PTX3000 Packet Transport Router Hardware Guide

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PTX3000 Packet Transport Router Hardware Guide

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

YEAR 2000 NOTICE

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

END USER LICENSE AGREEMENT

Table of Contents

About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the PTX3000 Packet Transport Router.

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

RELATED DOCUMENTATION

- PTX3000 Quick Start
- PTX Series Interface Module Reference
- PTX3000 Packet Transport Router with Integrated Photonic Line Card

1

CHAPTER

Overview

PTX3000 System Overview

IN THIS SECTION

PTX3000 Description

IN THIS SECTION

The Juniper Networks PTX3000 Packet Transport Router is designed for large networks and network applications, such as those supported by ISPs and high-volume content providers.

Benefits of the PTX3000 Router

- Increased scalability—The PTX3000 scales to 8 Tbps in a single chassis, supporting up to 768 10-Gigabit Ethernet interfaces, 192 40-Gigabit Ethernet interfaces, and 80 100-Gigabit Ethernet interfaces, giving service providers the performance and scalability needed as networks grow. The purpose-built ASICs in the PTX3000 provide enhanced packet processing for both full IP functionality and MPLS transport, accommodating scale as traffic continues to increase and optimizing IP/MPLS transit functionality.

- Space efficiency—The compact form-factor of the PTX3000 meets ETSI 300 mm standards, thus meeting installation requirements for colocations, central offices, and regional networks in emerging markets and transport-focused environments.
- Always-on infrastructure base—The PTX3000 is engineered with full hardware redundancy for cooling, power, switch fabric, and host subsystems—either the Routing Engines and Control Boards or the Routing and Control Boards (RCBs) and RCB companion cards—allowing service providers to meet stringent service-level agreements across the core.
- Nondisruptive software upgrades—The Junos operating system on the PTX3000 supports high availability (HA) features such as graceful Routing Engine switchover (GRES), nonstop active routing (NSR), and unified in-service software upgrade (unified ISSU), providing software upgrades and changes without disrupting network traffic.
- Integrated deployment of optical and IP/MPLS—The optical transport options provided by the PTX3000 allow service providers to deploy a single router rather than deploying optical equipment and IP/MPLS routers separately, reducing network management requirements and operational complexities.

System Overview

The PTX3000 router occupies 22 rack units (22 U) and accommodates up to eight Flexible PIC Concentrators (FPCs), each of which supports one PIC. The PTX3000 also accommodates up to 16 *integrated photonic line cards* (*IPLC* base modules) or up to 8 base modules and 8 expansion modules. The IPLCs are installed in any of the FPC or PIC slots.

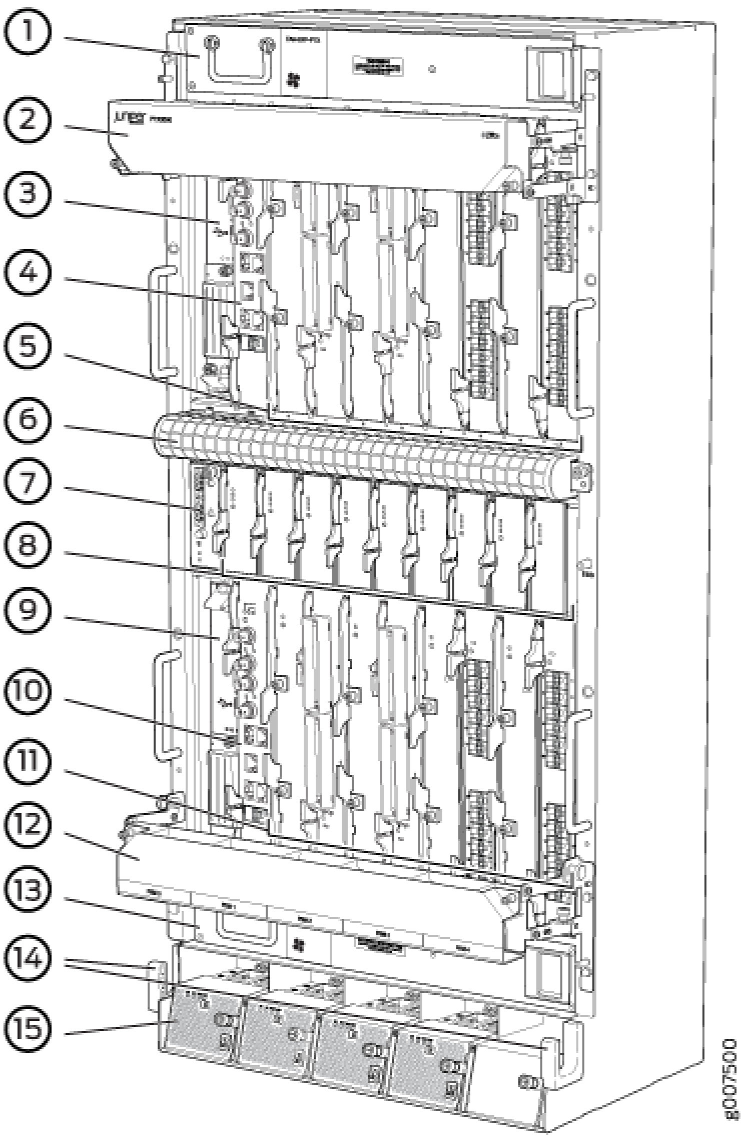
A PTX3000 with SIB-SFF-PTX-240 Switch Interface Boards (SIBs) and first-generation FPCs (FPC-SFF-PTX-P1 and FPC-SFF-PTX-T) provides up to 1.9 Tbps, full duplex (3.8 Tbps of any-to-any, nonblocking, half-duplex) switching. A PTX3000 with SIB3-SFF-PTX SIBs and third-generation FPCs (FPC3-SFF-PTX) provides up to 8 Tbps, full-duplex (16 Tbps of any-to-any, nonblocking, half-duplex) switching.

The system architecture cleanly separates control operations from packet forwarding operations. This design eliminates processing and traffic bottlenecks, permitting the PTX3000 to achieve high performance.

- Control operations are performed by the host subsystem, which runs Junos OS to handle routing protocols, traffic engineering, policy, policing, monitoring, and configuration management.
- Forwarding operations are performed by the Packet Forwarding Engines, which consist of hardware, including ASICs, designed by Juniper Networks. The ASICs are a definitive part of the hardware design, and enable the PTX3000 to achieve data forwarding rates that match current fiber-optic capacity.

Figure 1 on page 4 and Figure 2 on page 6 illustrate the front and rear of the PTX3000. Figure 3 on page 7 shows the FPC and PIC slots.

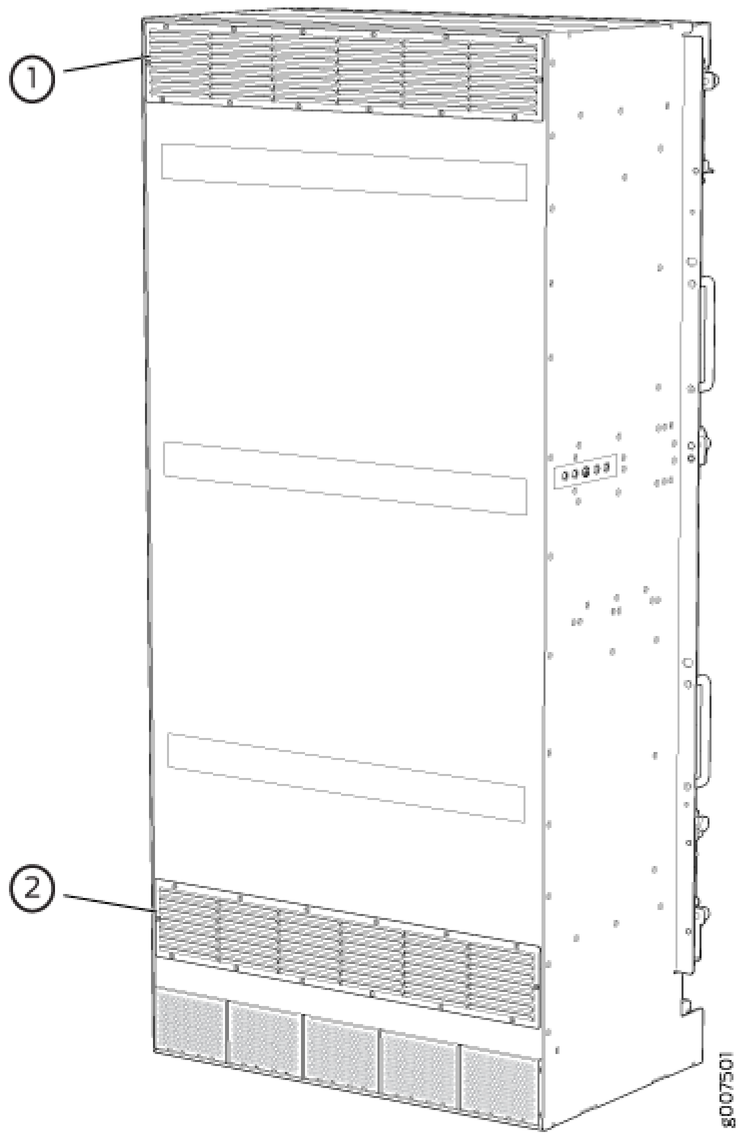
Figure 1: Front View of the PTX3000



1– Upper fan tray	9– Routing Engine or RCB companion card
2– Upper cable management system	10– Control Board or RCB
3– Routing Engine or Routing and Control Board (RCB) companion card	11– Lower card-cage FPC slots **8**, **10**, **12**, and **14** and PIC slots **9**, **11**, **13**, and **15**. See Figure 3 on page 7. The IPLCs are installed in any of the FPC or PIC slots.

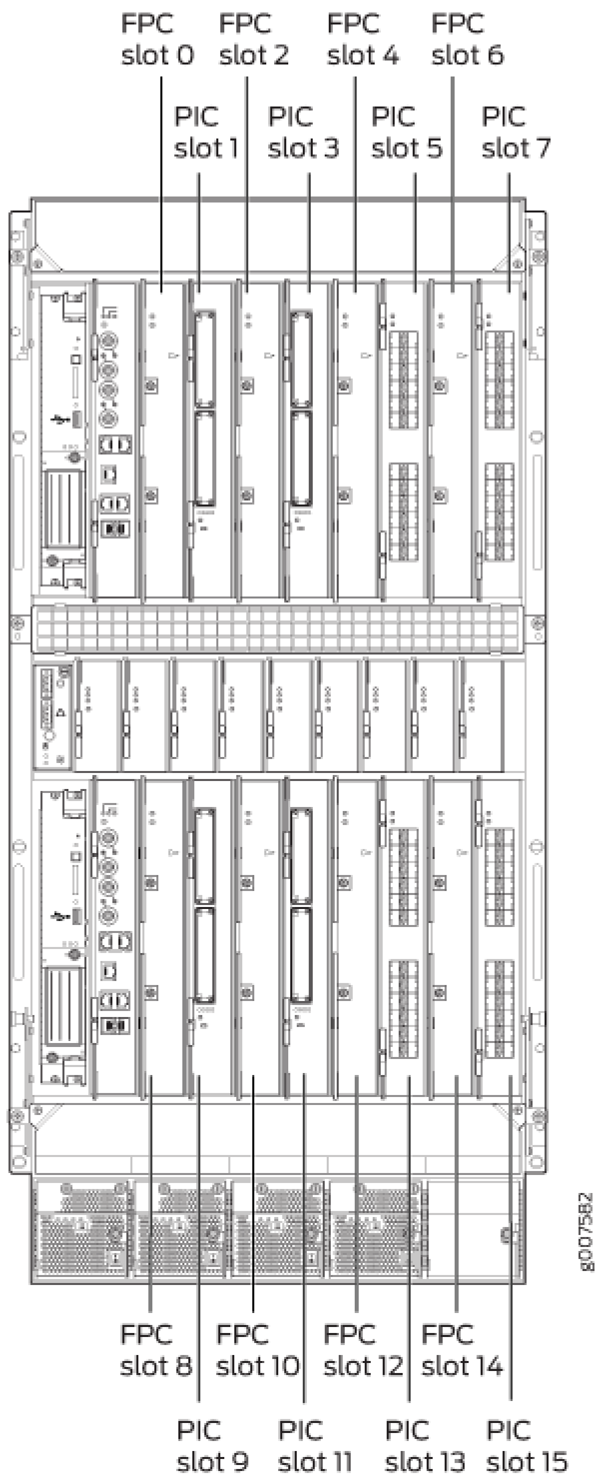
4– Control Board or Routing and Control Board (RCB)	12– Lower cable management system
5– Upper card-cage FPC slots **0**, **2**, **4**, and **6** and PIC slots **1**, **3**, **5**, and **7**. See Figure 3 on page 7. The IPLCs are installed in any of the FPC or PIC slots.	13– Lower fan tray
6– Air filter (intake)	14– Power cable management system
7– Craft interface	15– Power supply modules
8– Switch Interface Boards	

Figure 2: Rear View of the PTX3000



1– Upper air exhaust	2– Lower air exhaust

Figure 3: FPC and PIC Slots



NOTE: The IPLCs are installed in any of the FPC or PIC slots.

SEE ALSO

PTX3000 Chassis Description | 18
Overview of Installing the PTX3000 | 165

PTX3000 System Architecture Description

The PTX3000 has two main architectural components:

- Routing Engine—One or more Routing Engines provide Layer 3 routing services and network management.

  NOTE: The Routing and Control Board (RCB) provides Routing Engine and Control Board functionality in a single FRU.

- Packet Forwarding Engines—These high-performance, ASIC-based components provide packet forwarding, route lookups, and Layer 2 and Layer 3 packet switching. See "PTX3000 Packet Forwarding Engine Architecture" on page 8 for more information.

The Routing Engines and the Packet Forwarding Engines perform their primary tasks independently, but communicate through multiple links. This arrangement streamlines forwarding and routing control and runs Internet-scale backbone networks at high speeds.

PTX3000 Packet Forwarding Engine Architecture

IN THIS SECTION

The Packet Forwarding Engines provide packet switching, forwarding, and route lookup functions.

The Packet Forwarding Engines are implemented in ASICs that are physically located on the FPCs. The Packet Forwarding Engine architecture differs depending on which generation of FPCs and SIBs is installed in the PTX3000.

Packet Forwarding Engine Architecture with SIB-SFF-PTX-240 SIBs Installed

The SIB-SFF-PTX-240 SIBs support only first-generation FPCs (FPC-SFF-PTX-P1 and FPC-SFF-PTX-T).

Each first-generation FPC contains two Packet Forwarding Engines consisting of the following components:

- Lookup ASICs, which provide the route lookup function, control functions, Layer 2 and Layer 3 encapsulation and de-encapsulation, and manage the division and reassembly of packets within the PTX3000.
- Queuing and Memory Interface ASICs, which manage the buffering of data cells in memory and the queuing of notifications.

The fabric ASICs located on the SIB-SFF-PTX-240 SIBs act upon the fabric headers added by the Packet Forwarding Engine ASICs and manage the flow of data cells across the switch fabric.

NOTE: There is no second-generation FPC for the PTX3000.

Packet Forwarding Engine Architecture with SIB3-SFF-PTX SIBs Installed

The SIB3-SFF-PTX SIBs support the existing Packet Forwarding Engine architecture in the FPC-SFF-PTX-P1 FPC, and enable additional functionality by using the Packet Forwarding Engine architecture in third-generation FPCs (FPC3-SFF-PTX).

Each third-generation FPC contains two Packet Forwarding Engine ASICs that combine the functionality of first-generation Lookup and Queuing and Memory Interface ASICs to provide the route lookup function, control functions, and encapsulation and de-encapsulation; manage the division and reassembly of packets within the PTX3000; and manage packet buffering and queuing.

The Packet Forwarding Engine ASICs are supported by Hybrid Memory Cubes (HMCs), which are high-efficiency memory modules that provide an external memory interface for the Packet Forwarding Engine ASICs and support the buffering of data cells and virtual output queues (VOQs) for class of service (CoS).

The fabric ASICs located on the SIB3-SFF-PTX SIBs act upon the fabric headers added by the Packet Forwarding Engine ASICs and manage the flow of data cells across the switch fabric.

In addition to increased bandwidth and improvements to infrastructure features, the third-generation packet forwarding architecture also provides other improvements including enhancements to core IP routing and peering features, enhancements to label-switching router (LSR) features, and enhancements to label-edge router (LER) features. Some features are activated only when the `enhanced-mode` statement is configured at the `[edit chassis network-services]` hierarchy level.

NOTE:

- By default, the `enhanced-mode` statement is disabled.
- After you configure the `enhanced-mode` statement and commit the configuration, you must reboot the router.
- If the `enhanced-mode` statement is configured, only third-generation FPCs are powered on. Other FPCs cannot be brought online.
- If the `enhanced-mode` statement is not configured, third-generation FPCs do not support advanced features.

PTX3000 Hardware Component Overview

The PTX3000 supports the components in Table 1 on page 10 listed in alphabetic order.

Table 1: PTX3000 Hardware Components

Component	Spare Model Number	Hardware Label	CLI Output	Description
Air filter	FLTR-SFF-PTX-S	–	–	"PTX3000 Cooling System Description" on page 29
Backplane	–	–	`Backplane`	"PTX3000 Backplane Description" on page 22
Cable management system	–	–	–	"PTX3000 Cable Management System" on page 22

Table 1: PTX3000 Hardware Components *(Continued)*

Component	Spare Model Number	Hardware Label	CLI Output	Description
Chassis	CHAS-MP-PTX3000-S	–	`PTX3000`	"PTX3000 Chassis Description" on page 18
Control Board	CB-SFF-PTX-S	**CB-SFF-PTX**	`Control Board`	"PTX3000 Control Board Description" on page 62
Craft interface	FPD-SFF-PTX-S	–	`Front Panel Display`	"PTX3000 Craft Interface Description" on page 25
Fan tray	FAN-SFF-PTX-S	**FAN-SFF-PTX**	`Fan Tray`	"PTX3000 Cable Management System" on page 22
FPC	FPC-SFF-PTX-P1-A	**FPC-SFF-PTX-P1**	`FPC`	"PTX3000 FPC Description" on page 92
	FPC-SFF-PTX-T	**FPC-SFF-PTX-T**	`FPC-T`	
	FPC3-SFF-PTX	**FPC3-SFF-PTX-U1**	`FPC3-SFF-PTX-1X`	
	SFF-SLOT-BLNK **NOTE**: This blank panel is also used to cover empty FPC and PIC slots.	–	–	

Table 1: PTX3000 Hardware Components *(Continued)*

Component	Spare Model Number	Hardware Label	CLI Output	Description
Front doors	PTX3000-DOOR-S	–	–	**NOTE:** See "Installing the Front Doors on a PTX3000" on page 220 for information about installing the front doors on the chassis.
PIC	See the PTX Series Interface Module Reference for information about the PICs supported on the PTX3000.			"PTX3000 PIC Description" on page 103
IPLC	PTX-IPLC-B-32	**PTX-IPLC-B-32**	`OPT3-SFF-PTX`	"PTX3000 IPLC Description" on page 115
	PTX-IPLC-E-32	**PTX-IPLC-E-32**	–	"PTX3000 IPLC Description" on page 115
Power supply modules	PSM-SFF-PTX-DC-S	–	`DC 12V Power Supply`	"PTX3000 Power System Description" on page 36 **NOTE**: See "PTX3000 DC Power Cable and Lugs Specifications" on page 50 and "PTX3000 AC Power Cord Specifications" on page 47 for information about supported power cables and cords.
	PSM-SFF-PTX-AC-S	–	`AC 12V Power Supply`	
	SFF-PSM-BLNK	–	–	
Routing Engine	RE-DUO-C2600-16G-S	–	`RE-DUO-2600`	"PTX3000 Routing Engine Description" on page 55
Routing and Control Board (RCB)	RCB-PTX-X6-32G	**RCBPTX**	`RE-PTX-2X00x6`	"PTX3000 Routing and Control Board Description" on page 67

Table 1: PTX3000 Hardware Components *(Continued)*

Component	Spare Model Number	Hardware Label	CLI Output	Description
RCB companion card	RCB-CC	RCB-CC	`PTX3K CMPN RCB`	"PTX3000 Routing and Control Board Companion Card Description" on page 78
Shipping container	PKG-PTX3000-S	–	–	**NOTE**: See "Packing the PTX3000 for Shipment" on page 438 for information about using the shipping container to ship the PTX3000.
Switch Interface Board (SIB)	SIB-SFF-PTX-240-S	**SIB-SFF-PTX-240**	`SIB`	"PTX3000 Switch Interface Board Description" on page 87
	SIB3-SFF-PTX-S	**SIB3-SFF-PTX**	`SIB3-SFF-PTX`	

PTX3000 Component Redundancy

The PTX3000 is designed so that no single point of failure can cause the entire system to fail. The following major hardware components are redundant:

- Switch Interface Boards (SIBs)—The PTX3000 has nine SIBs. All nine SIBs are active and can sustain full throughput rate. The fabric plane can tolerate one SIB failure without any loss of performance. See "PTX3000 Switch Interface Board Description" on page 87.

- Host subsystem—The host subsystem consists of either a Routing Engine functioning together with a Control Board, or a Routing and Control Board (RCB) and RCB companion card. Depending on your configuration, each host subsystem requires the following components to operate:

  - A Routing Engine installed in a slot adjacent to the Control Board

  - An RCB companion card installed in a slot adjacent to the RCB

  The PTX3000 can have one or two host subsystems. If two host subsystems are installed, one functions as the primary and the other functions as the backup. If the primary host subsystem (or either of its components) fails, the backup can take over as the primary. See "PTX3000 Host Subsystem Description" on page 54.

> **NOTE**: The primary and backup host subsystems must be the same type during normal operation. For example, if the primary host subsystem is an RCB with RCB companion card, the backup host subsystem must also be an RCB with RCB companion card.

If the Routing Engines or RCBs are configured for *nonstop active routing* (NSR), the backup Routing Engine or RCB automatically synchronizes its configuration and state with the primary Routing Engine or RCB. Any update to the primary Routing Engine or RCB state is replicated on the backup Routing Engine or RCB. If the backup Routing Engine or RCB assumes primary role, packet forwarding continues through the PTX3000 without interruption. For more information about NSR, see the High Availability User Guide.

- Power system—The PTX3000 has five power supply module (PSM) slots. PSM redundancy varies depending on the number of PSMs and the number of FPCs. See the "PTX3000 Power System Description" on page 36 for more information about power system redundancy.

- Cooling system—The cooling system has redundant components, which are controlled by the host subsystem. If one of the fans fails, the host subsystem increases the speed of the remaining fans to provide sufficient cooling for the PTX3000 indefinitely. See "PTX3000 Cooling System Description" on page 29.

PTX3000 Field-Replaceable Units

Field-replaceable units (FRUs) are PTX3000 components that can be replaced at the customer site. Replacing most FRUs requires minimal PTX3000 downtime.

- Hot-removable and hot-insertable FRUs—You can remove and replace these components without powering off the PTX3000 or disrupting the routing functions.

- Hot-pluggable FRUs—You can remove and replace these components without powering off the PTX3000, but the routing functions of the system are interrupted when the component is removed.

- Other FRUs require that you power off the Routing Engine or Routing and Control Board (RCB).

Table 2 on page 15 lists the FRUs for the PTX3000.

Table 2: Field-Replaceable Units

Component	Effect of Replacement	For More Information
Air filter	Hot-removable and hot-insertable	"Replacing a PTX3000 Chassis Air Filter" on page 243
Craft interface	Hot-removable and hot-insertable	"Replacing a PTX3000 Craft Interface" on page 238
Backup Control Boards Primary Control Boards if nonstop active routing is configured	Hot-removable and hot-insertable	"Replacing a PTX3000 Control Board" on page 283
Primary Control Board if nonstop active routing is not configured Nonredundant Control Board	Hot-pluggable	
Fan trays	Hot-removable and hot-insertable	• "Replacing a PTX3000 Upper Fan Tray" on page 250 • "Replacing a PTX3000 Lower Fan Tray" on page 255
Flexible PIC Concentrators (FPCs)	Hot-removable and hot-insertable	"Replacing a PTX3000 FPC" on page 318
PICs	Hot-removable and hot-insertable	"Replacing a PTX3000 PIC" on page 324
Integrated photonic line cards (IPLCs)	Hot-removable and hot-insertable	"Replacing a PTX3000 PIC" on page 324

Table 2: Field-Replaceable Units *(Continued)*

Component	Effect of Replacement	For More Information
Power supply modules (PSMs)	Hot-removable and hot-insertable	• "Replacing a PTX3000 DC PSM" on page 264 • "Replacing a PTX3000 DC Power Cable" on page 266 • "Replacing a PTX3000 AC PSM" on page 262
Backup Routing Engine Primary Routing Engine if nonstop active routing is configured	Hot-removable and hot-insertable	"Replacing a PTX3000 C2600 Routing Engine" on page 271
Primary Routing Engine if nonstop active routing is not configured Nonredundant Routing Engine	Hot-pluggable	
Backup RCB Primary RCB if nonstop active routing is configured	Hot-removable and hot-insertable	"Replacing the PTX3000 RCB" on page 288
Primary RCB if nonstop active routing is not configured Nonredundant RCB	Hot-pluggable	
Backup RCB companion card Primary RCB companion card if nonstop active routing is configured Nonredundant RCB companion card	Hot-removable and hot-insertable	"Replacing the PTX3000 RCB Companion Card" on page 296
Primary RCB companion card if nonstop active routing is not configured	Hot-pluggable	

Table 2: Field-Replaceable Units *(Continued)*

Component	Effect of Replacement	For More Information
CompactFlash card in a Routing Engine	Power off the Routing Engine	"Replacing a CompactFlash Card in a PTX3000 Routing Engine" on page 276
Solid-state drive (SSD) in a Routing Engine	Power off the Routing Engine	"Replacing a Solid-State Drive in a PTX3000 Routing Engine" on page 279
Solid-state drive (SSD) in an RCB	Power off the RCB	"Replacing the SSD Cards in the PTX3000 RCB" on page 293
Switch Interface Boards (SIBs) if at least eight other SIBs are operational	Hot-removable and hot-insertable	"Replacing a PTX3000 Switch Interface Board" on page 307
SIBs if fewer than eight SIBs are operational	Hot-pluggable	

PTX3000 Chassis

IN THIS SECTION

PTX3000 Chassis Description

The PTX3000 chassis is a rigid sheet metal structure that houses all the other hardware components (see Figure 4 on page 19 and Figure 5 on page 20). The chassis measures 38.5 in. (97.8 cm) high, 10.6 in. (26.9 cm) deep, and 17.6 in. (44.7 cm) wide. The chassis can be installed into many types of racks or cabinets.

The chassis includes the following features:

- Front-mounting flanges for mounting in a four-post rack or cabinet.
- Center-mounting metal brackets for center-mounting in an open-frame rack.
- Handles on each side to facilitate positioning the PTX3000 in the rack.

> **CAUTION**: Do not use the handles to lift the PTX3000.

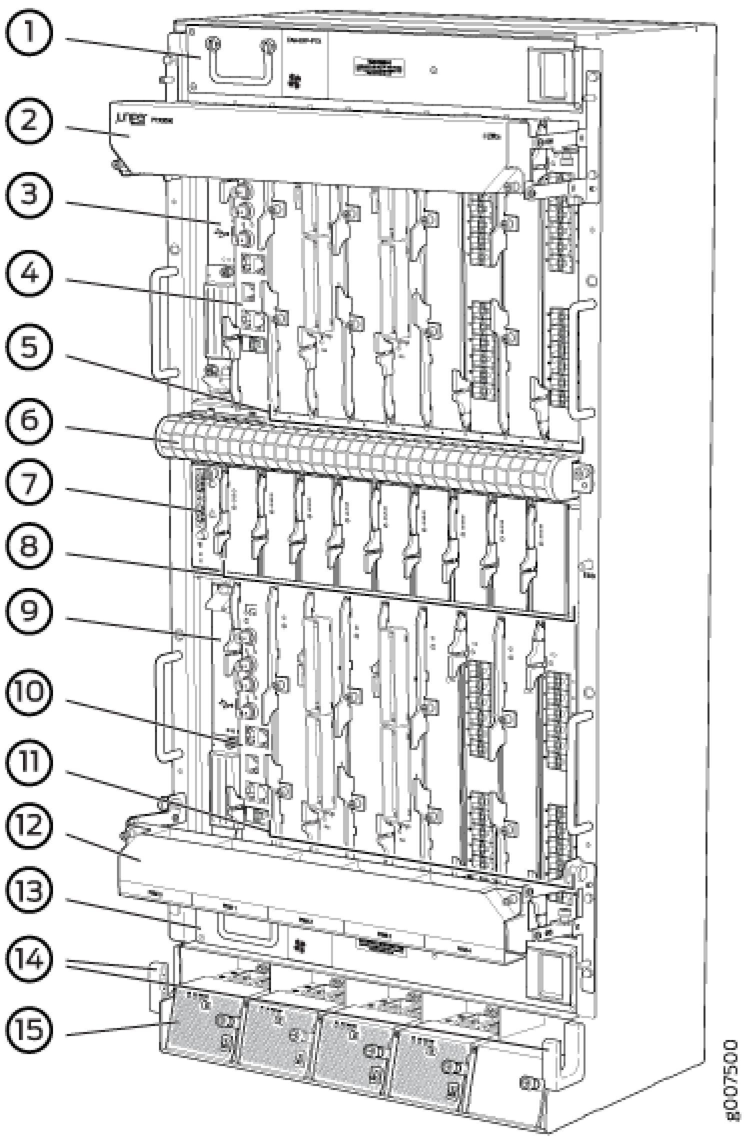
- One electrostatic discharge (ESD) point, a banana plug receptacle (see Figure 6 on page 21).

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

> **WARNING**: The PTX3000 must be connected to earth ground during normal operation.

Figure 4 on page 19 and Figure 5 on page 20 illustrate the front and rear of a PTX3000 chassis.

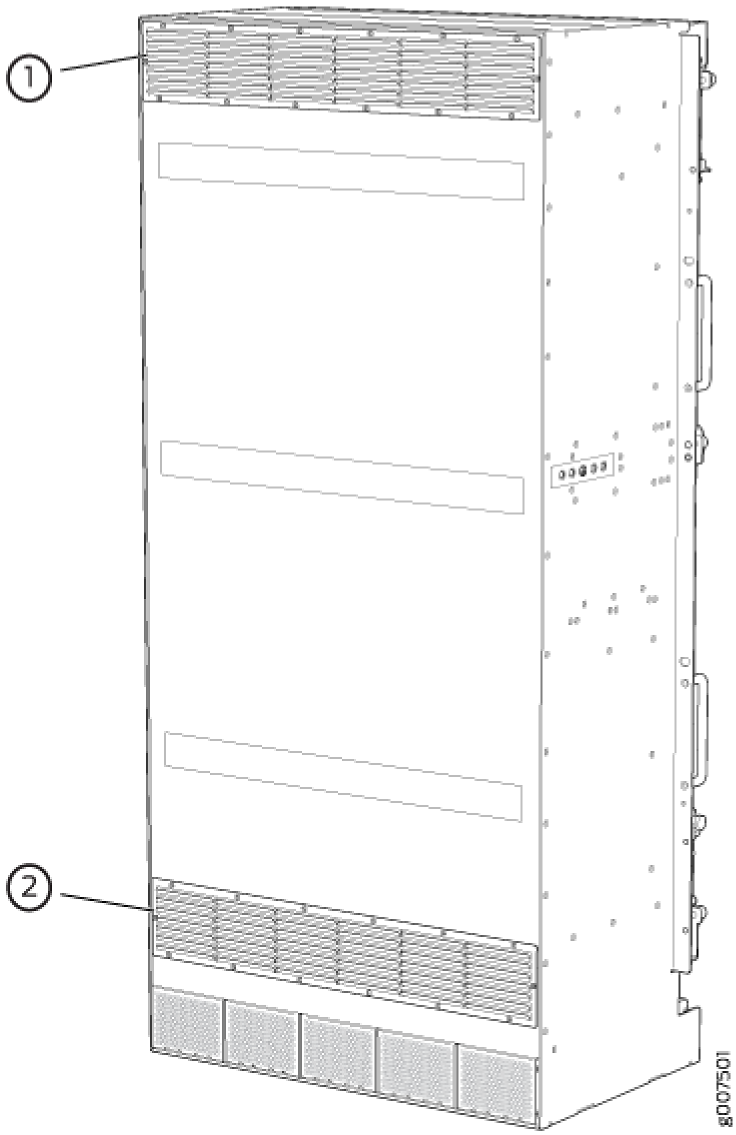
Figure 4: Front View of the PTX3000



1– Upper fan tray	9– Routing Engine or RCB Companion Cards
2– Upper cable management system	10– Control Board or RCB
3– Routing Engine or Routing and Control Board (RCB) companion card	11– FPC slots **8**, **10**, **12**, and **14** and PIC slots **9**, **11**, **13**, and **15** The IPLCs are installed in any of the FPC or PIC slots.
4– Control Board or Routing and Control Board (RCB)	12– Lower cable management system

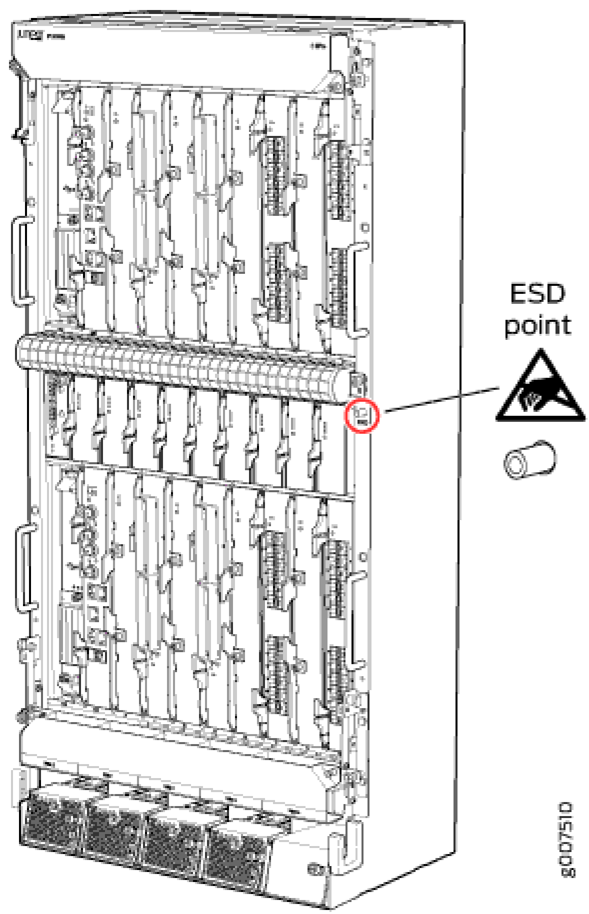
5– FPC slots **0**, **2**, **4**, and **6** and PIC slots **1**, **3**, **5**, and **7** The integrated photonic line cards (IPLCs) are installed in any of the FPC or PIC slots.	13– Lower fan tray
6– Air filter (intake)	14– Power cable management system
7– Craft interface	15– Power supply modules
8– Switch Interface Boards (SIBs	

Figure 5: Rear View of the PTX3000



1– Upper air exhaust	2– Lower air exhaust

Figure 6: ESD Point on the PTX3000



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Rack Requirements for the PTX3000 | 143

PTX3000 Backplane Description

The backplane is located in the rear of the card cage that contains the chassis components. All components install into the backplane from the front of the chassis. The backplane performs the following major functions:

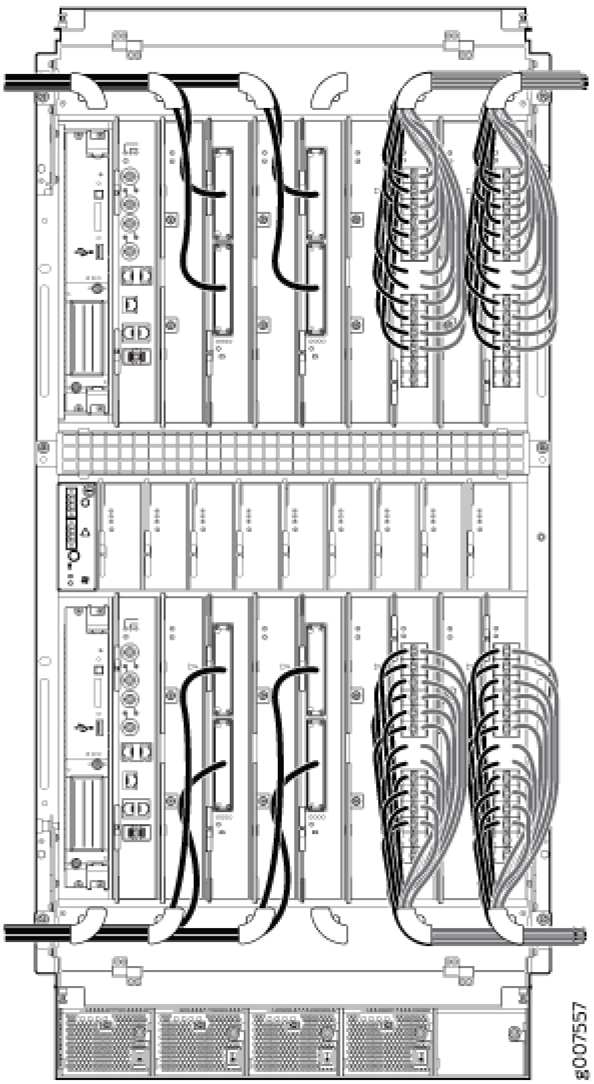
- Provides a data path—Data packets are transferred across the backplane from the Packet Forwarding Engine on the originating FPC to the SIBs, and from the SIBs across the backplane to the Packet Forwarding Engine on the destination FPC.
- Enables power distribution—The power supply modules (PSMs) are connected to the backplane. The backplane distributes power to all the PTX3000 components.
- Provides a signal path—The backplane provides the signal path to the FPCs, SIBs, host subsystem, and other system components for monitoring and control of the system.

PTX3000 Cable Management System

The cable management system for the PTX3000 organizes, supports, and provides strain relief for the PIC or IPLC cables. The PIC or IPLC cables are routed from the cable management system to both sides of the PTX3000, keeping the cables organized and securely in place. The cable management system adds 1.9 in. (4.8 cm) to the depth of the chassis. Figure 7 on page 23 shows the cable management system.

NOTE: We recommend that you use the cable management system to maintain the cable bend radius.

Figure 7: Cable Management System



The cable management system consists of an upper cable management system (Figure 8 on page 24) above the PICs in slots **1**, **3**, **5**, and **7**, and a lower cable management system (Figure 9 on page 24) below the PICs in slots **9**, **11**, **13**, and **15**. In addition, a power cable management system manages the DC power cables (see "PTX3000 Description" on page 2).

Figure 8: Upper Cable Management System

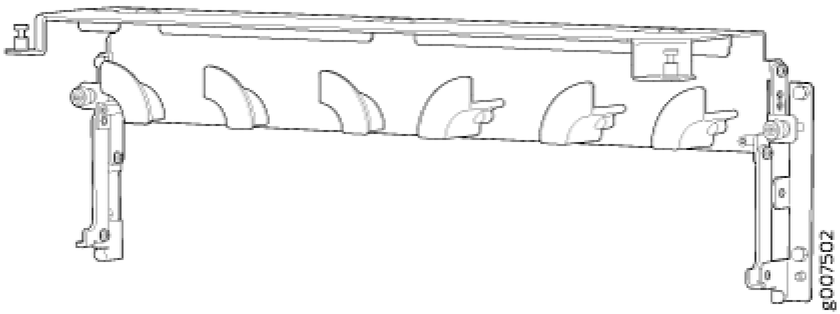
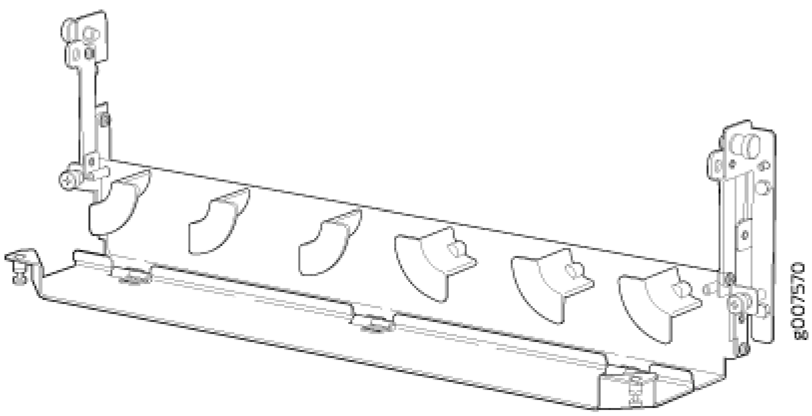


Figure 9: Lower Cable Management System



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PTX3000 PIC Description | **103**

PTX3000 IPLC Description | **115**

Maintaining the PTX3000 PICs and PIC Cables | **322**

PTX3000 Craft Interface Description

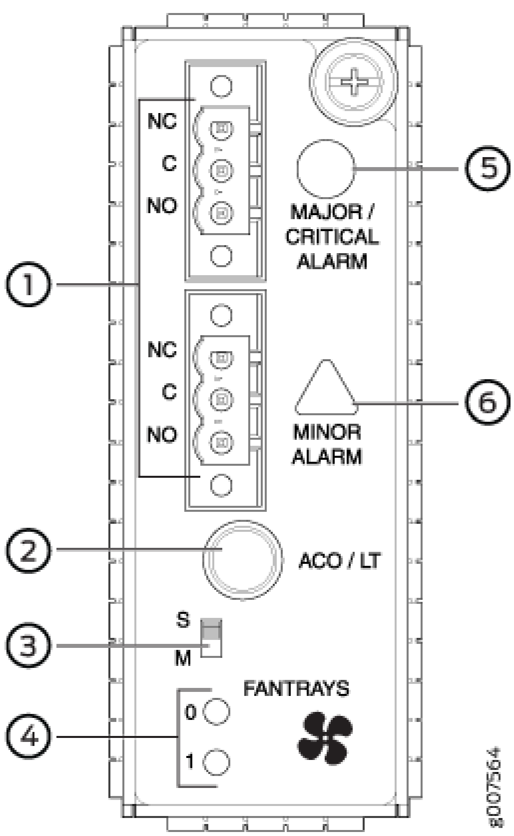
IN THIS SECTION

The craft interface—sometimes called a front panel display (FPD)—is located to the left of Switch Interface Boards (SIBs). It is hot-insertable and hot-removable. The craft interface allows you to view status information about the PTX3000 at a glance.

Craft Interface Components

Figure 10 on page 25 shows the craft interface.

Figure 10: Craft Interface



1– Alarm relay contacts	4– **FANTRAYS** LEDs labeled **0** and **1**
2– **ACO/LT** button	5– **MAJOR/CRITICAL ALARM** LED
3– **S** and **M** configuration switch	6– **MINOR ALARM** LED

The front panel of the craft interface contains:

- Alarm relay contacts, which connect the router to external alarm devices. Whenever a system condition triggers either the red (major) or yellow (minor) alarm on the craft interface, the alarm relay contacts are also activated. The terminal blocks that plug into the alarm relay contacts are supplied with the router.
- The **S** and **M** configuration switch, which must be set to **S**
- **ACO/LT** button. To deactivate red and yellow alarms, press the button labeled ACO/LT (alarm cutoff/ lamp test). Causes all LEDs on the craft interface to light (for testing purposes), when pressed and held.
- LEDs

PTX3000 Craft Interface LEDs

IN THIS SECTION

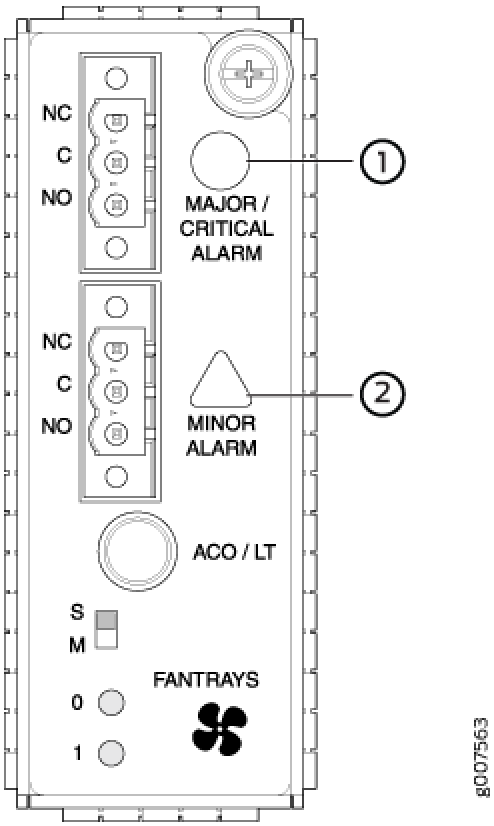
Alarm LEDs

Two large alarm LEDs are located on the craft interface (see Figure 11 on page 27). Both LEDs can be lit simultaneously.

- The circular red LED lights to indicate a critical condition that can result in a system shutdown.

- The triangular yellow LED lights to indicate a less severe condition that requires monitoring or maintenance.

Figure 11: Craft Interface Alarm LEDs



1— **MAJOR/CRITICAL ALARM** LED	2— **MINOR ALARM** LED

Table 3 on page 27 describes the alarm LEDs.

Table 3: Alarm LEDs on the PTX3000 Craft Interface

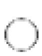
Shape	Color	State	Description
	Red	On steadily	Critical alarm LED—Indicates a critical condition that can cause the PTX3000 to stop functioning. Possible causes include component removal, failure, or overheating.

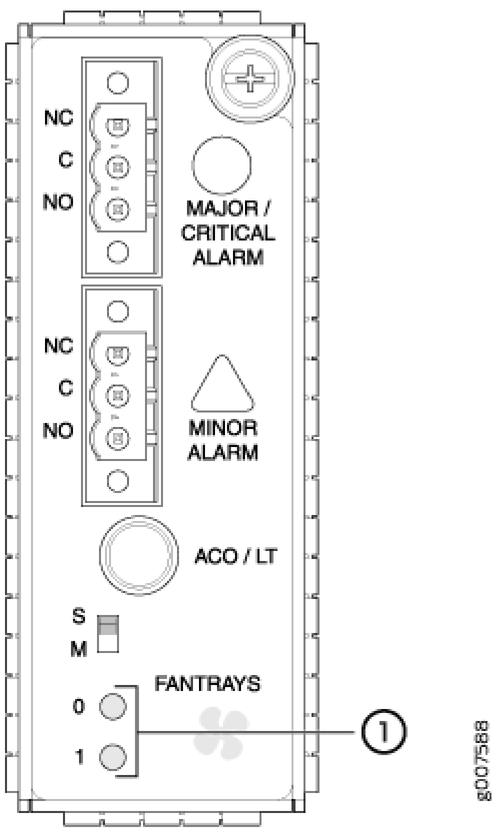
Table 3: Alarm LEDs on the PTX3000 Craft Interface *(Continued)*

Shape	Color	State	Description
	Yellow	On steadily	Warning alarm LED—Indicates a serious but nonfatal error condition, such as a maintenance alert or a significant increase in component temperature.

Fan Tray LEDs

One status LED for each fan tray—labeled **0** and **1**—is located on the craft interface (Figure 12 on page 28).

Figure 12: Craft Interface Fan Tray LEDs



1— **FANTRAYS** LEDs labeled **0** and **1**	

Table 4: Fan Tray LEDs on the Craft Interface

Color	State	Description
Green	On steadily	The fan tray is functioning normally.
Red	On steadily	The fan tray has failed.
–	Off	The fan tray is offline or absent.

PTX3000 Cooling System

IN THIS SECTION

PTX3000 Cooling System Description

IN THIS SECTION

In addition to the fan trays described below, each power supply module (PSM) contains one fan that cools the PSM.

Fan Trays

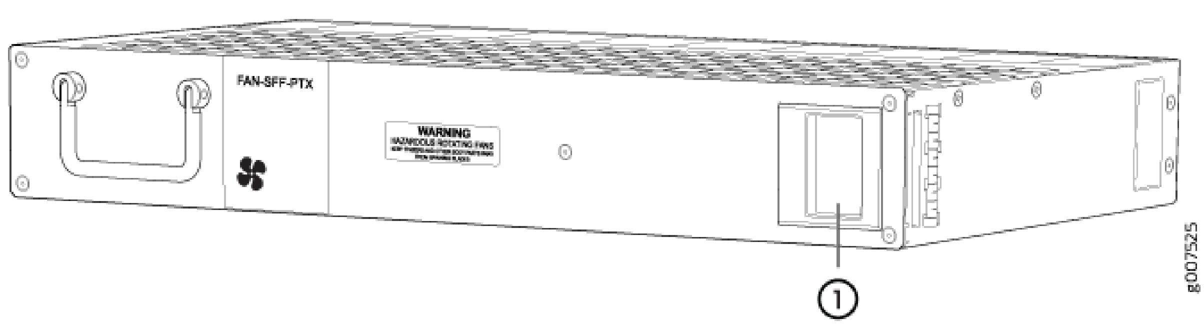
The cooling system contains two interchangeable, horizontal fan trays (Figure 13 on page 30). Each fan tray contains 14 fans. If a fan fails or the temperature rises above the temperature thresholds, the speed of the remaining fans in the zone is automatically adjusted to keep the temperature within the acceptable range. All fan trays are hot-insertable and hot-removable.

> **TIP**: Use the `show chassis temperature-thresholds` to show the temperature thresholds for various components.

The PTX3000 contains two cooling zones.

- Cooling zone 0—The upper fan tray (**Fan Tray 0**) cools the following components: the Routing Engine or RCB companion card installed in slot **RE0**, the Control Board or RCB installed in slot **CB0**, and the FPCs, PICs, and IPLCs in the upper card cage.
- Cooling zone 1—The lower fan tray (**Fan Tray 1**) cools the following components: the Routing Engine or RCB companion card installed in slot **RE1**, the Control Board or RCB installed in slot **CB1**, SIBs, and the FPCs, PICs, and IPLCs in the lower card cage.

Figure 13: Fan Tray



1– Fan tray release latch	

Airflow

Figure 14 on page 31 shows the airflow through a chassis that has first-generation FPCs (FPC-SFF-PTX-P1-A and FPC-SFF-PTX-T) installed. Figure 15 on page 32 shows the airflow through a chassis that has third-generation FPCs (FPC3-SFF-PTX) installed. Third-generation FPCs have air vents on the

FPC faceplates to allow additional airflow. Figure 16 on page 33 shows the airflow when four chassis are installed in a 4-post rack.

Figure 14: Airflow Through the Chassis with First-Generation FPCs Installed

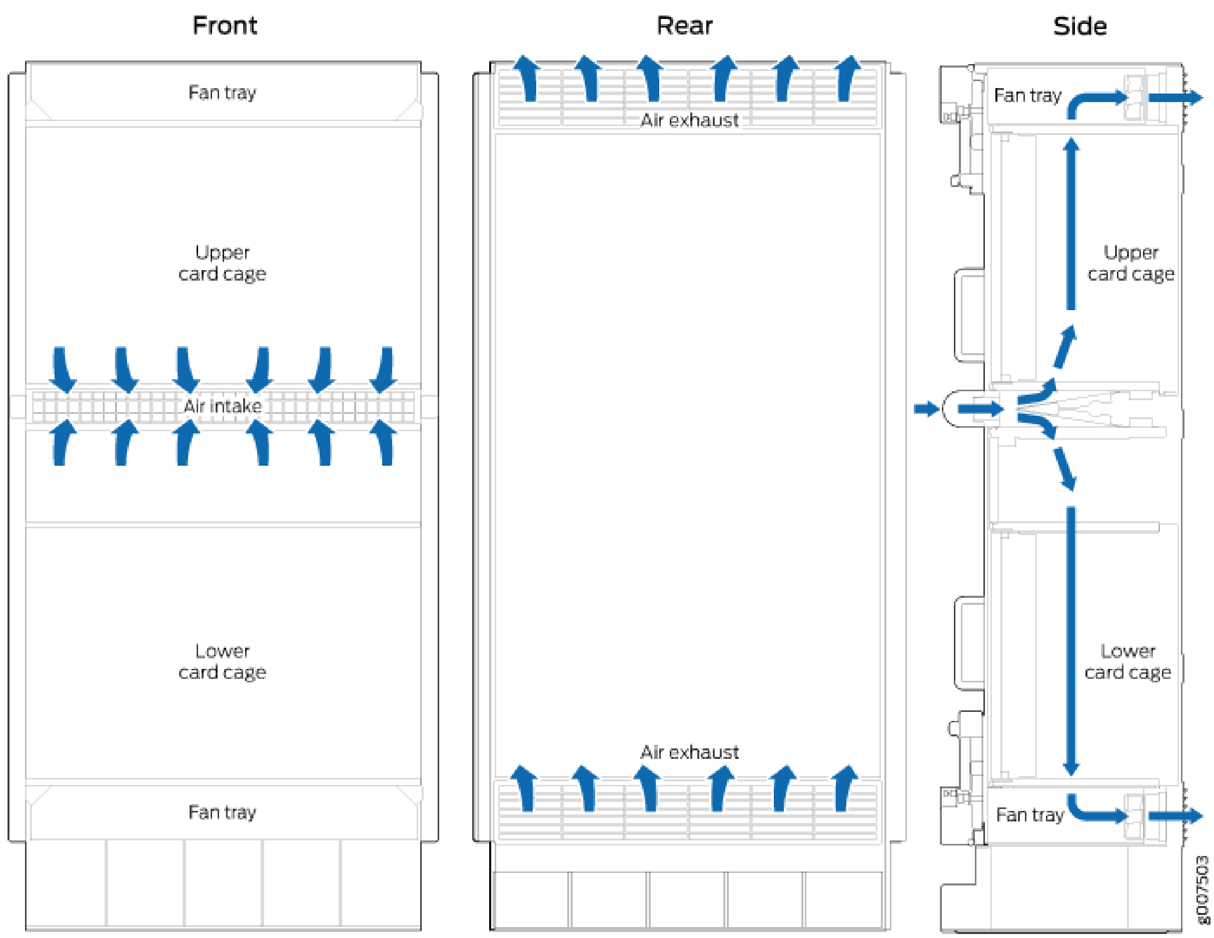


Figure 15: Airflow Through the Chassis with Third-Generation FPCs Installed

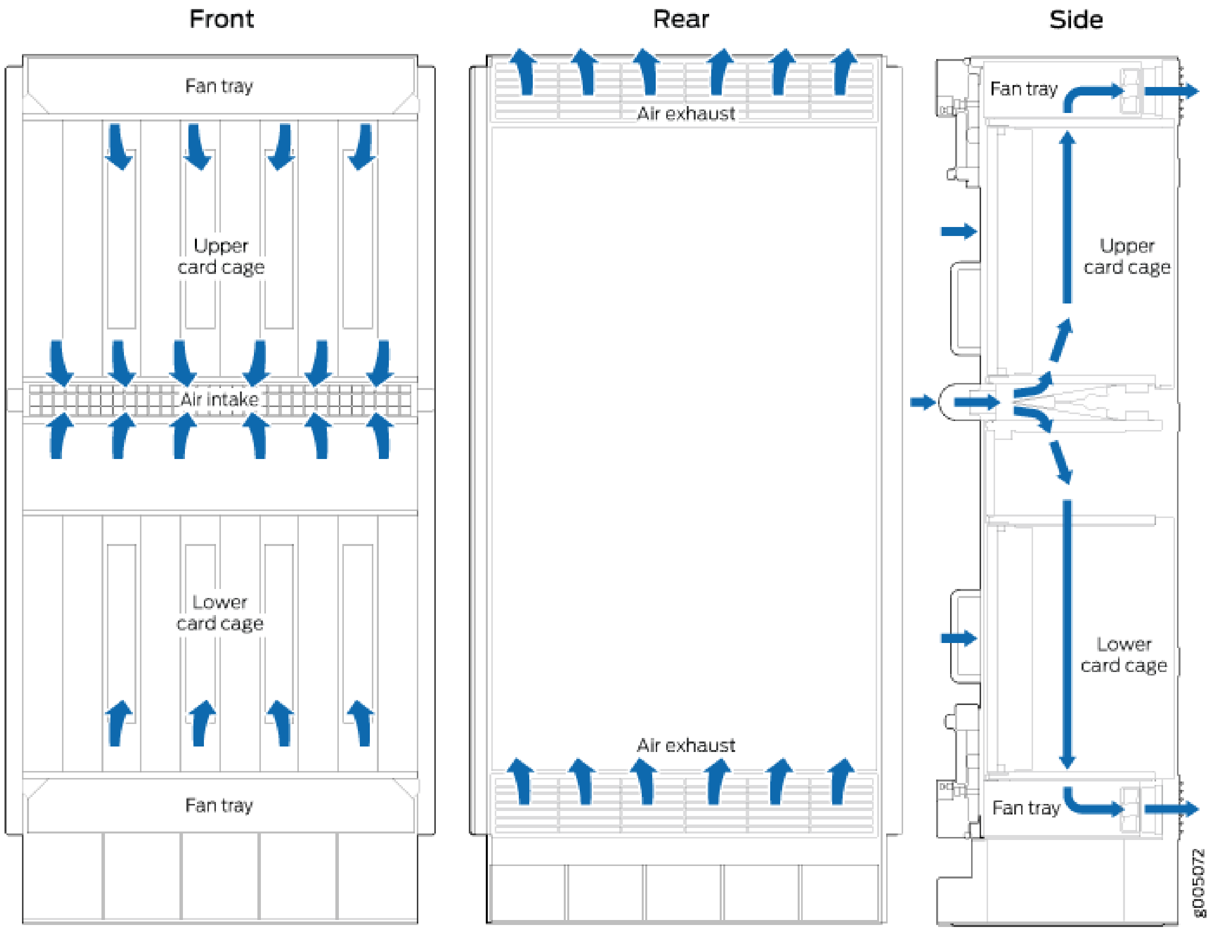
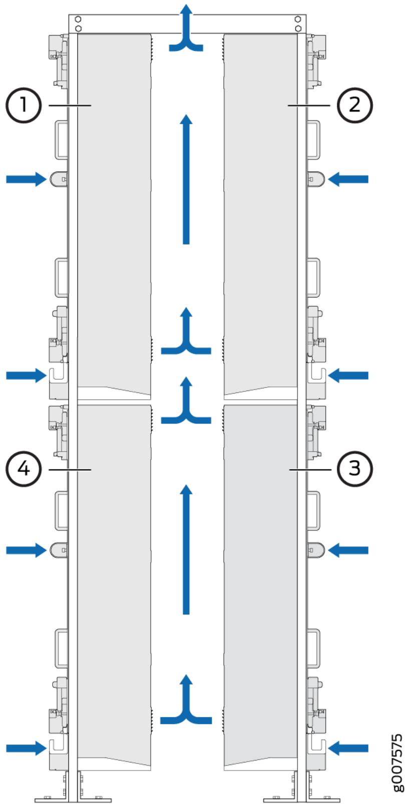


Figure 16: Side View of Airflow for Four Chassis in a 4-Post Rack

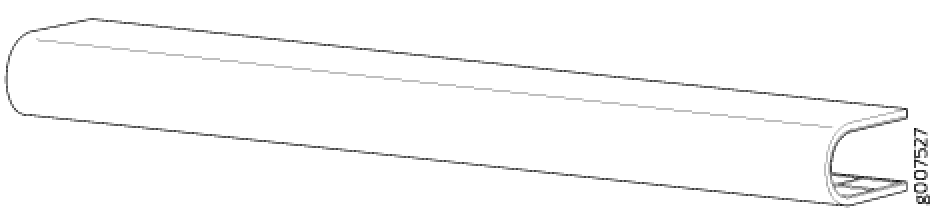


1– Upper chassis 1	3– Lower chassis 1
2– Upper chassis 2	4– Lower chassis 2

Air Filter

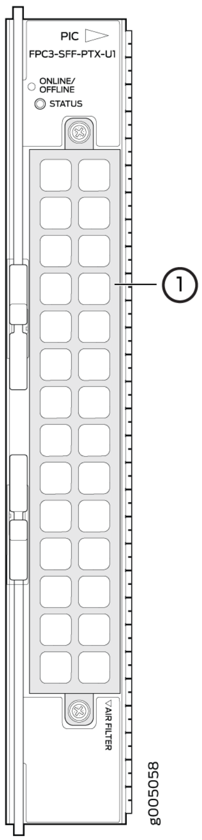
The cooling system contains an air filter (Figure 17 on page 33), located in the front of the chassis above the Switch Interface Boards (SIBs). The air filter is hot-insertable and hot-removable.

Figure 17: Chassis Air Filter



The third-generation FPCs (FPC3-SFF-PTX) have air vents on the FPC faceplate, and have a field-replaceable air filter cover over the air vents (see Figure 18 on page 34). First-generation FPCs do not have vents that require air filters.

Figure 18: Third-Generation FPC Air Filter

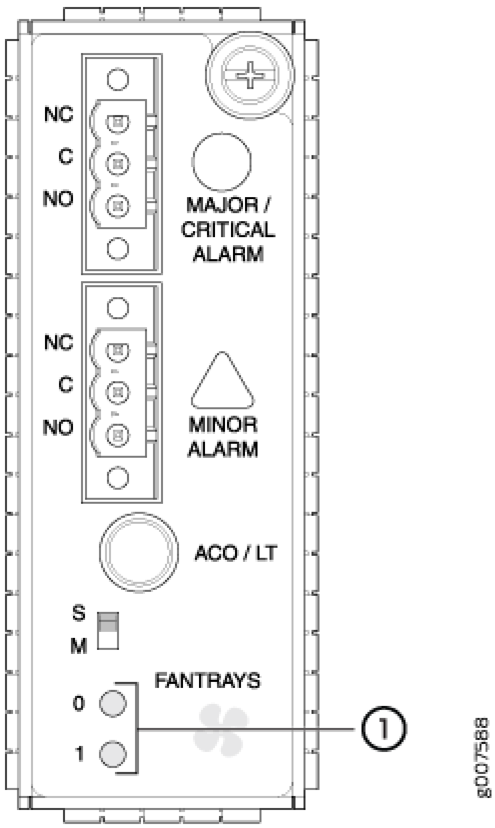


1– Air filter cover	

PTX3000 Fan Tray LEDs

The LEDs for the fan trays are located on the craft interface (Figure 19 on page 35). See "PTX3000 Craft Interface LEDs" on page 26 for more information.

Figure 19: Craft Interface Fan Tray LEDs



1– **FANTRAYS** LEDs labeled **0** and **1**

SEE ALSO

PTX3000 Craft Interface Description | 25

RELATED DOCUMENTATION

PTX3000 Clearance Requirements for Airflow and Hardware Maintenance | 135
Maintaining PTX3000 Cooling System Components | 241

PTX3000 Power System

IN THIS SECTION

The PTX3000 supports single-phase AC power supply modules (PSMs) or DC PSMs.

PTX3000 Power System Description

IN THIS SECTION

PSM Slots

The PTX3000 has five power supply module (PSM) slots, located in the lower front of the chassis. (See "PTX3000 Chassis Description" on page 18.) Each PSM is inserted into one of five slots—labeled **0** through **4**. For fully redundant power to the FPCs, the minimum number of PSMs must be installed as shown in Table 5 on page 37 and both inputs on each required PSM must be connected and operational.

Table 5: Minimum Number of Power Supply Modules for Redundant Power

Number of PSMs	Redundant Power to the FPCs and PICs
2	Redundant power to a maximum of one FPC and one PIC, or one IPLC
3	Redundant power to a maximum of four FPCs and four PICs, or four IPLCs
4 or 5	Redundant power to a maximum of eight FPCs and eight PICs, or 16 IPLCs (or up to 8 IPLC base modules and 8 IPLC expansion modules)

When the PTX3000 is operating normally and the PSMs are switched on, load sharing between them occurs automatically. When one PSM fails or is turned off, the other PSMs immediately assume the electrical load for the system. When one PSM input fails or is disconnected on a PSM with redundant connections, the other input assumes the electrical load for that PSM.

NOTE: The PTX3000 power system redundancy is *N*+1. For DC PSMs, the input with the highest voltage provides all the power to that PSM. If the two input feeds are within 300 mV, load sharing between inputs might occur. For AC PSMs, by default, input 1 provides all the power to that PSM—there is no load sharing between inputs.

PSM Function

The PSMs provide connections for the DC power cables or AC power cords and for voltage configuration, regulation, and filtering. The PSMs connect to the backplane, which distributes the different output voltages to the other hardware components in the chassis, depending on their voltage requirements.

PSMs Supported

The PTX3000 supports the PSMs listed in Table 6 on page 38.

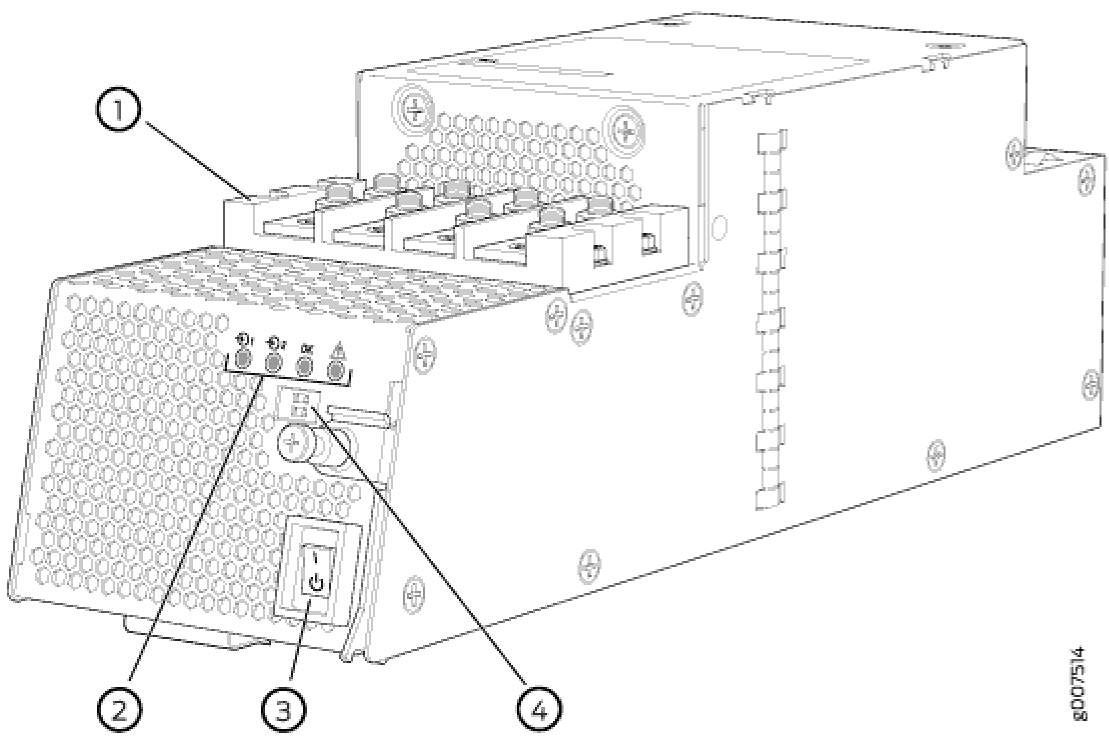
Table 6: Supported Power Supply Modules

Name	Spare Model Number	First Supported Junos OS Release
DC PSM	PSM-SFF-PTX-DC-S	13.2R2
AC PSM	PSM-SFF-PTX-AC-S	13.2R2

PTX3000 DC Power Supply Module Components

Figure 20 on page 38 shows the DC PSM.

Figure 20: DC PSM



1– DC input terminals	3– Power switch
2– Status LEDs	4– Input switches

Each DC PSM weighs 4.6 lb (2.1 kg) and has the following components.

- Two 60-A inputs. labeled input **1** and input **2**. Each input is labeled **RTN** and **–48 V** as shown in Figure 21 on page 40.

- DC PSM input switches as shown in Figure 22 on page 41.

- LEDs—labeled input
  (
) **1**, input
  (
) **2**, **OK**, and fault
  (
  ⚠
)—to monitor the status of the PSM.

- Power switch labeled (|) for the on position and
  (

⏻
) for the standby position.

Figure 21: DC PSM Inputs

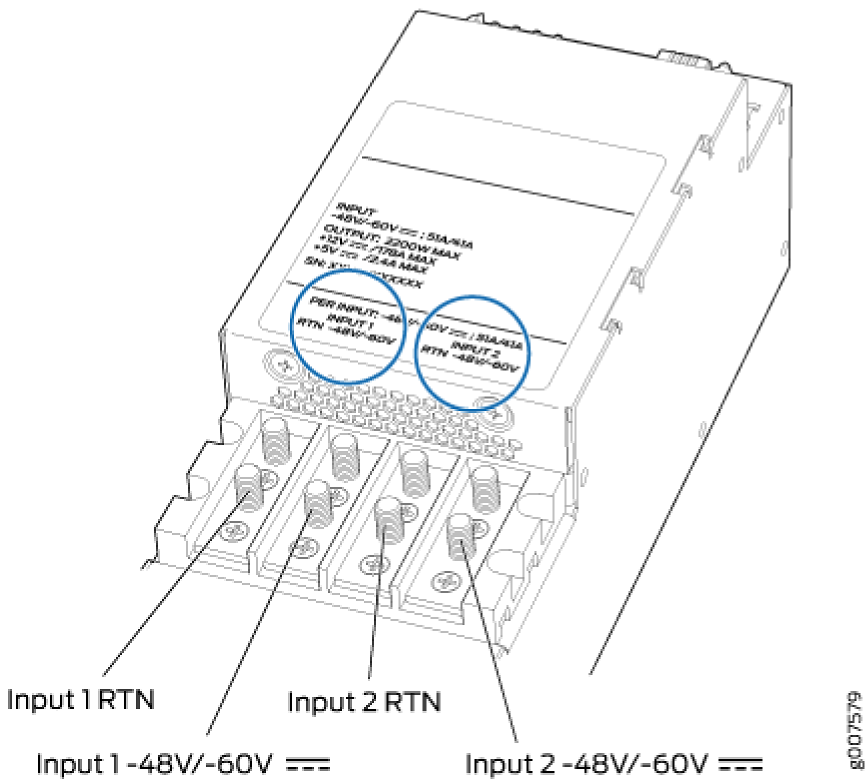
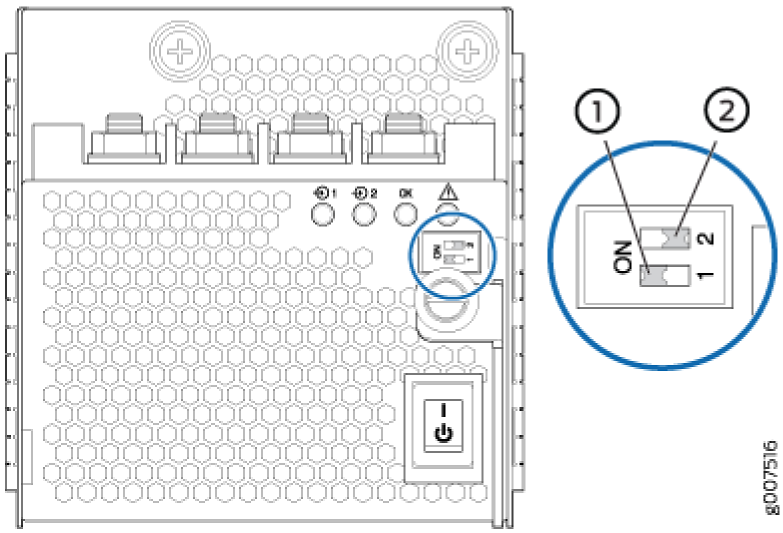


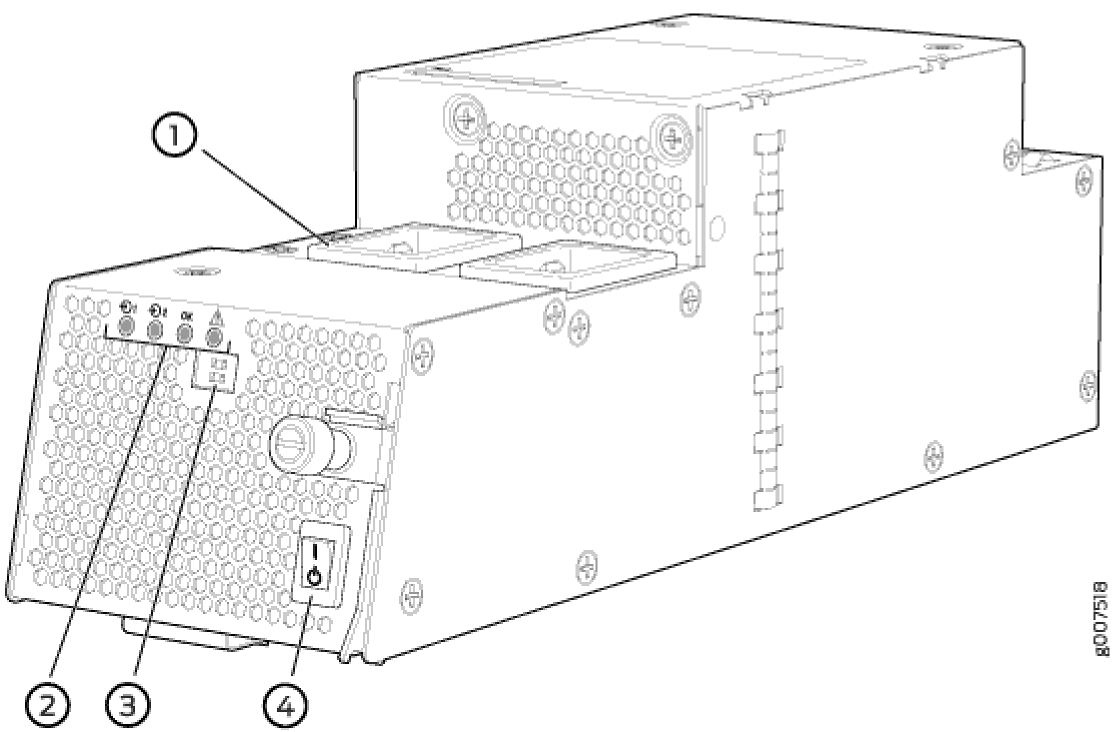
Figure 22: DC PSM Input Switches



PTX3000 AC Power Supply Module Components

Figure 23 on page 41 shows the AC PSM.

Figure 23: AC PSM

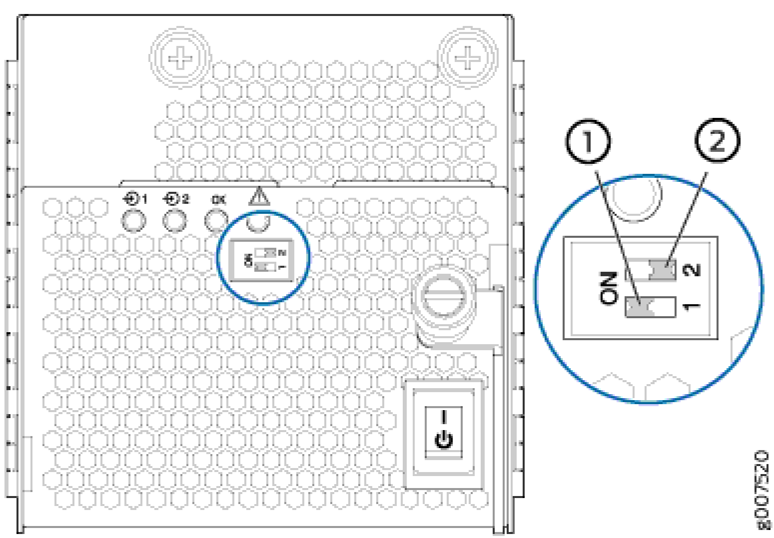


1– AC inputs	3– Input switches
2– LEDs	4– Power switch

Each AC PSM weighs 4.5 lb (2.0 kg) and has the following components.

- Two AC inputs labeled input **1**, and input **2**.
- AC PSM input switches as shown in Figure 24 on page 42.
- Power switch labeled (|) for the on position and
  (
  ⏻
) for the standby position.
- LEDs—labeled Input
  (
  ⊕
) **1**, Input
  (
  ⊕
) **2**, **OK**, and Fault
  (
  ⚠
)—to monitor the status of the PSM.

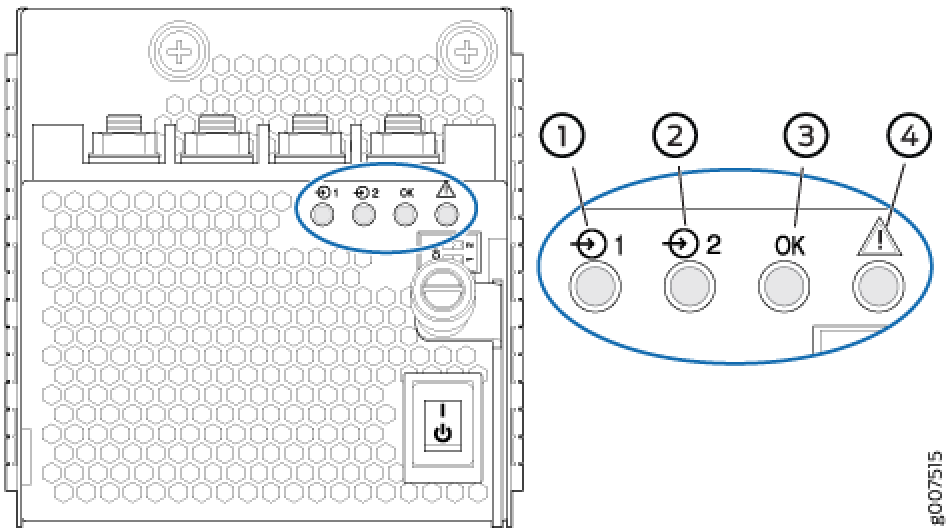
Figure 24: AC PSM Input Switches



PTX3000 Power Supply Module LEDs

Figure 25 on page 43 and Figure 26 on page 44 show the LEDs on the power supply module faceplates. Table 7 on page 44 describes the PSM LEDs.

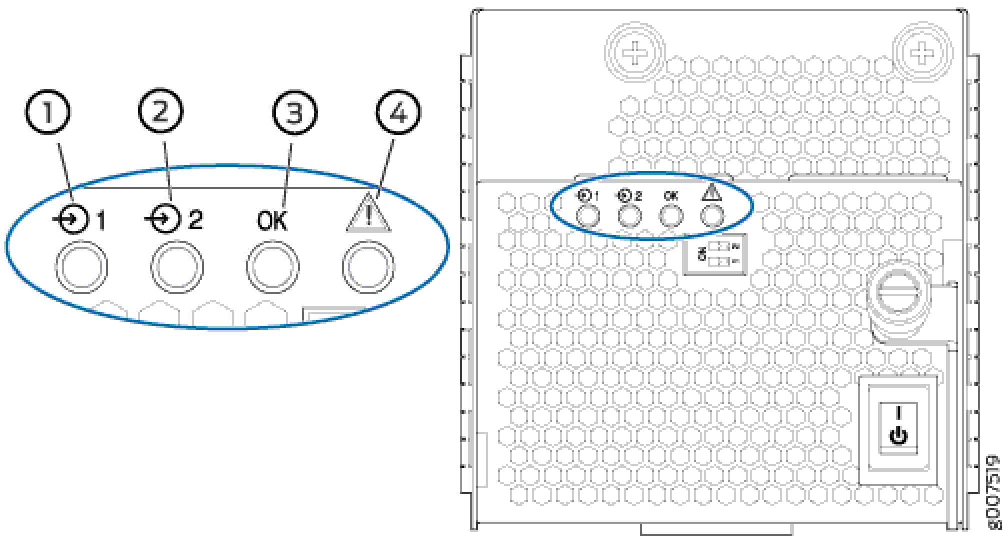
Figure 25: DC PSM LEDs



1– Input (⊕) 1 LED	3– OK LED
2– Input (	4– Fault (

) 2 LED	) LED

Figure 26: AC PSM LEDs



1– Input ( ) 1 LED	3– OK LED
2– Input ( ) 2 LED	4– Fault ( ) LED

Table 7: Power Supply Module LEDs

LED	Color	State	Description
Input ( ) **1**	Green	On steadily	PSM input **1** is receiving voltage.
		Blinking	PSM input **1** is receiving voltage outside the range of –40 V through –72 V.
	–	Off	PSM input **1** is not receiving voltage.

Table 7: Power Supply Module LEDs *(Continued)*

LED	Color	State	Description
Input ( ) 2	Green	On steadily	PSM input **2** is receiving voltage.
		Blinking	PSM input **2** is receiving voltage outside the range of –40 V through –72 V.
	–	Off	PSM input **2** is not receiving voltage.
OK	Green	On steadily	PSM is providing output voltage, and input voltage is within the supported range.
	–	Off	Output voltage is not functioning normally because of a fault condition or the PSM is not receiving input voltage.
Fault (⚠) LED—One per power supply	Red	On steadily	PSM might be starting up, not properly installed, not receiving sufficient power, or not functioning properly.
	–	Off	No faults have been detected for the PSM, or the PSM is not receiving any input voltage.

PTX3000 AC Power System Electrical Specifications

Table 8 on page 45 lists the AC power system electrical specifications.

Table 8: AC Power System Electrical Specifications

Item	Specification
AC input voltage	Operating range: 200 through 240 VAC (nominal)
AC input line frequency	50/60 Hz (nominal)

Table 8: AC Power System Electrical Specifications *(Continued)*

Item	Specification
AC input current rating (system)	52 A @ 200 VAC 40 A @ 240 VAC **NOTE**: This is the maximum limit for the PTX3000 power system with five PSMs installed—one PSM is reserved for redundancy. To determine the actual power consumption for your configuration, use the information provided in "Calculating PTX3000 Power Consumption" on page 145.

PTX3000 AC Power Supply Module Specifications

Table 9 on page 46 lists the AC power supply module (PSM) specifications.

Table 9: AC PSM Electrical Specifications

Item	Specification
Maximum output power	2200 W
AC input voltage	Operating range: 200 through 240 VAC (nominal)
AC input line frequency	50/60 Hz (nominal)
AC input current rating	13 A @ 200 VAC maximum 10 A @ 240 VAC maximum
Efficiency	Approximately 90% at full load and nominal voltage

PTX3000 AC Power Cord Specifications

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 the power supply modules to the power distribution panel. Detachable AC power cords, each 4.5 m (approximately 14.75 ft) long, are supplied with the router and PSMs. The appliance coupler at the socket end of the cord inserts into the appliance inlet on the AC power supply module. The coupler is type C19 (left-angle) as described by International Electrotechnical Commission (IEC) standard 60320, except for the CBL-PTX-LA-US-C20 model number, which has a C21 (left-angle) coupler. The plug end of the power cord fits into the power source receptacle for your geographical location.

NOTE: In North America, AC power cords must not exceed 4.5 m (approximately 14.75 ft) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance.

Table 10 on page 47 provides specifications for the AC power cords.

Table 10: AC Power Cord Specifications

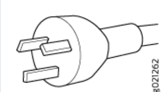
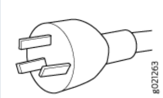
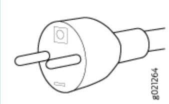
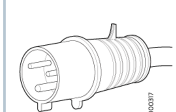
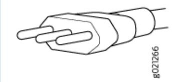
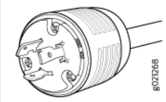
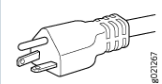
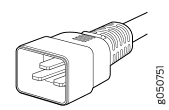
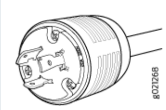
Region	Model Number	Electrical Specification	Plug Type	Graphic
Australia	CBL-PTX-LA-AU	16 A @ 250 VAC	AS/NZS 4417	
China	CBL-PTX-LA-CH	16 A @ 250 VAC	GB2099	
Europe (except Denmark, Italy, Switzerland, and United Kingdom)	CBL-PTX-LA-EU	16 A @ 250 VAC	CEE 7/7	
International	CBL-PTX-LA-INTL	16 A @ 250 VAC	IEC 60309	

Table 10: AC Power Cord Specifications *(Continued)*

Region	Model Number	Electrical Specification	Plug Type	Graphic
Italy	CBL-PTX-LA-IT	16 A @ 250 VAC	CEI 23-16	
Japan	CBL-PTX-LA-JP	20 A @ 250 VAC	Locking NEMA L6-20P	
North America	CBL-PTX-LA-US	20 A @ 250 VAC	NEMA 6-20P	
North America, jumper	CBL-PTX-LA-US-C20	20 A @ 250 VAC	IEC 60320 C20	
North America, locking	CBL-PTX-LA-US-L	20 A @ 250 VAC	NEMA L6-20P	
United Kingdom	CBL-PTX-LA-UK	13 A @ 250 VAC	BS 1363	

WARNING: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal (sized for UNC 1/4-20 ground lugs) provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth.

WARNING: Power cords must not block access to device components or drape where people could trip on them.

PTX3000 DC Power System Electrical Specifications

Table 11 on page 49 lists the DC power system electrical specifications.

Table 11: DC Power System Electrical Specifications

Item	Specification
DC input voltage	Operating range: –40.0 through –72.0 VDC
DC input current rating (system)	204 A @ –48 VDC (nominal) 164 A @ –60 VDC (nominal) **NOTE**: This is the maximum limit for the PTX3000 power system with five PSMs installed—one PSM is reserved for redundancy. To determine the actual power consumption for your configuration, use the information provided in "Calculating PTX3000 Power Consumption" on page 145.

For each input, we recommend that you provision 51 A @ –48 V. Doing so enables you to operate the PTX3000 in any configuration without upgrading the power infrastructure. You must provision a circuit breaker for each DC PSM input rated for at least 125% of the continuous current that the system draws at –48 VDC.

PTX3000 DC Power Supply Module Specifications

Table 12 on page 49 lists the DC power supply module (PSM) electrical specifications.

Table 12: DC PSM Electrical Specifications

Item	Specification
Maximum output power	2200 W
DC input voltage	Operating range: –40.0 through –72.0 VDC Nominal: –48 VDC, –60 VDC

Table 12: DC PSM Electrical Specifications *(Continued)*

Item	Specification
DC input current rating	51 A @ –48 VDC (nominal) per input 41 A @ –60 VDC (nominal) per input
Efficiency	Approximately 90% at full load and nominal voltage

PTX3000 DC Power Cable and Lugs Specifications

IN THIS SECTION

DC Power Cables

You must supply the DC power cables that meet the specifications in Table 13 on page 50, or as required by the local code, laws, and standards.

Table 13: DC Power Cable Specifications

Cable	Specification
Minimum size cable	6-AWG (13.3 mm^2) minimum
Maximum size cable	4-AWG (21.2 mm^2)

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

WARNING: DC Power cables must not block access to PTX3000 components or drape where people could trip on them.

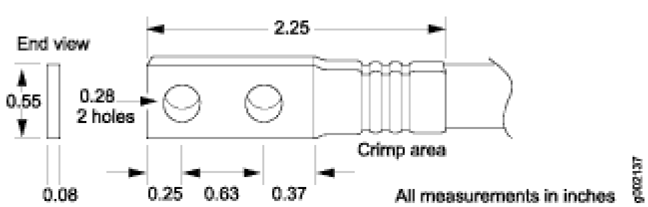
CAUTION: Before PTX3000 installation begins, a licensed electrician must attach a cable lug to the power cables that you supply. A cable with an incorrectly attached lug can damage the PTX3000.

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

DC Power Lugs

The accessory box shipped with the PTX3000 includes the cable lugs that attach to the terminal studs of each PSM. (The cable lug shown in Figure 27 on page 51 is also used for the grounding the chassis.) The cable lugs are dual hole, and sized to fit 1/4-20 UNC terminal studs at 15.86-mm (0.625-in.) center line.

Figure 27: DC Power Cable Lug



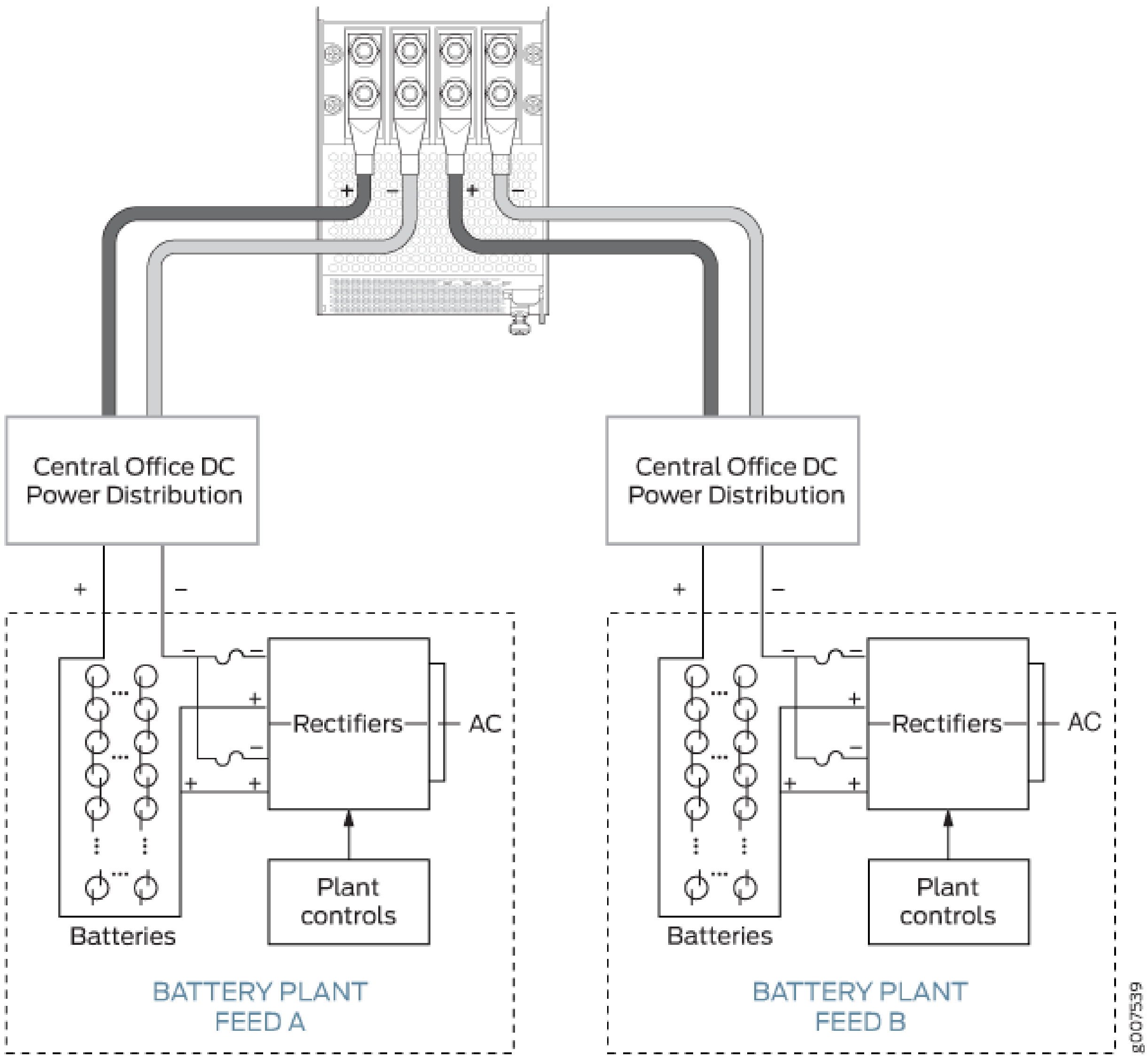
PTX3000 DC Power Distribution

Most sites distribute DC power through a main conduit that leads to frame-mounted DC power distribution panels, one of which might be located at the top of the rack that houses the PTX3000. A pair of cables (one input and one return) connects each set of terminal studs to the power distribution panel.

NOTE: On each PSM, one input must be powered by dedicated power feeds derived from feed A, and the other input must be powered by dedicated power feeds derived from feed B. Input **1** on all PSMs must be powered from the same power feed. Input **2** on all PSMs must be powered from a different power feed from input **1**. This configuration provides the commonly deployed A/B feed redundancy for the system.

Figure 28 on page 53 shows a typical DC source cabling arrangement.

Figure 28: Typical DC Source Cabling to the PTX3000



RELATED DOCUMENTATION

Calculating PTX3000 Power Consumption | 145

Connecting Redundant DC Power to the PTX3000 DC Power Supply Module | 191

Connecting Redundant AC Power to the PTX3000 AC Power Supply Modules | 184

Maintaining the PTX3000 Power System | 261

PTX3000 Host Subsystem

IN THIS SECTION

PTX3000 Host Subsystem Description

The host subsystem provides the routing and system management functions of the PTX3000. You can install one or two host subsystems. Depending on your configuration, a host subsystem consists of either a Routing Engine and a Control Board, or a Routing and Control Board (RCB) and RCB companion card. To operate, each host subsystem functions as a unit; the Routing Engine requires the corresponding Control Board, and the RCB requires the corresponding RCB companion card, and vice versa.

NOTE: The RCB provides Routing Engine, Control Board, and Centralized Clock Generator (CCG) functionality in a single FRU. The RCB companion card is a FRU that provides backplane connectivity to the RCBs.

NOTE: We recommend that you install two host subsystems for redundant protection. If you install only one host subsystem, we recommend that you install it in slots **RE0** and **CB0**.

NOTE: The primary and backup host subsystems must be the same type during normal operation. For example, if the primary host subsystem is an RCB with RCB companion card, the backup host subsystem must also be an RCB with RCB companion card.

If your configuration includes a Routing Engine and a Control Board, see the following topics for more information:

- "PTX3000 Control Board Description" on page 62
- "PTX3000 Routing Engine Description" on page 55

If your configuration includes an RCB and an RCB companion card, see the following topics for more information:

- "PTX3000 Routing and Control Board Description" on page 67
- "PTX3000 Routing and Control Board Companion Card Description" on page 78

PTX3000 Routing Engine Description

IN THIS SECTION

Routing Engine Slots

You can install one or two Routing Engines in the PTX3000. The Routing Engines install in the slots to the left of the Control Boards labeled **CB0** and **CB1**. If two Routing Engines are installed, one functions as the primary and the other acts as the backup. If the primary Routing Engine fails or is removed and the backup is configured appropriately, the backup restarts and becomes the primary.

Routing Engine Functions

The Routing Engine handles all routing protocol processes, as well as the software processes that control the router's interfaces, the chassis components, system management, and user access to the PTX3000. The routing and software processes run on top of a kernel that interacts with the Packet Forwarding Engines.

The Routing Engine constructs and maintains one or more routing tables. From the routing tables, the Routing Engine derives a table of active routes, called the forwarding table, which is then copied into the Packet Forwarding Engines. The design of the ASICs allows the forwarding table in the Packet Forwarding Engines to be updated without interrupting forwarding performance.

The Routing Engine includes the following functions and features:

- Processing of routing protocol packets—The Routing Engine handles all packets that concern routing protocols, freeing the Packet Forwarding Engine to handle only packets that represent Internet traffic.
- Software modularity—Because each software process is devoted to a different function and uses a separate process space, the failure of one process has little or no effect on the others.
- In-depth Internet functionality—Each routing protocol is implemented with a complete set of Internet features and provides full flexibility for advertising, filtering, and modifying routes. Routing policies are set according to route parameters (for example, prefix, prefix lengths, and BGP attributes).
- Scalability—Junos OS routing tables have been designed to hold all the routes in current networks with ample capacity for expansion. Additionally, Junos OS can efficiently support large numbers of interfaces and virtual circuits.
- Management interface—Different levels of system management tools are provided, including the Junos OS CLI, the Junos XML management protocol, the craft interface, and SNMP.
- Storage and change management—Configuration files, system images, and microcode can be held and maintained in primary and secondary storage systems, permitting local or remote upgrades.
- Monitoring efficiency and flexibility—The PTX3000 supports functions such as alarm handling and packet counting on every port without degrading packet-forwarding performance.

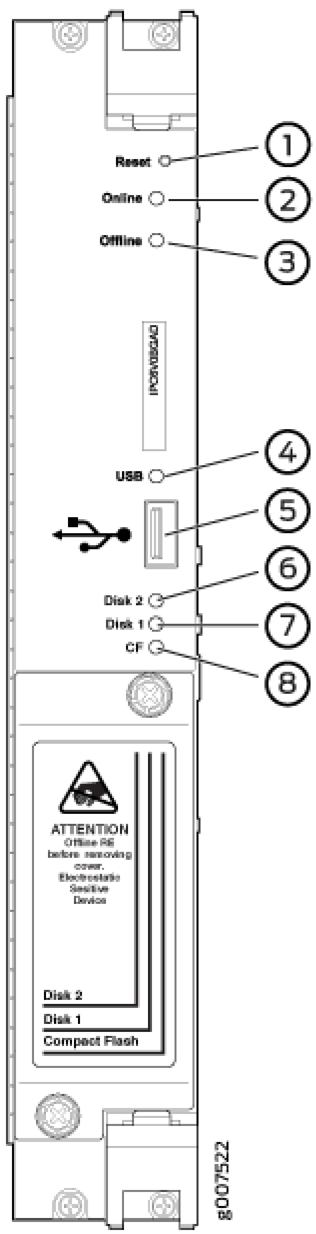
Routing Engine Components

Each Routing Engine consists of the following components:

- CPU—Runs Junos OS to maintain the routing tables and routing protocols.

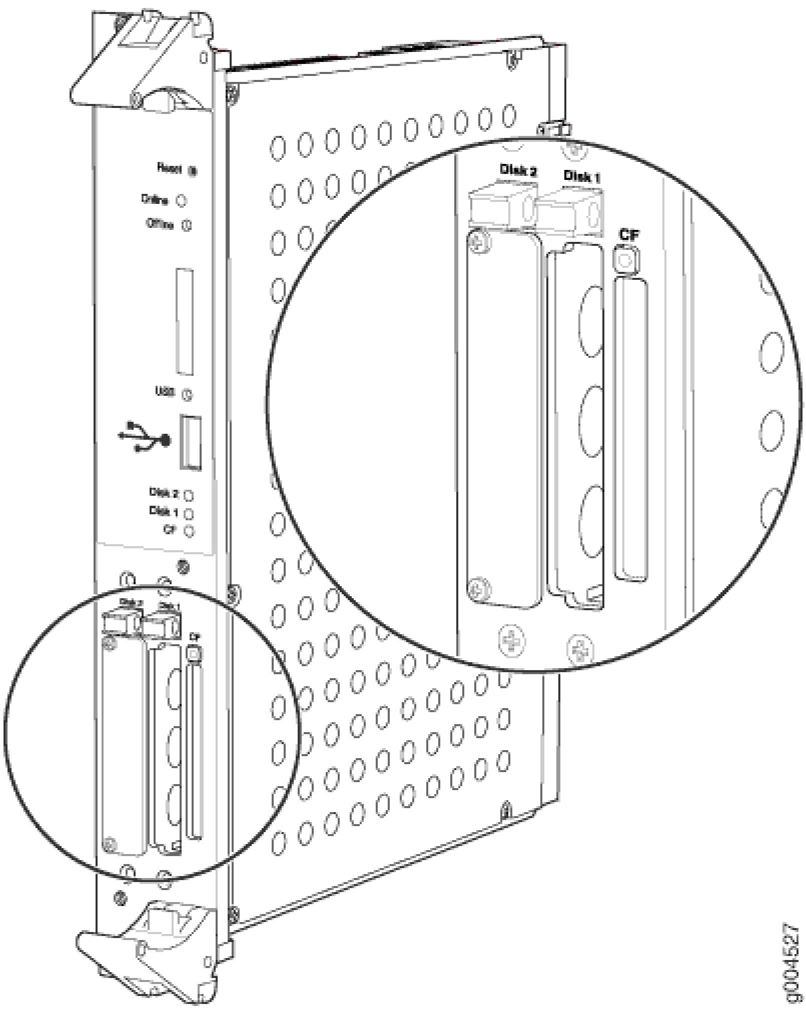
- DRAM—Provides storage for the routing and forwarding tables and for other Routing Engine processes.
- EEPROM—Stores the serial number of the Routing Engine.
- Interfaces for management access—Provide information about Routing Engine status to the external management devices (console, laptop, or terminal server) connected to the management ports on the Control Board.

Figure 29: Routing Engine (C2600)



1– Reset button	5– USB port
2– **Online** LED	6– **Disk 2** LED
3– **Offline** button	7– **Disk 1** LED
4– **USB** LED	8– **CF** LED

Figure 30: Routing Engine SSD and CompactFlash Card Slots



The faceplate of the Routing Engine (shown in Figure 29 on page 57) contains the following components:

- USB port—Provides a removable media interface through which you can install the Junos OS manually. The **USB** LED displays status for the USB port. The Junos OS supports USB versions 2.0 and 1.1.
- CompactFlash card slot—Provides primary storage for software images, configuration files, and microcode. The **CF** LED displays status for the CompactFlash card slot.

- Two solid-state drive slots—Provide secondary storage for log files, memory dumps, and rebooting the system if the CompactFlash card fails. The **Disc 2** and **Disc 1** LEDs display status for the solid-state drives. See Figure 30 on page 58.

  > **NOTE**: The second solid-state drive (**Disk 2**) is not currently supported.

- Reset button—Reboots the Routing Engine when pressed.
- Offline button—Takes the Routing Engine offline when pressed.
- Ejector handles—Control the locking system that secures the Routing Engine.
- LEDs—"PTX3000 Routing Engine LEDs" on page 60 describes the functions of these LEDs.

> **NOTE**: For specific information about Routing Engine components (for example, the amount of DRAM), issue the `show chassis routing-engine` operational mode command.

Routing Engine Boot Sequence

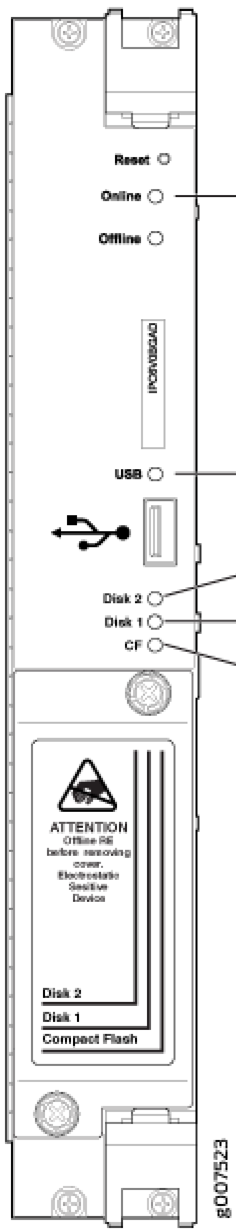
The Routing Engine boots from the storage media in this order: the USB device (if present), the CompactFlash card **CF** (if present), the disk (if present) in slot 1 (**Disk 1**), and then the LAN.

> **NOTE**: **Disk 2** is not currently supported.

PTX3000 Routing Engine LEDs

Three LEDs—**Online**, **CF**, and **Disk 1**—indicate the status of the Routing Engine (see Figure 31 on page 60). See Table 14 on page 61 for a description of the LEDs.

Figure 31: Routing Engine LEDs



1– **Online** LED	4– **Disk 1** LED
2– **USB** LED	5– **CF** LED

3– **Disk 2** LED (currently not used)	

> **NOTE**: The LEDs on the Routing Engine do not necessarily indicate routing-related activity.

Table 14: Routing Engine LEDs

Label	Color	State	Description
Online	Green	On steadily	Routing Engine is functioning normally.
	Red	On steadily	Routing Engine is not functioning normally.
	–	Off	Routing Engine is not online or not functioning normally.
Disk 1	Green	On steadily	An SSD is installed in the **Disk 1** slot in the Routing Engine.
		Blinking	Indicates disk activity.
	–	Off	There is no disk activity.
Disk 2	–	Off	**NOTE**: Currently, the second SSD is not supported and this LED is nonfunctional.
CF	Green	On steadily	A CompactFlash card is installed in the Routing Engine.
		Blinking	Indicates activity for the CompactFlash card.
	–	Off	There is no activity for the CompactFlash card.
USB	Yellow	On steadily	A USB device connected to the Routing Engine.
	–	Off	There is no USB device connected to the Routing Engine.

PTX3000 Control Board Description

IN THIS SECTION

Control Board Slots

You can install up to two Control Boards in the PTX3000. Control Boards install into the front of the chassis in the slots labeled **CB0** and **CB1**. A Routing Engine installs in a slot to the left of each Control Board. The Control Boards cannot function if a Routing Engine is not present.

If the PTX3000 contains a redundant host subsystem, one host subsystem functions as the primary and the other as its backup. If the primary fails or is removed, the backup restarts and becomes the primary.

Control Board Function

Each Control Board works with the Routing Engine to provide the following control, monitoring, and clocking functions for the PTX3000:

- Determining Routing Engine primary role
- Controlling power and reset for the other PTX3000 components
- Monitoring and controlling fan speed
- Monitoring system status
- Providing Centralized Clock Generator (CCG) ports and a 19.44-MHz Stratum 3 clock signal for the Ethernet network interfaces on the PTX3000

Control Board Components

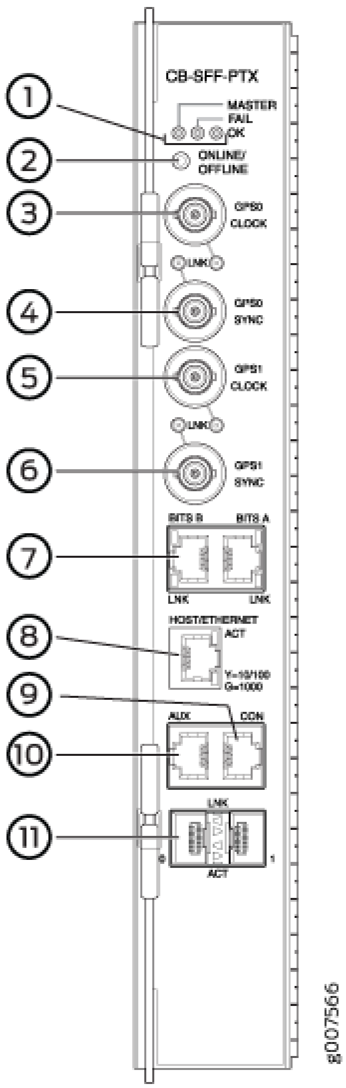
Each Control Board consists of the following components:

- Ethernet switch used for intermodule communication.
- PCI bus to the Routing Engines.

- 19.44-MHz Stratum 3 clock.
- Field-programmable gate array (FPGA) that performs multiplexing of clock sources.

Figure 32 on page 63 shows the components of the Control Board.

Figure 32: Control Board



1– **MASTER**, **FAIL**, and **OK** status LEDs	7– **BITS A** and **BITS B** ports
2– **ONLINE/OFFLINE** button	8– **HOST/ETHERNET** port
3– **GPS0 CLOCK** port	9– Console **CON** port
4– **GPS0 SYNC** port	10– Auxiliary **AUX** port
5– **GPS1 CLOCK** port	11– Ports reserved for future use

6– **GPS1 SYNC** port	

The following components are located on the Control Board faceplate:

- Three status LEDs—**MASTER**, **FAIL**, and **OK**—which indicate the status of the Control Board
- **ONLINE/OFFLINE** button, located beneath the status LEDs.
- Three RJ-45 management ports for connecting the Routing Engine to external management devices. The management ports on each Control Board connect to the Routing Engine installed into that Control Board. From these management devices, you can use the CLI to configure and manage the PTX3000. Each Control Board includes the following management ports:
  - **HOST/ETHERNET**—10/100-Mbps or 1-Gbps Ethernet port for connecting to a management network. This port connects the Routing Engine through a copper 10/100/1000 BASE-T Ethernet connection to a management LAN (or any other device that plugs into an Ethernet connection) for management of the PTX3000. The port uses an autosensing RJ-45 connector to support 10-Mbps, 100-Mbps, or 1-Gbps connections. Two small LEDs on the bottom edge of the port indicate the port speed and traffic on the port. The left LED is labeled **Y=10/100 G=1000**, and the right LED is labeled **ACT**.
  - **CON**—One copper 9600 baud port for connecting the Routing Engine to a system console through a copper cable with RJ-45 connectors.
  - **AUX**— One copper 9600 baud port for connecting the Routing Engine to a laptop, modem, or other auxiliary device through a copper cable with RJ-45 connectors.

> **NOTE**: If a PTX3000 contains two host subsystems, connect both Control Boards to your external management network.

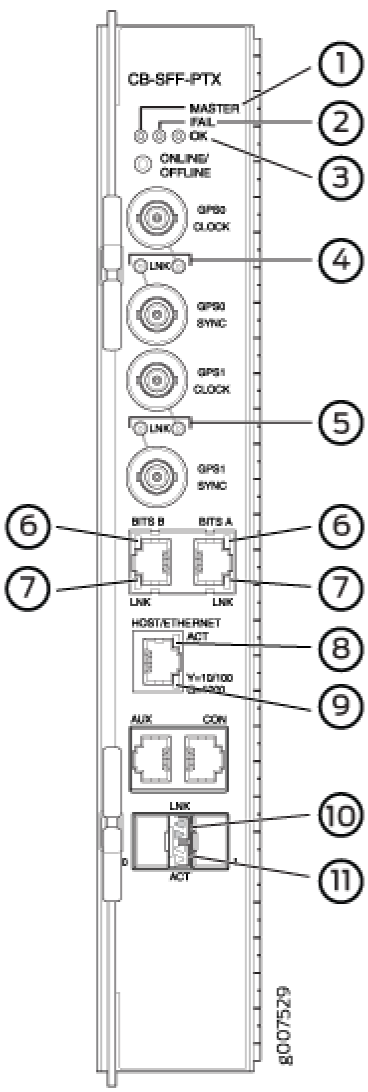
- Clocking ports for connection to external clocking devices:
  - **GPS0** and **GPS1 CLOCK** ports
  - **GPS0** and **GPS1 SYNC** ports, which are reserved for future use
  - **BITS A** and **BITS B** port

  See "PTX3000 Clocking Port Cable Specifications and Pinouts" on page 159 for more information.

PTX3000 Control Board LEDs

LEDs located on the Control Board indicate its status and the status of the Control Board ports (see Figure 33 on page 65). Table 15 on page 66 and Table 16 on page 66 describe the functions of the Control Board LEDs.

Figure 33: Control Board LEDs



1– **MASTER** status LED	7– **LNK** LEDs for the **BITS A** and **BITS B** ports
2– **FAIL** status LED	8– **HOST/ETHERNET** port **ACT** LED
3– **OK** status LED	9– **HOST/ETHERNET** port **Y=10/100 G=1000** LED

4– **LNK** LEDs for the **GPS0 CLOCK** and **GPS0 SYNC** port	10– **LNK** LEDs—Ports reserved for future use
5– **LNK** LEDs for the **GPS1 CLOCK** and **GPS1 SYNC** port	11– **ACT** LEDs—Ports reserved for future use
6– LEDs for the **BITS A** and **BITS B** ports reserved for future use.	

Table 15: Control Board LEDs

Label	Color	State	Description
MASTER	Blue	On steadily	Control Board is functioning as the primary.
	–	Off	Control Board is functioning as the backup.
FAIL	Yellow	On steadily	Control Board has failed.
	–	Off	No faults have been detected on the Control Board.
OK	Green	On steadily	Control Board is online and is functioning normally.
	–	Off	Control Board is offline.

Table 16: Control Board Port LEDs

Port	Label	Color	State	Description
HOST/ETHERNET	**Y=10/100** **G=1000**	Green	On steadily	1-Gbps connection.
		Yellow	On steadily	10/100-Mbps connection.
		–	Off	Control Board is offline.
	ACT	Green	On steadily	Traffic is passing through the port.
		–	Off	No traffic is passing through the port.

Table 16: Control Board Port LEDs *(Continued)*

Port	Label	Color	State	Description
GPS0 CLOCK GPS1 CLOCK	LNK	Green	On steadily	GPS*n* 10/5 MHz clock is active. The LED is driven based on the presence of GPS Clock.
		–	Off	GPS*n* 10/5 MHz clock is not active.
GPS0 SYNC GPS1 SYNC	LNK	–	Off	**NOTE**: These ports are reserved for future use.
BITS A	LNK	Yellow	On steadily	BITS A link is not active.
		–	Off	BITS A link is active.
BITS B	LNK	Yellow	On steadily	BITS B link is not active.
		–	Off	BITS B link is active.
10-Gigabit Ethernet port	LNK	Green	–	**NOTE**: This port is reserved for future use.
	ACT	Green	–	

PTX3000 Routing and Control Board Description

IN THIS SECTION

Routing and Control Board Slots

You can install one or two Routing and Control Boards (RCBs) in the PTX3000. The RCBs install in the slots labeled **CB0** and **CB1**. If two RCBs are installed, one functions as the primary and the other acts as the backup. If the primary RCB fails or is removed and the backup is configured appropriately, the backup becomes the primary.

NOTE: The RCB combines the functionality of a Routing Engine, Control Board, and Centralized Clock Generator (CCG) in a single FRU. Although the functionality is combined in a single FRU, you must install an RCB companion card in the **RE0** and **RE1** slots adjacent to each RCB to enable the RCBs to communicate through the backplane. Because the RCB companion cards are only used for communication between the RCBs, if you are installing a single host subsystem with no backup RCB, you do not need to install RCB companion cards (install Routing Engine blanks instead to ensure proper cooling).
The Routing Engine in the RCB is based on Intel's multi-core Haswell processor, and provides higher computing power, higher memory, and higher storage for the operating system. It has a virtualized architecture where Junos OS runs as a virtual machine (VM) over a Linux-based host (VM Host).

The Control Board (CB) in the RCB provides control and management interfaces to all the FRUs in the chassis.

The CCG provides the central timing card function for the chassis, and distributes systemwide timing. The CCG is compliant with Synchronous Ethernet.

NOTE: RCB primary role controls all aspects of the RCB, including the CCG ports. For example, when the RCB installed in slot **CB0** is the primary RCB, the Routing Engine, Control Board, and CCG functions occur on that RCB. If primary role is switched to **CB1**, the RCB in that slot takes over the Routing Engine, Control Board, and CCG functions.

Routing and Control Board Function

The RCB handles all routing protocol processes, as well as the software processes that control the PTX3000 interfaces, the chassis components, system management, and user access to the PTX3000.

The RCB constructs and maintains one or more routing tables. From the routing tables, the RCB derives a table of active routes, called the forwarding table, which is then copied into the Packet Forwarding Engines in the flexible PIC concentrators (FPCs). The design of the ASICs allows the forwarding table in the Packet Forwarding Engines to be updated without interrupting forwarding performance.

The RCB includes the following functions and features:

- Processing of routing protocol packets—The RCB handles all packets that concern routing protocols, freeing the Packet Forwarding Engine to handle only packets that represent Internet traffic.
- Software modularity—Because each software process is devoted to a different function and uses a separate process space, the failure of one process has little or no effect on the others.
- In-depth Internet functionality—Each routing protocol is implemented with a complete set of Internet features and provides full flexibility for advertising, filtering, and modifying routes. Routing policies are set according to route parameters (for example, prefix, prefix lengths, and BGP attributes).
- Scalability—Junos OS routing tables have been designed to hold all the routes in current networks with ample capacity for expansion. Additionally, Junos OS can efficiently support large numbers of interfaces and virtual circuits.
- Management interface—Different levels of system management tools are provided, including the Junos OS CLI, the Junos XML management protocol, the craft interface, and SNMP.
- Storage and change management—Configuration files, system images, and microcode can be held and maintained in primary and secondary storage systems, permitting local or remote upgrades.
- Monitoring efficiency and flexibility—The PTX3000 supports functions such as alarm handling and packet counting on every port without degrading packet-forwarding performance.
- Chassis management functions:
  - Detection of the insertion or removal of PTX3000 components
  - Controlling power and reset for the other PTX3000 components
  - Monitoring and controlling fan speed
  - Monitoring system status
- Providing Centralized Clock Generator (CCG) ports and a 19.44-MHz Stratum 3 clock signal for the Ethernet network interfaces on the PTX3000
- Secure Boot— Secure Boot implementation in the RCB is based on the UEFI 2.4 standard. The BIOS is hardened and serves as a core root of trust. The BIOS updates, the bootloader, and the kernel are cryptographically protected. No action is required to implement Secure Boot.

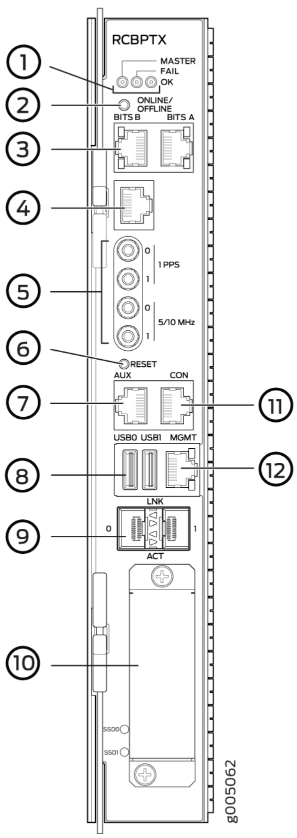
Routing and Control Board Components

Each RCB consists of the following components:

- CPU—Runs Junos OS to maintain the routing tables and routing protocols.
- DRAM—Provides storage for the routing and forwarding tables and for other Routing Engine processes.
- EEPROM—Stores the serial number of the RCB.
- CCG—Provides clock synchronization signal and 19.44-MHz Stratum 3 clock.
- 10-Gigabit Ethernet and PCIe switches—Provide control plane connectivity to the other components.
- Field-programmable gate arrays (FPGAs)—Perform multiplexing of clock sources as well as other control and management functions.

- Interfaces for management access—Provide information about RCB status to the external management devices (console, laptop, or terminal server) connected to the management ports on the RCB.

Figure 34: Routing and Control Board



1– **MASTER**, **FAIL**, and **OK** status LEDs	7– Auxiliary (**AUX**) port
2– **ONLINE/OFFLINE** button	8– **USB0** and **USB1** ports
3– **BITS B** and **BITS A** ports	9– SFP+ ports (**0** and **1**)
4– **ToD** port (Reserved for future use)	10– **SSD0** and **SSD1** (cover installed)
5– **1 PPS** and **5/10 MHz** ports	11– Console (**CON**) port
6– **RESET** button	12– Management (**MGT**) port

The faceplate of the Routing Engine and Control Board (shown in Figure 34 on page 71) contains the following components:

- Three status LEDs—**MASTER**, **FAIL**, and **OK**—that indicate the status of the RCB.

- **ONLINE/OFFLINE** button, located beneath the status LEDs. This button is used to power the RCB on if it is offline, or power it off in preparation for removal or replacement.

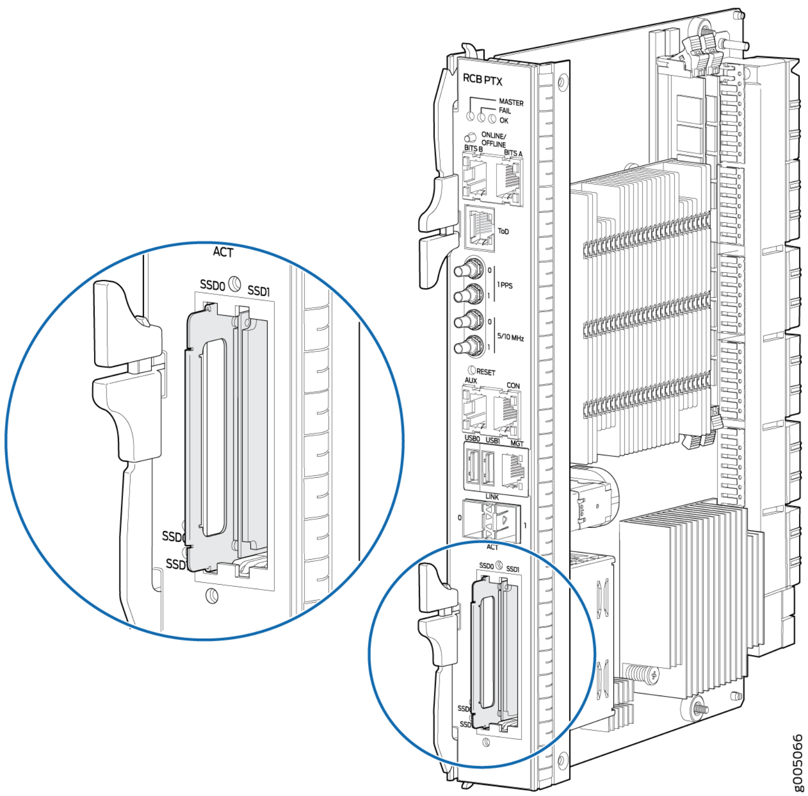
- Clocking ports for connection to external clocking devices:
  - **1 PPS** GPS ports labeled **0** and **1**.
  - **5/10 MHz** GPS ports labeled **0** and **1**.
  - Building integrated timing supply (BITS) ports labeled **BITS B** and **BITS A**. Two small LEDs on each port indicate link status and faults.
- Three RJ-45 management ports for connecting the RCB to external management devices. From these management devices, you can use the CLI to configure and manage the PTX3000. Each RCB includes the following management ports:
  - **AUX**— One copper 9600-baud port for connecting the RCB to a laptop, modem, or other auxiliary device through a copper cable with RJ-45 connectors.
  - **CON**—One copper 9600-baud port for connecting the RCB to a system console through a copper cable with RJ-45 connectors.
  - **MGMT**—10/100-Mbps/1-Gbps Ethernet port for connecting to an out-of-band management network. This port connects the RCB through a copper 10/100/1000 BASE-T Ethernet connection to a management LAN (or any other device that plugs into an Ethernet connection) for management of the PTX3000. The port uses an autosensing RJ-45 connector to support 10-Mbps, 100-Mbps, or 1-Gbps connections. Two small LEDs indicate link speed and activity on the port.

    NOTE: If there are two RCBs installed, connect both to your external management network.

- USB ports—Provides a removable media interface through which you can install Junos OS manually. Junos OS supports USB versions 2.0 and 1.1.
- SFP+ ports—For connecting to external service appliances.
- Two SSD slots—Provide primary storage for software images, configuration files, and microcode. The solid-state drives (SSDs) also provide storage for log files and memory dumps. The **SSD0** and **SSD1**

LEDs display status for the SSDs. Figure 35 on page 73 shows the RCB with the SSD slot cover removed and an SSD installed in slot **SSD0**.

Figure 35: Routing and Control Board Solid-State Drive Slots



- **RESET** button—Reboots the RCB when pressed. This button is designed for use if the RCB is unresponsive.

- LEDs—"PTX3000 Routing and Control Board LEDs" on page 74 describes the functions of these LEDs.

NOTE: For specific information about RCB components (for example, the amount of DRAM), issue the `show chassis routing-engine` command.

Routing and Control Board Boot Sequence

By default, the RCB boots from the storage media in the following order:

1. USB device (if present) in port 0 (**USB0**)

2. USB device (if present) in port 1 (**USB1**)

3. Solid-state drive (SSD) (if present) in slot 0 (**SSD0**)

4. SSD (if present) in slot 1 (**SSD1**)

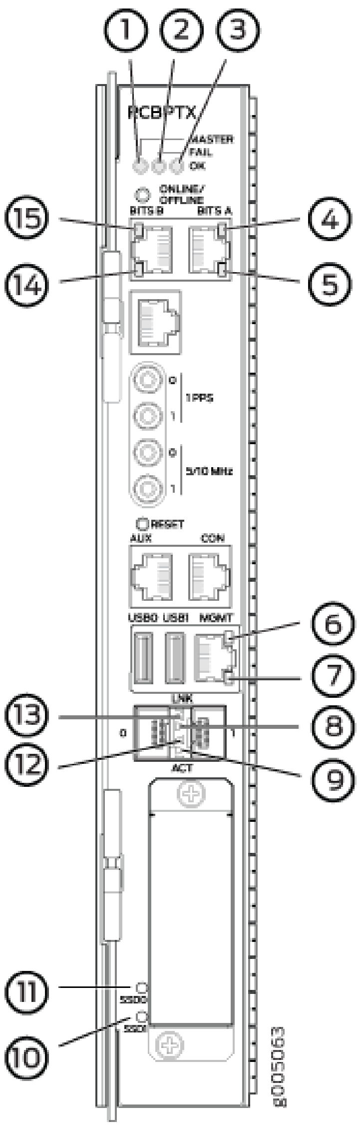
5. LAN

PTX3000 Routing and Control Board LEDs

LEDs located on the Routing and Control Board (RCB) indicate its status and the status of the RCB ports (see Figure 36 on page 75). Table 17 on page 76 and Table 18 on page 76 describe the functions of the RCB LEDs.

NOTE: The LEDs on the RCB do not indicate routing-related activity.

Figure 36: Routing and Control Board LEDs



1– **MASTER** status LED	9– **ACT** LED for the SFP **1** port
2– **FAIL** status LED	10– **SSD1** status LED
3– **OK** status LED	11– **SSD0** status LED
4– **BITS A** link LED	12– **ACT** LED for the SFP **0** port
5– **BITS A** fault (loss of frame) LED	13– **LNK** LED for the SFP **0** port

6– **MGMT** port speed LED	14– **BITS B** fault (loss of frame) LED
7– **MGMT** port link activity LED	15– **BITS B** link LED
8– **LNK** LED for the SFP **1** port	

Table 17: Routing and Control Board Status LEDs

Label	Color	State	Description
MASTER	Blue	On steadily	RCB is functioning as the primary.
	–	Off	RCB is functioning as the backup.
FAIL	Yellow	On steadily	RCB has failed.
	–	Off	No faults have been detected on the RCB.
OK	Green	Blinking at 1-second interval	RCB is shutting down gracefully or BIOS/Linux is booting
		Blinking at 0.5-second interval	Junos OS is booting up in the RCB.
		On steadily	RCB is online.
	–	Off	RCB is offline.

Table 18: Routing Control Board Port LEDs

Port	Label	Color	State	Description
Management Ethernet port (labeled **MGT**)	Port Speed **NOTE**: This LED is not labeled.	Green	On steadily	A 100-Mps link is established.
		Orange	On steadily	A 10-Mbps link is established.
		Yellow	On Steadily	A 1-Gbps link is established.

Table 18: Routing Control Board Port LEDs *(Continued)*

Port	Label	Color	State	Description
		–	Off	There is no link.
	Link Activity **NOTE**: This LED is not labeled.	Yellow	Blinking	Traffic is passing through the port.
		–	Off	No traffic is passing through the port.
BITS ports (labeled **BITS A** or **BITS B**)	Link **NOTE**: This LED is not labeled.	Green	On steadily	A valid signal is detected on the BITS port.
		–	Off	The link is down due to loss of signal (LOS). Check the cable and verify the external clock source is generating a valid signal.
	Fault **NOTE**: This LED is not labeled.	Yellow	On steadily	A loss of frame (LOF) error has occurred.
		–	Off	There are no faults.
SFP+ ports (labeled **0** and **1**)	**LNK**	Green	On steadily	A link is established.
		–	Off	The link is down. Check the cable and verify the connected device is operational.
	ACT	Green	Blinking	The port is operating at 10-Gbps and there is traffic passing through the port.

Table 18: Routing Control Board Port LEDs *(Continued)*

Port	Label	Color	State	Description
		–	Off	There is no activity.
Solid-state drive slots (labeled **SSD0** and **SSD1**)	**SSD0** or **SSD1**	Green	On steadily	An SSD has been detected and mounted.
			Blinking	The SSD is being accessed.
		–	Off	No SSD is present or detected, or Junos OS has not finished booting.

PTX3000 Routing and Control Board Companion Card Description

IN THIS SECTION

Routing and Control Board Companion Card Slots

You can install up to two Routing and Control Board (RCB) companion cards (RCB-CC) in the PTX3000. RCB companion cards install in the **RE0** and **RE1** slots to the left of each RCB. The RCB companion cards do not function if an RCB is not present in its adjacent slot.

Routing and Control Board Companion Card Function

The RCB companion card provides passive connectivity across the backplane between the RCBs. The companion card must be installed only in the **RE** slot when an RCB is installed in the router, and no other Routing Engine must be installed in that slot.

> **NOTE**: In a redundant host subsystem, when you are performing the primary-role switchover from one Routing Engine to another Routing Engine, you must install both the RCB companion cards.

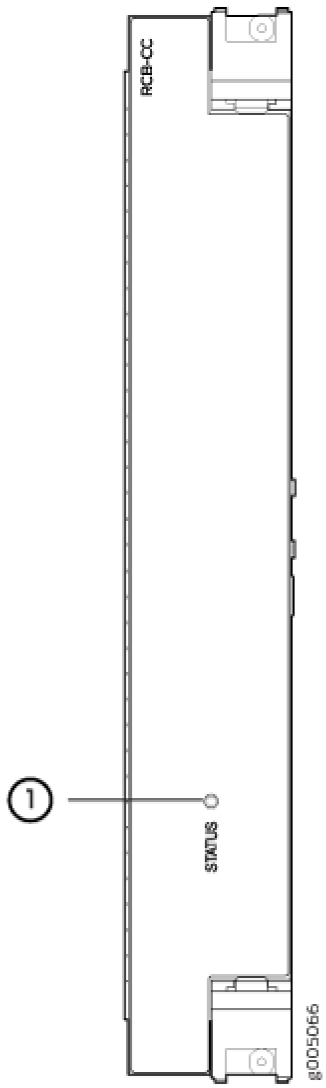
> **NOTE**: If you are using only a single RCB in the PTX3000 (that is, in a nonredundant host subsystem), with no backup RCB, you do not need to install an RCB companion card. However, to ensure proper cooling, the Routing Engine slot must be populated with either the RCB-CC or a Routing Engine blank.

Routing and Control Board Companion Card Components

Each RCB companion card has Ethernet cross-links that provide passive connectivity between the RCBs.

Figure 37 on page 80 shows the components of the RCB companion card. The faceplate has only the LED and ejector handles.

Figure 37: Routing and Control Board Companion Card



1— Status LED	

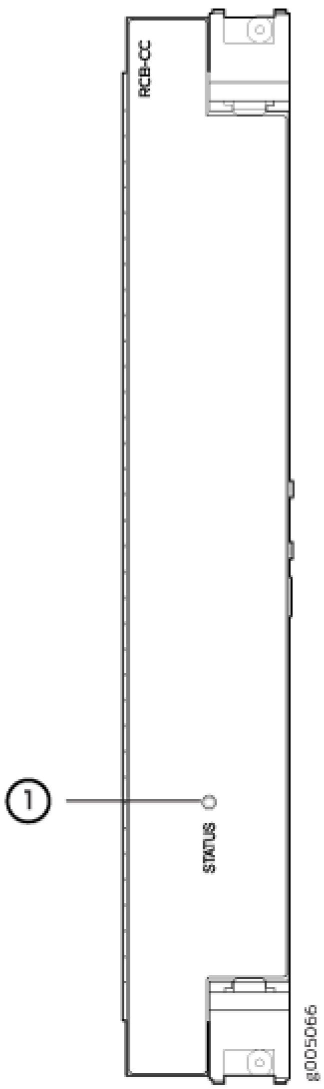
The following components are located on the RCB companion card faceplate:

- Status LED—"PTX3000 Routing and Control Board Companion Card LED" on page 81 describes the functions of this LED.
- Ejector handles—Control the locking system that secures the RCB companion card.

PTX3000 Routing and Control Board Companion Card LED

The LED located on the Routing and Control Board (RCB) companion card indicates its status (see Figure 38 on page 81). Table 19 on page 82 describes the functions of the RCB companion card LED.

Figure 38: Routing and Control Board Companion Card LED



1– STATUS LED	

Table 19: Routing and Control Board Companion Card Status LED

Label	Color	State	Description
STATUS	Green	On steadily	RCB companion card is online.
	Red	On steadily	Junos OS is not able to bring the RCB companion card online.
	–	Off	RCB is offline or absent, or the RCB companion card is offline, or Junos OS has not yet detected it.

Routing Engines Supported on PTX Series Routers

IN THIS SECTION

The following tables list the Routing Engines that each PTX Series router supports and the Routing Engine specifications.

PTX1000 Routing Engines

Table 20 on page 83 lists the Routing Engine supported on the PTX1000.

> **NOTE**: The PTX1000 supports 64-bit Junos OS only.

Table 20: PTX1000 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
Built-in Routing Engine	`RE-PTX1000`	• 16.1X65-D30 • 17.2R1	em0	bme0 em1

PTX3000 Routing Engines

Table 21 on page 83 lists the Routing Engines supported on the PTX3000.

NOTE: The PTX3000 supports 64-bit Junos OS only.

Table 21: PTX3000 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C2600-16G	`RE-DUO-2600`	13.2R2	em0	ixgbe0 ixgbe1
RCB-PTX-X6-32G	`RE-PTX-2X00x6`	16.1R4 17.1R1 This Routing Engine does not support Junos OS Release 16.2.	em0	ixlv0 ixlv1

PTX5000 Routing Engines

Table 22 on page 84 lists the Routing Engines supported on the PTX5000.

NOTE:

- PTX5000 supports 64-bit Junos OS only.

- The PTX5000 router supports two midplanes. The midplane identified as `Midplane-8S` in the CLI output is supported in Junos OS releases, 12.1X48, 12.3, and 13.2. The enhanced midplane, identified as `Midplane-8SeP` is supported from Junos OS release 14.1 onwards.

  The RE-DUO-2600 routing engine with Junos OS 13.2 or earlier is not supported on the PTX5000BASE2 midplane.

Table 22: PTX5000 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C2600-16G	`RE-DUO-2600`	12.1X48 12.3 13.2 **NOTE**: The PTX5000 does not support Junos OS Releases 12.1, 12.2, or 13.1.	em0	ixgbe0 ixgbe1
RE-PTX-X8-64G	`RE-PTX-2X00x8`	15.1F4 16.1R1	em0	ixlv0 ixlv1 em1
RE-PTX-X8-128G	`RE-PTX-2X00x8-128G`	18.1R1	em0	ixlv0 ixlv1 em1

PTX10008 and PTX10016 Routing Engines

Table 23 on page 85 lists the Routing Engines supported on the PTX10008 and PTX10016 routers.

Table 23: PTX10008 and PTX10016 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
JNP10K-RE0	`RE-PTX-2X00x4`	17.2R1	em0, em1	bme0 bme1
JNP10K-RE1 JNP10K-RE1-LT	`RE X10`	18.2R1	em0, em1	bme0 bme1
JNP10K-RE1-128	`RE X10 128`	18.3R1	em0, em1	bme0 bme1

PTX Series Routing Engine Specifications

Table 24 on page 85 lists the current specifications for Routing Engines supported on the PTX Series.

NOTE: The memory listed in Table 24 on page 85 indicates the amount of total memory. To determine the amount of available memory, issue the `show chassis routing-engine` CLI command.

Table 24: PTX Series Routing Engine Specifications

Model Number	Processor	Memory	Connection to Packet Forwarding Engines	Disk	Media
RE-DUO-C2600-16G	2.6 GHz	16 GB	Gigabit Ethernet	SSD	4-GB CompactFlash card
RE-PTX-X8-64G (PTX5000 only)	2.3 GHz	64 GB	10-Gigabit Ethernet	Dual SSD	–
RE-PTX-X8-128G (PTX5000 only)	2.3 GHz	128 GB	10-Gigabit Ethernet	Dual SSD	–

Table 24: PTX Series Routing Engine Specifications *(Continued)*

Model Number	Processor	Memory	Connection to Packet Forwarding Engines	Disk	Media
RCB-PTX-X6-32G (PTX3000 only)	2.0 GHz	32 GB	10-Gigabit Ethernet **NOTE**: Each link can operate at 10-Gbps or 1-Gbps depending on the capability of the FPC. Some FPCs operate only at 1-Gbps. When there is a mix of RE-DUO-C2600-16G and RCB-PTX-X6-32G the links operate at 1- Gbps.	Dual SSD	–
PTX1000 built-in Routing Engine	2.5 GHz	16 GB	10-Gigabit Ethernet	Dual SSD	–
JNP10K-RE0	2.5 GHz	32 GB	10-Gigabit Ethernet	Dual SSD	–
JNP10K-RE1 JNP10K-RE1-LT	2.3 GHz	64 GB	10-Gigabit Ethernet	Dual SSD	–
JNP10K-RE1-128G	2.3 GHz	128 GB	10-Gigabit Ethernet	Dual SSD	–

SEE ALSO

Understanding Internal Ethernet Interfaces

Understanding Management Ethernet Interfaces

RELATED DOCUMENTATION

Maintaining the PTX3000 Routing Engines | 270
Maintaining the PTX3000 Control Boards | 282
Maintaining the PTX3000 RCB Companion Card | 296
Troubleshooting the PTX3000 Routing Engines | 390

PTX3000 Switch Interface Boards

IN THIS SECTION

PTX3000 Switch Interface Board Description

IN THIS SECTION

The PTX3000 contains nine Switch Interface Boards (SIBs) located at the center of the chassis in the slots labeled **SIB0** through **SIB8** (left to right). SIBs are hot-insertable and hot-removable.

SIBs create the switch fabric for the PTX3000.

NOTE: FPC-SFF-PTX-T FPCs are not supported in a PTX3000 with SIB3-SFF-PTX SIBs.

NOTE: Third-generation FPCs (FPC3-SFF-PTX) are supported only in a PTX3000 with SIB3-SFF-PTX SIBs. Third-generation FPCs and FPC-SFF-PTX-P1-A first-generation FPCs can interoperate with each other in the same system.

SIBs Supported

The PTX3000 supports the SIBs listed in Table 25 on page 88.

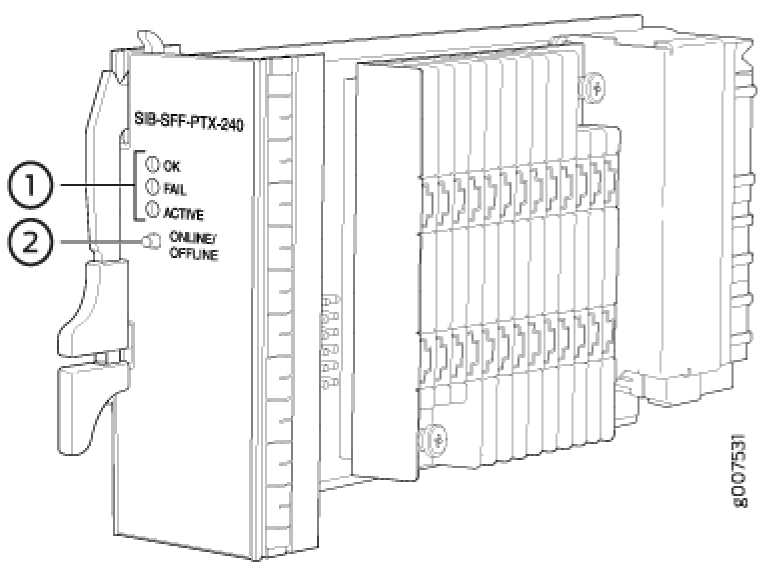
Table 25: Supported Switch Interface Boards

Spare Model Number	First Supported Junos OS Release	First-Generation FPCs First Supported Junos OS Release	Third-generation FPCs First Supported Junos OS Release
SIB-SFF-PTX-240-S	13.2R2	FPC-SFF-PTX-P1-A: 13.2R2 FPC-SFF-PTX-T: 14.1	Not supported
SIB3-SFF-PTX-S	15.1F6 16.1R2	FPC-SFF-PTX-P1-A: 15.1F6, 16.1R2 FPC-SFF-PTX-T: Not supported	15.1F6, 16.1R2

SIB Components

Figure 39 on page 88 shows a SIB. Each SIB-SFF-PTX-240 weighs 1.5 lb (0.7 kg). Each SIB3-SFF-PTX weighs 1.9 lb (0.9 kg).

Figure 39: SIB



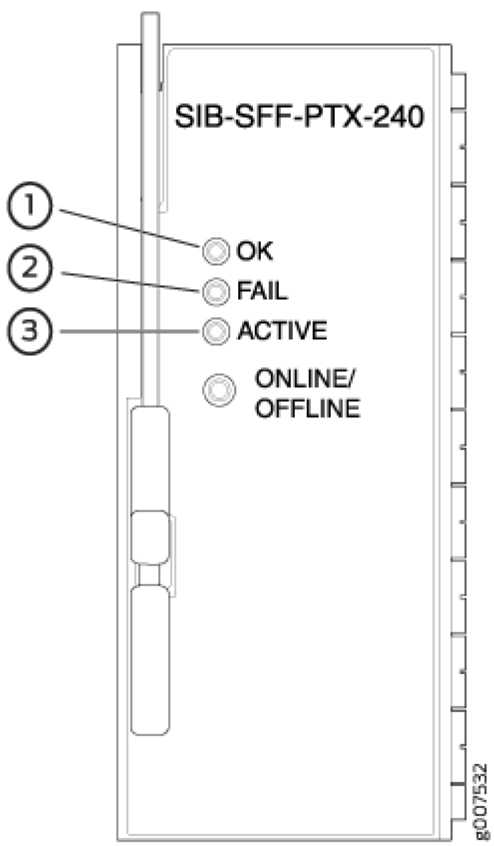
1– **OK**, **FAIL**, and **ACTIVE** LEDs	2– **ONLINE/OFFLINE** button

Each SIB consists of the following components:

- Switch fabric ASICs
- High-speed links to each FPC
- SIB **ONLINE/OFFLINE** button, located on the SIB faceplate
- Three LEDs located on the SIB faceplate that display the status of the SIB

PTX3000 Switch Interface Board LEDs

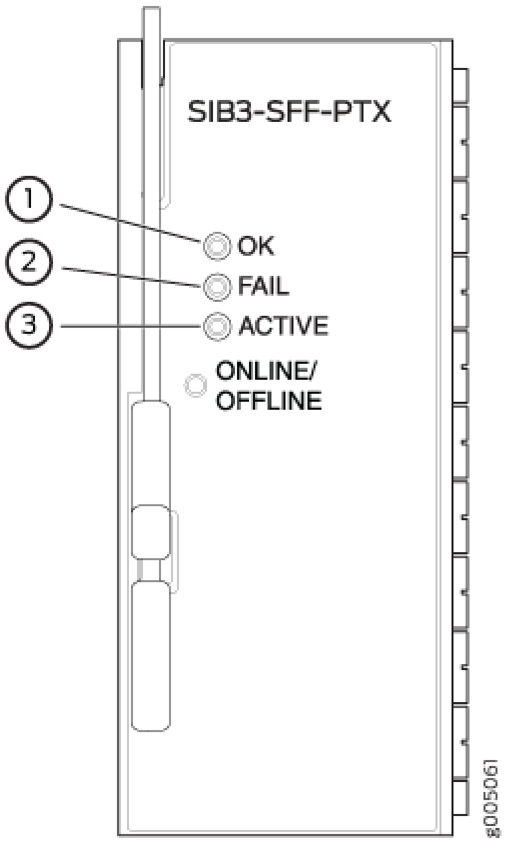
Figure 40: SIB-SFF-PTX-240 SIB LEDs



1– **OK** LED	3– **ACTIVE** LED

2– **FAIL** LED	

Figure 41: SIB3-SFF-PTX SIB LEDs



1– **OK** LED	3– **ACTIVE** LED
2– **FAIL** LED	

The status LEDs are located above the **ONLINE/OFFLINE** button. See Figure 40 on page 89 and Figure 41 on page 90. Table 26 on page 90 describes the functions of these LEDs.

Table 26: SIB LEDs

Label	Color	State	Description
ACTIVE	Green	On steadily	SIB is actively passing traffic.
	–	Off	SIB is either offline or not actively passing traffic.

Table 26: SIB LEDs *(Continued)*

Label	Color	State	Description
OK	Green	On steadily	SIB is functioning normally.
	–	Off	SIB is offline or not seated properly.
FAIL	Yellow	On steadily	SIB has failed.
	–	Off	No faults have been detected for the SIB.

RELATED DOCUMENTATION

Maintaining the PTX3000 Switch Interface Boards | 306
Troubleshooting the PTX3000 Switch Interface Boards | 403

PTX3000 Interface Modules

IN THIS SECTION

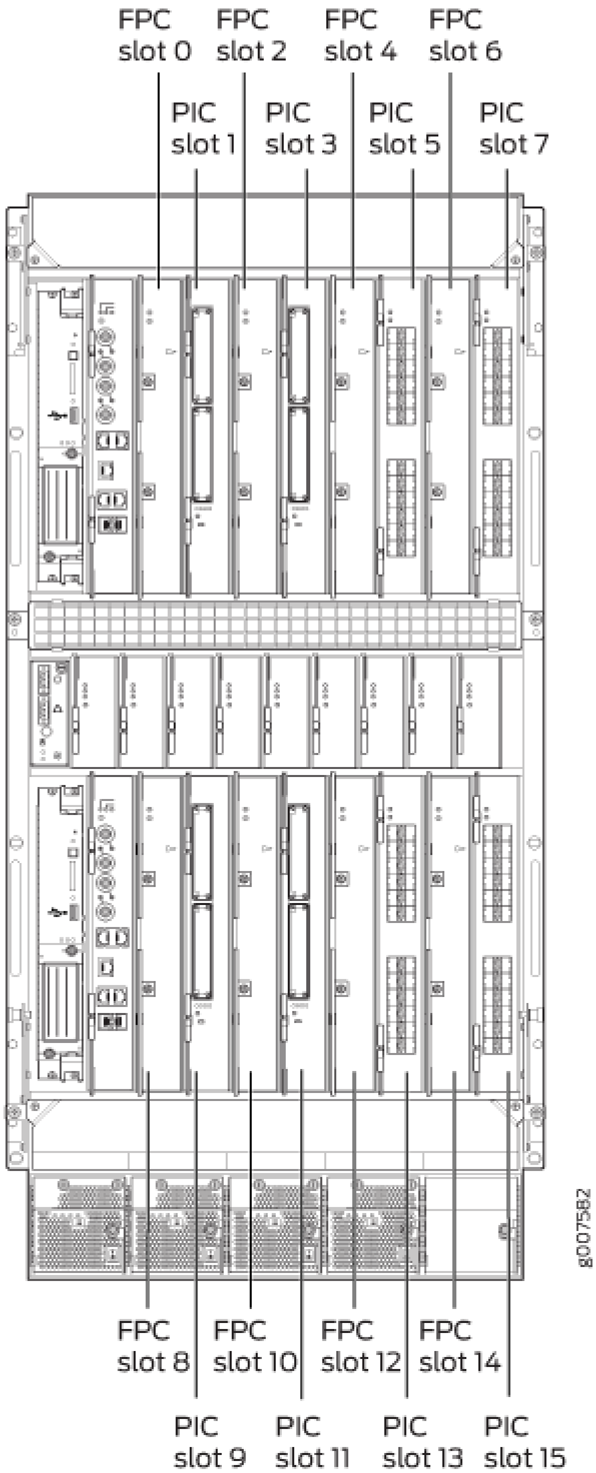
PTX3000 FPC Description

IN THIS SECTION

FPC Slots

Up to eight FPCs install vertically in the front of the PTX3000 (Figure 42 on page 94). The FPC slots are numbered **0**, **2**, **4**, and **6** in the upper chassis, and **8**, **10**, **12**, and **14** in the lower chassis. If a slot is not occupied by an FPC, a blank panel must be installed to shield the empty slot and to allow cooling air to circulate properly through the PTX3000. The PIC in the slot to the right of an FPC is associated with that FPC. For example, the PIC in slot 1 is associated with the FPC in slot 0.

Figure 42: FPC Slots



NOTE: The integrated photonic line cards (IPLCs) are installed in any of the FPC or PIC slots.

FPC Function

The main function of an FPC is to connect the PIC installed in the slot to its right to other components in the chassis. The Packet Forwarding Engine receives incoming packets from the associated PIC and forwards them through the switch plane to the appropriate destination port.

When you install an FPC into a functioning PTX3000, the Routing Engine downloads the FPC software, the FPC runs its diagnostics, and the adjacent PIC to the right of the FPC is enabled. Forwarding on other FPCs continues uninterrupted during this process.

NOTE: After an FPC is taken offline, the FPC might restart if any configuration changes are made. To configure an FPC to stay offline and prevent it from restarting, include the `power off` statement at the `[edit chassis fpc *fpc-slot-number*]` hierarchy level. For more information, see the *power* CLI reference documentation.

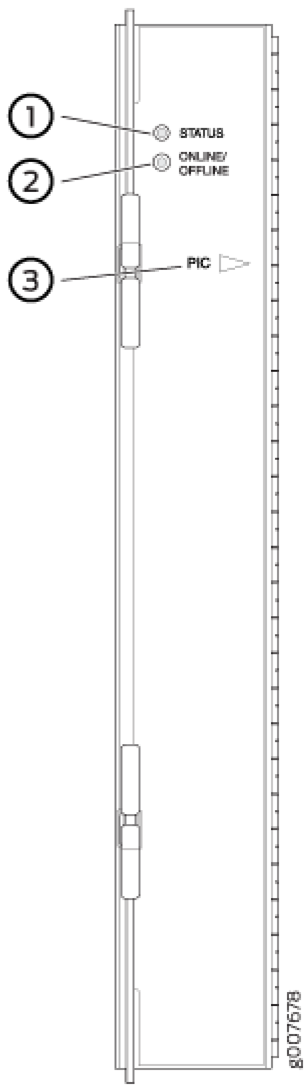
NOTE: Third-generation FPCs (FPC3-SFF-PTX) support additional features when the *enhanced-mode* statement is configured at the `[edit chassis network-services]` hierarchy level.

- By default, the `enhanced-mode` statement is disabled.
- After you configure the `enhanced-mode` statement and commit the configuration, you must reboot the router.
- If the `enhanced-mode` statement is configured, only third-generation FPCs are powered on. Other FPCs cannot be brought online.
- If the `enhanced-mode` statement is not configured, third-generation FPCs do not support advanced features.

FPC Components

Figure 43 on page 96 shows a first-generation FPC (FPC-SFF-PTX-P1 and FPC-SFF-PTX-T) faceplate.

Figure 43: First-Generation FPC Faceplate



1– **STATUS** LED	3– **PIC** label indicating the location of the PIC associated with the FPC
2– **ONLINE/OFFLINE** button	

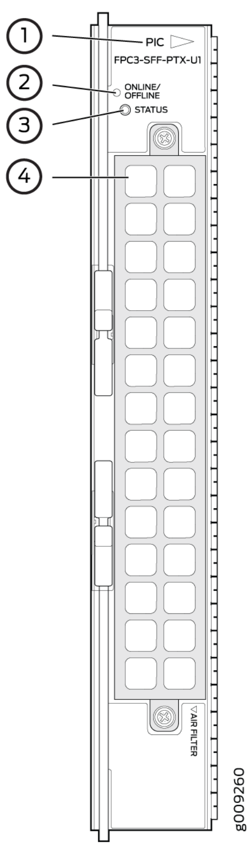
Each first-generation FPC weighs 5.9 lb (2.7 kg), and consists of the following components:

NOTE: FPC-SFF-PTX-T FPCs are not supported in a PTX3000 with SIB3-SFF-PTX SIBs.

- FPC card carrier
- Two Packet Forwarding Engines, consisting of Lookup ASICs and the Queuing and Memory Interface ASICs
- Processor Mezzanine Board (PMB), which includes a 1.8-GHz CPU, 16 GB of SDRAM, and two Gigabit Ethernet interfaces for internal communication
- One LED on the FPC that displays the status of the FPC
- FPC online/offline button

Figure 44 on page 97 shows a third-generation FPC (FPC3-SFF-PTX) faceplate.

Figure 44: Third-Generation FPC Faceplate



1– **PIC** label indicating the location of the PIC associated with the FPC	3– **STATUS** LED
2– **ONLINE/OFFLINE** button	4– Air filter cover

Each third-generation FPC weighs 10.5 lb (4.8 kg) and consists of the following components:

NOTE: Third-generation FPCs are supported only in a PTX3000 with SIB3-SFF-PTX SIBs.

- FPC card carrier
- A field-replaceable faceplate air filter that allows additional cooling for the FPC
- Two Packet Forwarding Engine ASICs
- A two-core 1.7-GHz CPU, 16 GB of SDRAM, and two Gigabit Ethernet interfaces for internal communication
- One LED on the FPC that displays the status of the FPC
- FPC online/offline button

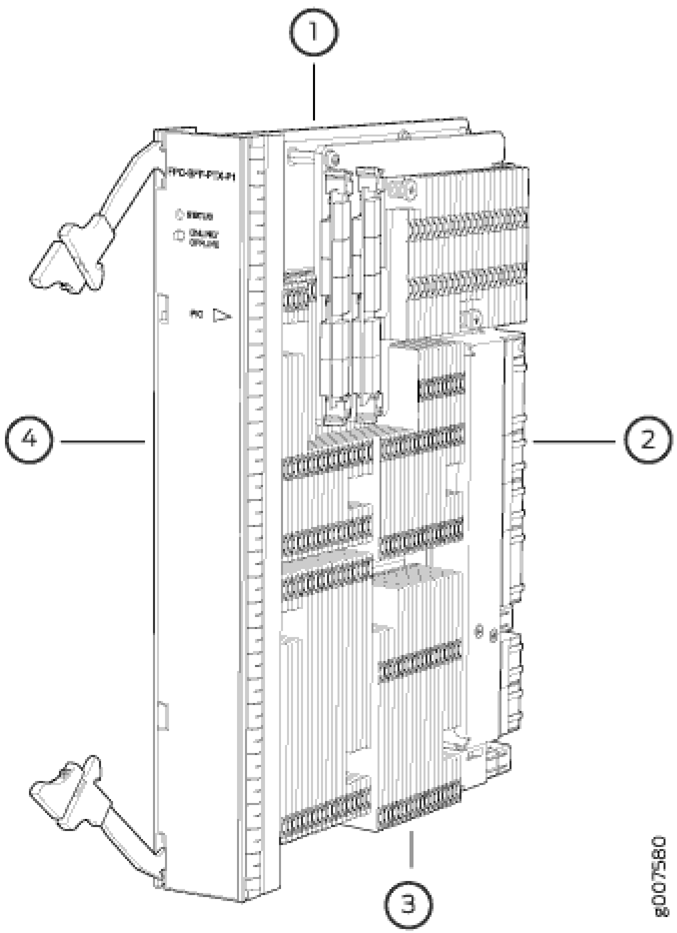
FPC Terminology

Regardless of whether you are holding an FPC vertically or horizontally, this document uses the same terms for all four edges of the FPC (see Figure 45 on page 99):

- Faceplate—Edge of the FPC that is visible when the FPC is inserted in to the front of the chassis
- Connector edge—Edge opposite the faceplate; this edge has the connectors that attach to the backplane
- Top edge—Edge at the top of the FPC when it is vertical

- Bottom edge—Edge at the bottom of the FPC when it is vertical

Figure 45: FPC Edges



1– Top edge	3– Bottom edge
2– Connector edge	4– Faceplate

FPCs Supported on the PTX3000

Table 27 on page 100 lists the FPCs supported on the PTX3000. The First Junos OS Release Supported column indicates the first release that the FPC is supported on the PTX3000.

CAUTION: FPC-SFF-PTX-T does not interoperate with other FPCs in the same PTX3000. FPC-SFF-PTX-T can be used only with other FPC-SFF-PTX-T FPCs. If an

FPC-SFF-PTX-T FPC is deployed in a mixed-FPC environment, then an alarm is raised and an error condition results.

FPC-SFF-PTX-T FPCs are not supported in a PTX3000 with SIB3-SFF-PTX SIBs.

NOTE: Third-generation FPCs (FPC3-SFF-PTX) are supported only in a PTX3000 with SIB3-SFF-PTX SIBs. Third-generation FPCs and FPC-SFF-PTX-P1-A first-generation FPCs can interoperate with each other in the same system.

NOTE: The different third-generation FPC models are collectively referred to as FPC3-SFF-PTX throughout this hardware guide. The third-generation FPCs are identified as FPC3-SFF-PTX-U1 on the FPC faceplate.

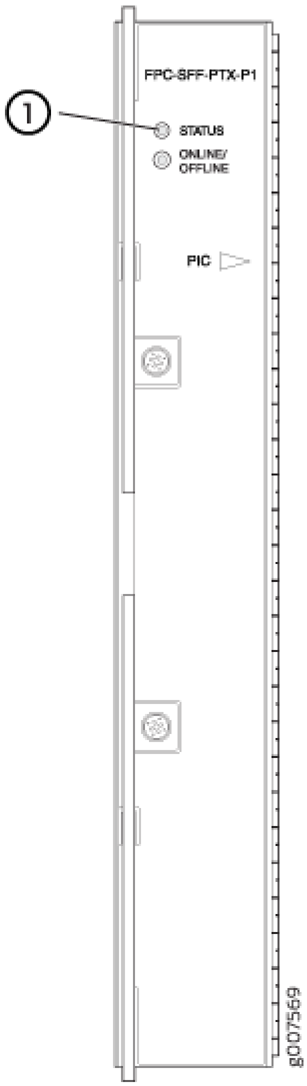
You can upgrade an FPC3-SFF-PTX-1H FPC to an FPC3-SFF-PTX-1T FPC and increase the maximum throughput from 500 Gbps to 1 Tbps by purchasing an additional license from Juniper Networks.

Table 27: FPCs Supported on the PTX3000

FPC Generation	Model Number	Maximum Throughput per FPC	First Junos OS Release Supported
First generation	FPC-SFF-PTX-P1-A	240 Gbps	13.2R2
	FPC-SFF-PTX-T **NOTE**: FPC-SFF-PTX-T has a 10-ms RTT buffer capacity and does not support IPv6 or IP multicast features.	240 Gbps	14.1
Third generation	FPC3-SFF-PTX-1H-R FPC3-SFF-PTX-1H-IR	500 Gbps	15.1F6
	FPC3-SFF-PTX-1T-R FPC3-SFF-PTX-1T-IR	1 Tbps	15.1F6

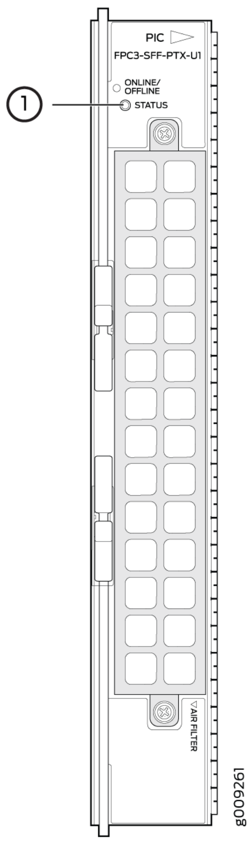
PTX3000 FPC LED

Figure 46: First-Generation FPC LED



1– **STATUS** LED	

Figure 47: Third-Generation FPC LED



1– **STATUS** LED	

Each FPC has one LED—labeled **STATUS**. Table 28 on page 102 describes the functions of the **STATUS** LED on PTX3000 FPCs. See Figure 46 on page 101 and Figure 47 on page 102.

Table 28: PTX3000 FPC Status LED

Label	Color	State	Description
STATUS	Green	On steadily	FPC is online and is functioning normally.
		Blinking	FPC is booting.

Table 28: PTX3000 FPC Status LED *(Continued)*

Label	Color	State	Description
	Red	On steadily	FPC has failed.
	–	Off	FPC is offline.

PTX3000 PIC Description

IN THIS SECTION

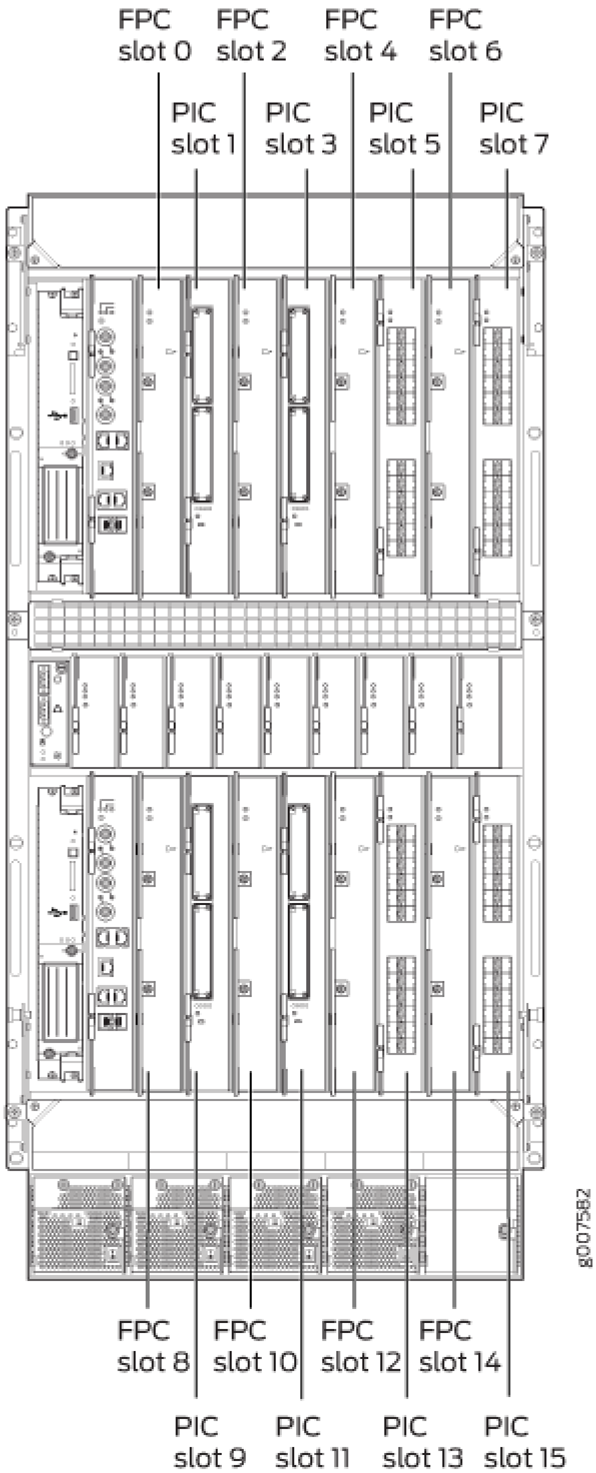
PIC Slots

Up to eight PICs install vertically in the front of the PTX3000 (Figure 48 on page 105). The PIC slots are numbered **1**, **3**, **5**, and **7** in the upper chassis, and **9**, **11**, **13**, and **15** in the lower chassis.

The PIC in the slot to the right of an FPC is associated with that FPC. Each PIC requires an FPC to be installed in the adjacent FPC slot to its left as specified in Table 29 on page 106. For example, the PIC in slot **1** is associated with the FPC in slot **0**.

When a slot is not occupied by a PIC, you must insert a blank PIC to fill the empty slot and ensure proper cooling of the system. Blank PICs resemble other PICs but do not provide any physical connection or activity. PICs are hot-removable and hot-insertable.

Figure 48: PIC Slots



NOTE: The integrated photonic line cards (IPLCs) are installed in any of the FPC or PIC slots.

NOTE: In the CLI, all PTX3000 PICs are represented as `pic0`.

Table 29: CLI Representation of PIC Slots

FPC Slot in Chassis	PIC Slot in Chassis	CLI Representation of PIC Slots
0	1	`fpc0-pic0-`*`port-number`*
2	3	`fpc2-pic0-`*`port-number`*
4	5	`fpc4-pic0-`*`port-number`*
6	7	`fpc6-pic0-`*`port-number`*
8	9	`fpc8-pic0-`*`port-number`*
10	11	`fpc10-pic0-`*`port-number`*
12	13	`fpc12-pic0-`*`port-number`*
14	15	`fpc14-pic0-`*`port-number`*

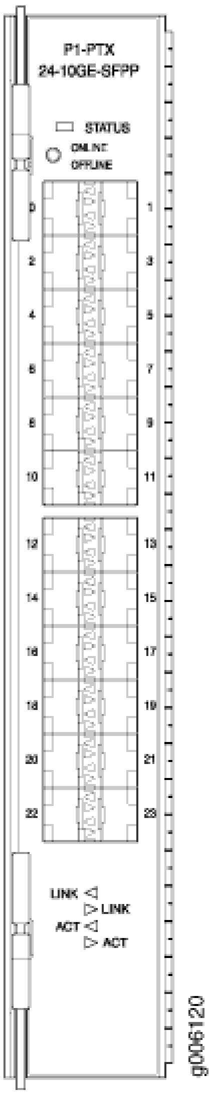
PIC Function

PICs provide the physical connection to various network media types, receiving incoming packets from the network and transmitting outgoing packets to the network. During this process, each PIC performs framing and line-speed signaling for its media type. Before transmitting outgoing data packets, the PICs encapsulate the packets received from the FPCs.

PIC Components

Figure 49 on page 107 shows an example of a PIC supported on the PTX3000. PICs have an upper ejector handle and a lower ejector handle.

Figure 49: PIC Faceplate



PICs Supported on the PTX Series

Table 30 on page 108 lists the PICs supported on the PTX Series and the first Junos OS release that supports each PIC.

See *PTX Series PIC/FPC Compatibility* for information about supported FPC and PIC combinations.

NOTE: PTX5000 does not support Junos OS Releases 12.1, 12.2, or 13.1.

Table 30: PICs Supported on the PTX Series

PIC Family and Type	Ports	Model Number	PIC First Supported on PTX3000	PIC First Supported on PTX5000
10-Gigabit Ethernet				
10-Gigabit Ethernet PIC with SFP+ (PTX Series)	24	P1-PTX-24-10GE-SFPP	13.2R2	12.1X48 12.3R1 13.2R1
10-Gigabit Ethernet LAN/WAN OTN PIC with SFP + (PTX Series)	24	P1-PTX-24-10G-W-SFPP	13.2R2	12.3R2 13.2R1
10-Gigabit Ethernet/40-Gigabit Ethernet				
10-Gigabit Ethernet/40-Gigabit Ethernet LAN/WAN OTN PIC with QSFP+ (PTX Series)	12	P2-10G-40G-QSFPP	15.1F6 16.1R2 17.1R1	14.1R2
24-Port 10-Gigabit Ethernet, 40-Gigabit Ethernet PIC with QSFP+ (PTX Series)	24	P3-24-U-QSFP28	15.1F6 16.1R2 17.1R1	15.1F3 16.1R2 17.1R1
40-Gigabit Ethernet				
40-Gigabit Ethernet PIC with CFP (PTX Series)	2	P1-PTX-2-40GE-CFP	13.2R2	12.1X48 12.3R1 13.2R1

Table 30: PICs Supported on the PTX Series *(Continued)*

PIC Family and Type	Ports	Model Number	PIC First Supported on PTX3000	PIC First Supported on PTX5000
10-Gigabit Ethernet/40-Gigabit Ethernet/100-Gigabit Ethernet				
10-Port 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet PIC with QSFP28 (PTX Series)	10	P3-10-U-QSFP28	16.1R3 17.1R1 **NOTE**: The P3-10-U-QSFP28 PIC is supported on PTX3000 on a service release version of Junos OS 15.1F6-S2.	17.1R1
15-Port 10-Gigabit, 40-Gigabit Ethernet, 100-Gigabit Ethernet PIC with QSFP28 (PTX Series)	15	P3-15-U-QSFP28	Not supported	15.1F5 16.1R2 17.1R1
100-Gigabit Ethernet				
100-Gigabit Ethernet PIC with CFP (PTX Series)	2	P1-PTX-2-100GE-CFP	13.2R2	12.1X48 12.3R1 13.2R1
100-Gigabit Ethernet PIC with CFP2 (PTX Series)	4	P2-100GE-CFP2	Not supported	14.1R1
100-Gigabit Ethernet OTN PIC with CFP2 (PTX Series)	4	P2-100GE-OTN	15.1F6 16.1R2 17.1R1	14.1R2
100-Gigabit DWDM OTN				

Table 30: PICs Supported on the PTX Series *(Continued)*

PIC Family and Type	Ports	Model Number	PIC First Supported on PTX3000	PIC First Supported on PTX5000
100-Gigabit DWDM OTN PIC (PTX Series)	2	P1-PTX-2-100G-WDM	13.3R1	13.2R1
100-Gigabit DWDM OTN PIC with CFP2-ACO (PTX Series)	5	PTX-5-100G-WDM	15.1F6 17.1R1	15.1F6 17.1R1

PTX Series PIC/FPC Compatibility

IN THIS SECTION

Table 31 on page 111 and Table 32 on page 113 list the PICs supported on each PTX Series router, the FPCs that support each PIC, and the first Junos OS release that supports each PIC and FPC combination.

NOTE: PTX5000 does not support Junos OS Releases 12.1, 12.2, or 13.1.

PTX3000 PIC/FPC Compatibility

Table 31 on page 111 describes PIC/FPC compatibility for the PTX3000.

Table 31: PTX3000 PIC/FPC Compatibility

PIC Family and Type	Model Number	PIC First Supported on FPC-SFF-PTX-P1	PIC First Supported on FPC-SFF-PTX-T	PIC First Supported on FPC3-SFF-PTX
10-Gigabit Ethernet				
10-Gigabit Ethernet PIC with SFP+ (PTX Series)	P1-PTX-24-10GE-SFPP	13.2R2	14.1R1	Not supported
10-Gigabit Ethernet LAN/WAN OTN PIC with SFP+ (PTX Series)	P1-PTX-24-10G-W-SFPP	13.2R2	14.1R1	15.1F6 16.1R2 17.1R1
10-Gigabit Ethernet/40-Gigabit Ethernet				
10-Gigabit Ethernet/40-Gigabit Ethernet LAN/WAN OTN PIC with QSFP+ (PTX Series)	P2-10G-40G-QSFPP	Not supported	Not supported	15.1F6 16.1R2 17.1R1
24-Port 10-Gigabit Ethernet, 40-Gigabit Ethernet PIC with QSFP + (PTX Series)	P3-24-U-QSFP28	Not supported	Not supported	15.1F6 16.1R2 17.1R1
40-Gigabit Ethernet				
40-Gigabit Ethernet PIC with CFP (PTX Series)	P1-PTX-2-40GE-CFP	13.2R2	14.1R1	Not supported
10-Gigabit Ethernet/40-Gigabit Ethernet/100-Gigabit Ethernet				

Table 31: PTX3000 PIC/FPC Compatibility *(Continued)*

PIC Family and Type	Model Number	PIC First Supported on FPC-SFF-PTX-P1	PIC First Supported on FPC-SFF-PTX-T	PIC First Supported on FPC3-SFF-PTX
10-Port 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet PIC with QSFP28 (PTX Series)	P3-10-U-QSFP28	Not supported	Not supported	16.1R3 17.1R1 **NOTE**: The P3-10-U-QSFP28 PIC is supported on PTX3000 on a service release version of Junos OS 15.1F6-S2.
100-Gigabit Ethernet				
100-Gigabit Ethernet PIC with CFP (PTX Series)	P1-PTX-2-100GE-CFP	13.2R2	14.1R1	Not supported
100-Gigabit Ethernet OTN PIC with CFP2 (PTX Series)	P2-100GE-OTN	Not supported	Not supported	15.1F6 16.1R2 17.1R1
100-Gigabit DWDM OTN				
100-Gigabit DWDM OTN PIC (PTX Series)	P1-PTX-2-100G-WDM	13.3R1	14.1R1	Not supported
100-Gigabit DWDM OTN PIC with CFP2-ACO (PTX Series)	PTX-5-100G-WDM	Not supported	Not supported	15.1F6 17.1R1

PTX5000 PIC/FPC Compatibility

Table 32 on page 113 describes PIC/FPC compatibility for the PTX5000.

Table 32: PTX5000 PIC/FPC Compatibility

PIC Family and Type	Model Number	PIC First Supported on FPC-PTX-P1-A	PIC First Supported on FPC2-PTX-P1A	PIC First Supported on FPC3-PTX-U2	PIC First Supported on FPC3-PTX-U3
10-Gigabit Ethernet					
10-Gigabit Ethernet PIC with SFP+ (PTX Series)	P1-PTX-24-10GE-SFPP	12.1X48 12.3 13.2	14.1R1	Not supported	Not supported
10-Gigabit Ethernet LAN/WAN OTN PIC with SFP+ (PTX Series)	P1-PTX-24-10G-W-SFPP	12.3R2 12.3 13.2	14.1R1	15.1F5	15.1F5
10-Gigabit Ethernet/40-Gigabit Ethernet					
10-Gigabit Ethernet/40-Gigabit Ethernet LAN/WAN OTN PIC with QSFP+ (PTX Series)	P2-10G-40G-QSFPP	Not supported	14.1R2	15.1F5 16.1R2 17.1R1	15.1F5 16.1R2 17.1R1
24-Port 10-Gigabit Ethernet, 40-Gigabit Ethernet PIC with QSFP+ (PTX Series)	P3-24-U-QSFP28	Not supported	Not supported	15.1F3 16.1R2 17.1R1	15.1F3 16.1R2 17.1R1
40-Gigabit Ethernet					
40-Gigabit Ethernet PIC with CFP (PTX Series)	P1-PTX-2-40GE-CFP	12.1X48 12.3 13.2	14.1R2	Not supported	Not supported

Table 32: PTX5000 PIC/FPC Compatibility *(Continued)*

PIC Family and Type	Model Number	PIC First Supported on FPC-PTX-P1-A	PIC First Supported on FPC2-PTX-P1A	PIC First Supported on FPC3-PTX-U2	PIC First Supported on FPC3-PTX-U3
10-Gigabit Ethernet/40-Gigabit Ethernet/100-Gigabit Ethernet					
10-Port 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet PIC with QSFP28 (PTX Series)	P3-10-U-QSFP28	Not supported	Not supported	17.1R1	17.1R1
15-Port 10-Gigabit, 40-Gigabit Ethernet, 100-Gigabit Ethernet PIC with QSFP28 (PTX Series)	P3-15-U-QSFP28	Not supported	Not supported	15.1F5 16.1R2 17.1R1	15.1F5 16.1R2 17.1R1
100-Gigabit Ethernet					
100-Gigabit Ethernet PIC with CFP (PTX Series)	P1-PTX-2-100GE-CFP	12.1X48 12.3 13.2	14.1R2	Not supported	Not supported
100-Gigabit Ethernet PIC with CFP2 (PTX Series)	P2-100GE-CFP2	Not supported	14.1R1	Not supported	Not supported
100-Gigabit Ethernet OTN PIC with CFP2 (PTX Series)	P2-100GE-OTN	Not supported	14.1R2	15.1F5 16.1R2 17.1R1	15.1F5 16.1R2 17.1R1
100-Gigabit DWDM OTN					

Table 32: PTX5000 PIC/FPC Compatibility *(Continued)*

PIC Family and Type	Model Number	PIC First Supported on FPC-PTX-P1-A	PIC First Supported on FPC2-PTX-P1A	PIC First Supported on FPC3-PTX-U2	PIC First Supported on FPC3-PTX-U3
100-Gigabit DWDM OTN PIC (PTX Series)	P1-PTX-2-100G-WDM	13.2R1	14.1R1	Not supported	Not supported
100-Gigabit DWDM OTN PIC with CFP2-ACO (PTX Series)	PTX-5-100G-WDM	Not supported	Not supported	15.1F6 17.1R1	15.1F6 17.1R1

PTX3000 IPLC Description

IN THIS SECTION

The integrated photonic line card (*IPLC*) base module (PTX-IPLC-B-32) is an integrated optical card that provides the combined functionalities of optical multiplexing and demultiplexing, optical amplification, optical equalization, and optical channel monitoring. The IPLC base module multiplexes and enables amplification of up to 32 individual wavelengths for transmission over single-mode optical fiber (through the add and drop ports on the front panel). The add and drop ports on the front panel of the IPLC connect to compatible dense wavelength-division multiplexing (DWDM) PICs or MICs. The wavelengths from the add and drop ports on the IPLC are amplified, monitored, and controlled and then transmitted toward the line direction (through the **Line OUT** port on the front panel). In the reverse direction, the received signals from the line are amplified to enable long-distance transmission and received through the **Line IN** port and then demultiplexed into individual wavelengths and sent to the respective add and drop ports on the front panel.

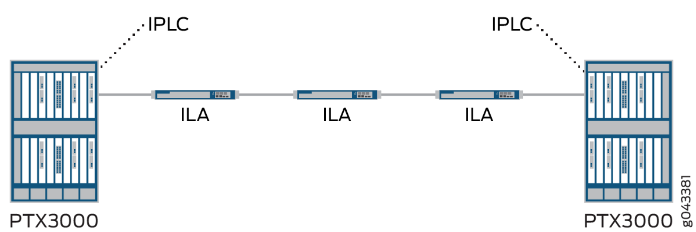
The IPLC expansion module (PTX-IPLC-E-32) is an optical multiplexing and demultiplexing card that interfaces with the IPLC base module to increase the add/drop capacity of the system up to 64 channels.

In a PTX3000 chassis, you can install an IPLC in any of the FPC or PIC slots. The IPLCs install vertically in the front of the PTX3000. Up to 16 IPLC base modules or up to 8 base modules and 8 expansion modules are supported in a PTX3000 chassis. Each expansion module must be connected to a base module. The IPLC connects directly to the integrated DWDM PICs/MICs (for example, the P1-PTX-2-100G-WDM or P1-PTX-5-100G-WDM) in the same chassis, or an external chassis through the IPLC front panel add and drop ports. See "PTX Series IPLC Compatibility" on page 127 to see which PICs/MICs are supported by the IPLC. Also, the IPLC can connect to another IPLC in the same chassis through the bidirectional express ports (**XPN** IN and **XPN OUT**) to enable an optical bypass function.

The IPLC can also connect to an *optical inline amplifier* (ILA) in the network to enable transmission across longer spans. See the *Optical Inline Amplifier Hardware Guide* for more details about the optical ILA.

Figure 50 on page 116 shows a point-to-point configuration for an IPLC.

Figure 50: Point-to-Point Configuration



In this example, the IPLC in the PTX3000 chassis is connected to compatible PICs in the same chassis through the add and drop ports. The wavelengths from the add and drop ports on the IPLC are multiplexed and then amplified, monitored, and transmitted in a single fiber toward the line (through the **Line OUT** port on the IPLC) and the IPLC is connected to the remote IPLC (through the **Line IN** port) in the remote PTX3000 chassis through the optical ILA . The IPLC connects to the optical ILA through the **Line IN** and **Line OUT** ports. The optical ILAs provide periodic amplification of the signal to enable long-distance transmission and are typically placed between 50 miles (80 km) and 62 miles (100 km) apart. The signals received by the IPLC in the remote chassis are demultiplexed into individual wavelengths and sent to the respective add and drop ports (which are connected to the compatible PICs) in that PTX3000 chassis. See "PTX Series IPLC Compatibility" on page 127 to see which PICs/MICs are supported by the IPLC.

You can manage the IPLCs by using the Junos operating system (Junos OS). For information about configuring the IPLCs, see the *Integrated Photonic Line Card (IPLC) System User Guide*.

Starting with Junos OS release 17.1, you can control and manage optical inline amplifiers (ILA) over the optical supervisory channel (OSC) of the IPLCs. For information see the *Integrated Photonic Line Card (IPLC) System User Guide*.

You can also manage the IPLC through Connectivity Services Director (CSD), which is a Junos Space application developed to manage the optical functionality provided by IPLCs that are installed in the PTX3000 routers. CSD is managed over a data communications network (DCN). See the Packet *Optical Support in CSD Guide* for more information.

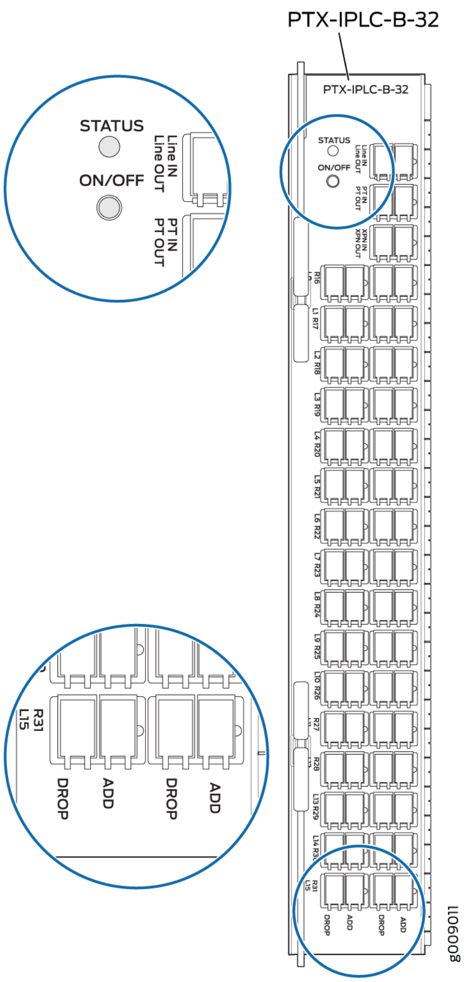
IPLC Base Module

The IPLC base module provides the following optical functions:

- Multiplexing and demultiplexing of up to 32 channels spaced at 100 GHz.
- Amplification of the aggregate multiplexed wavelengths to enable long-distance transmission.
- Per channel power monitoring and control through the use of an on-board optical channel monitor (OCM) and wavelength selective switch (WSS).
- Bypass of optical channels between pairs of IPLCs for low-cost optical networking. Two IPLC base modules installed in the same chassis can form an optical bypass. In addition, adding an expansion module (connected to an IPLC base module) can expand the number of channels supported beyond the 32 channels, up to 64 channels.
- Support for the optical supervisory channel (OSC) is transmitted through an OC-3 1510 nm signal that enables the IPLC to communicate with the remote IPLC or communicate with and manage the optical ILA.

IPLC Base Module Components

Figure 51: IPLC Base Module Faceplate



Each IPLC base module weighs 6.3 lb (2.85 kg). See Figure 51 on page 118. The add and drop ports are numbered **0** through **31** and the port numbers are denoted by **R** and **L**. For example, as shown in the lower magnified view in Figure 51 on page 118, **L15** refers to the add and drop ports on the left side and **R31** refers to the add and drop ports on the right side on the front panel.

The IPLC base module consists of these components:

- **STATUS** LED that displays the status of the IPLC.
- **ON/OFF** button that resets the IPLC.
- **Line IN** and **Line OUT** ports—An input and an output port to connect to another optical network device. You can use these ports to connect to another IPLC or to the optical ILA.

- **PT IN** and **PT OUT** ports—An input and an output port to connect to an another IPLC base module. Two IPLCs can be installed in the same chassis to form an optical express-in (bypass).
- **XPN IN** (expansion in) and **XPN OUT** (expansion out) ports—An input and an output port to connect to an IPLC expansion module.
- **ADD** and **DROP** ports—A total of 32 pairs of ports (32 add ports and 32 drop ports) for 32 DWDM channels.

NOTE: All the ports on the IPLC use fiber-optic cables with LC connectors. See "Connecting PIC or IPLC Cables to the PTX3000" on page 211 for more information.

Table 33 on page 119 provides the supported wavelength allocation on the IPLC ports.

Table 33: Supported Wavelength Allocation for the IPLC Base Module (PTX-IPLC-B-32)

Frequency (THz)	Central Wavelength (nm)	Port Number on the IPLC Base Module
192.05	1561.01	0
192.15	1560.20	1
192.25	1559.39	2
192.35	1558.58	3
192.45	1557.77	4
192.55	1556.96	5
192.65	1556.15	6
192.75	1555.34	7
192.85	1554.54	8

192.95	1553.73	9
193.05	1552.93	10
193.15	1552.12	11
193.25	1551.32	12
193.35	1550.52	13
193.45	1549.72	14
193.55	1548.91	15
193.65	1548.11	16
193.75	1547.32	17
193.85	1546.52	18
193.95	1545.72	19
194.05	1544.92	20
194.15	1544.13	21
194.25	1543.33	22
194.35	1542.54	23
194.45	1541.75	24
194.55	1540.95	25

194.65	1540.16	26
194.75	1539.37	27
194.85	1538.58	28
194.95	1537.79	29
195.05	1537.00	30
195.15	1536.22	31

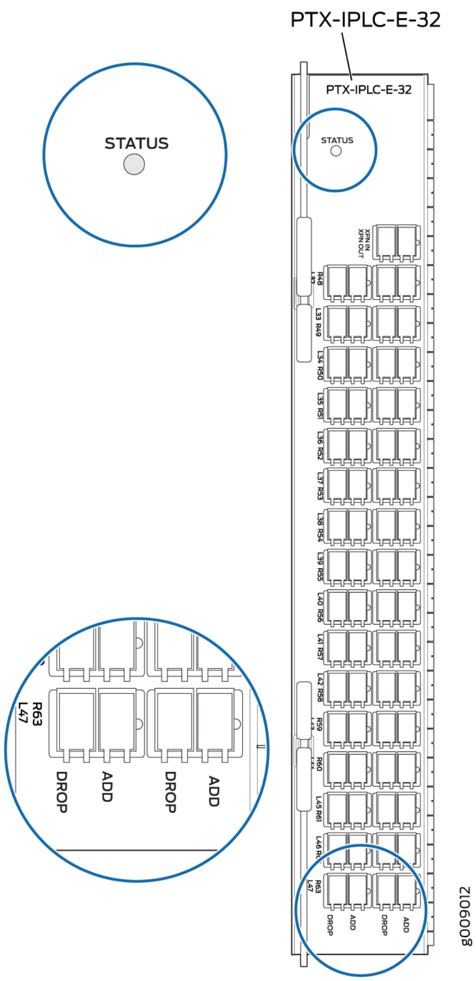
IPLC Expansion Module

The IPLC expansion module connects to the IPLC base module through the **XPN IN** and **XPN OUT** ports. It provides the following optical functions:

- Increases the total optical DWDM channel capacity by 32 ports. It does not interface directly with the network.
- Provides multiplexing and demultiplexing of up to 32 channels spaced at 100 GHz.

IPLC Expansion Module Components

Figure 52: IPLC Expansion Module Faceplate



Each IPLC expansion module weighs 3.3 lb (1.49 kg). See Figure 52 on page 122. The add and drop ports are numbered **32** through **63** and the port numbers are denoted by **R** and **L**. For example, as shown in the lower magnified view in Figure 52 on page 122, **L47** refers to the add and drop ports on the left side and **R63** refers to the add and drop ports on the right side on the front panel. The IPLC expansion module consists of these components:

- **STATUS** LED that displays the status of the IPLC.
- **XPN IN** (expansion in) and **XPN OUT** (expansion out) ports—A pair of input and output ports to connect to the IPLC base module.
- **ADD** and **DROP** ports—A total of 32 pairs of ports (32 add ports and 32 drop ports) for 32 DWDM channels.

All the ports on the IPLC use fiber-optic cables with LC connectors. See "Connecting PIC or IPLC Cables to the PTX3000" on page 211 for more information.

Table 34 on page 123 provides the supported wavelength allocation on the ports.

Table 34: Supported Wavelength Allocation for the IPLC Expansion Module (PTX-IPLC-E-32)

Frequency (THz)	Central Wavelength (nm)	Port Number on the IPLC Expansion Module
192.10	1560.61	32
192.20	1559.79	33
192.30	1558.98	34
192.40	1558.17	35
192.50	1557.36	36
192.60	1556.55	37
192.70	1555.75	38
192.80	1554.94	39
192.90	1554.13	40
193.00	1553.33	41
193.10	1552.52	42
193.20	1551.72	43
193.30	1550.92	44

Table 34: Supported Wavelength Allocation for the IPLC Expansion Module (PTX-IPLC-E-32) *(Continued)*

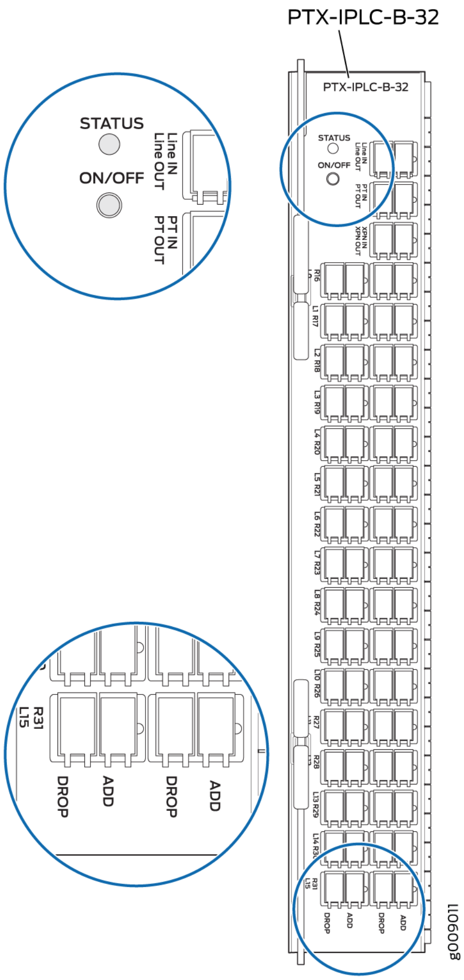
Frequency (THz)	Central Wavelength (nm)	Port Number on the IPLC Expansion Module
193.40	1550.12	45
193.50	1549.32	46
193.60	1548.51	47
193.70	1547.72	48
193.80	1546.92	49
193.90	1546.12	50
194.00	1545.32	51
194.10	1544.53	52
194.20	1543.73	53
194.30	1542.94	54
194.40	1542.14	55
194.50	1541.35	56
194.60	1540.56	57
194.70	1539.77	58
194.80	1538.98	59

Table 34: Supported Wavelength Allocation for the IPLC Expansion Module (PTX-IPLC-E-32) *(Continued)*

Frequency (THz)	Central Wavelength (nm)	Port Number on the IPLC Expansion Module
194.90	1538.19	60
195.00	1537.40	61
195.10	1536.61	62
195.20	1535.82	63

PTX3000 IPLC LED

Figure 53: IPLC LED



An *IPLC* base module and an IPLC expansion module each has one LED—labeled **STATUS.**Table 35 on page 126 describes the functions of the LED.

Table 35: PTX3000 IPLC LED

Label	Color	State	Description
STATUS	Green	On steadily	IPLC is online.
		Blinking	IPLC is booting.

Table 35: PTX3000 IPLC LED *(Continued)*

Label	Color	State	Description
	Red	On steadily	IPLC is in a failed state.
	–	Off	IPLC is offline.

PTX Series IPLC Compatibility

The *IPLC* modules are connected to PICs in the same chassis, or to PICs or MICs in a remote chassis. Table 36 on page 127 lists the PICs and MIC supported by the IPLC modules.

Table 36: PTX3000 IPLC PIC/MIC Compatibility

PIC/MIC	Model Number	Description	IPLC Base Module	IPLC Expansion Module
2-port 100-Gigabit *DWDM* OTN PIC	• P1-PTX-2-100G-WDM	Supported on PTX3000 and PTX5000.	15.1F6 17.1R1	15.1F6 17.1R1
5-port 100-Gigabit DWDM OTN PIC with CFP2-ACO	• PTX-5-100G-WDM	Supported on PTX3000 and PTX5000 using third-generation FPCs.	15.1F6 17.1R1	15.1F6 17.1R1
1-port 100-Gigabit DWDM OTN MIC with CFP2-ACO	• MIC3-100G-DWDM	Supported on MX240, MX480, MX960, MX2010, and MX2020 using MPC3E-3D and MPC3E-NG MPCs.	15.1F6 17.1R1	15.1F6 17.1R1

NOTE: Juniper Networks supports alien wavelengths at 50 GHz spacing through third-party transponders directly into the IPLC module.

See the *PTX Series Interfaces Module Reference* and the *MX Series Interface Module Reference* for detailed information on the PICs and the MIC.

SEE ALSO

- *100-Gigabit DWDM OTN PIC (PTX Series)*
- *100-Gigabit DWDM OTN PIC with CFP2-ACO (PTX Series)*
- *100-Gigabit DWDM OTN MIC with CFP2-ACO*

RELATED DOCUMENTATION

- Maintaining the PTX3000 FPCs | **317**
- Maintaining the PTX3000 PICs and PIC Cables | **322**
- Maintaining the PTX3000 IPLCs and IPLC Cables | **342**
- Troubleshooting the PTX3000 FPCs | **409**
- Troubleshooting the PTX3000 PICs and PIC Cables | **414**
- Troubleshooting the PTX3000 IPLCs | **415**

2

CHAPTER

Site Planning, Preparation, and Specifications

Overview of Preparing the Site for the PTX3000

To prepare a site for PTX3000 installation:

1. Verify that environmental factors such as temperature and humidity do not exceed PTX3000 tolerances.

   See "PTX3000 Environmental Specifications" on page 132.
2. Verify that the site and installation plan meets all safety guidelines and requirements.

   See *General Site Guidelines* and *General Safety Guidelines and Warnings*.
3. Locate sites for connection of system grounding.

   See "PTX3000 Chassis Grounding Cable and Lug Specifications" on page 133.
4. Calculate the power consumption and requirements.

   Measure the distance between external power sources and the PTX3000 installation site.

   For an AC-powered PTX3000:

   - See "Calculating PTX3000 Power Consumption" on page 145.
   - See "PTX3000 AC Power Supply Module Specifications" on page 46.
   - See "PTX3000 AC Power Cord Specifications" on page 47.
   - See "PTX3000 AC Power System Electrical Specifications" on page 45.

   For a DC-powered PTX3000:

   - See "Calculating PTX3000 Power Consumption" on page 145.
   - See "PTX3000 DC Power Distribution" on page 52.
   - See "PTX3000 DC Power Supply Module Specifications" on page 49.
   - See "PTX3000 DC Power Cable and Lugs Specifications" on page 50.
   - See "PTX3000 DC Power System Electrical Specifications" on page 49.

5. Plan rack location, including the required space clearances.

   - See "PTX3000 Clearance Requirements for Airflow and Hardware Maintenance" on page 135.
   - See "PTX3000 Physical Specifications" on page 138.

6. Verify that the plan for power installation meets all electrical safety guidelines.

   See *Site Electrical Wiring Guidelines* and *General Electrical Safety Guidelines and Warnings*.
7. Verify that your rack meets the minimum requirements for installation of the PTX3000.

   - See "Rack Requirements for the PTX3000" on page 143.

- See "PTX3000 Chassis Description" on page 18.

8. Plan to secure the rack to the floor and building structure.

   See "Rack Requirements for the PTX3000" on page 143.

9. Acquire cables and connectors:

   - Determine the number of cables and type of cable needed based on your planned configuration.
     - The PTX Series Interface Module Reference describes the PICs supported on PTX Series routers.
     - **TIP**: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers supported on your Juniper Networks device.
   - Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.
     - See *Calculating Power Budget and Power Margin for Fiber-Optic Cables*.
     - See *Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion*.

10. Plan the cable routing and management.

    - See "PTX3000 Cable Management System" on page 22
    - See "Maintaining the PTX3000 PICs and PIC Cables" on page 322.

RELATED DOCUMENTATION

PTX3000 Description | 2

Overview of Installing the PTX3000 | 165

PTX3000 Site Guidelines and Requirements

IN THIS SECTION

PTX3000 Environmental Specifications

Table 37 on page 132 specifies the environmental specifications required for normal PTX3000 operation. In addition, the site should be as dust-free as possible.

Table 37: PTX3000 Environmental Specifications

Description	Value
Altitude	No performance degradation to 10,000 ft (3048 m)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing
Temperature	Normal operation ensured in temperature range of 32°F (0°C) through 104°F (40°C) Nonoperating storage temperature in shipping crate: –40°F (–40°C) through 158°F (70°C)
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements
Maximum thermal output	20,634 BTU/hr (6051 W)

NOTE: Install the PTX3000 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.

SEE ALSO

Routine Maintenance Procedures for the PTX3000 | 235

General Site Guidelines

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

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

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

PTX3000 Chassis Grounding Cable and Lug Specifications

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the PTX3000 must be adequately grounded before power is connected.

Two 1/4"-20 thread, 1/2" long studs are provided on the right flange of the chassis for connecting the PTX3000 to earth ground. The grounding points are spaced at 0.625-in. (15.86-mm) centers.

> **NOTE**: You must install the PTX3000 in a restricted-access location and ensure that the chassis is always properly grounded. The PTX3000 has a two-hole protective grounding terminal provided on the chassis. We recommend that you use this protective grounding terminal as the preferred method for grounding the chassis regardless of the power supply configuration. However, if additional grounding methods are available, you can also use those methods. For example, you can use the grounding wire in the AC power cord or use the grounding terminal or lug on a DC power supply. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

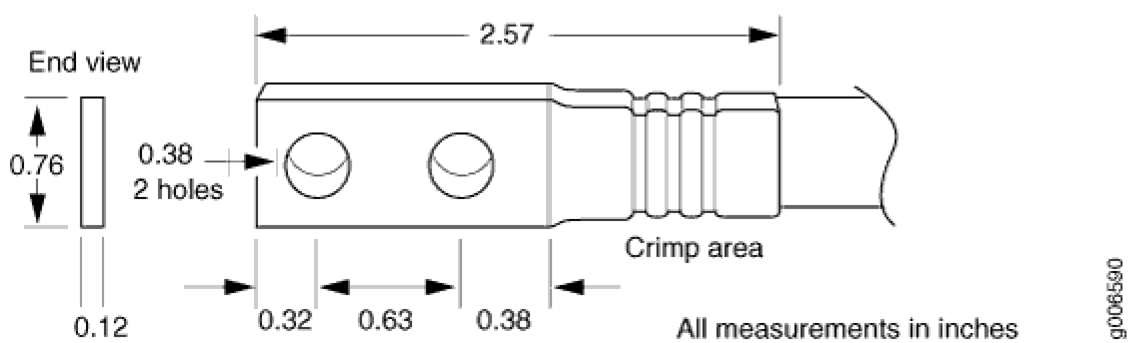
The accessory box shipped with the PTX3000 includes:

- Two acorn nuts to secure the grounding cable to the grounding points.
- One 4-AWG (21 mm^2) cable lug used to secure the grounding cable to the grounding points.

> **NOTE**: The cable lug shown in Figure 54 on page 134 can also used for the DC power cables.

> **CAUTION**: Before PTX3000 installation begins, a licensed electrician must attach a cable lug to the grounding cable that you supply. A cable with an incorrectly attached lug can damage the PTX3000.

Figure 54: Grounding Cable Lug



You must supply a grounding cable. Table 38 on page 135 summarizes the specifications for the grounding cable and lug.

In addition, GR1089-CORE requires the following:

- The grounding conductor must be copper.
- Bare conductors shall be coated with an antioxidant before crimp connections are made.
- Plated areas that are electrically connected to the grounding conductor shall be cleaned and free of contaminants before the connection is made.

Table 38: Grounding Cable Specifications

Item	Specification
Cable	6-AWG (13 mm^2), minimum **NOTE**: You can also use a 4-AWG (21 mm^2) grounding cable.
Connector	Cable lug; dual hole, sized to fit 1/4-20 UNC terminal studs at 15.86-mm (0.625-in.) center line.

SEE ALSO

Connecting the PTX3000 Grounding Cable | 183

PTX3000 Clearance Requirements for Airflow and Hardware Maintenance

When planning the installation site, allow sufficient clearance around the rack (see Figure 55 on page 137):

- For the cooling system to function properly, the airflow around the chassis must be unrestricted.
- For service personnel to remove and install hardware components, there must be adequate space at the front of the chassis. At least 24 in. (61.0 cm) is required in front of the PTX3000. NEBS GR-63 recommends that you allow at least 30 in. (72.6 cm) in front of the rack.
- Additional clearance is required to accommodate the depth of the cable management system: 1.9 in. (4.8 cm) additional depth in the front of the chassis.
- The compact form-factor of the chassis allows up to four PTX3000 routers to be installed in a single four-post rack. For all configurations, there must be at least 10 in. (25.4 cm) between the PTX3000 and neighboring devices to the side, and there must be no obstruction above the chassis that prevents airflow. Depending on your installation, the required clearance at the rear of the chassis varies:
  - A standalone PTX3000 requires 2 in. (5.1 cm) of clearance at the rear (see Figure 55 on page 137).
  - Two PTX3000 routers installed back-to-back require 4 in. (10.2 cm) of clearance between the routers at the rear.

- Four PTX3000 routers installed back-to-back and stacked in a single rack require 10 in. (25.4 cm) of clearance between the routers at the rear (see Figure 56 on page 138).

NOTE: These requirements have been designed to provide adequate cooling in deployments with ambient temperatures up to 104°F (40°C).

Figure 55: Chassis Dimensions and Clearance Requirements

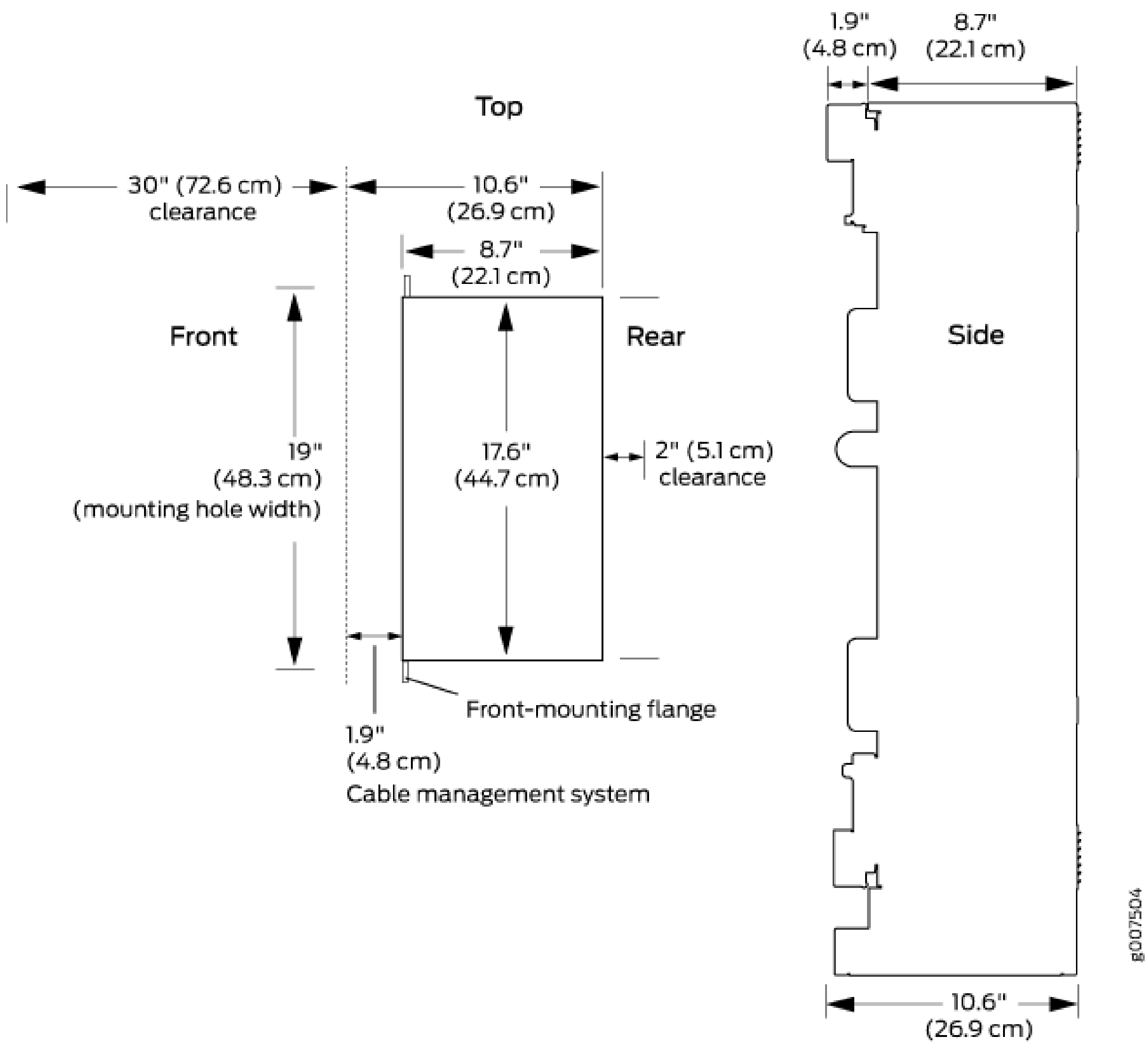
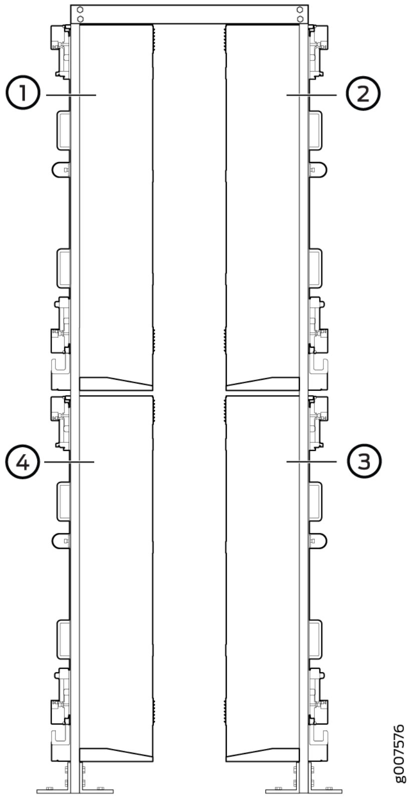


Figure 56: Four Routers Installed Back-to-Back



1– Upper chassis 1	3– Lower chassis 1
2– Upper chassis 2	4– Lower chassis 2

SEE ALSO

PTX3000 Installation Safety Guidelines | 166
PTX3000 Cooling System Description | 29

PTX3000 Physical Specifications

Table 39 on page 139 lists the physical specifications for the PTX3000 chassis and components.

Table 39: Physical Specifications

Description	Weight	Height	Width	Depth
Chassis with backplane and cable management system	78.2 lb (35.5 kg)	38.5 in. (97.8 cm)	17.6 in. (44.7 cm) (excluding the mounting flanges)	8.7 in. (22.1 cm) (from mounting flange to chassis rear) 10.6 in. (26.9 cm) (including the cable management system)
Control Board	3.1 lb (1.4 kg)	11.1 in. (28.2 cm)	1.7 in. (4.3 cm)	7.8 in. (19.8 cm)
Routing Engine	2.8 lb (1.3 kg)	10.3 in. (26.2 cm)	1.7 in. (4.4 cm)	6.9 in. (17.5 cm)
Routing and Control Board	3.75 lbs (1.7 kg)	11.1 in. (28.2 cm)	1.7 in. (4.3 cm)	7.8 in. (19.8 cm)
Routing and Control Board companion card	1.17 lb (0.53 kg)	10.3 in. (26.2 cm)	1.7 in. (4.4 cm)	6.9 in. (17.5 cm)
Craft interface	0.4 lb (0.2 kg)	3.8 in. (9.6 cm)	1.4 in. (3.5 cm)	7.8 in. (19.8 cm)
FPC	• FPC-SFF-PTX-P1-A: 5.9 lb (2.7 kg) • FPC-SFF-PTX-T: 5.9 lb (2.7 kg) • FPC3-SFF-PTX: 10.5 lb (4.8 kg)	11.1 in. (28.2 cm)	1.7 in. (4.3 cm)	7.8 in. (19.8 cm)

Table 39: Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
PIC	• P1-PTX-24-10GE-SFPP: 3.7 lb (1.7 kg) • P1-PTX-24-10G-W-SFPP: 2.5 lb (1.1 kg) • P2-10G-40G-QSFPP: 4.3 lb (2 kg) • P1-PTX-2-40GE-CFP: 3.5 lb (1.6 kg) • P3-24-U-QSFP28: 3.5 lb (1.6 kg) • P1-PTX-2-100GE-CFP: 3.5 lb (1.6 kg) • P2-100GE-OTN: 4.4 lb (2 kg) • P1-PTX-2-100G-WDM: 5.5 lb (2.5 kg)	11.1 in. (28.2 cm)	1.7 in. (4.3 cm)	7.8 in. (19.8 cm)
Blank panel for FPC and PIC slots	1.3 lb (0.6 kg)	11.1 in. (28.2 cm)	1.7 in. (4.3 cm)	

Table 39: Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
IPLC	• PTX-IPLC-B-32: 6.3 lb (2.85 kg) • PTX-IPLC-E-32: 3.3 lb (1.49 kg)	11.1 in. (28.2 cm)	1.7 in. (4.3 cm)	7.8 in. (19.8 cm)
DC PSM	4.6 lb (2.1 kg)	3.5 in. (8.9 cm)	3.4 in. (8.7 cm)	10.1 in. (25.7 cm)
AC PSM	4.5 lb (2.0 kg)	3.5 in. (8.9 cm)	3.4 in. (8.7 cm)	10.1 in. (25.7 cm)
SIB	• SIB-SFF-PTX-240: 1.5 lb (0.7 kg) • SIB3-SFF-PTX: 1.9 lb (0.9 kg)	3.9 in. (10 cm)	1.7 in. (4.3 cm)	7.8 in. (19.8 cm)
Fan tray	7.5 lb (3.4 kg)	2.5 in. (6.4 cm)	17.3 in. (43.8 cm)	7.8 in. (19.8 cm)
Air filter	1.0 lb (0.5 kg)	–	–	–

SEE ALSO

PTX3000 Installation Safety Guidelines | 166

Site Electrical Wiring Guidelines

Table 40 on page 142 describes the factors you must consider while planning the electrical wiring at your site.

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

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

Table 40: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a twisted-pair cable with a good distribution of grounding conductors. • If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Strong sources of electromagnetic interference (EMI) can cause: • Destruction of the signal drivers and receivers in the device, • Electrical hazards as a result of power surges conducted over the lines into the equipment.

Rack Requirements for the PTX3000

IN THIS SECTION

Rack Size and Strength

The PTX3000 is designed for installation in a rack that complies with either of the following standards:

- A 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Components Industry Association (http://www.ecianow.org/).
- A 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (http://www.etsi.org). The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the mounting brackets, which measure 19 in. (48.3 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required.

The rack rails must be spaced widely enough to accommodate the chassis's external dimensions: 38.5 in. (97.8 cm) high, 8.7 in. (22.1 cm) deep, and 17.6 in. (44.7 cm) wide. The cable management system on the front of the chassis adds 1.9 in. (4.8 cm) to the depth, for a total depth of 10.6 in. (26.9 cm). The outer edges of the mounting brackets extend the width to 19 in. (48.3 cm).

The spacing of rails and adjacent racks must also allow for the clearances around the chassis and rack that are specified in "PTX3000 Clearance Requirements for Airflow and Hardware Maintenance" on page 135.

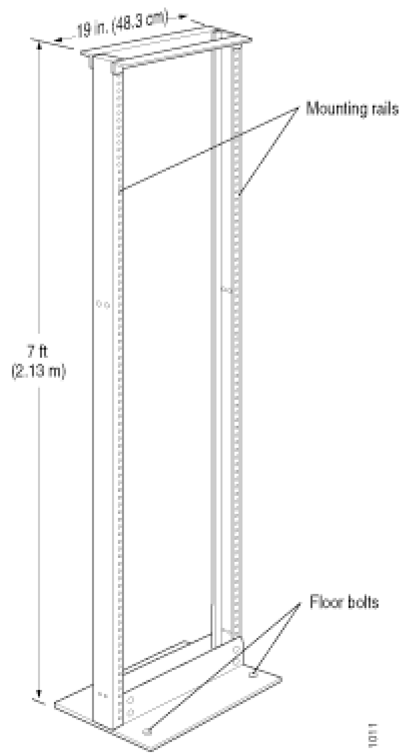
The chassis height of 38.5 in. (97.8 cm) high is approximately 22 U. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association. You can install one chassis in a rack that has at least 22 U of usable vertical space.

The compact form-factor of the chassis allows up to four PTX3000 routers to be installed in a single four-post rack. Depending on your installation, the required clearance at the rear of the chassis varies,

see "PTX3000 Clearance Requirements for Airflow and Hardware Maintenance" on page 135 for more information.

The rack must be strong enough to support the weight of the fully configured PTX3000, up to about 310 lb (140.6 kg).

Figure 57: Typical Open-Frame Rack



Spacing of Mounting Bracket and Flange Holes

The holes in the mounting brackets and front-mount flanges used to attach the chassis to a rack are spaced at 3 U (5.25 in. or 13.3 cm). The PTX3000 can be mounted in any rack that provides holes spaced at those distances.

Connection to Building Structure

Always secure the rack to the structure of the building. If your geographical area is subject to earthquakes, bolt the rack to the floor. For maximum stability, also secure the rack to ceiling brackets.

SEE ALSO

PTX3000 Installation Safety Guidelines | 166
PTX3000 Chassis Description | 18
PTX3000 Physical Specifications

Calculating PTX3000 Power Consumption

IN THIS SECTION

Power Requirements for PTX3000 Components

Table 41 on page 145 lists the output power requirements for the required and optional FRUs for the PTX3000. The power requirements vary depending on the ambient air temperature for your installation.

Table 41: Power Requirements for PTX3000 Components

Component	Typical Output Power Requirement	Maximum Output Power Requirement
Base system with SIB-SFF-PTX-240 SIBs (2 fan trays + 1 craft interface + 1 host subsystem + 9 SIB-SFF-PTX-240 SIBs)	730 W	1555 W
Base system with SIB3-SFF-PTX SIBs (2 fan trays + 1 craft interface + 1 host subsystem + 9 SIB3-SFF-PTX SIBs)	826 W	1600 W

Table 41: Power Requirements for PTX3000 Components *(Continued)*

Component	Typical Output Power Requirement	Maximum Output Power Requirement
Base system with SIB3-SFF-PTX SIBs (2 fan trays + 1 craft interface + 1 host subsystem + 9 SIB3-SFF-PTX SIBs)	826 W	1600 W
Base System Components		
Fan tray	120 W (typical speed)	450 W (higher speed)
Craft interface	4.8 W	4.8 W
Host subsystem (Control Board and Routing Engine)	95 W	110 W
SIB-SFF-PTX-240	43.3 W	60 W
SIB3-SFF-PTX	54 W	65 W
SIB3-SFF-PTX	54 W	65 W
FPCs		
FPC-SFF-PTX-P1-A	200 W	270 W
FPC-SFF-PTX-T	200 W	270 W
FPC3-SFF-PTX	250 W	300 W
PICs		
P1-PTX-24-10GE-SFPP	60 W	70 W
P1-PTX-24-10G-W-SFPP	82 W	115 W

Table 41: Power Requirements for PTX3000 Components *(Continued)*

Component	Typical Output Power Requirement	Maximum Output Power Requirement
P1-PTX-2-40GE-CFP	27 W	35 W
P3-24-U-QSFP28	110 W	167 W
P1-PTX-2-100GE-CFP	70 W	75 W
P1-PTX-2-100G-WDM	250 W	280 W
IPLCs		
PTX-IPLC-B-32	50 W	75 W
PTX-IPLC-E-32	1 W	3 W

Calculating Power Consumption for your Configuration

By using the information in Table 41 on page 145, you can calculate the power consumption for your configuration.

NOTE: PTX3000 AC and DC power supply module (PSM) efficiency is approximately 90% at full load and nominal voltage. The power supply efficiency is used to calculate the input power in the calculations below.

NOTE: In the examples below, a base system is defined as described in Table 41 on page 145.

- Example of calculating *typical* power consumption for a *minimum* configuration using an FPC-SFF-PTX-P1-A FPC and SIB-SFF-PTX-240 SIBs:

```
Base system with SIB-SFF-PTX-240 SIBs + 1 FPC-SFF-PTX-P1-A FPC + 1 P1-PTX-24-10G-W-SFPP PIC =
output power in watts

730 W + 200 W + 82 W = 1012 W

Output power in watts / power supply efficiency = input power consumption in watts

1012 W / 0.9 = 1125 W
```

- Example of calculating *typical* power consumption for a *maximum* configuration using FPC-SFF-PTX-P1-A FPCs and SIB-SFF-PTX-240 SIBs:

```
Base system with SIB-SFF-PTX-240 SIBs + 1 host subsystem + 8 FPC-SFF-PTX-P1-A FPCs + 8 P1-
PTX-24-10G-W-SFPP PICs = output power in watts

730 W + 95 W + 8(200 W) + 8(82 W) =
730 W + 95 W + 1600 W + 656 W = 3081 W

Output power in watts / power supply efficiency = input power consumption in watts

3081 W / 0.9 = 3424 W
```

- Example of calculating *maximum* power consumption for a *maximum* configuration using FPC-SFF-PTX-P1-A FPCs and SIB-SFF-PTX-240 SIBs:

```
Base system with SIB-SFF-PTX-240 SIBs + 1 host subsystem + 8 FPC-SFF-PTX-P1-A FPCs + 8 P1-
PTX-24-10G-W-SFPP PICs = output power in watts

1555 W + 110 W + 8(270 W) + 8(115 W) =
1555 W + 110 W + 2160 W + 920 W = 4745 W

Output power in watts / power supply efficiency = input power consumption in watts

4745 W / 0.9 = 5273 W
```

- Example of calculating *typical* power consumption for a *minimum* configuration using an FPC3-SFF-PTX FPC and SIB3-SFF-PTX SIBs:

```
Base system with SIB3-SFF-PTX SIBs + 1 FPC3-SFF-PTX FPC + 1 P3-24-U-QSFP28 PIC = output power
in watts

826 W + 250 W + 110 W = 1186 W

Output power in watts / power supply efficiency = input power consumption in watts

1186 W / 0.9 = 1318 W
```

- Example of calculating *typical* power consumption for a *maximum* configuration using FPC3-SFF-PTX FPCs and SIB3-SFF-PTX SIBs:

```
Base system with SIB3-SFF-PTX SIBs + 1 host subsystem + 8 FPC3-SFF-PTX FPCs + 8 P3-24-U-
QSFP28 PICs = output power in watts

826 W + 95 W + 8(250 W) + 8(110 W) =
826 W + 95 W + 2000 W + 880 W = 3801 W

Output power in watts / power supply efficiency = input power consumption in watts

3801 W / 0.9 = 4223 W
```

- Example of calculating *maximum* power consumption for a *maximum* configuration using FPC3-SFF-PTX FPCs and SIB3-SFF-PTX SIBs:

```
Base system with SIB3-SFF-PTX SIBs + 1 host subsystem + 8 FPC3-SFF-PTX FPCs + 8 P3-24-U-
QSFP28 PICs = output power in watts

1600 W + 110 W + 8(300 W) + 8(167 W) =
1600 W + 110 W + 2400 W + 1336 W = 5446 W

Output power in watts / power supply efficiency = input power consumption in watts

5446 W / 0.9 = 6051 W
```

Calculating System Thermal Output

After you have calculated the power consumption for your configuration, you can use that information to determine the system thermal output (BTUs per hour). To do so, multiply the power consumption in watts by 3.41.

For example, above we calculated the power consumption for a redundant base configuration with FPC3-SFF-PTX FPCs and SIB3-SFF-PTX SIBs to be 6051 W. Using that information we can calculate the system thermal output for the configuration:

```
Power consumption in watts * 3.41 = system thermal output in BTU/hr

6051 W * 3.41 = 20,634 BTU/hr
```

RELATED DOCUMENTATION

PTX3000 Power System Description | 36

Network Cable and Transceiver Planning

IN THIS SECTION

Determining Transceiver Support and Specifications

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 allows you to search by product, displaying all the transceivers supported on that device, or category, displaying all the transceivers by interface speed or type. The Hardware Compatibility Tool is located at https://apps.juniper.net/hct/.

Some transceivers support additional monitoring using the operational mode CLI command `show interfaces diagnostics optics`. Use the Hardware Compatibility Tool to determine if your transceiver supports monitoring. See the Junos OS documentation for your device for a description of the monitoring fields.

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

- show interfaces diagnostics optics (Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet, and Virtual Chassis Port)
- show interfaces diagnostics optics (SONET)
- show interfaces diagnostics optics
- show interfaces diagnostics optics
- show interfaces diagnostics optics

Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

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

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

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

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

Attenuation and Dispersion in Fiber-Optic Cable

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

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

- Chromatic dispersion—Spreading of the signal over time, resulting from the different speeds of light rays.

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

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

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

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

Calculating Power Budget and Power Margin for Fiber-Optic Cables

IN THIS SECTION

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

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

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

How to Calculate Power Budget for Fiber-Optic Cables

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

$P_B = P_T – P_R$

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

$P_B = P_T – P_R$

P_B = –15 dBm – (–28 dBm)

P_B = 13 dB

How to Calculate Power Margin for Fiber-Optic Cables

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

$P_M = P_B – LL$

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

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. Table 42 on page 154 lists an estimated amount of loss for the factors used in the following sample calculations. For information about the actual amount of signal loss caused by equipment and other factors, refer to vendor documentation.

Table 42: Estimated Values for Factors Causing Link Loss

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

Table 42: Estimated Values for Factors Causing Link Loss *(Continued)*

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

The following sample calculation for a 2-km-long multimode link with a power budget (P_B) of 13 dB uses the estimated values from Table 42 on page 154. This example calculates link loss (LL) as the sum of fiber attenuation (2 km @ 1 dB/km, or 2 dB) and loss for five connectors (0.5 dB per connector, or 2.5 dB) and two splices (0.5 dB per splice, or 1 dB) as well as higher-order mode losses (0.5 dB). The power margin (P_M) is calculated as follows:

$P_M = P_B – LL$

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

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

P_M = 7 dB

The following sample calculation for an 8-km-long single-mode link with a power budget (P_B) of 13 dB uses the estimated values from Table 42 on page 154. This example calculates link loss (LL) as the sum of fiber attenuation (8 km @ 0.5 dB/km, or 4 dB) and loss for seven connectors (0.5 dB per connector, or 3.5 dB). The power margin (P_M) is calculated as follows:

$P_M = P_B – LL$

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

P_M = 13 dB – 4 dB – 3.5 dB

P_M = 5.5 dB

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

PTX3000 Alarm, Management, and Clocking Cable Specifications and Pinouts

IN THIS SECTION

PTX3000 Alarm Relay Contact Wire Specifications

For management and service operations, you can connect the PTX3000 to external alarm-reporting devices through the alarm relay contacts on the craft interface. You must provide a wire with gauge between 28-AWG and 14-AWG (0.08 and 2.08 mm^2).

SEE ALSO

Connecting the PTX3000 to an External Alarm-Reporting Device | 210

PTX3000 Management Interface Cable Specifications

Table 43 on page 157 lists the specifications for the cables that connect to the management ports on the Control Board or Routing and Control Board (RCB).

Table 43: Cable Specifications for Routing Engine Management

Port	Cable Specification	Cable Supplied	Maximum Length	PTX3000 Receptacle
Console or auxiliary interface (labeled **CON** and **AUX**)	RS-232 (EIA-232) serial cable	One 6-ft (1.83-m) length with RJ-45 connectors	6 ft (1.83 m)	RJ-45
Management Ethernet interface (labeled **HOST/ ETHERNET** on the Control Board and **MGT** on the RCB	Category 5 cable or equivalent suitable for 10/100-Mbps/1-Gbps operation	One 15-ft (4.57-m) length with RJ-45/ RJ-45 connectors	328 ft (100 m)	RJ-45

SEE ALSO

Connecting the PTX3000 to a Management Console or Auxiliary Device | 207
Connecting the PTX3000 to a Management Ethernet Device | 208

RJ-45 Connector Pinouts for the PTX3000 Auxiliary and Console Ports

The auxiliary and console ports on the Control Board and Routing and Control Board (RCB)(labeled **AUX** and **CON**) are RJ-45 receptacles that accept RS-232 (EIA-232) cable. The **AUX** port connects the Routing Engine or RCB to a laptop, modem, or other auxiliary unit, and the **CON** port connects the Routing Engine or RCBto a management console. The ports are configured as data terminal equipment (DTE). Table 44 on page 157 describes the RJ-45 connector pinouts.

Table 44: RJ-45 Connector Pinouts for the PTX3000 Auxiliary and Console Ports

Pin	Signal	Description
1	RTS Output	Request to send
2	DTR Output	Data terminal ready

Table 44: RJ-45 Connector Pinouts for the PTX3000 Auxiliary and Console Ports *(Continued)*

Pin	Signal	Description
3	TxD Output	Transmit data
4	Signal Ground	Signal ground
5	Signal Ground	Signal ground
6	RxD Input	Receive data
7	CD Input	Data carrier detect
8	CTS Input	Clear to send

SEE ALSO

Connecting the PTX3000 to a Management Console or Auxiliary Device | 207

RJ-45 Connector Pinouts for the PTX3000 Management Ethernet Port

The management Ethernet port on the Control Board (labeled **HOST/ETHERNET**) and Rounting and Control Board (RCB) (labeled **MGT**) is an autosensing 10/100-Mbps/1-Gbps Ethernet RJ-45 receptacle that accepts an Ethernet cable for connecting the Routing Engine or RCBto a management LAN (or other device that supports out-of-band management). Table 45 on page 158 describes the RJ-45 connector pinouts.

Table 45: RJ-45 Connector Pinouts

Pin	Signal
1	TX+

Table 45: RJ-45 Connector Pinouts *(Continued)*

Pin	Signal
2	TX –
3	RX+
4	Termination network
5	Termination network
6	RX–
7	Termination network
8	Termination network

SEE ALSO

Connecting the PTX3000 to a Management Ethernet Device | 208

PTX3000 Clocking Port Cable Specifications and Pinouts

IN THIS SECTION

The PTX3000 has Centralized Clock Generator (CCG) ports for connection to external clocking devices located on the Control Board and the Routing and Control Board (RCB). See *Synchronizing Internal Stratum 3 Clock to External Clock Sources on PTX Series Routers* for more information about configuring the PTX3000 to use external clocking devices. See *Clock Sources for PTX Series Packet Transport Routers* for more information about the supported external clocking sources.

Control Board GPS Port Specifications

The GPS **CLOCK** ports labeled **GPS0** and **GPS1** on the front panel of the Control Board can be configured to support 5 or 10-MHz GPS signals. These signals are internally isolated and have surge protection.

NOTE: The GPS **SYNC** ports are reserved for future use.

NOTE: The BNC cable assembly must have an integrated 50-ohm terminator.

Table 46 on page 160 lists the specifications for the cables that connect to the **GPS0** and **GPS1** ports.

Table 46: Control Board GPS Clock Port Specifications

Specification	Value
Cable	Coaxial
Router receptacle	BNC

Routing and Control Board GPS Port Specifications

The **5/10 MHz** clocking ports labeled **0** and **1** on the front panel of the RCB can be configured to support 5 or 10-MHz GPS signals. The **1 PPS** clocking ports labeled **0** and **1** on the front panel of the RCB can be configured to support 1-pulse-per-second (PPS) GPS signals. These signals are internally isolated and have surge protection.

Table 47 on page 161 lists the specifications for the cables that connect to the **5/10 MHz** and **1 PPS** ports.

NOTE: The SMB cable assembly must have an integrated 50-ohm terminator.

Table 47: Routing and Control Board GPS Clock Port Specifications

Specification	Value
Cable	Coaxial
Router receptacle	Four SMB input and output connectors

BITS Port Specifications

The Control Board and the RCB both have external building-integrated timing system (BITS) clock interface ports labeled **BITS A** and **BITS B** on the front panel. These portsallow you to connect external clock signal sources. These signals are internally isolated and have surge protection.

BITS Port Cable Specifications

Table 48 on page 162 lists the specifications for the cables that connect to the BITS port.

NOTE: The plastic connector at the end of the RJ-48 cable is physically identical to an RJ-45 connector (see Figure 58 on page 161). You must ensure that the cable pinouts match the pinouts described in Table 49 on page 162.

Figure 58: RJ-48 Connector for PTX3000 BITS Ports

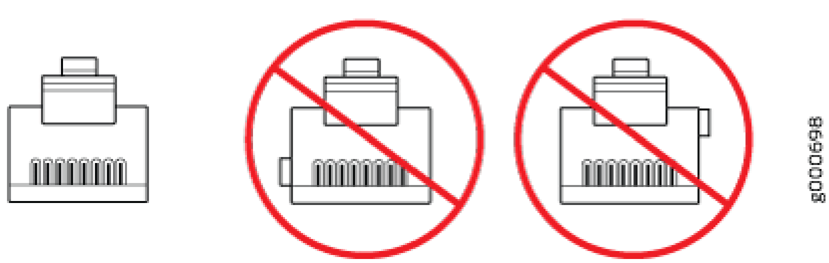


Table 48: PTX3000 BITS Port Cable Specifications

Specification	Value
Cable	RJ-48 shielded cable
Router receptacle	Autosensing RJ-48 connector

BITS Port Pinouts

Table 49 on page 162 provides the pinout information for the RJ-48 connector for the BITS port.

Table 49: PTX3000 BITS Port Pinouts

Pin	Description	Direction
1	RX, Ring	Input
2	RX, Tip	Input
3	Reserved	–
4	TX, Ring	Output
5	TX, Tip	Output
6	Reserved	–
7	Reserved	–
8	Reserved	–

SEE ALSO

Connecting an External Clocking Device to a GPS Port on a PTX3000 Control Board | 216

Connecting an External Clocking Device to a PTX3000 BITS Port | 219

synchronization (PTX Series)

RELATED DOCUMENTATION

PTX3000 Craft Interface Description | 25

PTX3000 Routing and Control Board Description | 67

PTX3000 Control Board Description | 62

3

CHAPTER

Initial Installation and Configuration

PTX3000 Installation Overview

IN THIS SECTION

Overview of Installing the PTX3000

You must proceed through the installation process in the following order:

1. Prepare the installation site for the PTX3000.

   See "Overview of Preparing the Site for the PTX3000" on page 130.
2. Review all safety guidelines and warnings for the PTX3000.

   > **WARNING**: To avoid harm to yourself or the PTX3000 as you install and maintain it, you must follow the safety procedures for working with routers, as well as the guidelines and warnings for working with and near electrical equipment. However, providing an exhaustive set of guidelines for working with electrical equipment is beyond the scope of this documentation.

   See "PTX3000 Installation Safety Guidelines" on page 166.
3. Unpack the PTX3000 and verify the parts received.

   See "Overview of Unpacking the PTX3000" on page 167.
4. Install the PTX3000.

   See "Overview of Installing a PTX3000 in a Rack" on page 175.
5. Ground the PTX3000.

   See "Connecting the PTX3000 Grounding Cable" on page 183.
6. Connect the PTX3000 to external devices.

   - See "Connecting the PTX3000 to a Management Console or Auxiliary Device" on page 207.
   - See "Connecting the PTX3000 to a Management Ethernet Device" on page 208.
   - See "Connecting the PTX3000 to an External Alarm-Reporting Device" on page 210.

- See "Connecting an External Clocking Device to a GPS Port on a PTX3000 Control Board" on page 216.
- See "Connecting an External Clocking Device to a PTX3000 BITS Port" on page 219.

7. Connect the power, and power on the PTX3000.
   - See "Connecting Nonredundant DC Power to the PTX3000 DC Power Supply Modules" on page 199.
   - See "Connecting Redundant DC Power to the PTX3000 DC Power Supply Module" on page 191.
   - See "Connecting Nonredundant AC Power to the PTX3000 AC Power Supply Modules" on page 188.
   - See "Connecting Redundant AC Power to the PTX3000 AC Power Supply Modules" on page 184.
   - See "Powering On a DC-Powered PTX3000" on page 224.
   - See "Powering On an AC-Powered PTX3000" on page 223.

PTX3000 Installation Safety Guidelines

IN THIS SECTION

Observe the following guidelines before and during PTX3000 installation:

General Installation Safety Guidelines

Before installing or moving the PTX3000, verify that the intended site meets the specified power, environmental, and clearance requirements. See the following documentation:

- "Overview of Preparing the Site for the PTX3000" on page 130
- "PTX3000 Clearance Requirements for Airflow and Hardware Maintenance" on page 135
- "Rack Requirements for the PTX3000" on page 143
- "PTX3000 Environmental Specifications" on page 132

- "Calculating PTX3000 Power Consumption" on page 145

PTX3000 Chassis Lifting Guidelines

The weight of a fully configured PTX3000 is 310 lb (140.6 kg). Observe the following guidelines for lifting and moving the PTX3000:

- Do not attempt to lift a fully configured PTX3000. Use a mechanical lift to maneuver the PTX3000 into a rack.
- Before moving the PTX3000, disconnect all external cables.

RELATED DOCUMENTATION

PTX3000 Chassis Description | 18

PTX3000 Physical Specifications | 138

Installing the PTX3000 in a Rack by Using a Mechanical Lift | 176

Installation Safety Warnings for Juniper Networks Devices

Unpacking the PTX3000

IN THIS SECTION

Overview of Unpacking the PTX3000

To unpack the PTX3000:

1. Gather the tools required to unpack the PTX3000.

See "Tools and Parts Required to Unpack the PTX3000" on page 168.

2. Remove the PTX3000, accessory box, tool kit, and all parts from the shipping crate.

   See "Unpacking the PTX3000" on page 168.

3. Verify that all parts have been received.

   See "Verifying the PTX3000 Parts Received" on page 171.

Tools and Parts Required to Unpack the PTX3000

Gather the tools required to unpack the PTX3000:

- Phillips (+) screwdriver, number 2
- 1/2-in. or 13-mm open-end or socket wrench to remove bracket bolts from the shipping pallet

Unpacking the PTX3000

The PTX3000 is shipped in a wooden crate. A wooden pallet forms the base of the crate. The PTX3000 chassis is bolted to this pallet.

The shipping crate measures:

- 50.1 in. (127.3 cm) high
- 28.0 in. (71.1 cm) wide
- 28.0 in. (71.1 cm) deep

The total weight of the crate containing the PTX3000 and accessories can range up to approximately 350 lb (158.8 kg).

> **NOTE**: The PTX3000 is maximally protected inside the shipping crate. Do not unpack it until you are ready to begin installation.

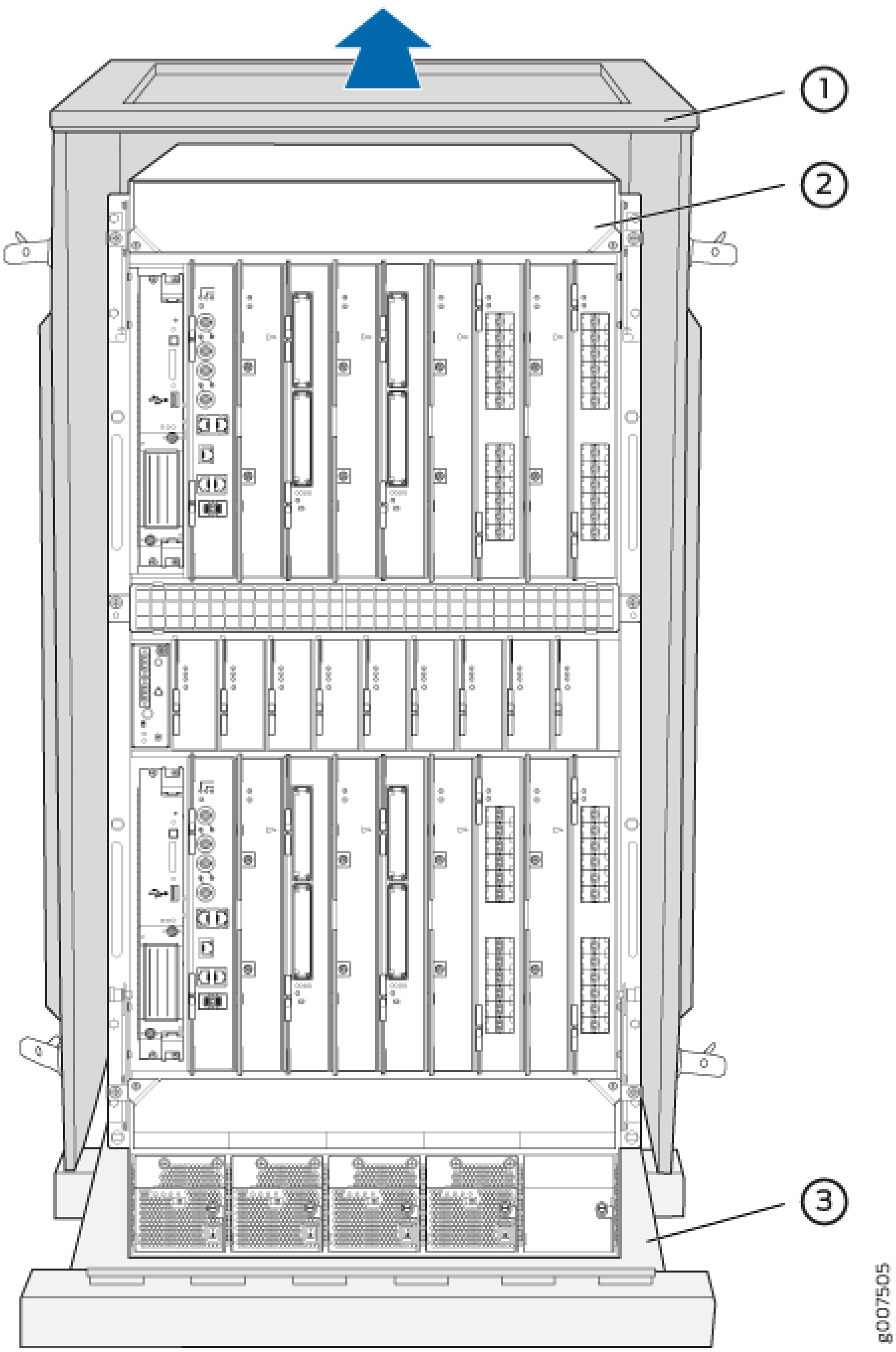
To unpack the PTX3000 (see Figure 59 on page 170):

1. Move the shipping crate to a staging area as close to the installation site as possible, where you have enough room to remove the components from the chassis. While the chassis is bolted to the pallet, you can use a forklift or pallet jack to move it.
2. Position the shipping crate with the arrows pointing up.

3. Open all the latches on the shipping crate.
4. Remove the front door of the shipping crate cover and set it aside.
5. Slide the remainder of the shipping crate cover off the pallet.
6. Remove the foam covering the top of the PTX3000.
7. Remove the accessory box.
8. Verify the parts received against the lists in "Verifying the PTX3000 Parts Received" on page 171.
9. Remove the vapor corrosion inhibitor (VCI) packs attached to the pallet, being careful not to break the VCI packs open.
10. To remove the brackets holding the chassis on the pallet, use a 1/2-in. socket wrench and a number 2 Phillips screwdriver to remove the bolts and screws from the brackets.
11. Store the brackets and bolts inside the accessory box.

12. Save the shipping crate cover, pallet, and packing materials in case you need to move or ship the PTX3000 at a later time.

Figure 59: Contents of the Shipping Crate



1– Shipping crate cover	3– Shipping crate base
2– Chassis	

Verifying the PTX3000 Parts Received

A packing list is included in each shipment. The packing list specifies the part numbers and descriptions of each part in your order.

To verify that you have received all parts:

1. Verify that the items on the packing list are included in the parts in the main shipment.

   See Table 50 on page 171.
2. Verify that all parts in the accessory box have been received.

   See Table 51 on page 172.
3. If any part is missing, contact a customer service representative.

Table 50: PTX3000 Parts List

Component	Quantity
Chassis, including backplane	1
Craft interface	1
FPCs	Up to 8
PICs	Up to 8 (one for each FPC)
SIBs	9
IPLCs	Up to 16 (eight base modules and eight expansion modules)
Host subsystem consisting of one of the following two options: • Routing Engine and Control Board • Routing and Control Board (RCB) and RCB companion card	1 or 2 **NOTE**: If you are installing only one RCB with no backup RCB, the RCB companion card is not required.

Table 50: PTX3000 Parts List *(Continued)*

Component	Quantity
Power supply modules (PSMs)	Up to 5 **NOTE**: Only four are required for maximum redundancy.
Fan trays	2
Mounting shelf	1
Blank panels for slots without components installed	One blank panel for each slot not occupied by a component

Table 51: Accessory Box Parts List

Part	Quantity
Number 1 Phillips (+) screws to mount chassis	10
Split washers for the grounding cable	3
Acorn nuts for grounding the router	3
4-AWG DC power lugs and grounding cable lug	26 **NOTE**: One cable lug is for the grounding cable. Four cable lugs are for each PSM. The remaining lugs are spares.
Connectors for alarm relay cables, Terminal Block Plug, 3 Pole, 5.08 mm spacing, 12 A	3
End User License Agreement (EULA)	1
ROHS and warranty card	1

Table 51: Accessory Box Parts List *(Continued)*

Part	Quantity
15-ft Ethernet cable to connect the Routing Engine to a management device (RJ-45 connectors, 4-pair stranded UTP, Category 5E)	1
7-ft serial cable to connect the Routing Engine to a management console (DB9 to RJ-45 adapter, straight through)	1
Electrostatic discharge (ESD) wrist strap	1

RELATED DOCUMENTATION

Overview of Installing the PTX3000 | 165

Installing the PTX3000 in a Rack

IN THIS SECTION

Installing the PTX3000 Mounting Hardware

IN THIS SECTION

Installing Cage Nuts in the PTX3000 Rack

Insert cage nuts on the front rack rails, if needed. The hole distances are relative to the standard U division on the rack that is aligned with the bottom of the mounting shelf.

To install cage nuts on the front rack rails:

1. Insert cage nuts in the holes specified for the mounting shelf (see Table 1).

   NOTE: A mounting shelf is not required to install the PTX3000.

   Table 52: Mounting-Hole Locations for Installing a PTX3000 Mounting Shelf

Hole	Distance Above U Division	
1	0.02 in. (.06 cm)	0.01 U
2	0.2 in. (0.4 cm)	0.08 U

2. Insert cage nuts in the holes specified for mounting the chassis (see Table 2).

Table 53: Mounting-Hole Locations for Installing a Chassis

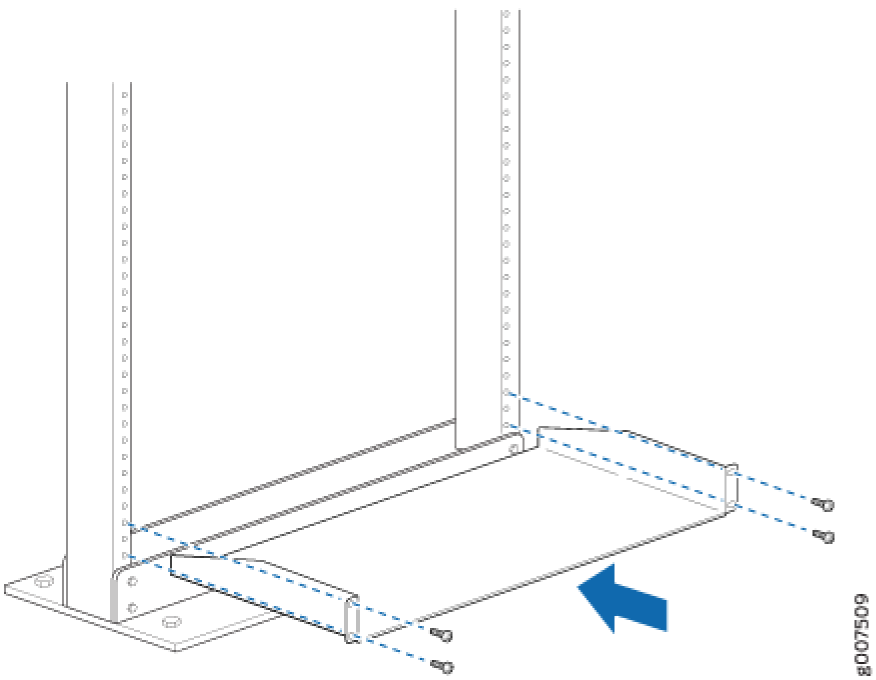
Hole	Distance Above U Division	
1	4.9 in. (12.5 cm)	2.8 U
2	15.4 in. (39.1 cm)	8.8 U
3	29.9 in. (76.0 cm)	17.1 U

Installing the Mounting Shelf

Optionally, you can install the mounting shelf before mounting the chassis in the rack. To install the mounting shelf (see Figure 60 on page 175):

1. Align the mounting shelf with the mounting holes on the rack rail.
2. Partially insert a mounting screw appropriate for your rack into the holes specified in Table 1.
3. Tighten all the screws completely to secure the mounting shelf to the rack rails.

Figure 60: Installing the Mounting Hardware



RELATED DOCUMENTATION

Rack Requirements for the PTX3000 | 143

Overview of Installing a PTX3000 in a Rack

Before installing the PTX3000 in a rack, verify that you have prepared your site, unpacked the PTX3000 from the shipping crate, and installed the mounting hardware.

Because of the PTX3000 router's size and weight—up to 310 lb (140.6 kg) depending on the configuration—you must install the PTX3000 by using a mechanical lift.

To install the PTX3000:

1. Gather the tools and parts required to install the PTX3000 in a rack:
   - Mechanical lift
   - Screwdriver appropriate for your mounting screws (a number 1 Phillips (+) screwdriver is required for the mounting screws included in the accessory box
   - Mounting screws appropriate for your rack (ten mounting screws are included in the accessory box)
   - Cage nuts (if required for your rack or cabinet)
2. Read the safety information in *General Safety Guidelines and Warnings* and "PTX3000 Installation Safety Guidelines" on page 166.
3. Install the PTX3000 into the rack.

   See "Installing the PTX3000 in a Rack by Using a Mechanical Lift" on page 176.

Installing the PTX3000 in a Rack by Using a Mechanical Lift

CAUTION: Before installing the PTX3000 router:

- Verify that a mechanical lift is available for the installation.
- Have a qualified technician verify that the rack is strong enough to support the chassis weight and is adequately supported at the installation site.
- Ensure that the rack is in its permanent location and is secured to the building.
- Ensure that the installation site allows adequate clearance for both airflow and maintenance.

NOTE: A mounting shelf is not required to install the PTX3000.

To install the PTX3000 by using a lift (see Figure 61 on page 179 and Figure 62 on page 180):

1. Load the PTX3000 onto the lift, making sure the PTX3000 rests securely on the mechanical lift.

CAUTION: Do not lift the PTX3000 by using the handles on the front-mounting flanges. Use these handles only to help position the PTX3000.

2. Using the lift, position the PTX3000 in front of the rack. Lift the chassis slightly above the position you plan to install it, and position it as close as possible to the rack.
3. With two people in front, push the front-mounting flanges to slide the PTX3000 into the rack until the front-mounting flanges contact the rack rails. The front-mounting flanges of the chassis align with the holes in the rack rails.
4. Install a mounting screw into each of the mounting holes aligned with the rack, starting from the bottom (see Table 54 on page 177). Use an appropriate screwdriver to tighten all the screws completely.

   Visually inspect the alignment of the PTX3000. If the PTX3000 is installed properly in the rack, all the mounting screws on one side of the rack should be aligned with the mounting screws on the opposite side, and the PTX3000 should be level.
5. Move the lift away from the rack.
6. If you are installing two to four routers in the rack, repeat this procedure for each router. See Figure 63 on page 181 and Figure 64 on page 182 for examples of multiple routers installed in a single rack.

Table 54: Mounting-Hole Locations for Installing a Chassis in a Rack

Hole	Distance Above U Division	
1	4.9 in. (12.5 cm)	2.8 U
2	15.4 in. (39.1 cm)	8.8 U

Table 54: Mounting-Hole Locations for Installing a Chassis in a Rack ***(Continued)***

Hole	Distance Above U Division	
3	29.9 in. (76.0 cm)	17.1 U

Figure 61: Loading the PTX3000 onto the Lift

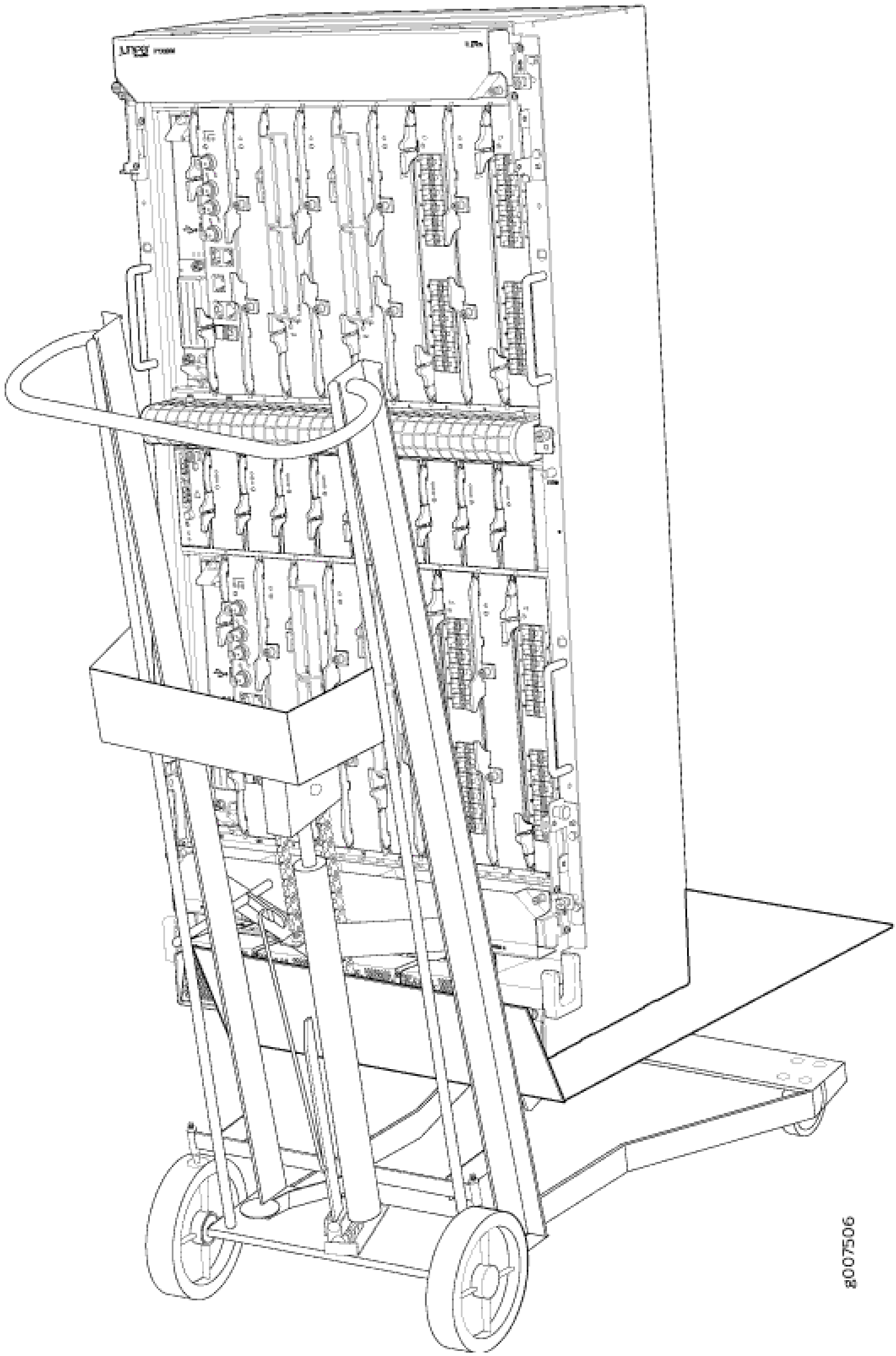


Figure 62: Installing the PTX3000 in a Rack

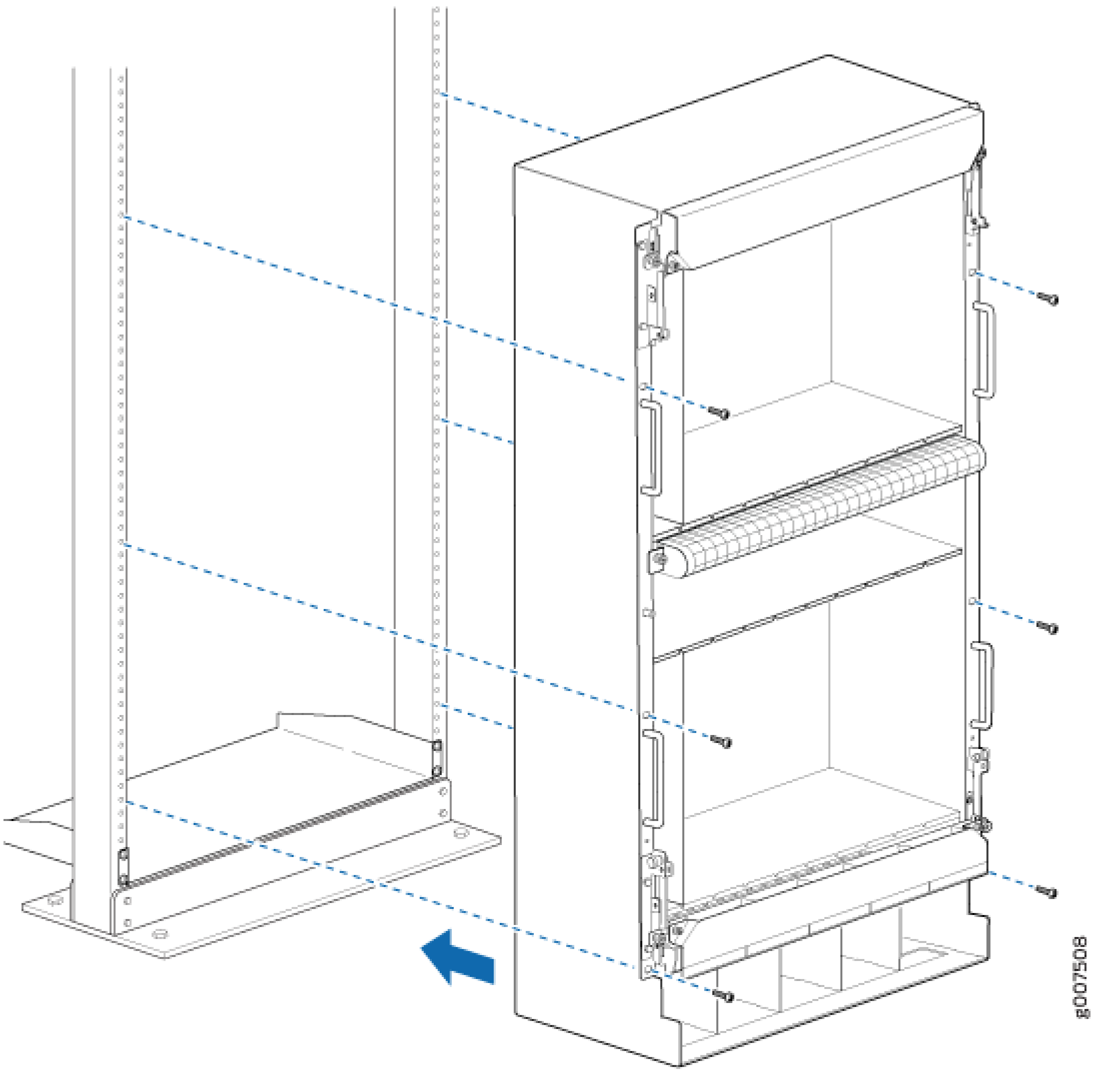
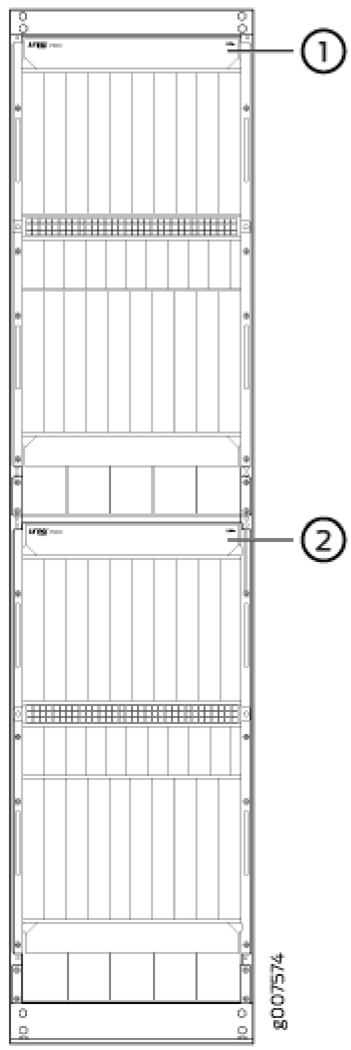
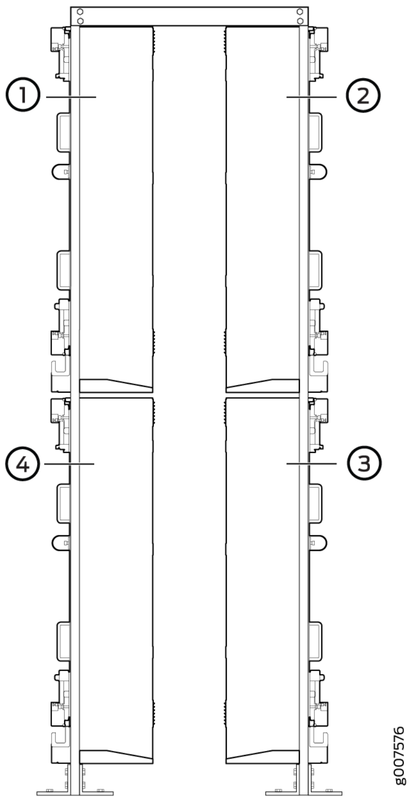


Figure 63: Installing Two Routers in a Rack (Front View)



1– Upper chassis	2– Lower chassis

Figure 64: Installing Four Routers in a Rack (Side View)



1– Upper chassis 1	3– Lower chassis 1
2– Upper chassis 2	4– Lower chassis 2

RELATED DOCUMENTATION

Overview of Preparing the Site for the PTX3000 | 130
Overview of Unpacking the PTX3000 | 167
Overview of Installing a PTX3000 in a Rack | 175

Connecting the PTX3000 to Power

IN THIS SECTION

Connecting the PTX3000 Grounding Cable

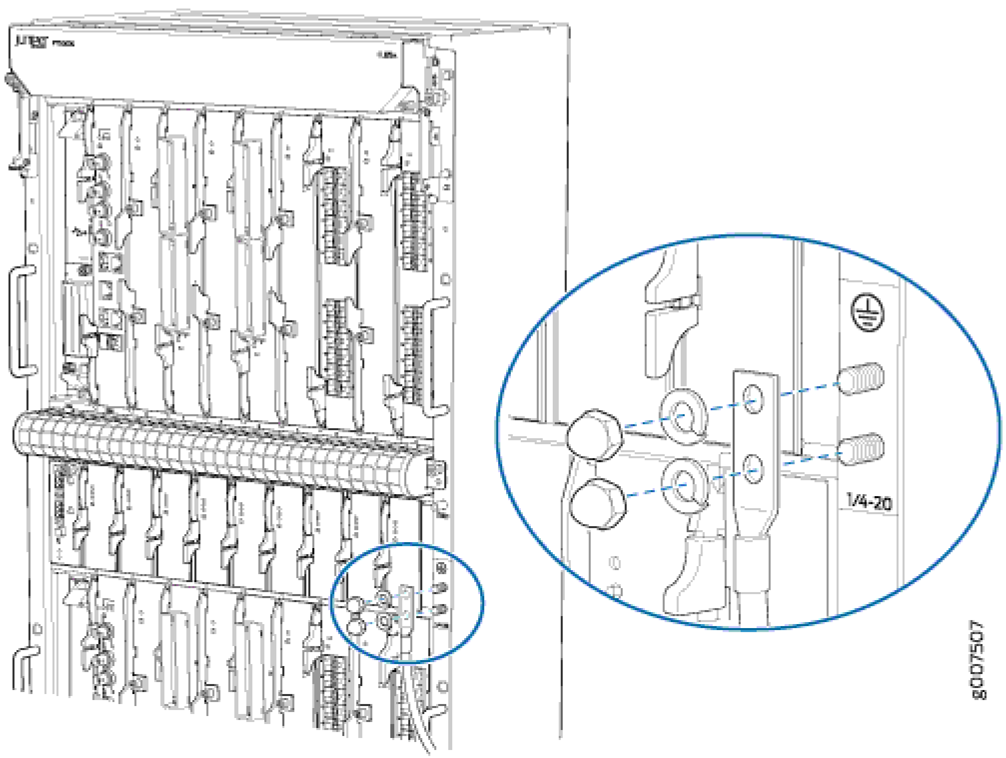
You ground the PTX3000 by attaching a grounding cable to the chassis. You must provide the grounding cable. A 4-AWG cable lug is supplied with the PTX3000 for grounding the router. See "PTX3000 Chassis Grounding Cable and Lug Specifications" on page 133 in the *PTX3000 Packet Transport Router Hardware Guide* for more information. You must install the PTX3000 in a restricted-access location and ensure that the chassis is always properly grounded. The PTX3000 has a two-hole protective grounding terminal provided on the chassis. See Figure 65 on page 184. We recommend that you use this protective grounding terminal as the preferred method for grounding the chassis regardless of the power supply configuration. However, if additional grounding methods are available, you can also use those methods. For example, you can use the grounding wire in the AC power cord or use the grounding terminal or lug on a DC power supply. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

To ground the PTX3000:

1. Gather the tools and parts required to ground the router:
   - Electrostatic discharge (ESD) grounding wrist strap
   - Grounding cable (which you must provide)
   - Grounding lug (one 4-AWG lug for grounding the router is provided with the PTX3000)
   - Two acorn nuts with washers (three acorn nuts are provided with the PTX3000)
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.
3. Connect the grounding cable to a proper earth ground.

4. Verify that a licensed electrician has attached the cable lug provided with the PTX3000 to the grounding cable.
5. Ensure that grounding surfaces are clean and brought to a bright finish before you connect the grounding cable.
6. Place the grounding cable lug over the grounding points (Figure 65 on page 184).
7. Secure the grounding cable lug to the grounding points, first with the washers, then with the acorn nuts.
8. Verify that the grounding cabling is correct, that the grounding cable does not touch or block access to the PTX3000 components, and that it does not drape where people could trip on it.

Figure 65: Connecting the Grounding Cable



Connecting Redundant AC Power to the PTX3000 AC Power Supply Modules

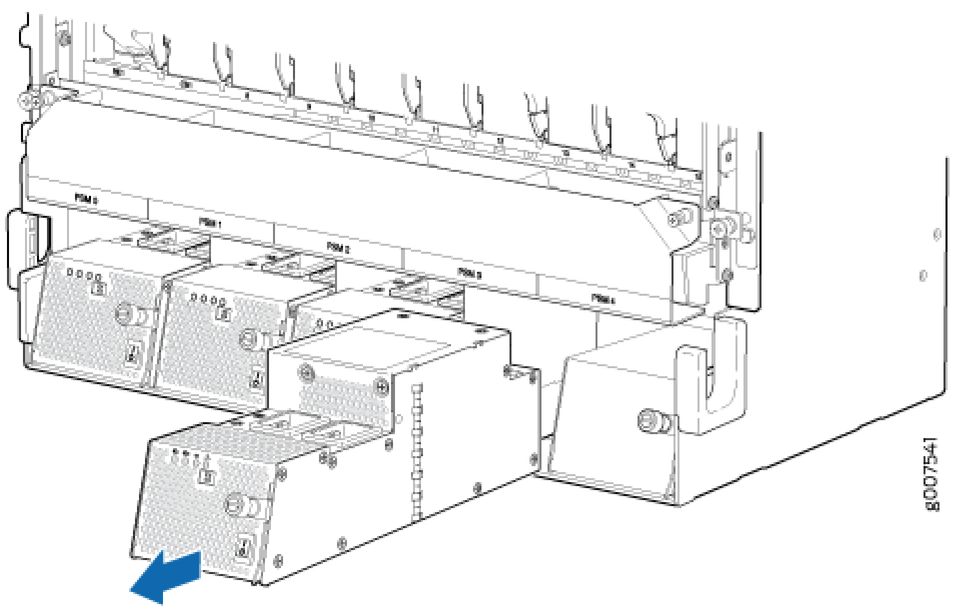
To connect the AC power cables to both AC PSM inputs for redundant power:

1. Gather the following tools and parts:

- Electrostatic discharge (ESD) grounding wrist strap.
- AC power cords, which must have a plug appropriate for your geographical location. See "PTX3000 AC Power Cord Specifications" on page 47 in the *PTX Series Interface Module Reference* for more information.
- Phillips (+) screwdriver, number 2.

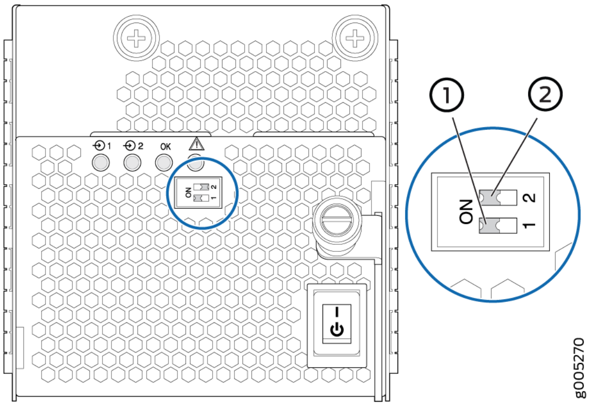
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
3. Switch the power switch on the PSM faceplate to the standby position
   (
   ⏻
).
4. Loosen the captive screw on the PSM, using the screwdriver if necessary.
5. Grasp the PSM, and pull it out to remove it from the chassis.

Figure 66: Removing an AC PSM



6. Set the input switches for redundant power by setting both switches for input **1** and **2** to the on position (**ON**).

Figure 67: Setting the Input Switches for Redundant Power



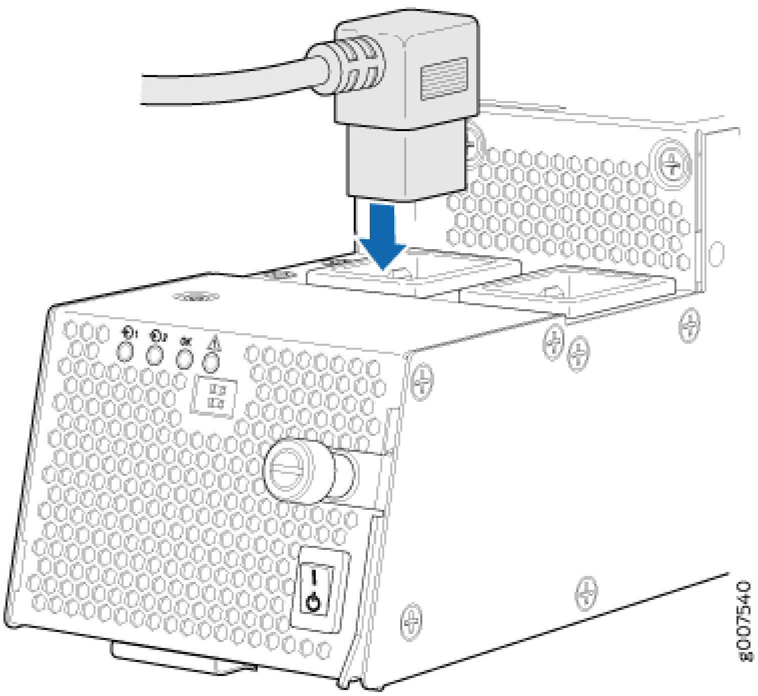
1– Input **1** switch **ON**	2– Input **2** switch **ON**

7. Insert the AC power cord couplers into input **1** and input **2** on the PSM (see Figure 68 on page 187).

> **CAUTION**: One input on each AC PSM must be powered by a dedicated power feed derived from feed A, and the other input on each PSM must be powered by dedicated power feed derived from feed B.

This configuration provides the commonly deployed A/B feed redundancy for the system. For example, you can connect input **1** on each AC PSM to feed A, and input **2** on each AC PSM to feed B.

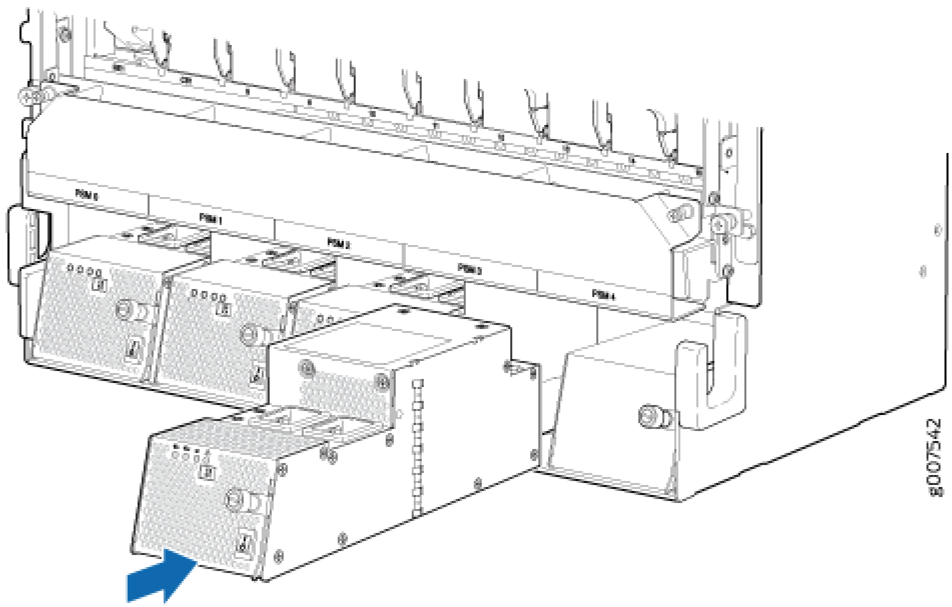
Figure 68: Connecting the AC Power Cords to a PSM



8. Insert the power cord plug into an external AC power receptacle.

9. Reinstall the PSM into the chassis (see Figure 69 on page 188), and tighten the captive screw to secure it.

Figure 69: Installing an AC PSM



10. Repeat the procedure for the remaining PSMs.
11. Verify that the AC power cords do not drape where people could trip on them.

Connecting Nonredundant AC Power to the PTX3000 AC Power Supply Modules

> **WARNING**: You must ground the router before connecting the router to power.

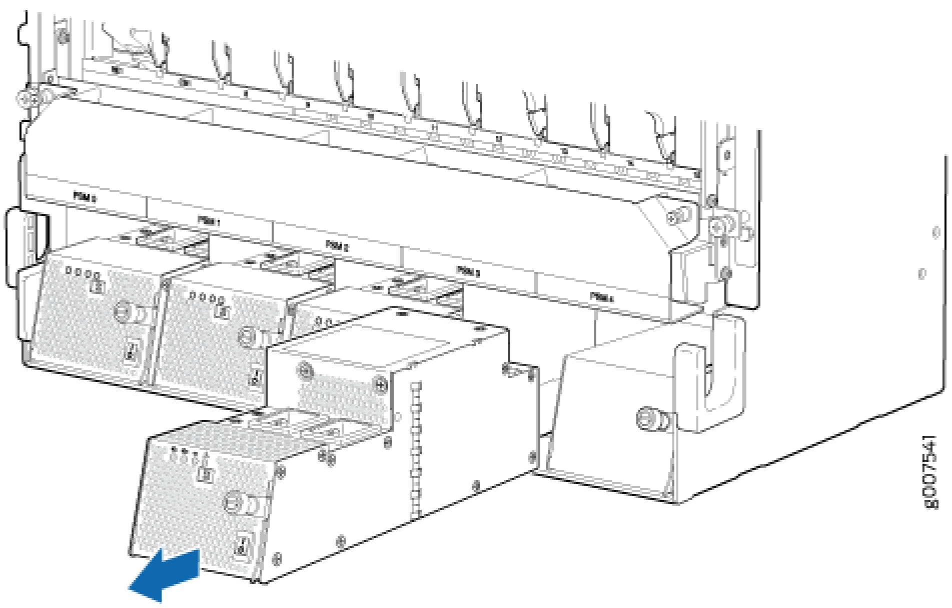
To connect AC power to the router:

1. Gather the following tools and parts:
   - ESD grounding wrist strap
   - AC power cords , which should have a plug appropriate for your geographical location. See "PTX3000 AC Power Cord Specifications" on page 47 for more information.

- Phillips (+) screwdriver, number 2

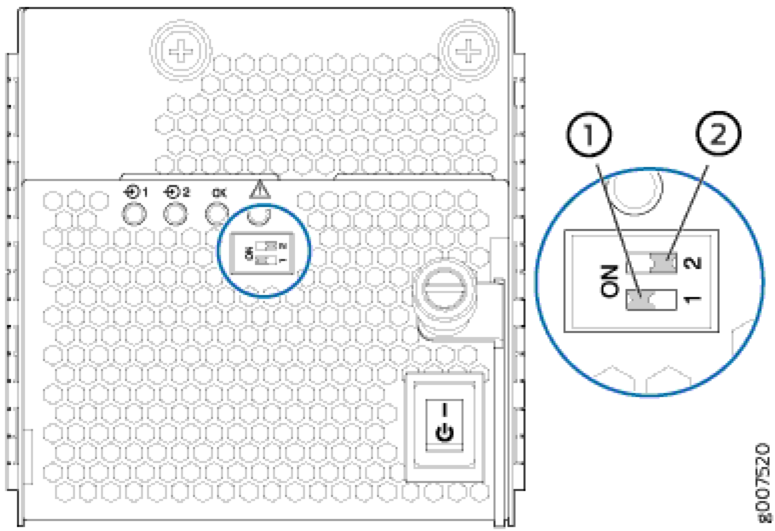
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
3. Switch the power switch on the PSM faceplate to the standby position (⏻).
4. Loosen the captive screw on the PSM, using the screwdriver if necessary.
5. Grasp the PSM, and pull it out to remove the PSM from the chassis. See Figure 70 on page 189.

Figure 70: Removing an AC PSM



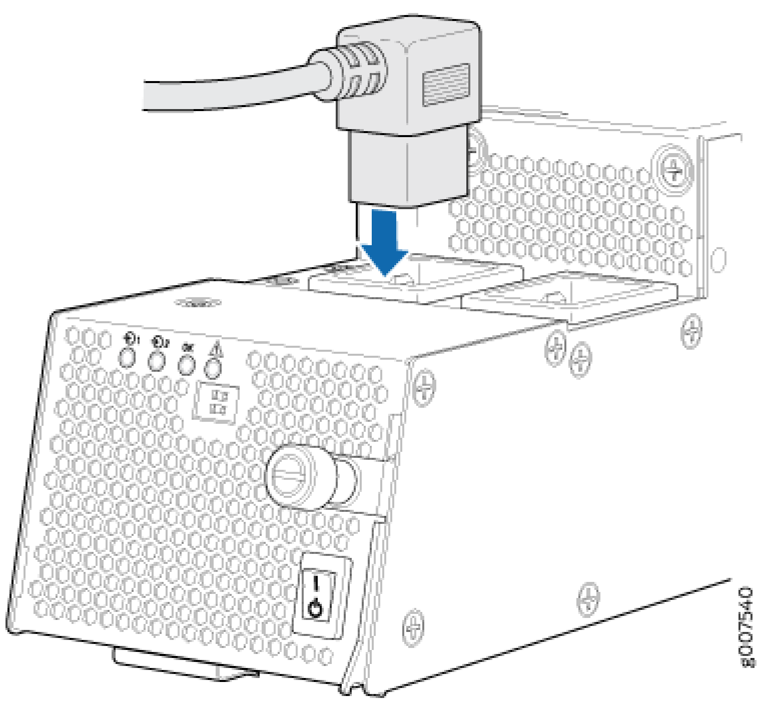
6. Set the input switches for nonredundant power by setting the switch for input **1** to the on position (labeled **ON**) and setting the switch for input **2** to the off position. See Figure 71 on page 190.

Figure 71: Setting the Input Switches for Nonredundant Power



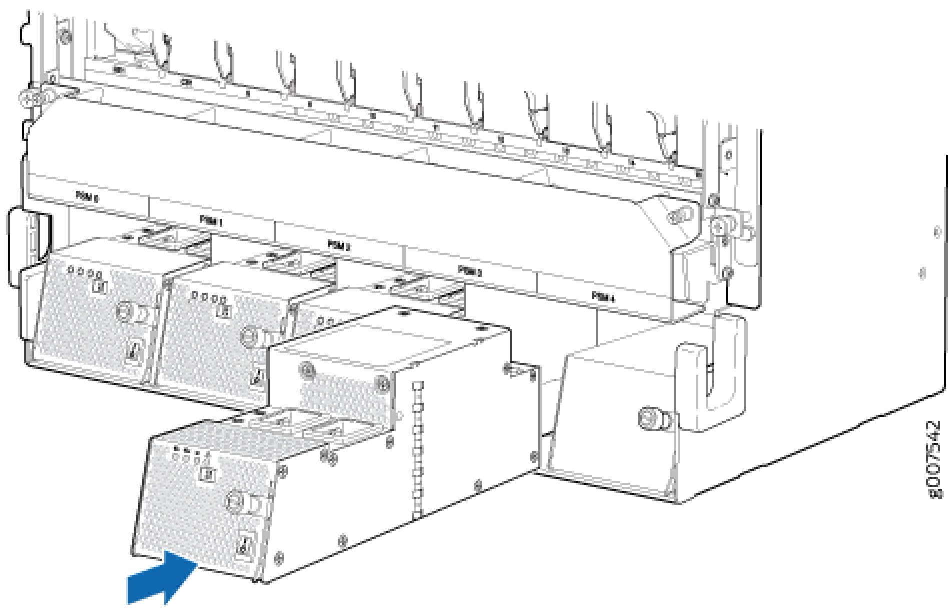
1– Input **1** switch **ON**	2– Input **2** switch **OFF**

Figure 72: Connecting the AC Power Cords to a PSM



7. Insert the AC power cord coupler into input **1** on the PSM.
8. Insert the AC power cord plug into external AC power receptacle.
9. Reinstall the PSM into the chassis (see Figure 73 on page 191), and tighten the captive screw to secure it.

Figure 73: Installing an AC PSM



10. Repeat the procedure for the remaining PSMs.
11. Verify that the power cords do not drape where people could trip on them.

Connecting Redundant DC Power to the PTX3000 DC Power Supply Module

> **WARNING**: You must ground the router before connecting the router to power.

To connect the DC source power cables to both DC PSM inputs for redundant power:

1. Gather the following tools and parts:
   - Electrostatic discharge (ESD) grounding strap

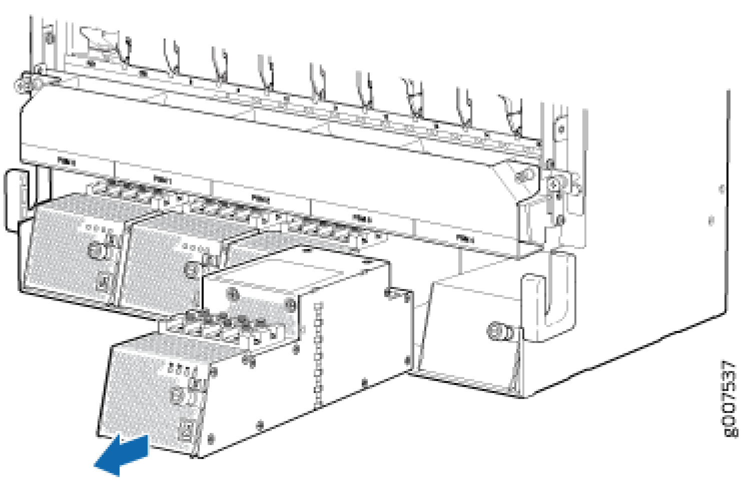
- 10-mm nut driver, for tightening nuts to the terminal studs

> **CAUTION**: You must use an appropriate torque-controlled tool to tighten the nuts. Applying excessive torque damages the terminal studs. The maximum torque that may be applied to this nut is 24 lb-in. (2.7 Nm).

- Phillips (+) screwdriver, number 1
- DC power cables, which you must provide
- DC power lugs

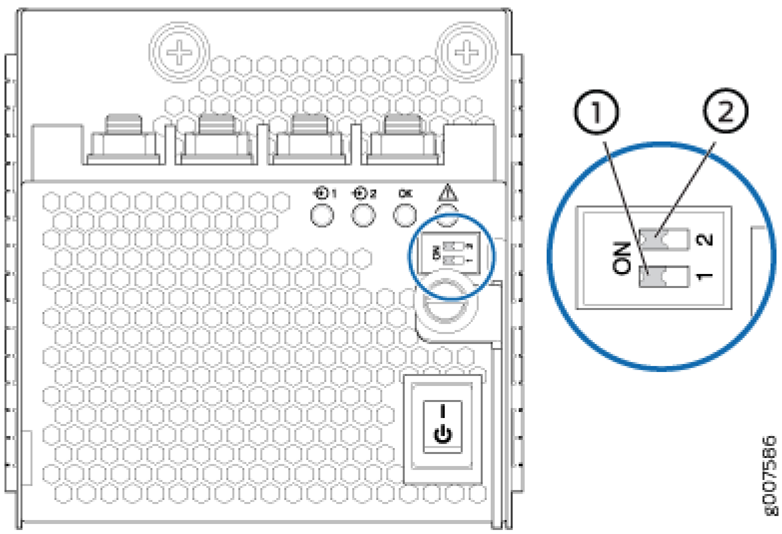
2. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
3. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
4. Switch the power switch on the power supply module (PSM) faceplate to the standby position
(
⏻
).
5. Loosen the captive screw on the PSM.
6. Grasp the PSM, and pull it out to remove it from the chassis (see Figure 74 on page 192). The DC PSM weighs 4.6 lb (2.1 kg).

Figure 74: Removing a DC PSM



7. Set the switches for input **1** and input **2** to the on position (**ON**) for redundant power. See Figure 75 on page 193.

Figure 75: Setting the Input Switches for Redundant Power



1– Input **1** switch **ON**	2– Input **2** switch **ON**

8. Use a number 1 Phillips (+) screwdriver to loosen the screws on the input terminal cover, and remove the input terminal cover.
9. Remove the nuts from the DC power terminal studs.
10. Install heat-shrink tubing insulation around the power cables.

    To install heat-shrink tubing:

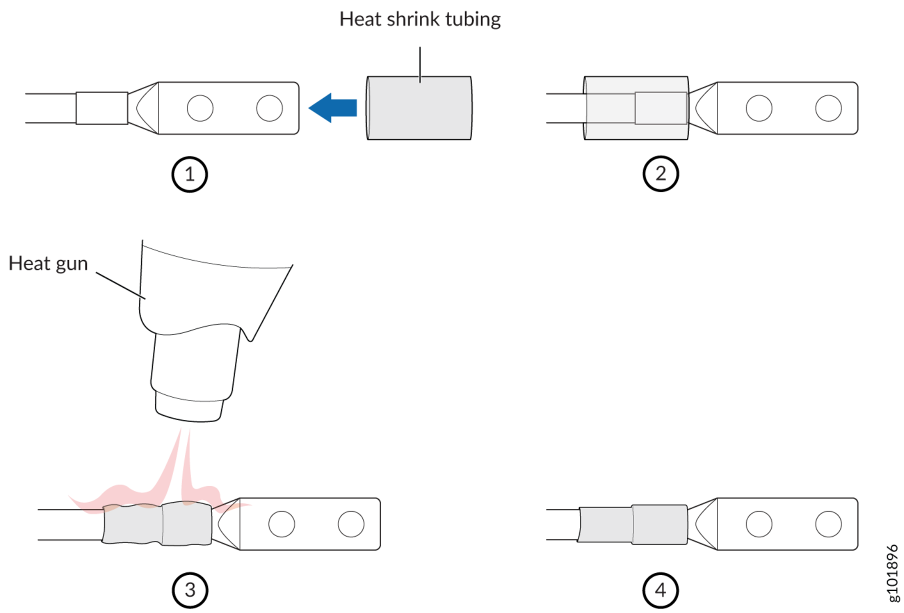
    a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

    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 76 on page 194 shows the steps to install heat-shrink tubing.

NOTE: Do not overheat the tubing.

Figure 76: How to Install Heat-Shrink Tubing



11. Connect the positive (+) DC source power cables to input **1** and input **2 RTN** (return) input terminals (Figure 77 on page 196 and Figure 78 on page 197).

> **CAUTION**: One input on each DC PSM must be powered by dedicated power feeds derived from feed A, and the other input on each PSM must be powered by dedicated power feeds derived from feed B.
>
> This configuration provides the commonly deployed A/B feed redundancy for the system. For example, you can connect input **1** on each DC PSM to feed A, and input **2** on each DC PSM to feed B.

> **CAUTION**: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled **(+)** and **(–)** to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by

the external DC power source at your site determines the color coding for the leads on the power cables that attach to the terminal studs on each power supply.

Secure the positive (+) DC source power cable lugs to the **RTN** (return) terminals with a nut for each terminal. Use a 10-mm nut driver to tighten the nuts.

> ⚠ **CAUTION**: You must use an appropriate torque-controlled tool to tighten the nuts. Applying excessive torque damages the terminal studs and power supply. The maximum torque that may be applied to this nut is 24.0 lb-in. (2.7 Nm).

Figure 77: DC PSM Inputs

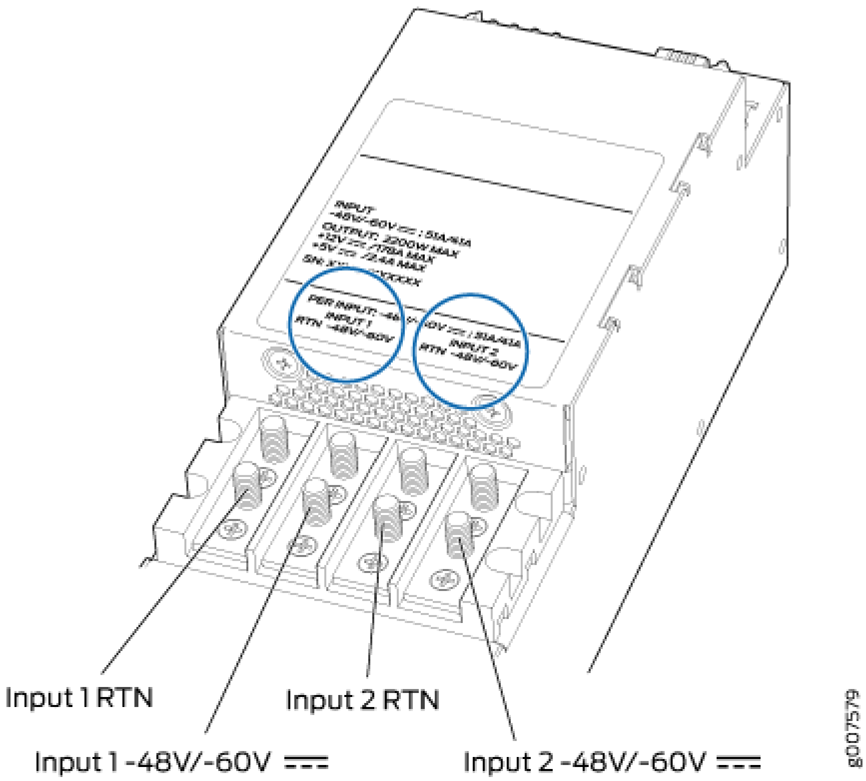
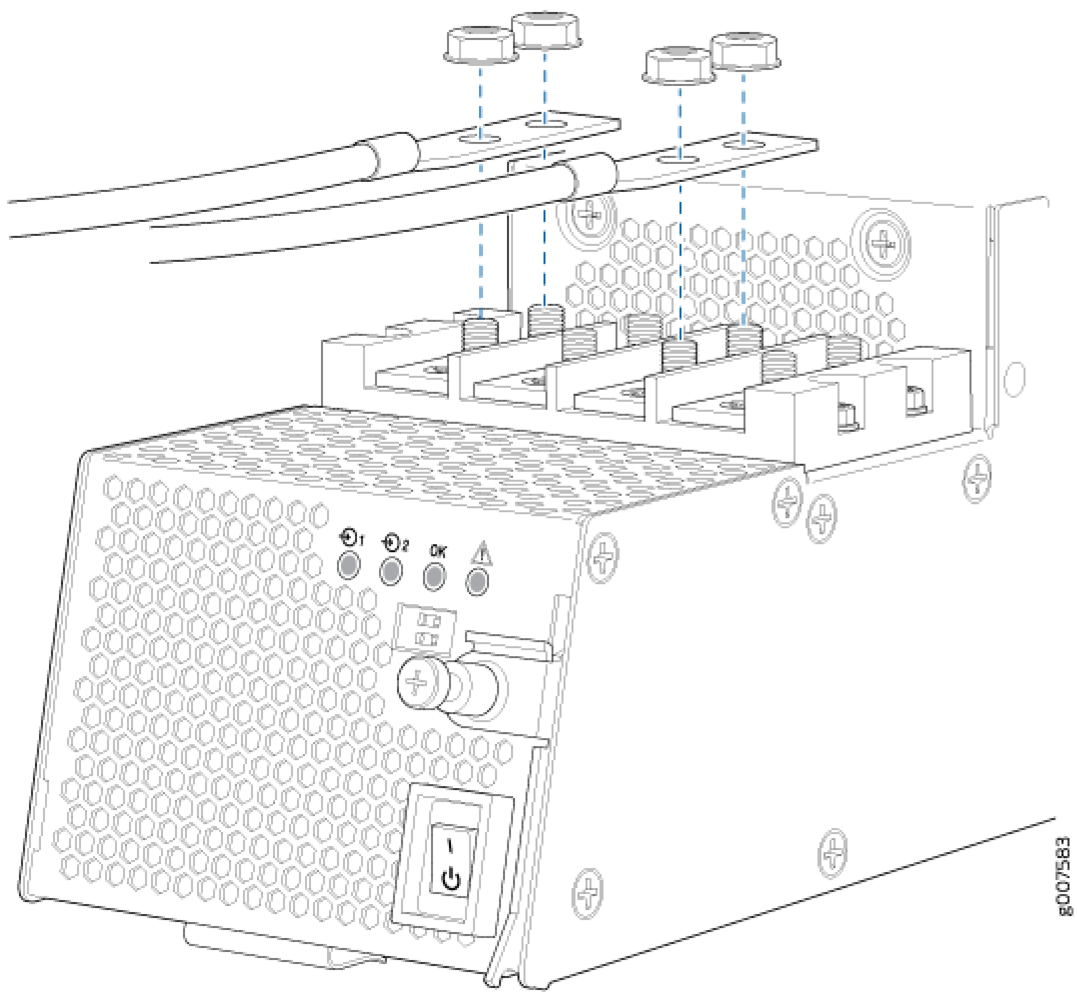


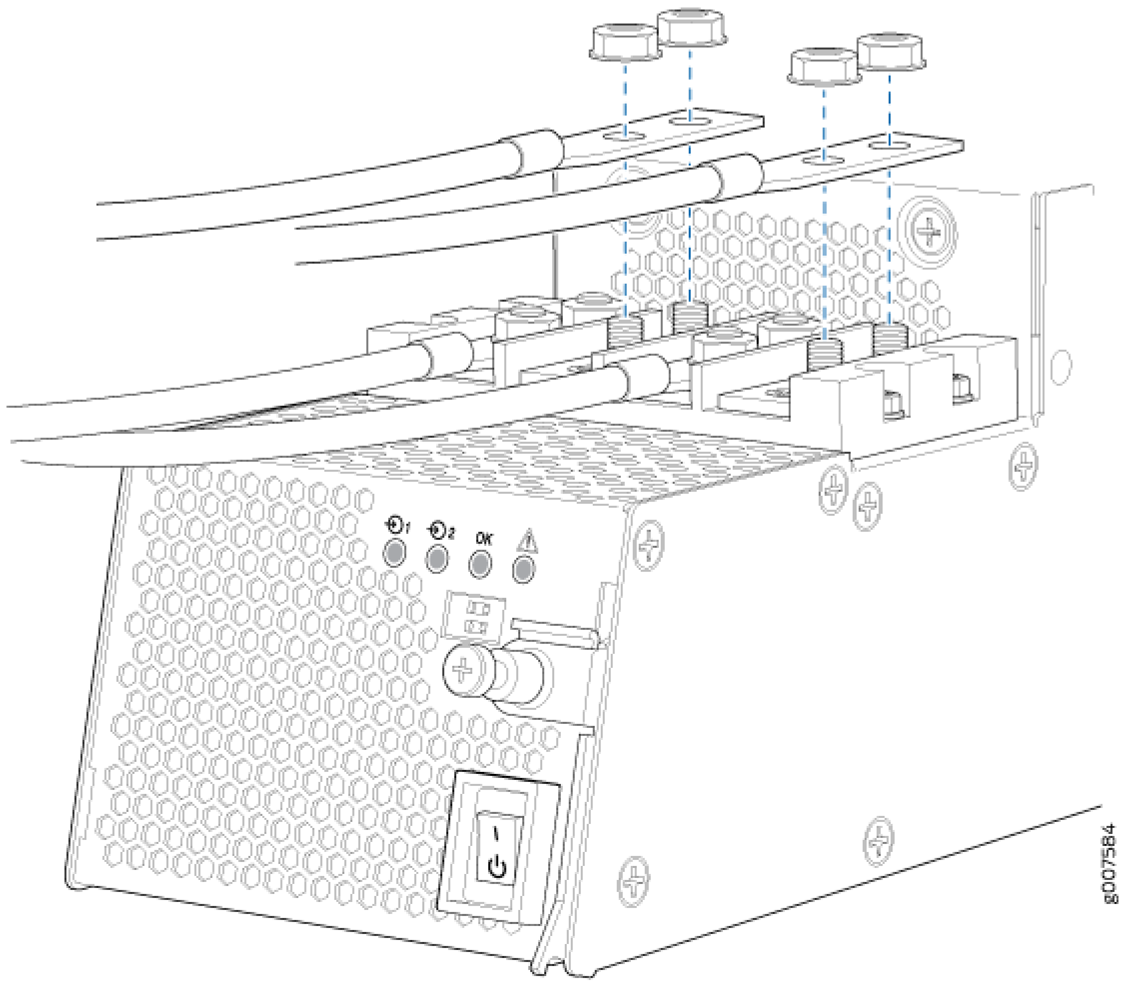
Figure 78: Connecting the Positive DC Source Power Cable Lugs to a PSM



12. Connect the negative (–) DC source power cables to input **1** and input **2 –48V** input terminals (Figure 77 on page 196 and Figure 79 on page 198).

Secure the negative (–) DC source power cable lugs to the **–48V** input terminals. Use a 10-mm nut driver to tighten the nuts.

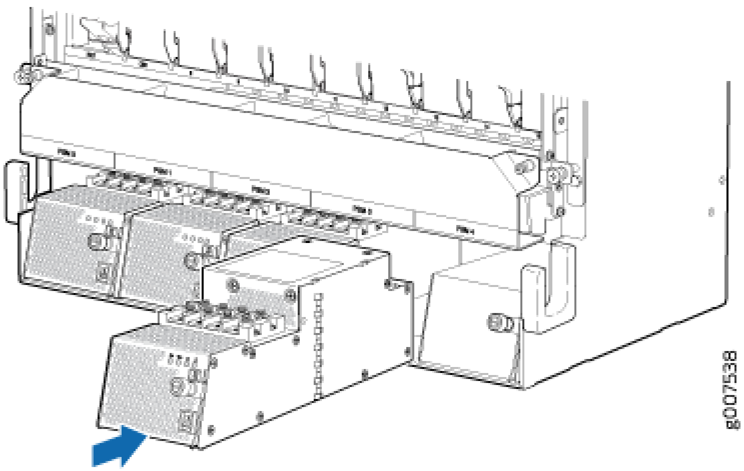
Figure 79: Connecting the Negative DC Source Power Cable Lugs to a PSM



13. Verify that the source power cables are connected to the appropriate terminal: the positive (+) source cable to the return terminal (labeled **RTN**) and the negative (–) source cable to the input terminal (labeled **–48V**).
14. Replace the input terminal cover over the DC power cables, and tighten the screws.
15. Verify that both input **1** and input **2** LEDs on the PSM faceplate are lit steadily green, indicating that the inputs are receiving power.

16. Reinstall the PSM into the chassis (see Figure 80 on page 199), and tighten the captive screw to secure it.

Figure 80: Installing a DC PSM



17. Repeat the procedure for the remaining PSMs.
18. Verify that the DC power cables do not touch or block access to the components, and that they do not drape where people could trip on them.

SEE ALSO

PTX3000 DC Power Cable and Lugs Specifications | 50

Connecting Nonredundant DC Power to the PTX3000 DC Power Supply Modules

To connect the DC source power cables to either input **1** or input **2** on each DC PSM for nonredundant power:

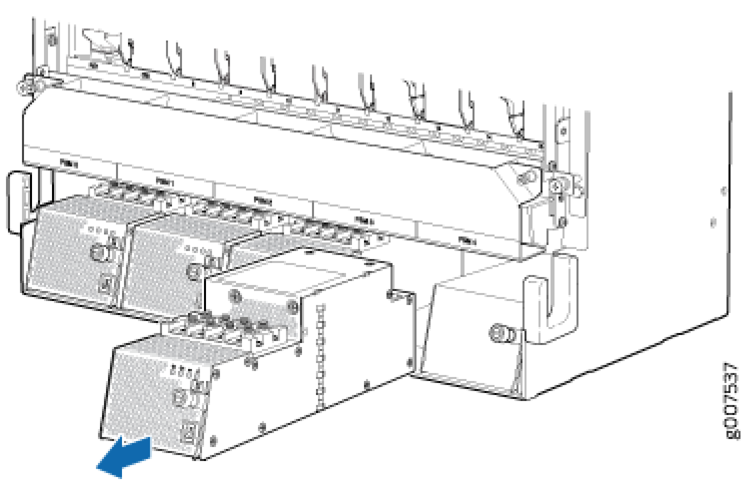
1. To connect the PTX3000 to DC power, you need the following tools and parts:
   - 10 mm nut driver, for tightening nuts to the terminal studs

> **CAUTION**: You must use an appropriate torque-controlled tool to tighten the nuts. Applying excessive torque damages the terminal studs. The maximum torque that may be applied to this nut is 24 lb-in. (2.7 Nm).

- Phillips (+) screwdriver, number 1
- DC power cables, which you must provide
- DC power lugs

2. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
3. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
4. Switch the power switch on the PSM faceplate to the standby position.
   (
   ⏻
).
5. Loosen the captive screw on the PSM .
6. Grasp the PSM, and pull it out to remove it from the chassis. The DC PSM weighs 4.6 lb (2.1 kg). See Figure 81 on page 200.

Figure 81: Removing a DC PSM



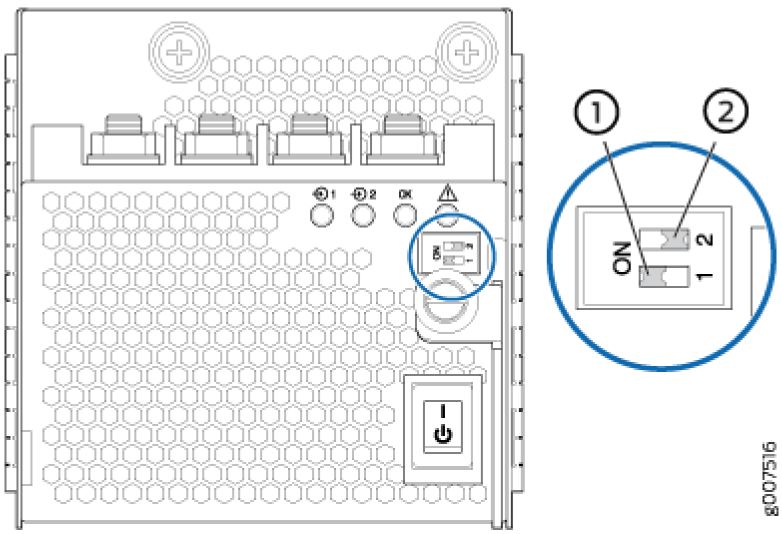
7. Use a number 1 Phillips (+) screwdriver to loosen the screws on the input terminal cover, and remove the input terminal cover.
8. Remove the nuts from the DC power terminal studs.

9. Set the input switches. See Figure 82 on page 201.

    - Set the input switch for the input to be connected to **ON**.
    - Set the input switch for the input that will not be connected to the off position.

    For example, connect input **1** on a DC PSM. The input **2** on the DC PSM remains disconnected. The input switch for input **2** is set to off.

    Figure 82: Setting the Input Switches

1– Input **1** switch	2– Input **2** switch

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

    To install heat-shrink tubing:

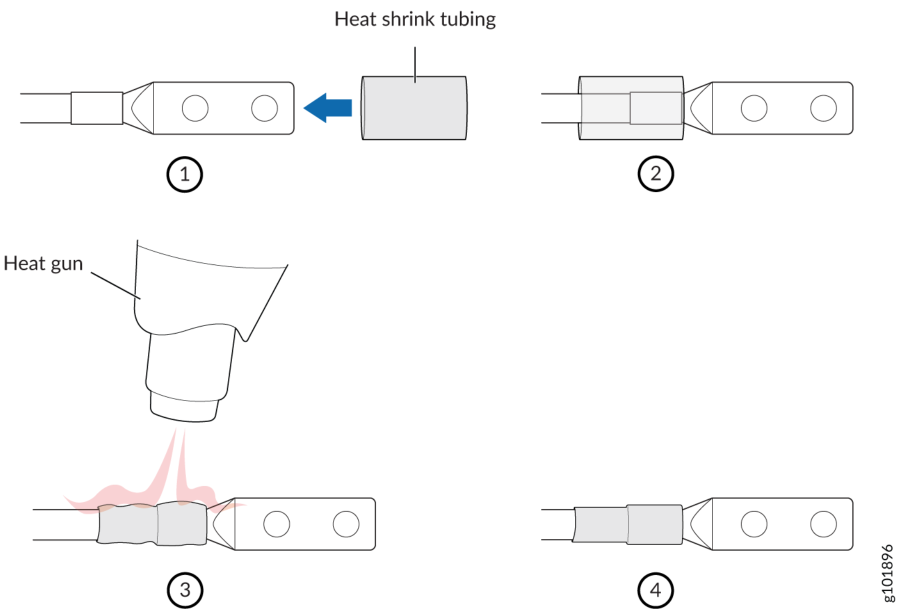
    a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

    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 83 on page 202 shows the steps to install heat-shrink tubing.

NOTE: Do not overheat the tubing.

Figure 83: How to Install Heat-Shrink Tubing



11. Connect the positive (+) DC source power cable to either input **1** or input **2RTN** input terminal. See Figure 84 on page 203.

> **CAUTION**: One input on each DC PSM must be powered by a dedicated power feed for nonredundant power. To achieve this, connect the positive (+) source cable to the return terminal (labeled **RTN**) and the negative (–) source cable to the input terminal (labeled **-48V**). The other input remains disconnected.
>
> You must ensure that power connections maintain the proper polarity. The power source cables might be labeled **(+)** and **(–)** to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the terminal studs on each power supply.

Secure the positive (+) DC source power cable lug to the **RTN** (return) terminal with a nut. Use a 10 mm nut driver to tighten the nut. See Figure 85 on page 204.

CAUTION: You must use an appropriate torque-controlled tool to tighten the nuts. Applying excessive torque damages the terminal studs and power supply. The maximum torque that may be applied to this nut is 24.0 lb-in. (2.7 Nm).

Figure 84: DC PSM Inputs

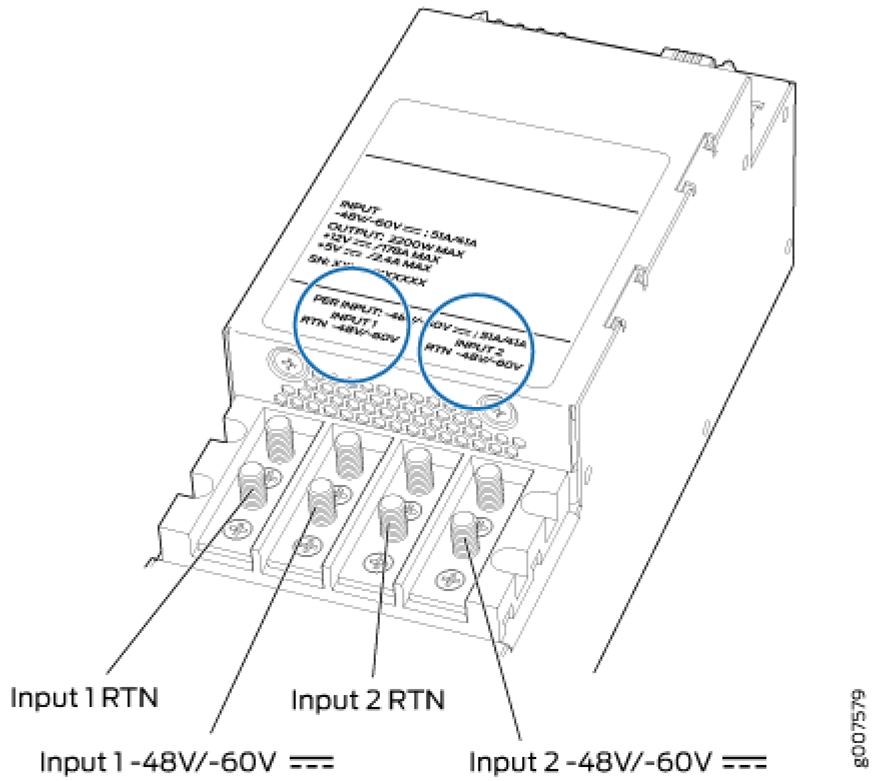
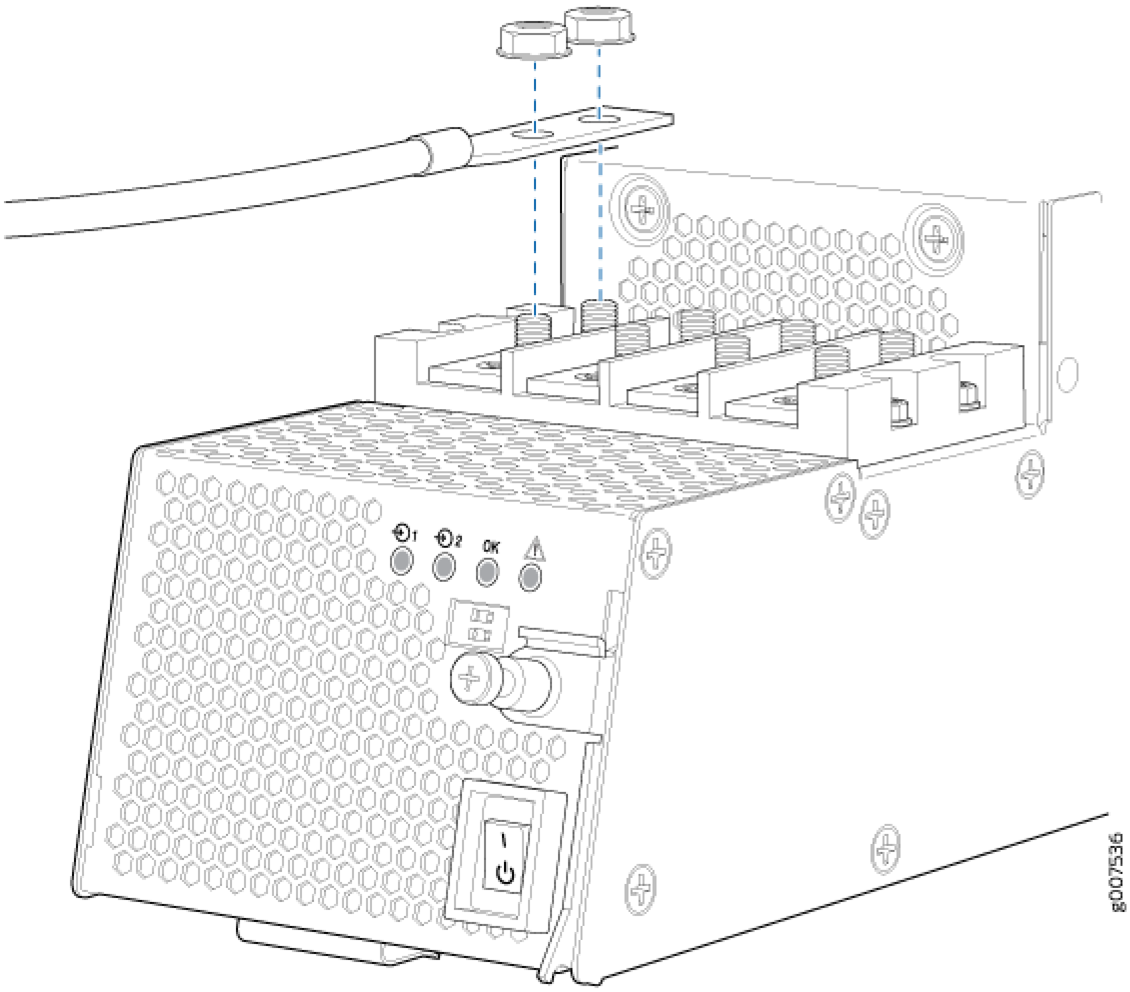


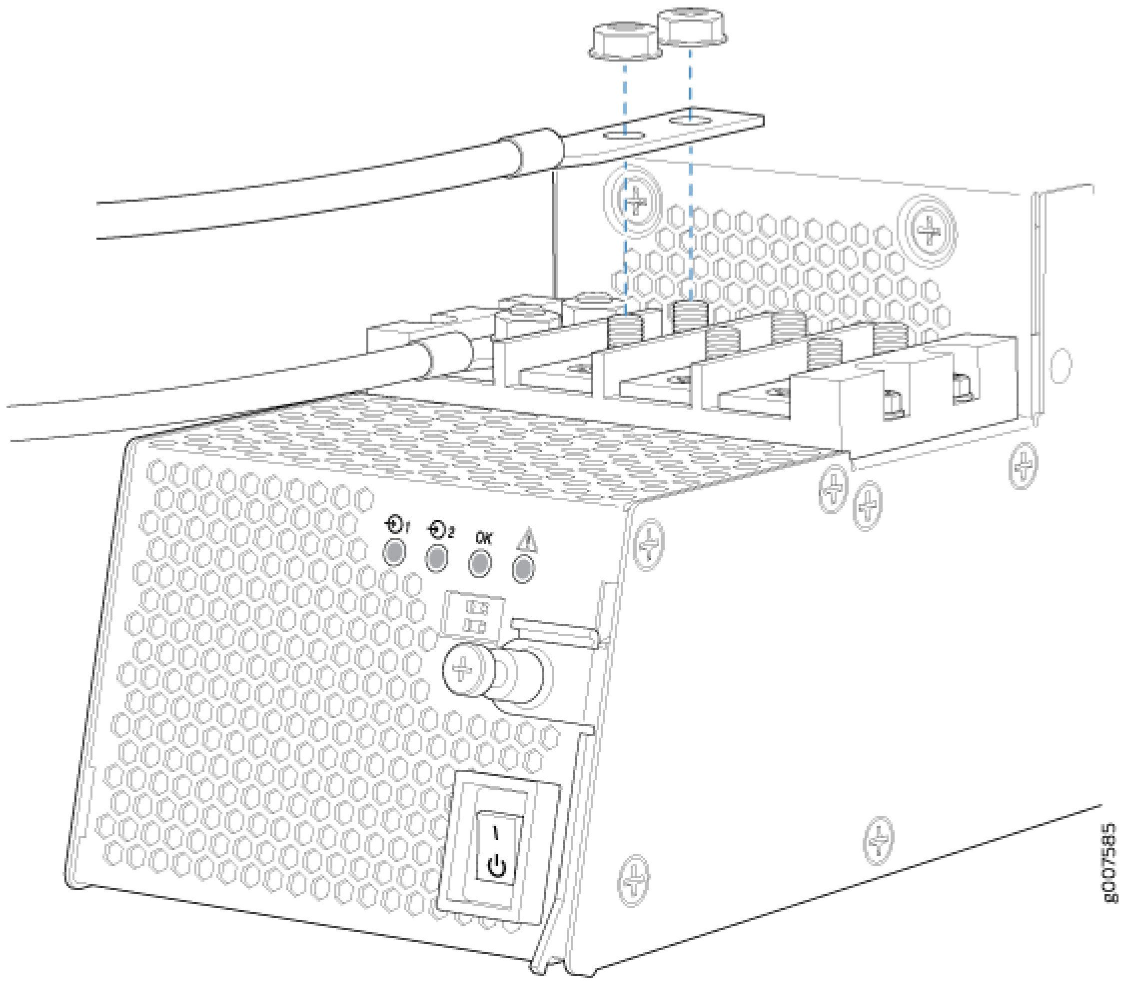
Figure 85: Connecting the Positive (+) DC Source Power Cable Lugs to a PSM RTN Input



12. Connect the negative (–) DC source power cable to the other input—either input **1** or input **2** **–48V** (input) terminal.

Secure the negative (–) DC source power cable lug to the **–48V** (input) terminal. Use a 10 mm nut driver to tighten the nut.

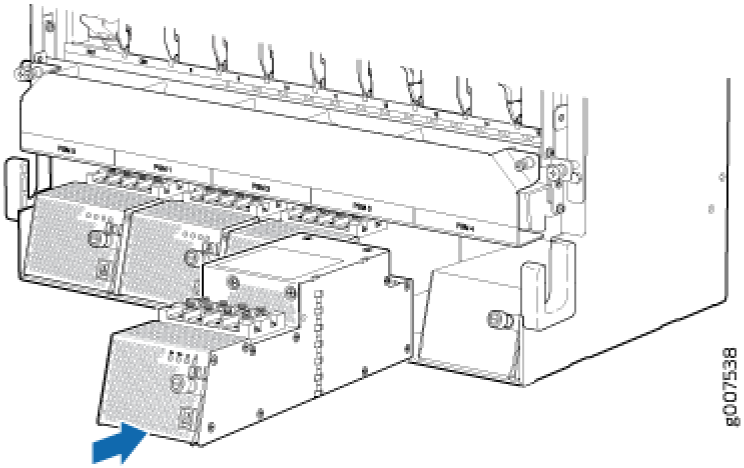
Figure 86: Connecting the Negative (–) DC Source Power Cable Lugs to a PSM –48V Input



13. Verify that the source power cables are connected to the appropriate terminal: the positive (+) source cable to the return terminal (labeled **RTN**) and the negative (–) source cable to the input terminal (labeled **–48V**).
14. Replace the input terminal cover over the DC power cables, and tighten the screws.
15. Verify that either the input **1** or the input **2** LEDs for the input on the PSM faceplate is lit steadily green, indicating that the input is receiving power.
16. Reinstall the PSM into the chassis (see Figure 87 on page 206), and tighten the captive screw to secure it .
17. Repeat the procedure for all PSMs in the chassis.

18. Verify that the DC power cables do not touch or block access to the components, and that they do not drape where people could trip on them.

Figure 87: Installing a DC PSM



SEE ALSO

PTX3000 DC Power Cable and Lugs Specifications | 50

RELATED DOCUMENTATION

Powering the PTX3000 On and Off | 223

Connecting the PTX3000 to External Devices

IN THIS SECTION

Connecting the PTX3000 to a Management Console or Auxiliary Device

Attach one or more management console or auxiliary devices to the Routing Engine ports on each Control Board or Routing and Control Board (RCB) for management and service operations (see Figure 88 on page 208).

To connect the cables to a management console or auxiliary device:

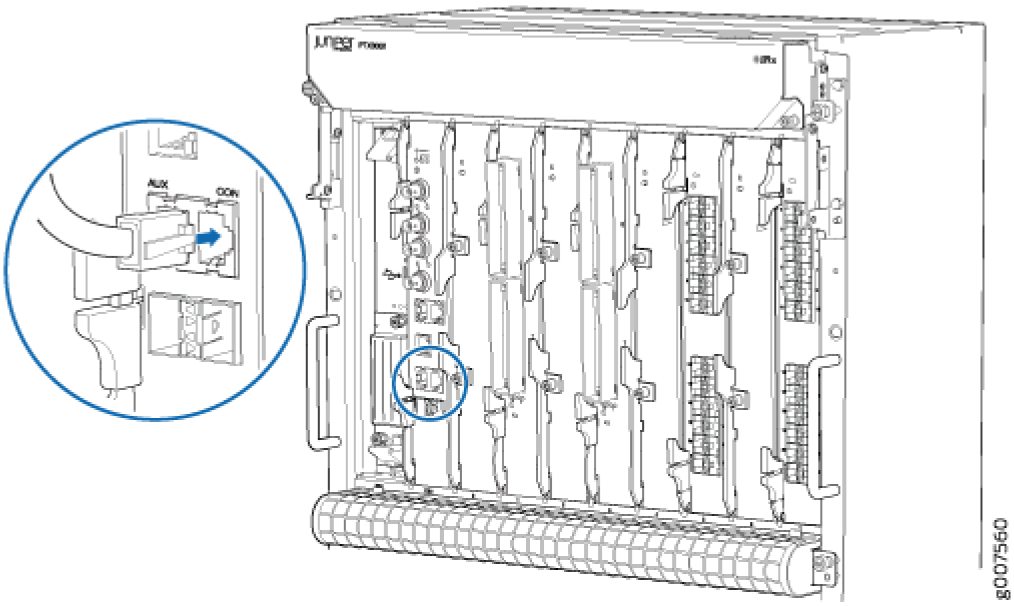
1. To connect the PTX3000 to external devices, you need an electrostatic discharge (ESD) grounding wrist strap (provided in the accessory box).
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

   > **CAUTION**: During the initial installation before the chassis is grounded, you must connect the wrist strap to an approved site ESD point. See the instructions for your site.

3. If necessary, turn off power to the console or auxiliary device.
4. Plug one end of a copper cable with RJ-45 connectors into the **CON** or **AUX** port on the Control Board or RCB in slot **CB0** (Figure 88 on page 208).
5. Attach the other end of the cable to the console or auxiliary device.
6. Plug one end of another copper cable with RJ-45 connectors into the **CON** or **AUX** port on the Control Board or RCB in slot **CB1**.

7. Attach the other end of the cable to the console or auxiliary device.

Figure 88: Connecting to the Console or Auxiliary Port on the Control Board or RCB



SEE ALSO

PTX3000 Management Interface Cable Specifications | 156
RJ-45 Connector Pinouts for the PTX3000 Auxiliary and Console Ports | 157

Connecting the PTX3000 to a Management Ethernet Device

To connect the management Ethernet ports on each Control Board or Routing and Control Board (RCB) to a network for management of the PTX3000, connect a UTP Category 5 Ethernet cable with an RJ-45 connector to the **HOST/ETHERNET** port on a Control Board, or the **MGT** port on an RCB.

NOTE: For PTX3000 routers with two host subsystems, we recommend that you connect both host subsystems to a network. One cable is provided in the accessory box. To connect another cable to the management Ethernet ports on the second Control Board or RCB, you must provide an additional cable.

To connect a cable to a network device:

1. To connect the PTX3000 to external devices, you need an electrostatic discharge (ESD) grounding wrist strap (provided in the accessory box).
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

   CAUTION: During the initial installation before the chassis is grounded, you must connect the wrist strap to an approved site ESD point. See the instructions for your site.

3. Plug one end of a UTP Category 5 Ethernet cable (Figure 89 on page 210 shows the connector) into the management Ethernet port on the Control Board or RCB in slot **CB0** (see Figure 90 on page 210).

   NOTE: The management Ethernet port is labeled **HOST/ETHERNET** on a Control Board. The port is labeled **MGT** on an RCB.

4. Plug the other end of the cable into the network device.
5. Plug one end of another UTP Category 5 Ethernet cable into the management Ethernet port on the Control Board or RCB in slot **CB1**.

6. Plug the other end of the cable into the network device.

Figure 89: Routing Engine Ethernet Cable Connector

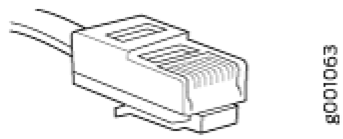
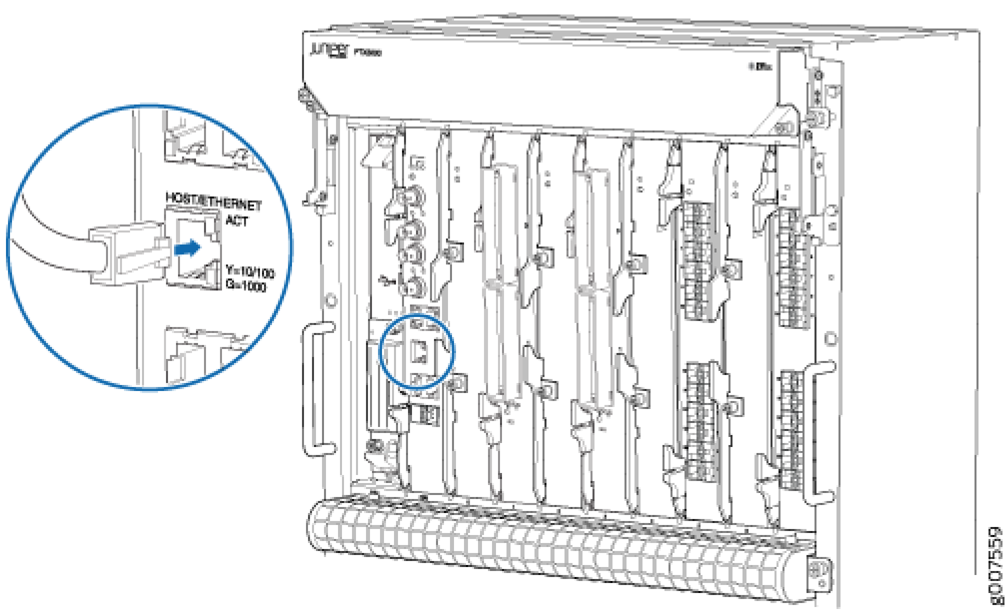


Figure 90: Connecting to the Management Ethernet Port on the Control Board or RCB



SEE ALSO

PTX3000 Management Interface Cable Specifications | 156
RJ-45 Connector Pinouts for the PTX3000 Management Ethernet Port | 158

Connecting the PTX3000 to an External Alarm-Reporting Device

To connect an external device to an alarm relay contact on the craft interface:

1. To connect the PTX3000 to external devices, you need:

- 2.5-mm flat-blade (–) screwdriver for the alarm relay contacts
- Electrostatic discharge (ESD) grounding wrist strap (an ESD grouding strap is provided in the accessory box)

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

> **CAUTION**: During the initial installation before the chassis is grounded, you must connect to an approved site ESD point. See the instructions for your site.

3. Prepare the required length of wire with gauge between 28-AWG and 14-AWG (0.08 and 2.08 mm^2).
4. While the terminal block is not plugged into the relay contact, use a 2.5-mm flat-blade screwdriver to loosen the small screws on its side. With the small screws on its side facing left, insert wires into the slots in the front of the block based on the wiring for the external device. Connect the major and minor alarm circuits to the **NO** (normally open) pins on the alarm connectors. Tighten the screws to secure the wire.

> **NOTE**: The top, middle, and bottom slots correspond to **NC** (normally closed), **C** (common), and **NO** (normally open), respectively.

5. Plug the terminal block into the relay contact, and use a 2.5-mm flat-blade screwdriver to tighten the screws on the face of the block.
6. Attach the other end of the wires to the external device.

SEE ALSO

PTX3000 Alarm Relay Contact Wire Specifications | **156**

Connecting PIC or IPLC Cables to the PTX3000

The PTX3000 supports PICs and IPLCs that use various kinds of network cable, including multimode and single-mode fiber-optic cable. For information about the type of cable used by each PIC, see the PTX Series Interface Module Reference.

You connect the IPLCs to compatible PICs/MICs (see "PTX Series IPLC Compatibility" on page 127), or to other IPLCs, or to the optical inline amplifier (ILA).

You connect PICs to the network by plugging in network cable. To connect cable to compatible PICs or IPLCs (see Figure 91 on page 214):

1. To connect the PTX3000 to external devices, you need the following:
   - The required length of the type of cable used by the PIC. See the *PTX Series Interface Module Reference*.
   - Number 1 Phillips (+) screwdriver to loosen the captive screws on the cable management system.
   - Electrostatic discharge (ESD) grounding wrist strap (provided in the accessory box).
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

   > **CAUTION**: During the initial installation before the chassis is grounded, you must connect the wrist strap to an approved site ESD point. See the instructions for your site.

3. If the PIC cable connector port is covered by a rubber safety plug, remove the plug. The IPLC ports have an attached cover for the connector.

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

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

4. Insert the cable connector into the cable connector port on the PIC or IPLC faceplate. See Figure 91 on page 214 and Figure 92 on page 214.
5. Using a number 1 Phillips (+) screwdriver, loosen the two inner captive screws on the upper or lower cable management system. Move the cover of the upper cable management system up (Figure 93 on page 215). Move the cover of the lower cable management system down (Figure 94 on page 215).
6. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points (Figure 95 on page 216). Secure the cable so that it is not supporting its own weight as it hangs to the floor.

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

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

7. Move the cover of the upper cable management system down, and secure the two inner captive screws on the upper cable management system by using a number 1 Phillips (+) screwdriver. Move

the cover of the lower cable management system up, and secure the two inner captive screws on the lower cable management system by using the screwdriver.

Figure 91: Connecting PIC Cables

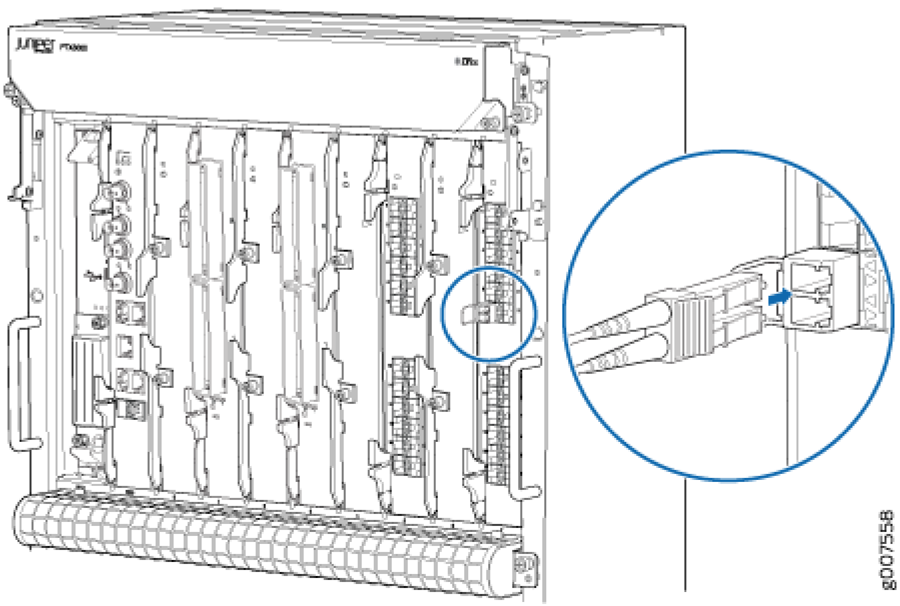


Figure 92: Connecting IPLC Cables with LC Connectors

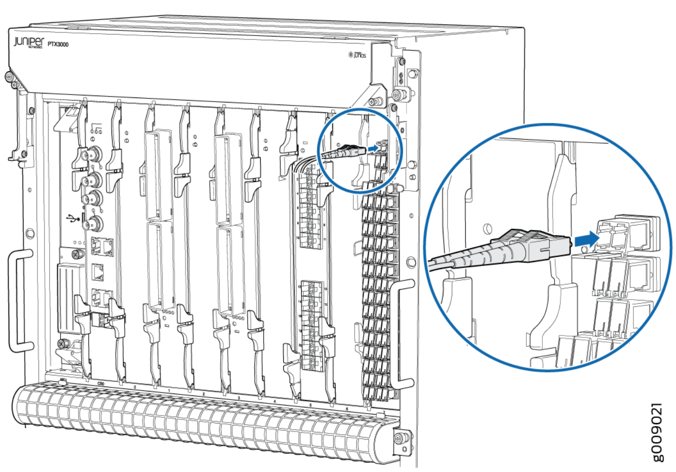


Figure 93: Upper Cable Management System

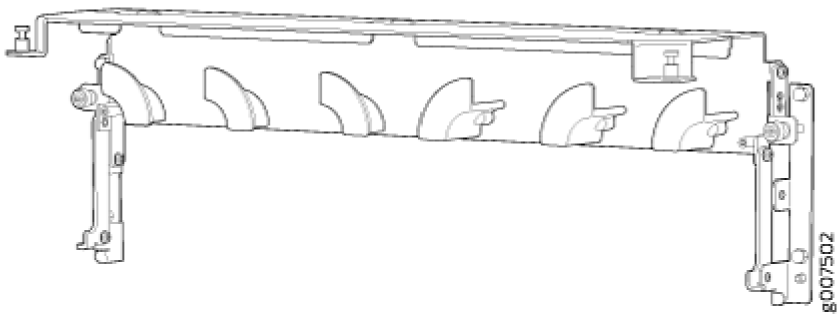


Figure 94: Lower Cable Management System

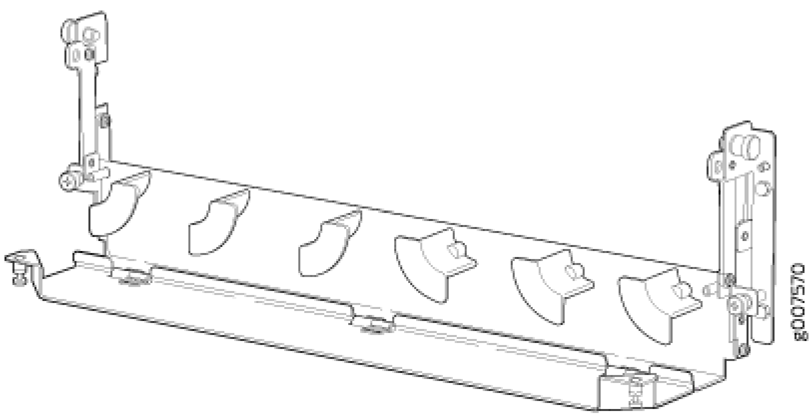
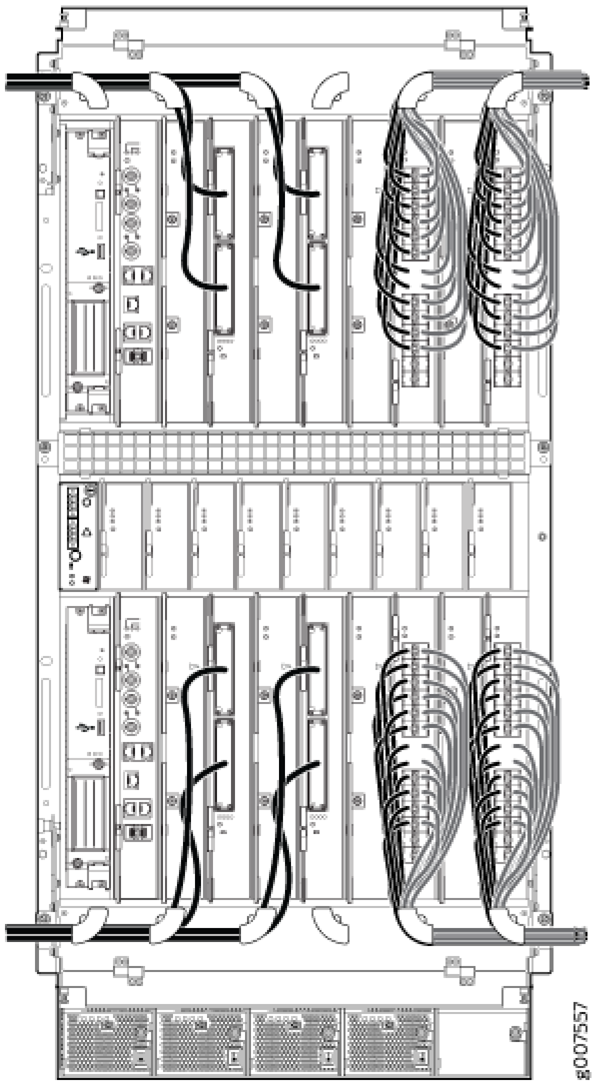


Figure 95: Routing the PIC Cables in the Cable Management System



> **NOTE**: The IPLC cables are arranged similar to the PIC cables shown in Figure 95 on page 216.

Connecting an External Clocking Device to a GPS Port on a PTX3000 Control Board

To connect the PTX3000 to one or two external clocking devices, connect a cable with BNC connectors to the **GPS0 CLOCK** and **GPS1 CLOCK** ports on the Control Board.

To connect the PTX3000 to external devices, you need an ESD grounding wrist strap (provided in the accessory box).

1. Plug one end of the cable into the **GPS0 CLOCK** port on the Control Board.
2. Plug the other end of the cable into the GPS external clocking device.
3. Repeat the procedure for the **GPS1 CLOCK** port on the Control Board.
4. Verify that the **LNK** LED for the ports on the Control Board is lit steadily green.
5. Configure the port. See the *synchronization* statement for the PTX Series.
6. Issue the `show chassis synchronization extensive` command to check the status of the port.

```
user@host> show chassis synchronization extensive
Clock Synchronization Status :
  Clock module on CB 0
    Current state            : Online - Master
    Validation interval      : 103 seconds
    Signal type              : t1
    Switching mode           : non-revertive
    Line termination         : no-y-cable
    Transmitter              : disabled
    Current clock state      : holdover
      Selected for           : 1 hour, 18 minutes, 2 seconds
      Selected since         : 2013-05-07 13:35:10 PDT
      Deviation (in ppm)     : -0.00
      Last deviation (in ppm): -0.00
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
                             (in ppm)     (in ppm)
      gps-0-10mhz primary    unknown      unknown          unknown
Clock Synchronization Status :
  Clock module on CB 1
    Current state            : Online - Standby
    Validation interval      : 103 seconds
    Signal type              : t1
    Switching mode           : non-revertive
    Line termination         : no-y-cable
    Transmitter              : disabled
    Current clock state      : locked to master CB
      Selected for           : 1 hour, 17 minutes, 55 seconds
      Selected since         : 2013-05-07 13:35:17 PDT
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
```

```
                          (in ppm)     (in ppm)
      gps-0-10mhz primary    unknown      unknown          unknown
```

Connecting an External Clocking Device to a GPS Port on a PTX3000 Routing and Control Board (RCB)

To connect the PTX3000 to one or two external clocking devices, connect a cable with SMB connectors to the **PPS 0** and **PPS1** clock ports on the RCB.

To connect the PTX3000 to external devices, you need an electrostatic discharge (ESD) grounding wrist strap (provided in the accessory box).

1.
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Plug one end of the cable into the **1PPS0** port on the RCB.
4. Plug the other end of the cable into the GPS external clocking device.
5. Repeat the procedure for the **1PPS1** port on the RCB.
6. Configure the port. See the *synchronization* statement for the PTX Series.
7. Issue the `show chassis synchronization extensive` command to check the status of the port.

```
user@host> show chassis synchronization extensive
Clock Synchronization Status :
  Clock module on CB 0
    Current state            : Online - Master
    Validation interval      : 103 seconds
    Signal type              : t1
    Switching mode           : non-revertive
    Line termination         : no-y-cable
    Transmitter              : disabled
    Current clock state      : holdover
      Selected for           : 1 hour, 18 minutes, 2 seconds
      Selected since         : 2013-05-07 13:35:10 PDT
      Deviation (in ppm)     : -0.00
      Last deviation (in ppm): -0.00
    Configured sources
      Source      Priority   Deviation     Last deviation   Status
                             (in ppm)      (in ppm)
```

```
    gps-0-10mhz primary    unknown      unknown          unknown
Clock Synchronization Status :
  Clock module on CB 1
    Current state            : Online - Standby
    Validation interval      : 103 seconds
    Signal type              : t1
    Switching mode           : non-revertive
    Line termination         : no-y-cable
    Transmitter              : disabled
    Current clock state      : locked to master CB
      Selected for           : 1 hour, 17 minutes, 55 seconds
      Selected since         : 2013-05-07 13:35:17 PDT
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
                             (in ppm)     (in ppm)
      gps-0-10mhz primary    unknown      unknown          unknown
```

Connecting an External Clocking Device to a PTX3000 BITS Port

To connect the PTX3000 to one or two external clocking devices, connect a cable with RJ-48 connectors to the **BITS A** and **BITS B** ports on the Control Board or Routing and Control Board (RCB).

1. To connect the PTX3000 to external devices, you need an electrostatic discharge (ESD) grounding wrist strap (provided in the accessory box).
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Plug one end of the cable into the **BITS A** port on the Control Board or RCB.
4. Plug the other end of the cable into the external clocking device.
5. Repeat the procedure for the **BITS B** port on the Control Board or RCB.
6. Verify that the **LNK** LED for the port is lit steadily green.
7. Configure the port. See the *synchronization* statement for the PTX Series.
8. Issue the `show chassis synchronization clock-module` command to check the status of the port.

```
user@host> show chassis synchronization clock-module

re0:
--------------------------------------------------------------------------
Clock Synchronization Status :
```

```
  Clock module on CB 0
    Current state            : Online - Master
    Current clock state      : locked to other-ccg
      Selected for           : 37 minutes, 32 seconds
      Selected since         : 2016-07-04 04:59:55 PDT
      Deviation (in ppm)     : 0.21
      Last deviation (in ppm): 0.21
Clock Synchronization Status :
  Clock module on CB 1
    Current state            : Online - Standby
    Current clock state      : locked to master CB
      Selected for           : 37 minutes, 11 seconds
      Selected since         : 2016-07-04 05:00:16 PDT
      Deviation (in ppm)     : unknown
      Last deviation (in ppm): unknown
```

RELATED DOCUMENTATION

PTX3000 Routing and Control Board Description | 67

PTX3000 Control Board Description | 62

PTX3000 PIC Description | 103

Prevention of Electrostatic Discharge Damage

Radiation from Open Port Apertures Warning

Laser and LED Safety Guidelines and Warnings

Installing the Front Doors on a PTX3000

Front doors are installed over the card cage that contains the components in the chassis. Each PTX3000 is shipped with two front doors, one door for each card cage. Captive thumbscrews secure the door to the chassis.

To install an upper or lower card front door on a PTX3000 (see Figure 96 on page 222):

1. Gather the following tools:

   - Electrostatic discharge (ESD) grounding strap

   - Phillips (+) screwdriver, number 2

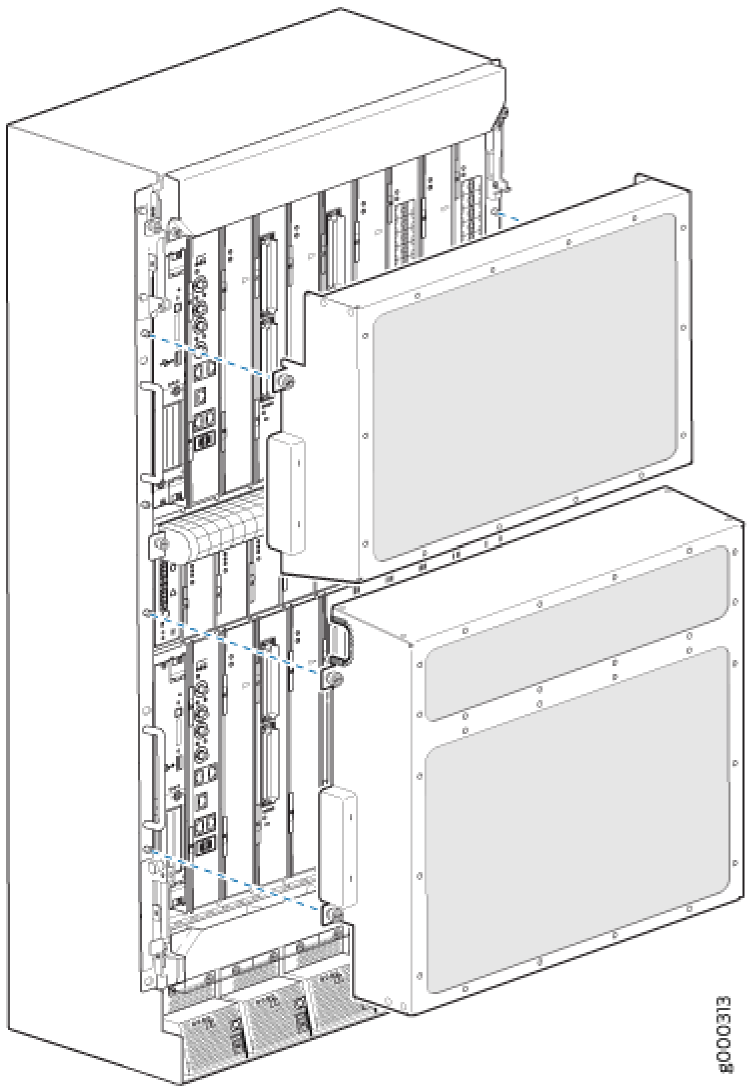
2. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

> **CAUTION**: During the initial installation before the chassis is grounded, you must connect the wrist strap to an approved site ESD point. See the instructions for your site.

3. Place the door over the appropriate card cage in the chassis.
4. Using your fingers, loosely tighten the thumbscrews on each side of the door.
5. Tighten the screws completely by using a number 2 Phillips (+) screwdriver to secure the door to the chassis.

NOTE: If you must return the chassis to Juniper Networks for any reason, you must remove the front doors from the chassis. See "Packing the PTX3000 for Shipment" on page 438 in the *PTX3000 Packet Transport Router Hardware Guide*.

Figure 96: Installing the Front Doors on the PTX3000



RELATED DOCUMENTATION

PTX3000 Hardware Component Overview | 10

PTX3000 Chassis Description | 18

Powering the PTX3000 On and Off

IN THIS SECTION

Powering On an AC-Powered PTX3000

To power on an AC-powered router:

1. Verify that each power supply module (PSM) is fully inserted in the chassis and that the captive screws on the PSM faceplates are tightened.
2. Verify that the AC power cords are connected correctly.
3. Verify that an external management device is connected to one of the Routing Engine ports on the Control Board or the Routing and Control Board (RCB). The auxiliary ports are labeled **AUX** and the management console ports are labeled **CON**.

   NOTE: The management Ethernet port labeled **HOST/ETHERNET** on the Control Board and **MGT** on the RCB are not available until after the initial software configuration. You can monitor the startup process during the initial installation by using devices connected to the **AUX** or **CON** ports.

4. Turn on power to the external management device.
5. Switch on the dedicated customer-site circuit breakers to provide power to the AC power cables. Follow your site's procedures.
6. Verify that the input **1** and input **2** LEDs on the AC PSM faceplates are lit steadily green for each connected input, indicating that the power supplies are receiving power.
7. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.

8. Switch the power switch on one of the AC PSMs to the on position (|). The **OK** LED blinks momentarily, and then is lit steadily.

   NOTE: The Routing Engine or the RCB—depending on your configuration—boots as the PSM completes its startup sequence. If the Routing Engine or RCB finishes booting and you need to power off the system, see "Powering Off the PTX3000" on page 225 in the *PTX3000 Packet Transport Router Hardware Guide*.

   After powering on a power supply, you must wait at least 60 seconds before powering it off.

9. Verify that the **OK** LED on the AC PSM faceplate is lit steadily, indicating that power supply is correctly installed, functioning properly, and providing power to the outputs.
10. On the external management device connected to the PTX3000, monitor the startup process to verify that the system has booted properly.
11. Repeat Step 8 and Step 9 for the other PSMs.

Powering On a DC-Powered PTX3000

To power on a DC-powered PTX3000:

NOTE: After powering off a power supply, you must wait at least 60 seconds before powering it on again.

1. Verify that the power supply modules (PSMs) are fully inserted in the chassis and that the captive screw on the faceplate of each PSM is tightened.
2. Verify that the DC power cables are connected correctly.
3. Verify that an external management device is connected to one of the Routing Engine ports on the Control Board or the Routing and Control Board (RCB). The auxiliary ports are labeled **AUX** and the management console ports are labeled **CON**.

   NOTE: The management Ethernet port labeled **HOST/ETHERNET** on the Control Board and **MGT** on the RCB are not available until after the initial software configuration. You can monitor the startup process during the initial installation by using devices connected to the **AUX** or **CON** ports.

4. Turn on the power to the external management device.

5. Switch on the customer-site circuit breakers to provide voltage to the DC power source cables. Follow your site's procedures.
6. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
7. Verify that the input **1** and input **2** LEDs on the PSM faceplate are lit steadily green, indicating that the inputs are receiving input voltage.
8. Switch the power switch on one PSM to the on position (|).

   NOTE: After a PSM is powered on, it can take up to 60 seconds for status indicators—such as the LEDs on the PSMs and the command output displays—to indicate that the PSMs are functioning normally. Ignore error indicators that appear during the first 60 seconds.

   NOTE: The Routing Engine or the RCB—depending on your configuration—boots as the PSM completes its startup sequence. If the Routing Engine or RCB finishes booting and you need to power off the system, see "Powering Off the PTX3000" on page 225 in the *PTX3000 Packet Transport Router Hardware Guide*.

   After powering on a power supply, you must wait at least 60 seconds before powering it off.

9. Verify that the **OK** LED on the PSM faceplate is lit steadily and that the
   ⚠
   LED is off, indicating that the PSM is correctly installed and is functioning properly.

   NOTE: If the **OK** LED is not light steadily, remove the PSM, repeat the cabling procedure, and reinstall the PSM into the PTX3000.

10. On the external management device connected to the PTX3000, monitor the startup process to verify that the system has booted properly.
11. Repeat Step 8 and Step 9 for the other PSMs.

Powering Off the PTX3000

IN THIS SECTION

Powering Off a PTX3000 with RE-DUO-C2600-16G Routing Engines

To power off a PTX3000 with RE-DUO-C2600-16G Routing Engines:

> **NOTE**: After powering on a power supply, wait at least 60 seconds before powering it off.

1. On an external management device connected to the PTX3000, issue the `request system halt both-routing-engines` operational mode command. The command shuts down the Routing Engines cleanly, so their state information is preserved. See *request system halt* in the *Junos OS Software Installation and Upgade Guide* for more information about the command.

   If the PTX3000 contains only one Routing Engine, issue the `request system halt` command.

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

   Wait until a message appears on the console confirming that the operating system has halted.

   ```
   Halt the system ? [yes,no] (no) yes

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

   System going down IMMEDIATELY

   Terminated

   ...

   syncing disks... 11 8 done

   The operating system has halted.

   Please press any key to reboot.
   ```

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Move the power switch on each PSM to the standby position
   (
   ⏻
).
4. Verify that the **OK** LED on each PSM faceplate is off.

   > **NOTE**: After powering off a power supply, you must wait at least 60 seconds before powering it on again.

Powering Off a PTX3000 with RCB-PTX-X6-32G Routing and Control Boards

To power off a PTX3000 with RCB-PTX-X6-32G Routing and Control Boards (RCBs):

> **NOTE**: After powering on a power supply, wait at least 60 seconds before powering it off.

1. On an external management device connected to the PTX3000, issue the `request vmhost halt routing-engine both` operational mode command. The command shuts down the RCBs cleanly, so their state information is preserved. See *request vmhost halt* in the *Junos OS Software Installation and Upgade Guide* for more information about the command.

   If the PTX3000 contains only one RCB, issue the `request vmhost halt` command.

   ```
   user@host> request vmhost halt routing-engine both
   ```

   Wait until a message appears on the console confirming that the operating system has halted.

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

   System going down IMMEDIATELY

   ...
   ```

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

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Move the power switch on each PSM to the standby position
   (
   ⏻
).
4. Verify that the **OK** LED on each PSM faceplate is off.

> **NOTE**: After powering off a power supply, you must wait at least 60 seconds before powering it on again.

RELATED DOCUMENTATION

PTX3000 Power System Description | **36**

Connecting Nonredundant AC Power to the PTX3000 AC Power Supply Modules | **188**

Connecting Redundant AC Power to the PTX3000 AC Power Supply Modules | **184**

Connecting Redundant DC Power to the PTX3000 DC Power Supply Module | **191**

Connecting Nonredundant DC Power to the PTX3000 DC Power Supply Modules | **199**

Performing the Initial Software Configuration for the PTX3000

IN THIS SECTION

These procedures connect a PTX3000 to the network but do not enable it to forward traffic. For complete information about enabling the PTX3000 to forward traffic, including examples, see the Junos OS configuration guides.

You configure the PTX3000 by issuing Junos OS CLI commands, either on a console device attached to the **CON** port, or over a Telnet connection to a network connected to the management Ethernet port.

NOTE: These procedures enable you to use the management Ethernet port. For the initial configuration, use a device attached to the **CON** port.

Preparing to Configure the PTX3000

Gather the following information before configuring the PTX3000:

- Name the PTX3000 will use on the network
- Domain name the PTX3000 will use
- IP address and prefix length information for the Ethernet interface
- IP address of a default router
- IP address of a DNS server
- Password for the root user

Entering Configuration Mode

1. Verify that the network device is powered on.

2. Log in as the root user. There is no password.

```
Amnesiac <ttyd0>
login: root
```

3. Start the CLI.

```
root@% cli
root>
```

4. Enter configuration mode.

```
root> configure
Entering configuration mode.
[edit]
root#
```

Configuring User Accounts and Passwords

For information about using an encrypted password or an SSH public key string (DSA or RSA), see *Configuring the Root Password* and *user*.

1. Add a password to the root administration user account. Enter a cleartext password.

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

2. Create a management console user account.

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

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

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

Configuring System Attributes

1. Configure the name of the PTX3000. If the name includes spaces, enclose the name in quotation marks (“ ”).

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

NOTE: The DNS server does not use the hostname to resolve to the correct IP address. This hostname is used to display the name of the device in the CLI. For example, this hostname is displayed on the command-line prompt when the user is logged in to the CLI:

user-name@host-name>

2. Configure the IP address of the DNS server.

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

3. Configure the domain name of the PTX3000.

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

4. Configure the IP address and prefix length for the PTX3000 router’s management Ethernet interface.

```
[edit]
root@# set interfaces em0 unit 0 family inet address address/prefix-length
```

5. Configure the IP address of a backup router. The backup router allows the PTX3000 to install a route to the management network while the Routing Engine or RCB is booting and before the routing protocol process (rpd) is up and running. The backup router must be directly connected—that is, on the same subnet—through the management Ethernet interface.

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

6. (Optional) Configure the static routes to remote subnets with access to the management port. Access to the management port is limited to the local subnet. To access the management port from a remote subnet, you must add a static route to that subnet within the routing table.

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

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

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

Committing the Configuration

1. Display the configuration to verify that it is correct.

```
[edit]
root@# show
system {
    host-name host-name;
    domain-name domain-name;
    backup-router address;
    root-authentication {
        authentication-method (password | public-key);
    }
    name-server {
        address;
    }
```

```
}
interfaces {
    em0 {
        unit 0 {
            family inet {
                address address/prefix-length;
            }
        }
    }
}
```

2. Commit the configuration to activate it.

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

3. Optionally, configure additional properties by adding the necessary configuration statements. Then commit the changes to activate them.

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

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

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

RELATED DOCUMENTATION

PTX3000 Routing Engine Description | 55

PTX3000 Routing and Control Board Description | 67

4

CHAPTER

Maintaining Components

Maintaining the PTX3000 Chassis

IN THIS SECTION

Routine Maintenance Procedures for the PTX3000

IN THIS SECTION

Purpose

For optimum performance, perform preventive maintenance procedures.

Action

On a regular basis:

- Inspect the installation site for moisture, loose wires or cables, and excessive dust. Make sure that airflow is unobstructed around the PTX3000 and into the air intake vents.
- Check the status-reporting devices on the craft interface: system alarms, LEDs, and the craft interface display.
- Inspect all air filters in the PTX3000, replacing them every 6 months. Do not run the PTX3000 for more than a few minutes without all the air filters in place.

SEE ALSO

Maintaining PTX3000 Cooling System Components | 241

Tools and Parts Required to Maintain the PTX3000 Components

To maintain the hardware components, you need the following tools and parts:

- ESD grounding wrist strap
- Flat-blade (–) screwdriver
- Phillips (+) screwdriver, number 1

Tools and Parts Required for Removing and Installing PTX3000 Hardware Components

To replace hardware components, you need the tools and parts listed in Table 55 on page 236.

Table 55: Tools and Parts Required for Component Replacement

Components	Tool or part
All	Electrostatic discharge (ESD) grounding wrist strap
Air filter	Phillips (+) screwdriver, number 1
Control Board	Phillips (+) screwdriver, number 1 Electrostatic bag or antistatic mat Blank panel (if component is not reinstalled)
Craft interface	Phillips (+) screwdriver, number 1

Table 55: Tools and Parts Required for Component Replacement *(Continued)*

Components	Tool or part
DC PSM	Phillips (+) screwdriver, number 1 10 mm nut driver **CAUTION**: You must use an appropriate torque-controlled tool to tighten the nuts. Applying excessive torque damages the terminal studs and the PSM.
DC power cable	10 mm nut driver **CAUTION**: You must use an appropriate torque-controlled tool to tighten the nuts. Applying excessive torque damages the terminal studs.
Fan tray	Phillips (+) screwdriver, number 1
FPC	Phillips (+) screwdriver, number 1 Blank panel (if component is not reinstalled) Electrostatic bag or antistatic mat
PIC	Phillips (+) screwdriver, number 1 Rubber safety caps for fiber-optic transceivers and fiber-optic cables Electrostatic bag or antistatic mat Blank panel (if component is not reinstalled)
IPLC	Phillips (+) screwdriver, number 1 Fiber-optic LC cables Rubber safety caps for fiber-optic cables Electrostatic bag or antistatic mat
Routing Engine	Phillips (+) screwdriver, number 1 Electrostatic bag or antistatic mat Blank panel (if component is not reinstalled)

Table 55: Tools and Parts Required for Component Replacement *(Continued)*

Components	Tool or part
Routing and Control Board (RCB)	Phillips (+) screwdriver, number 1 Electrostatic bag or antistatic mat Blank panel (if component is not reinstalled)
RCB companion card	Phillips (+) screwdriver, number 1 Electrostatic bag or antistatic mat Blank panel (if component is not reinstalled)
SIB	Phillips (+) screwdriver, number 1 Electrostatic bag or antistatic mat Blank panel (if component is not reinstalled)

SEE ALSO

Verifying the PTX3000 Parts Received | 171

Replacing a PTX3000 Craft Interface

IN THIS SECTION

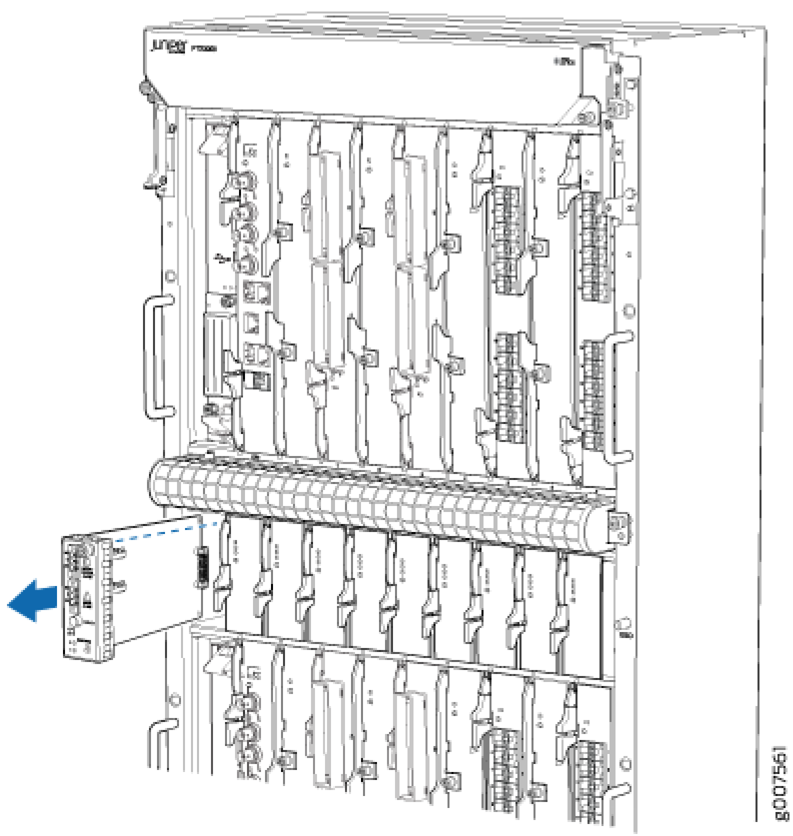
Removing a PTX3000 Craft Interface

The craft interface is located below the air filter and to the left of the SIBs. The craft interface weighs 0.4 lb (0.2 kg). It is hot-insertable and hot-removable.

To remove the craft interface (see Figure 1):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Loosen the captive screw on the craft interface, using a number 1 Phillips (+) screwdriver.
3. Grasp the craft interface, and slide it out of the chassis.

Figure 97: Removing the Craft Interface



Installing a PTX3000 Craft Interface

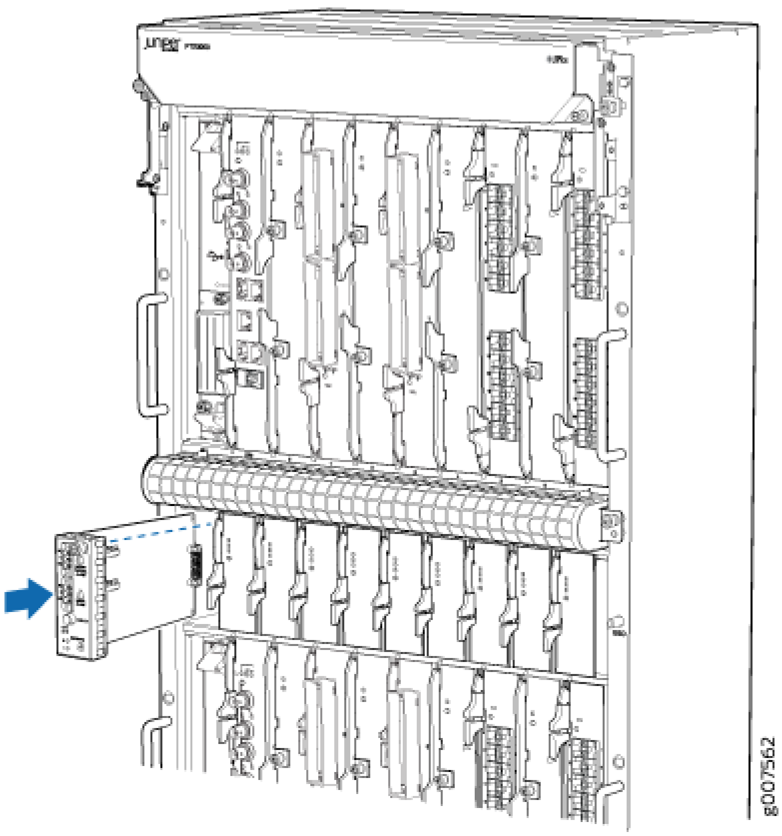
To install the craft interface (see Figure 98 on page 240):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Grasp the craft interface, and press it into the chassis.

3. Tighten the captive screws on the craft interface, using a Phillips screwdriver, number 1.

> **NOTE**: After you install the craft interface in an operating PTX3000, allow several minutes for the LEDs on the craft interface to reflect the current state of the PTX3000.

Figure 98: Installing a Replacement Craft Interface



RELATED DOCUMENTATION

PTX3000 Craft Interface Description | 25

Prevention of Electrostatic Discharge Damage

Maintaining the PTX3000 Cooling System

IN THIS SECTION

Maintaining PTX3000 Cooling System Components

IN THIS SECTION

Maintaining the PTX3000 Air Filters

IN THIS SECTION

Purpose

For optimum cooling, verify the condition of the main cooling system air filter, third-generation FPC air filters, and PIC air filters, if applicable.

Action

On a regular basis:

- Check the air filters for dust and debris. Replace the filter elements. The filter elements degrade over time, so the filter elements in use, as well as spares, must be replaced every 6 months.
- The shelf life of polyurethane filter varies from two years to five years depending on the storage conditions. Store in a cool, dry, and dark environment. Wrap the media in plastic and store in an environment with relative humidity between 40%- 80% and temperature between 40°F (4° C) to 90°F (32° C). Note that if the material flakes, or becomes brittle when rubbed or deformed, it is no longer usable.

CAUTION: Always keep the air filters in place while the PTX3000 is operating. The fans are very powerful, and could pull small bits of wire or other materials into the PTX3000 through the unfiltered air intake. This could damage the PTX3000 components.

Maintaining the PTX3000 Fan Trays

IN THIS SECTION

Purpose

For optimum cooling, verify the condition of the fan trays.

Action

On a regular basis:

- Check the fan tray LEDs on the craft interface. During normal operation, the LEDs are lit green to indicate that the cooling system is functioning normally.

- Place your hand near the exhaust vents at the rear of the chassis to determine whether the fans are pushing air out of the chassis.
  - The zone 0 air exhaust is located in the upper rear of the chassis.
  - The zone 1 exhaust vent is located at the lower rear of the chassis.
  - The power system air exhausts from the power supply modules (PSMs).
- Monitor the status of the fans. During normal operation, the fans in each fan tray function at less than full speed. Each fan tray contains multiple fans that work in unison to cool the PTX3000 components. If one fan fails, the host subsystem adjusts the speed of the remaining fans to maintain proper cooling. A red alarm is triggered when a fan fails, and a yellow alarm is triggered when a fan tray is removed.
- To display the status of the fans, issue the `show chassis fan` command.

Replacing a PTX3000 Chassis Air Filter

IN THIS SECTION

Removing a PTX3000 Chassis Air Filter

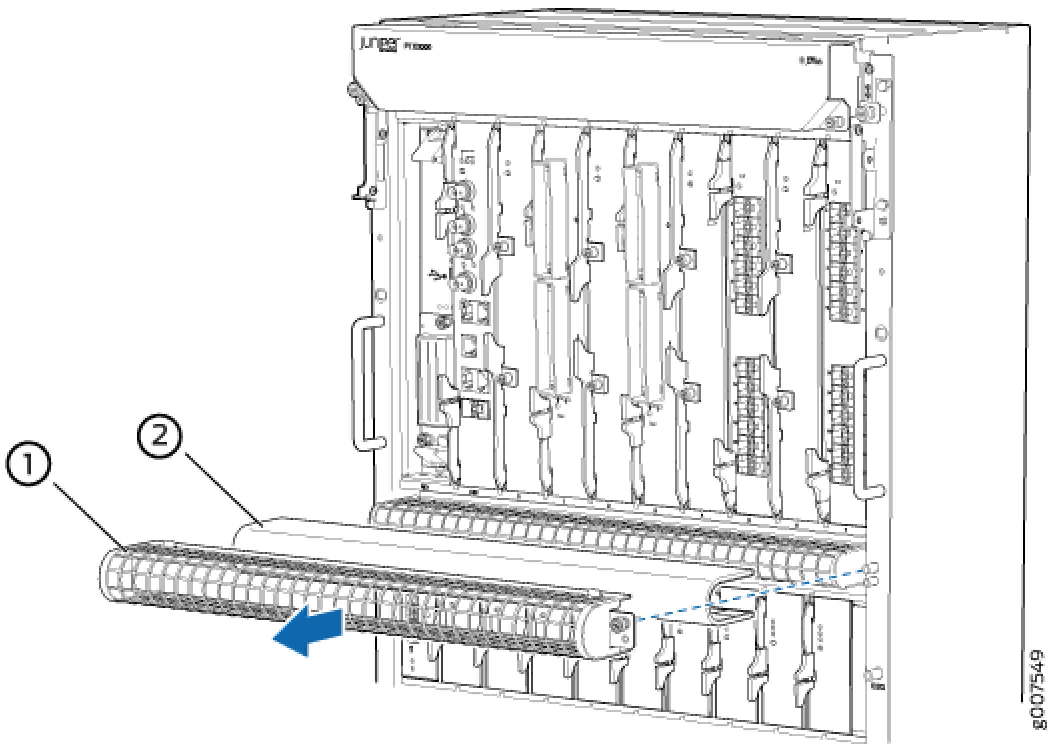
The air filter is located below the upper FPC and PIC card cage. The air filter weighs 1.0 lb (0.5 kg).

To remove the air filter:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Pull to remove the air filter cover and air filter (see Figure 1).
3. Remove air filter from the air filter cover.

4. Discard the air filter.

Figure 99: Removing a PTX3000 Chassis Air Filter



1– Air filter cover	2– Air filter

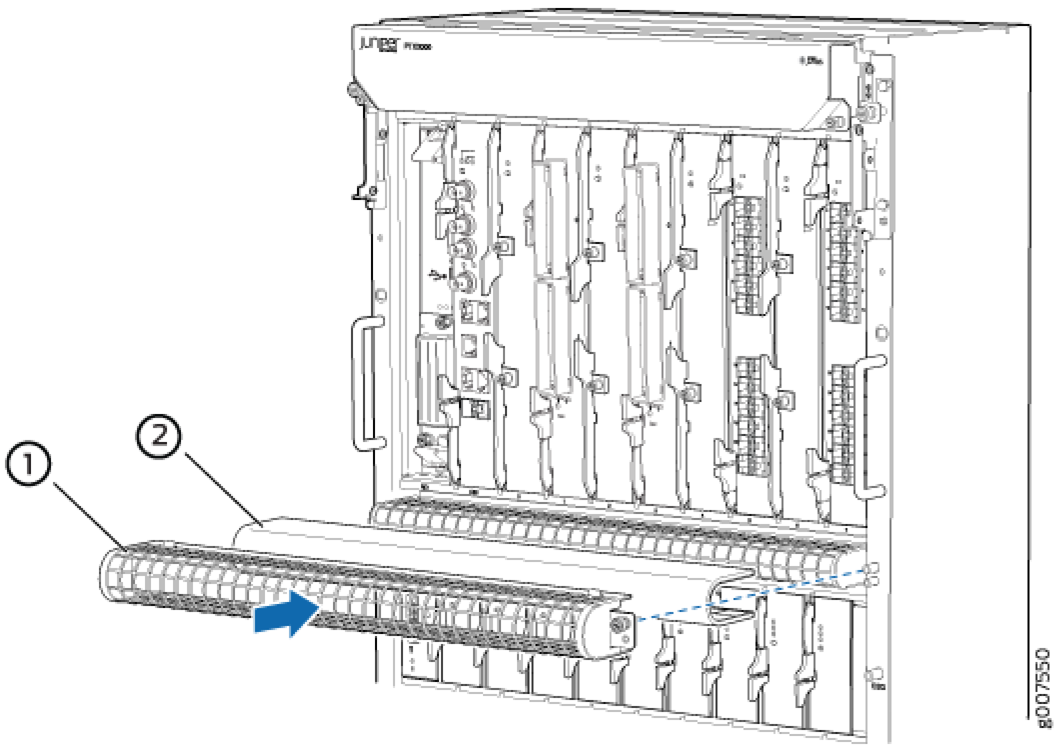
Installing a PTX3000 Chassis Air Filter

To install the air filter:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Place the air filter in the air filter cover (see Figure 100 on page 245).

3. Reinstall the horizontal air filter cover on to the chassis.

Figure 100: Installing a PTX3000 Chassis Air Filter



1– Air filter cover	2– Air filter

Replacing a PTX3000 FPC Air Filter

IN THIS SECTION

Removing a PTX3000 FPC Air Filter

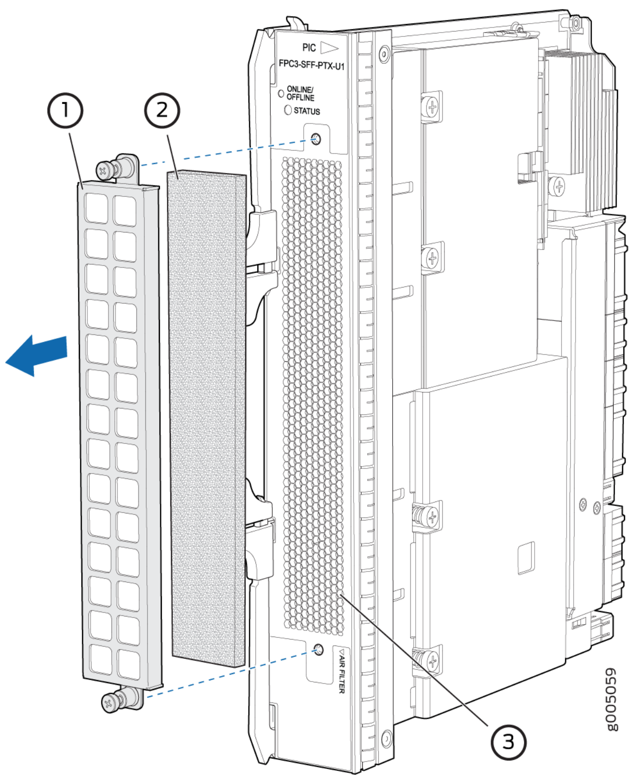
First-generation FPCs do not have vents that require air filters.

Third-generation FPCs (FPC3-SFF-PTX) have air vents on the FPC faceplate, and have a field-replaceable air filter cover over the air vents.

To remove the FPC air filter (see Figure 3):

1. To prevent damage to the equipment caused by static discharge, attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Loosen the thumbscrews that secure the air filter cover to the FPC faceplate.
3. Pull to remove the air filter cover and air filter.
4. Remove the air filter from the air filter cover.
5. Discard the air filter.

Figure 101: Removing an FPC Air Filter



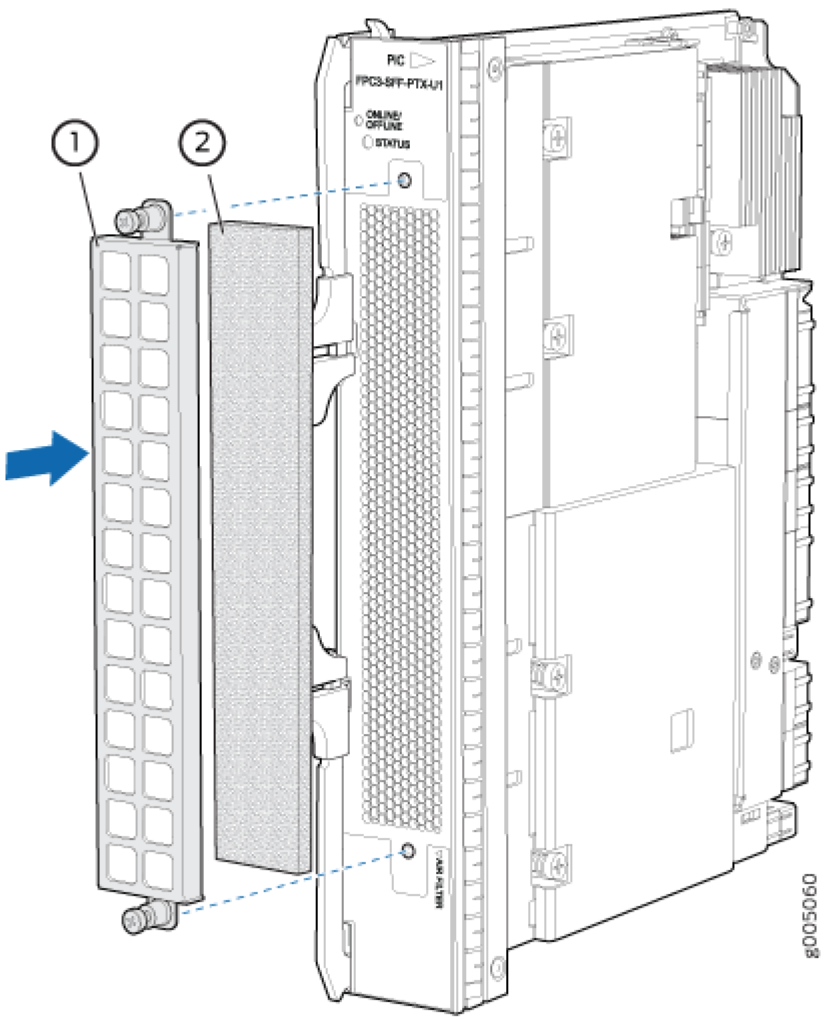
1– Air filter cover	3– Vents
2– Air filter	

Installing a PTX3000 FPC Air Filter

To install the FPC air filter (see Figure 102 on page 247):

1. To prevent damage to the equipment caused by static discharge, attach an ESD grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Place the air filter in the air filter cover.
3. Reinstall the air filter cover on to the FPC faceplate.
4. Tighten the thumbscrews that secure the air filter cover to the FPC faceplate.

Figure 102: Installing an FPC Air Filter



1– Air filter cover	2– Air filter

Replacing a PTX Series PIC Air Filter

IN THIS SECTION

Removing a PTX Series PIC Air Filter

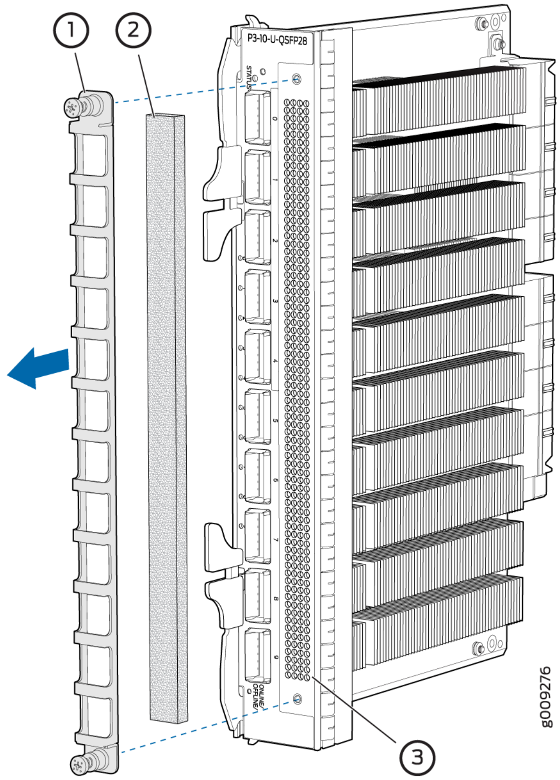
The 10-port 10-Gigabit Ethernet/40-Gigabit Ethernet/100-Gigabit Ethernet PIC with QSFP28 (P3-10-U-QSFP28) has air vents on the PIC faceplate, and has a field-replaceable air filter cover over the air vents.

To remove the PIC air filter (see Figure 5):

1.
2. Loosen the thumbscrews that secure the air filter cover to the PIC faceplate.
3. Pull to remove the air filter cover and air filter.
4. Remove the air filter from the air filter cover.

5. Discard the air filter.

Figure 103: Removing a PIC Air Filter



1– Air filter cover	3– Air vent
2– Air filter	

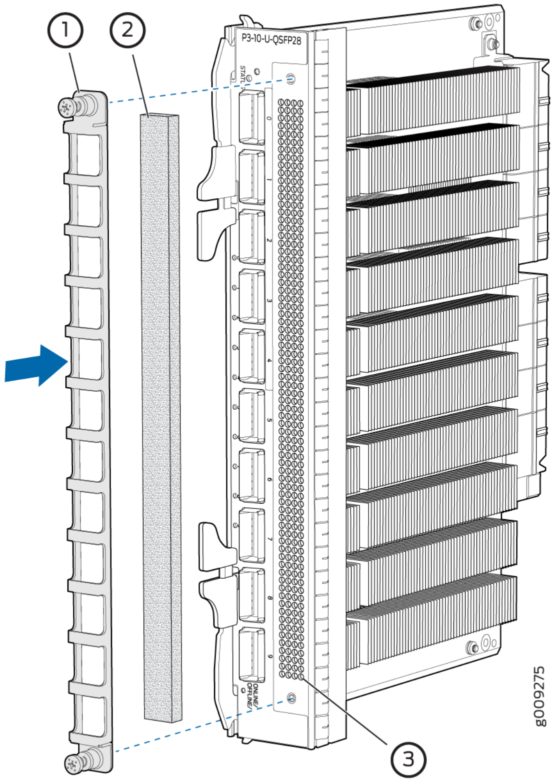
Installing a PTX Series PIC Air Filter

To install the PIC air filter (see Figure 104 on page 250):

1.
2. Place the air filter in the air filter cover.
3. Reinstall the air filter cover on to the PIC faceplate.

4. Tighten the thumbscrews that secure the air filter cover to the PIC faceplate.

Figure 104: Installing a PIC Air Filter



1– Air filter cover	3– Air vent
2– Air filter	

Replacing a PTX3000 Upper Fan Tray

IN THIS SECTION

Removing a PTX3000 Upper Fan Tray

The upper fan tray is located above the upper card cage. The fan tray weighs 7.5 lb (3.4 kg).

> **CAUTION**: Do not remove both fan trays at the same time or remove one of the fan trays for longer than four minutes. Removing both front fan trays or removing one of the fan trays for an extended period of time might cause the PTX3000 to shut down.

To remove an upper fan tray (see Figure 8):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Using a Phillips (+) screwdriver, number 1, loosen the outer captive screws on each side of the upper cable management system (Figure 7). Move the upper cable management system outward and down so that you can access the upper fan tray.

3. Slide the release latch located on the right side of the fan tray to the left. Grasp the handle on the left side of the fan tray, and pull the fan tray completely out of the chassis.

Figure 105: Lowering the Upper Cable Management System

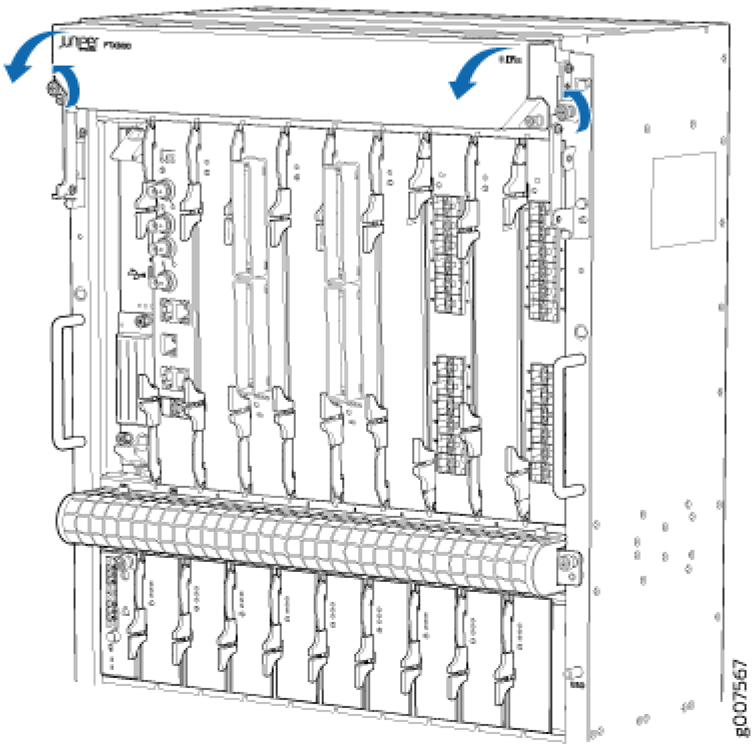
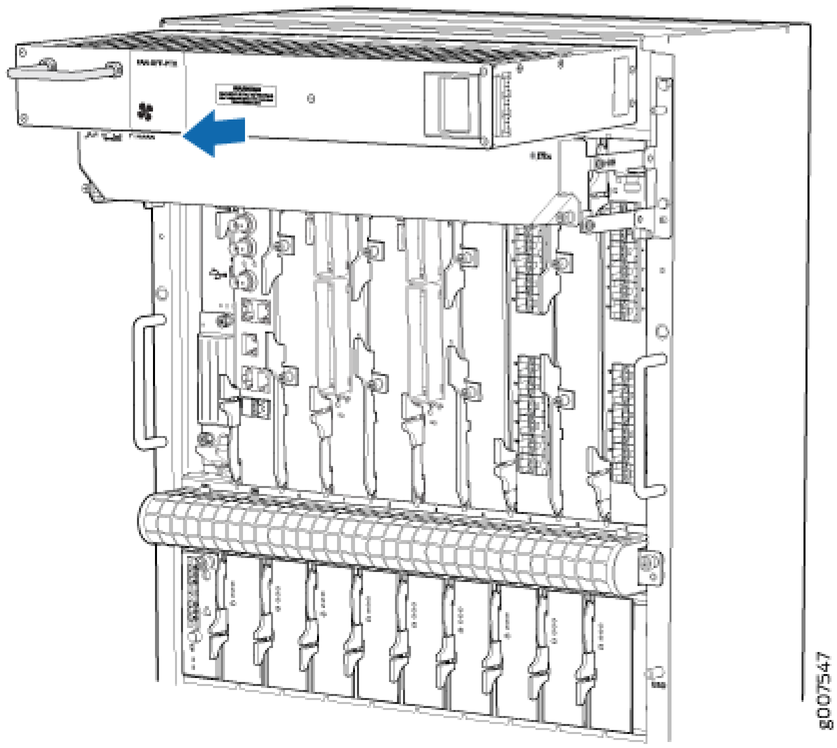


Figure 106: Removing an Upper Fan Tray



Installing a PTX3000 Upper Fan Tray

To install an upper fan tray (see Figure 107 on page 254):

> **CAUTION**: Wait at least ten seconds before replacing a fan tray after you remove it. If you replace a fan tray too quickly, the PTX3000 might not recognize the fan tray and a major alarm can occur. If a major alarm is raised while you are replacing a fan tray, then wait approximately ten seconds after you remove the fan tray, and then try to install a new fan tray or the one you had removed.

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Grasp the fan tray by its handle and insert it straight into the chassis (Figure 107 on page 254).

3. Lift the upper cable management system back into place in front of the upper fan tray (Figure 108 on page 255). Using a Phillips (+) screwdriver, number 1, tighten the outer captive screw on each side of the cable management system to secure it to the chassis.

Figure 107: Installing an Upper Fan Tray

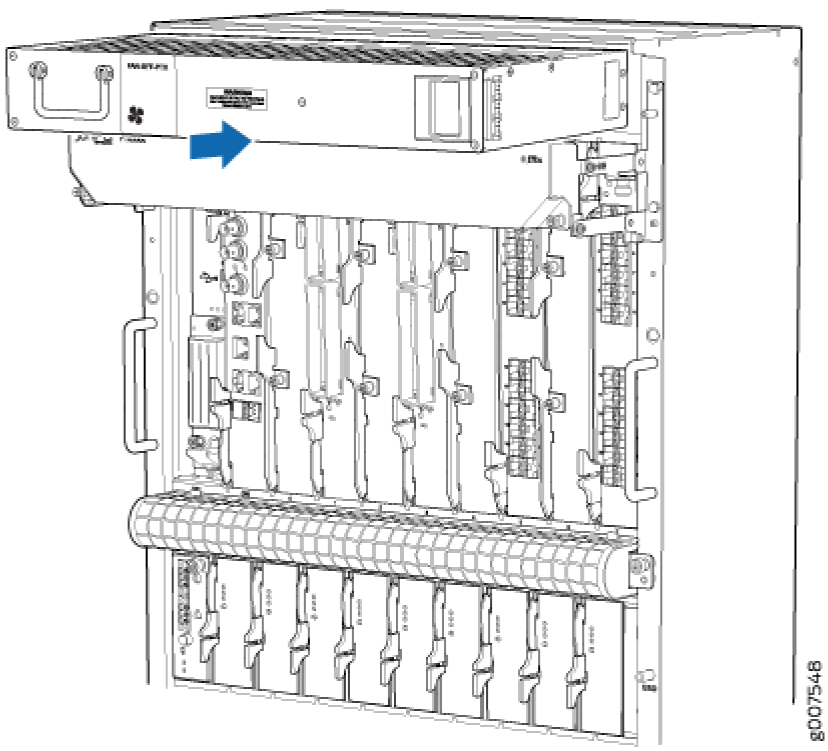
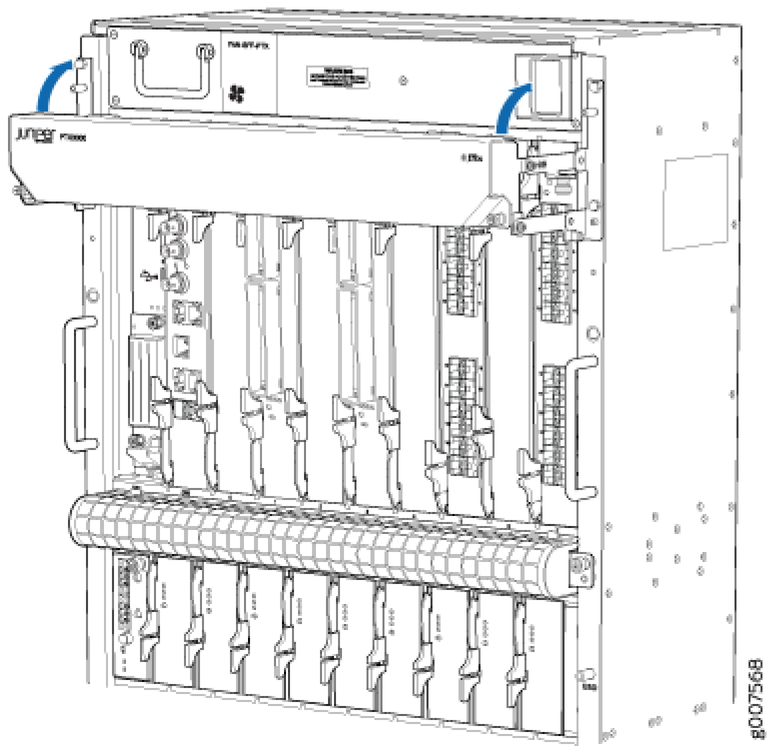


Figure 108: Lifting the Upper Cable Management System



Replacing a PTX3000 Lower Fan Tray

IN THIS SECTION

Removing a PTX3000 Lower Fan Tray

The lower fan tray is located below the lower card cage. The fan tray weighs 7.5 lb (3.4 kg).

CAUTION: Do not remove both fan trays at the same time or remove one of the fan trays for longer than four minutes. Removing both front fan trays or removing one of the fan trays for an extended period of time might cause the PTX3000 to shut down.

To remove the lower fan tray:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Using a Phillips (+) screwdriver, number 1, loosen the outer captive screws on each side of the lower cable management system (Figure 11), and move the lower cable management system up so that you can access the lower fan tray.

3. Slide the release latch located on the right side of the fan tray to the left. Grasp the handle on the left side of the fan tray, and pull the fan tray completely out of the chassis (Figure 12).

Figure 109: Raising the Lower Cable Management System

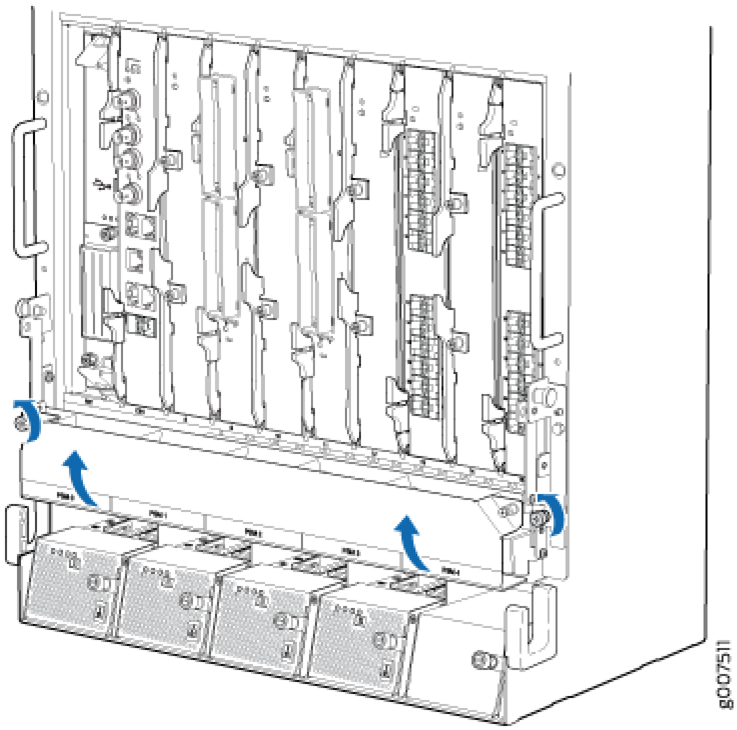
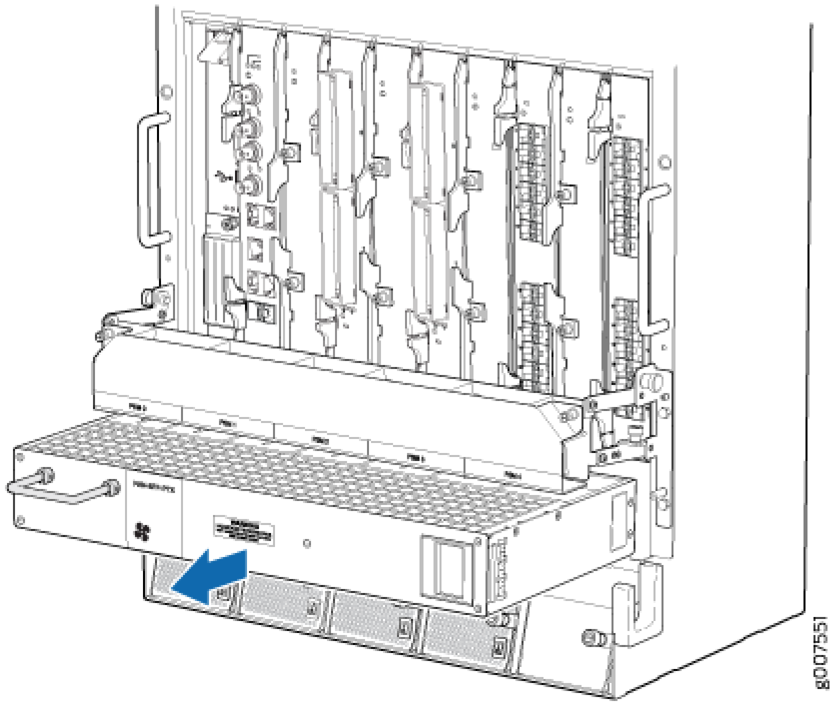


Figure 110: Removing a Lower Fan Tray



Installing a PTX3000 Lower Fan Tray

To install a lower fan tray (see Figure 111 on page 259):

> **CAUTION**: Wait at least ten seconds before replacing a fan tray after you remove it. If you replace a fan tray too quickly, the PTX3000 might not recognize the fan tray and a major alarm can occur. If a major alarm is raised while you are replacing a fan tray, then wait approximately ten seconds after you remove the fan tray, and then try to install a new fan tray or the one you had removed.

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Grasp the fan tray by its handle and insert it straight into the chassis.

3. Lower the cable management system back into place in front of the lower fan tray. See Figure 112 on page 260. Using a Phillips (+) screwdriver, number 1, tighten the outer captive screw on each side of the lower cable management system to secure it to the chassis.

Figure 111: Installing a Lower Fan Tray

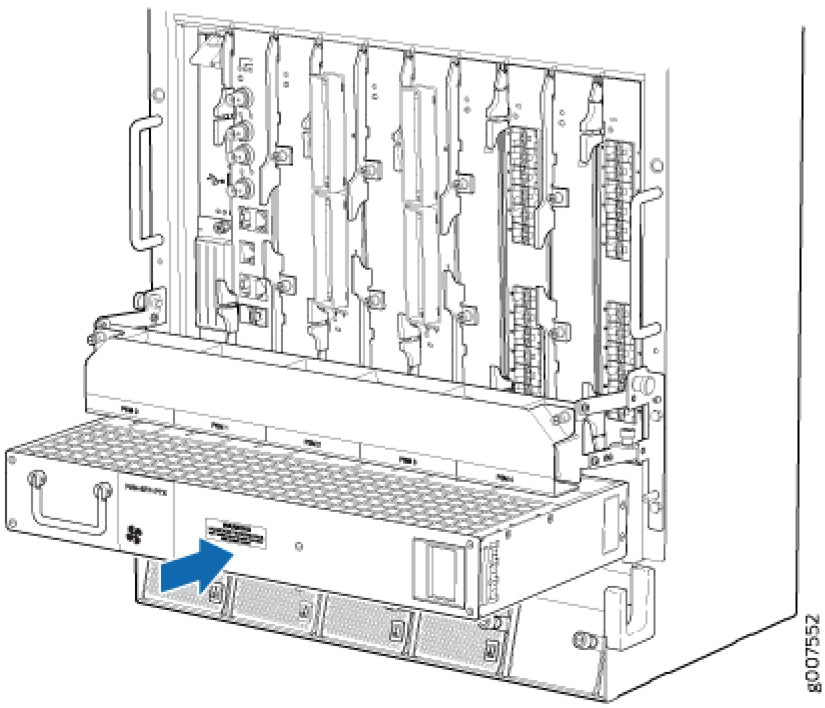
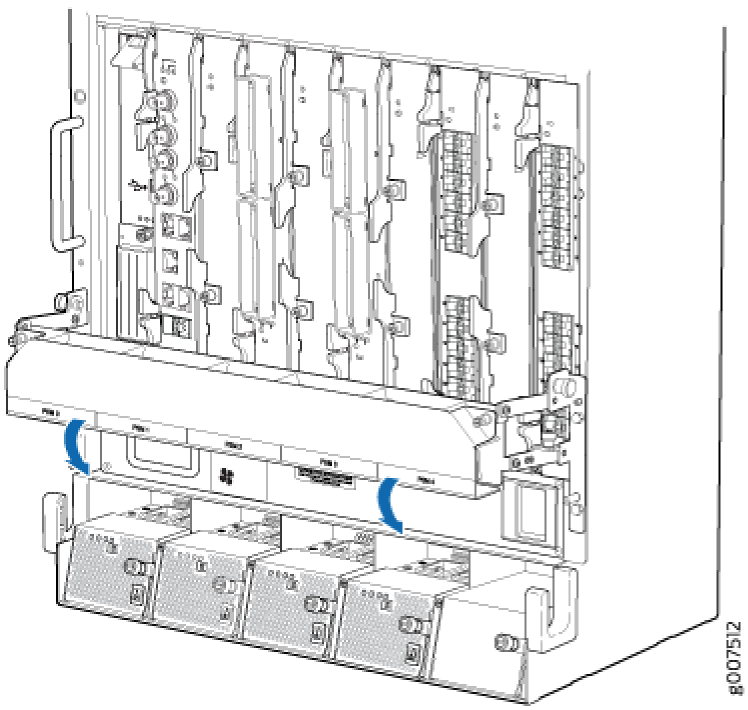


Figure 112: Lowering the Lower Cable Management System



RELATED DOCUMENTATION

PTX3000 Cooling System Description | 29

PTX3000 Craft Interface LEDs | 26

Troubleshooting the PTX3000 Cooling System | 365

Prevention of Electrostatic Discharge Damage

Maintaining the PTX3000 Power System

IN THIS SECTION

Maintaining the PTX3000 Power System

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the power supplies and grounding.

Action

On a regular basis:

- Inspect the site to ensure that the grounding and power cables connected to the PTX3000 are securely in place and that no moisture is accumulating near the chassis. To review grounding and site wiring requirements for the PTX3000, see "PTX3000 Chassis Grounding Cable and Lug Specifications" on page 133.
- Check the status of the power supplies by issuing the `show chassis environment psm` command.
- Make sure that the DC power cables or AC power cords are arranged so that they do not obstruct access to other PTX3000 components.
- Check the status LEDs on the PSM faceplates to verify that the power supplies are functioning normally. During normal operation:
  - The green **OK** LEDs are lit to indicate that the PSMs are functioning normally.
  - The green input **1** and input **2** LEDs on a PSM are lit when the input is receiving source DC power.

- Check the red and yellow alarm LEDs on the craft interface. PSM failure or removal triggers an alarm that causes one or both of the LEDs to be lit. You can display the associated error messages by issuing the following CLI command:

```
user@host> show chassis alarms
```

  For a list of possible alarm messages, see "Troubleshooting the PTX3000 Power Supply Modules" on page 386.

- The power supplies require an unobstructed airflow at both the front and rear of the chassis. Periodically check the site to ensure that both the air intake at the bottom front of the chassis and the exhaust from the power supply faceplates are unobstructed.

Replacing a PTX3000 AC PSM

IN THIS SECTION

Removing a PTX3000 AC PSM

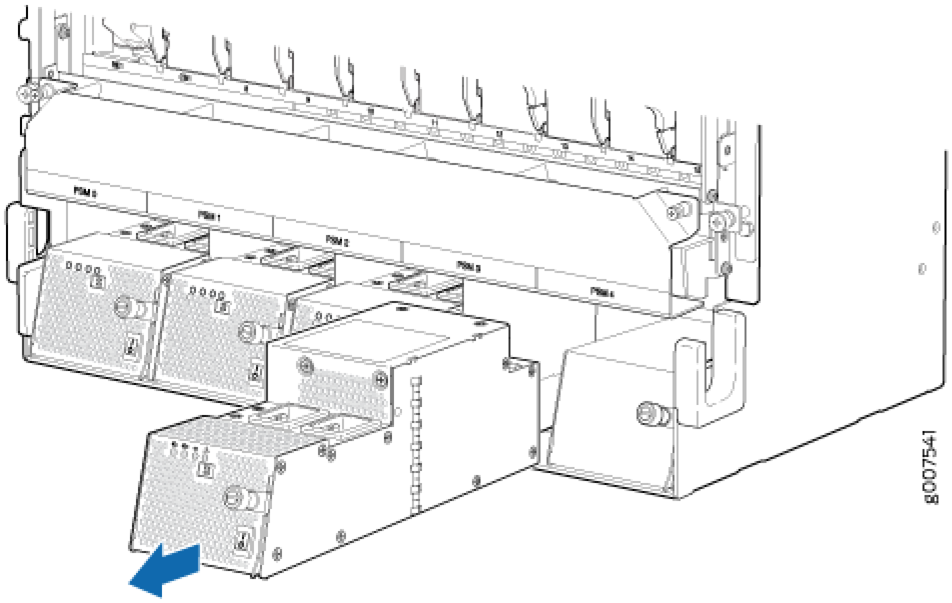
To remove an AC PSM:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Loosen the captive screw on the PSM, using a number 1 Phillips (+) screwdriver if necessary.
3. Grasp the handle and pull to eject the PSM. Slide it halfway out of the chassis (see Figure 1).

> **CAUTION**: Each AC PSM weighs 4.5 lb (2.0 kg). Be prepared to support the full weight of the PSM as you remove it from the PTX3000.

4. Place one hand underneath the PSM to support it and slide it completely out of the chassis.

Figure 113: Removing an AC PSM



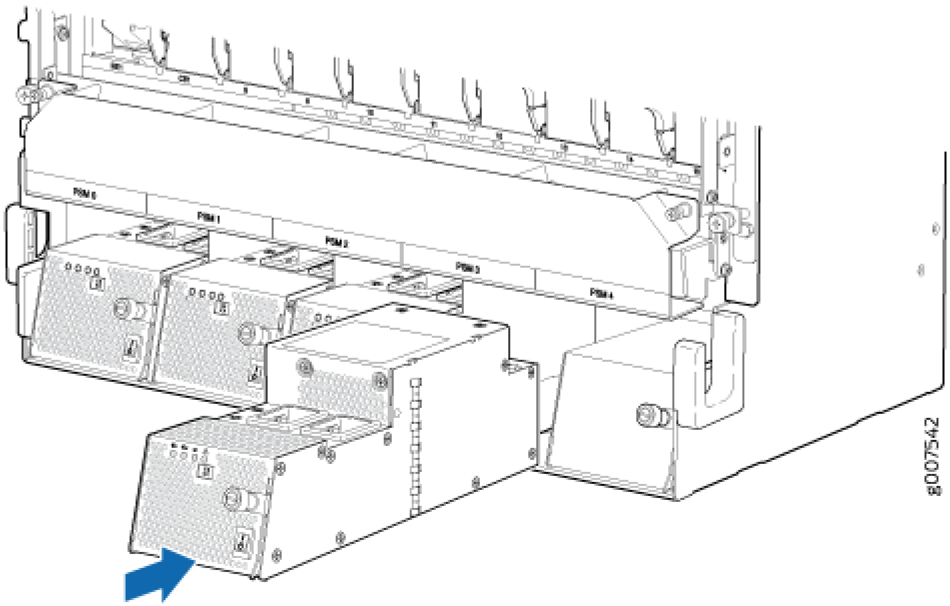
Installing a PTX3000 AC PSM

Each AC PSM weighs 4.5 lb (2.0 kg). To install an AC PSM (Figure 114 on page 264):

1. Using both hands, slide the PSM into the chassis until you feel resistance .
2. Tighten the captive screw on the PSM.
3. Verify that the input **1** and input **2** LEDs on the PSM faceplate are lit steadily, indicating that the PSM is receiving power.

4. Verify that the **OK** LED on the PSM faceplate is lit steadily.

Figure 114: Installing an AC PSM



Replacing a PTX3000 DC PSM

IN THIS SECTION

Removing a PTX3000 DC PSM

To remove a DC PSM:

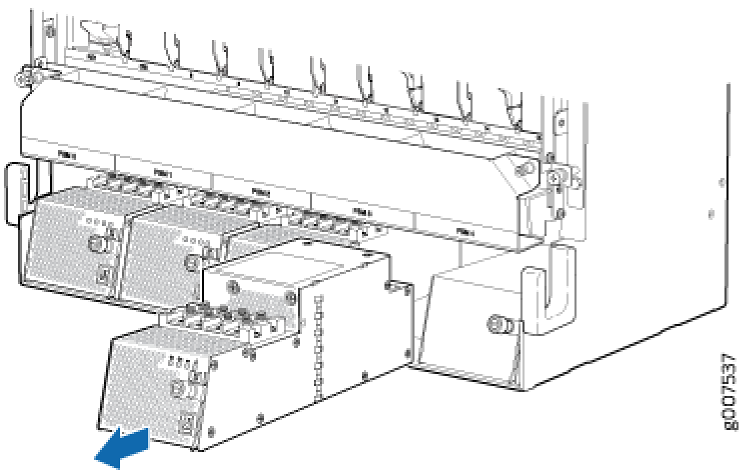
1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Loosen the captive screw on the PSM, using a number 1 Phillips (+) screwdriver if necessary.

3. Grasp the handle and pull to eject the PSM. Slide it halfway out of the chassis (see Figure 3).

> **CAUTION**: Each DC PSM weighs 4.6 lb (2.1 kg). Be prepared to support the full weight of the PSM as you remove it from the PTX3000.

4. Place one hand underneath the PSM to support it and slide it completely out of the chassis.

Figure 115: Removing a DC PSM



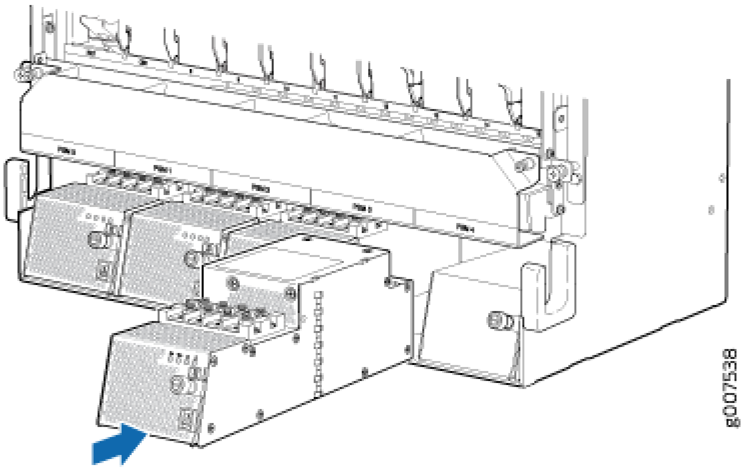
Installing a PTX3000 DC PSM

Each DC PSM weighs 4.6 lb (2.1 kg). To install a PSM (Figure 116 on page 266):

1. Using both hands, slide the PSM into the chassis until you feel resistance.
2. Tighten the captive screw on the PSM.
3. Verify that the input **1** and input **2** LEDs on the PSM faceplate are lit steadily, indicating that the PSM is receiving power.

4. Verify that the **OK** LED on the PSM faceplate is lit steadily.

Figure 116: Installing a DC PSM



Replacing a PTX3000 DC Power Cable

IN THIS SECTION

Removing a PTX3000 DC Power Cable

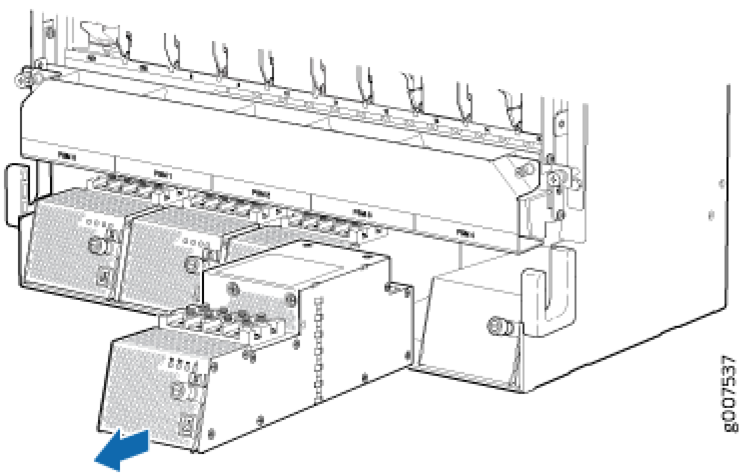
Each DC power supply module (PSM) is hot-insertable and hot-removable, and weighs 4.6 lb (2.1 kg).

To remove a DC power cable:

1. Switch off the customer-site circuit breakers to the input power tray that contains the DC power cable being removed.
2. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active during the removal process. On the PSM faceplate, verify that the input **1** and input **2** LEDs are off on the PSM.

3. On the PSM faceplate, switch the power switch for the PSM to the standby position
   (
   ⏻
).
4. Loosen the captive screw that secure the PSM to the chassis, using a number 1 Phillips (+) screwdriver if necessary.
5. Remove the PSM from the chassis. See Figure 5.

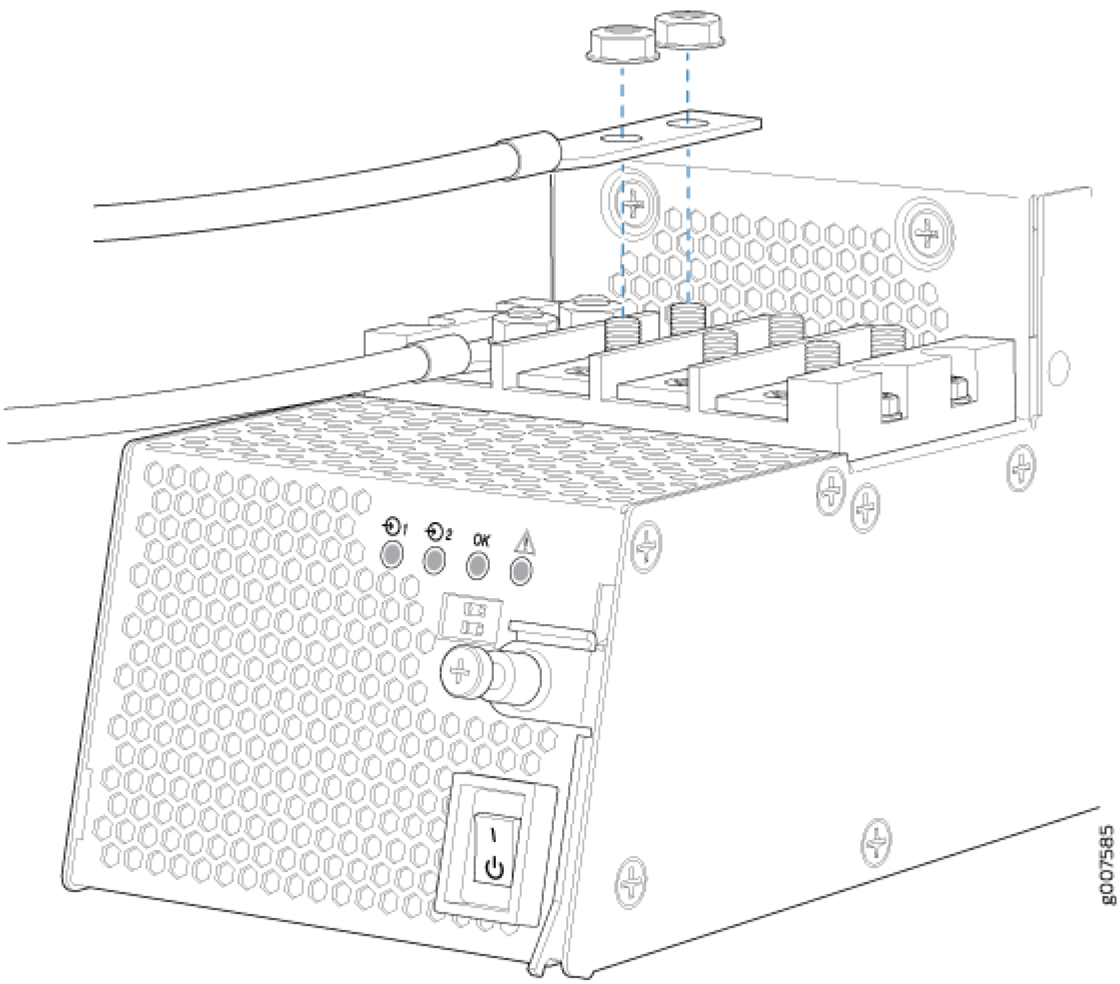
Figure 117: Removing the PSM



6. Use a number 1 Phillips (+) screwdriver to loosen the screws on the input terminal cover.
7. Remove the input terminal cover.
8. Use a 10-mm nut driver to loosen the nuts, and remove the nuts from the DC power terminal stud.

9. Remove the DC source power cable lug from the DC power terminal stud. See Figure 6.

Figure 118: Disconnecting a DC Source Power Cable Lug



Installing a PTX3000 DC Power Cable

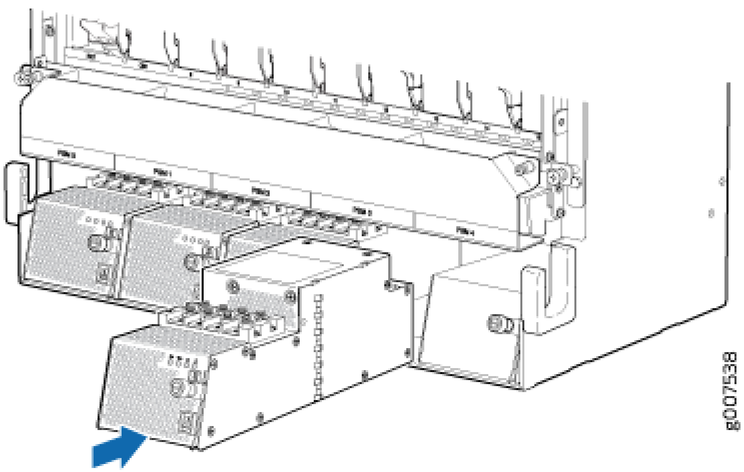
To install a DC power cable:

1. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active. Verify that the input **1** and input **2** LEDs on the PSM faceplate are off.
2. On the PSM faceplate, switch the power switch for the PSM to the standby position.
   (
   ⏻
).
3. Secure the DC source power cable lug to the terminal with a nut.

Use a 10-mm nut driver to tighten the nut.

4. Replace the input terminal cover over the DC power cables.
5. Verify that the source power cables are connected to the appropriate terminal: the positive (+) source cable to the return terminal (labeled **RTN**) and the negative (–) source cable to the input terminal (labeled **–48V**).
6. Insert the PSM into the chassis.

Figure 119: Installing a DC PSM



RELATED DOCUMENTATION

PTX3000 Power System Description | 36

PTX3000 Power Supply Module LEDs | 43

Troubleshooting the PTX3000 Power Supply Modules | 386

Maintaining the PTX3000 Host Subsystem

IN THIS SECTION

Maintaining the PTX3000 Routing Engines

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the Routing Engines.

Action

On a regular basis:

- Check the LEDs on the Routing Engine. During normal operation, the **ONLINE** LED on each Routing Engine is lit green, indicating that the Routing Engine is functional.
- Issue the `show chassis routing-engine` command to verify that the Routing Engines are operating properly.

Replacing a PTX3000 C2600 Routing Engine

IN THIS SECTION

Taking the PTX3000 Host Subsystem Offline

Before you replace a Control Board or a Routing Engine, you must take the host subsystem offline. The host subsystem is taken offline and brought online as a unit. Before you take a host subsystem offline, but be sure that you are aware of how this will affect the PTX3000.

To take a host subsystem offline:

1. Determine whether the host subsystem is functioning as the primary or as the backup, by issuing the `show chassis routing-engine` command. The primary Routing Engine is designated `Master` in the `Current state` field.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 36 degrees C / 96 degrees F
    CPU temperature             60 degrees C / 140 degrees F
    DRAM                      16365 MB (16365 MB installed)
    Memory utilization            6 percent
    CPU utilization:
      User                        1 percent
```

```
    Background                 0 percent
    Kernel                    17 percent
    Interrupt                  0 percent
    Idle                      81 percent
  Model                          RE-DUO-2600
  Serial ID                      P737A-002791
  Start time                     2013-05-06 18:54:48 PDT
  Uptime                         21 hours, 5 minutes, 36 seconds
  Last reboot reason             0x1:power cycle/failure
  Load averages:                 1 minute   5 minute  15 minute
                                     0.12       0.19       0.16
```

2. If the host subsystem is functioning as the primary, switch it to be the backup by using the following CLI command:

```
user@host> request chassis routing-engine master switch
warning: Traffic will be interrupted while the PFE is re-initialized
Toggle mastership between Routing Engines ? [yes,no] (no) yes

Resolving mastership...
Complete. The other Routing Engine becomes the master.
```

If the Routing Engines are running the same Junos OS Release and are configured for graceful switchover, the standby Routing Engine immediately assumes Routing Engine functions and there is no interruption to packet forwarding. Otherwise, packet forwarding halts while the standby Routing Engine becomes the primary and the Packet Forwarding Engine components reset and connect to the new primary Routing Engine. For information about configuring graceful switchover, see the High Availability User Guide.

NOTE: PTX3000 performance might change if the standby Routing Engine's configuration differs from the former primary's configuration. For the most predictable performance, configure the two Routing Engines identically, except for parameters unique to a Routing Engine, such as the hostname defined at the `[edit system]` hierarchy level and the management interface (`em0` or equivalent) defined at the `[edit interfaces]` hierarchy level.

To configure Routing Engine-specific parameters and still use the same configuration on both Routing Engines, include the appropriate configuration statements under the `re0` and `re1` statements at the `[edit groups]` hierarchy level and use the `apply-groups` statement. For instructions, see *Applying a Junos OS Configuration Group*.

3. To halt the PTX3000:

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

*** FINAL System shutdown message from user@host ***
System going down IMMEDIATELY
Terminated
...
syncing disks... 11 8 done
The operating system has halted.
Please press any key to reboot.
```

> **NOTE**: The `request system halt` command halts all Routing Engines on the control plane from which it was issued. To reboot a Routing Engine that has been halted, you must connect through the console.

The command shuts down the Routing Engine cleanly, so its state information is preserved. For more information about the command, see *request system halt*.

> **NOTE**: The SIBs might continue forwarding traffic for approximately 5 minutes after the `request system halt` command has been issued.

Removing a PTX3000 Routing Engine

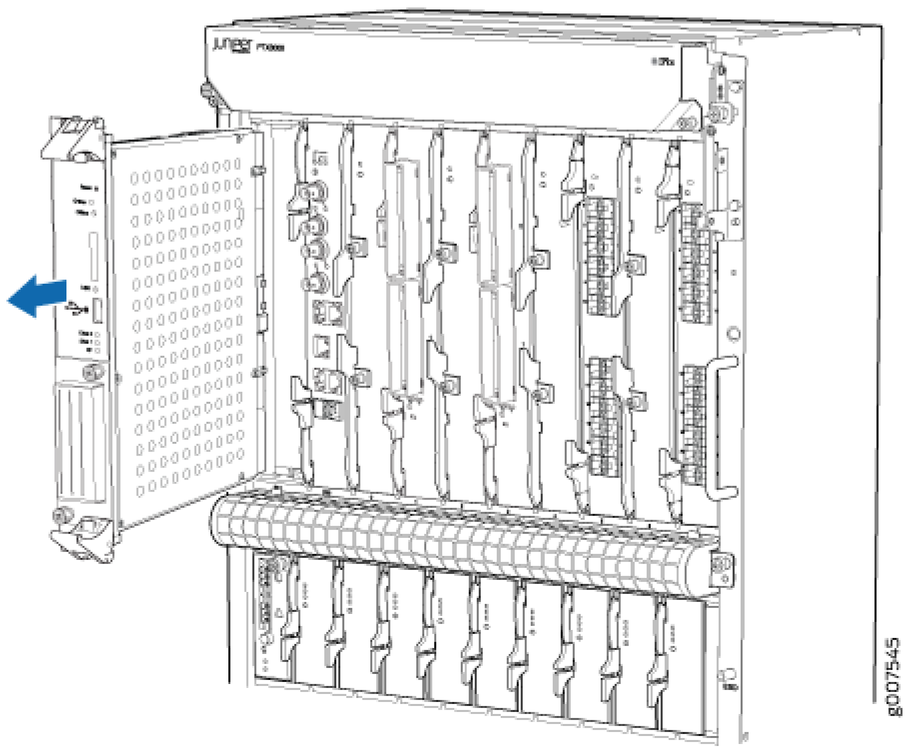
The PTX3000 can have one or two Routing Engines. They are located in a slot to the left of the Control Board. Each Routing Engine weighs 2.8 lb (1.3 kg).

To remove a Routing Engine (see Figure 120 on page 274):

1. If the Routing Engine to be replaced is currently functioning as the primary Routing engine, switch it to be the backup before removing it.
2. Take the host subsystem offline. If there is only one host subsystem, taking the host subsystem offline shuts down the PTX3000.
3. Place an electrostatic bag or antistatic mat on a flat, stable surface.
4. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
5. Take the host subsystem offline.

6. Press the red tabs on the ejector handles on both sides of the Routing Engine faceplate.
7. Flip the ejector handles outward to unseat the Routing Engine.
8. Grasp the Routing Engine by the ejector handles and slide it about halfway out of the chassis.
9. Place one of your hands underneath the Routing Engine to support it and slide it completely out of the chassis.
10. Place the Routing Engine on the antistatic mat.

Figure 120: Removing a Routing Engine



Installing a PTX3000 Routing Engine

To install a Routing Engine (see Figure 121 on page 275):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Ensure that the ejector handles are not in the locked position. If necessary, press the red tabs and flip the ejector handles outward.
3. Place one hand underneath the Routing Engine to support it. With the other hand, grasp one of the ejector handles on the faceplate.
4. Carefully align the sides of the Routing Engine with the guides inside the opening on the Control Board.

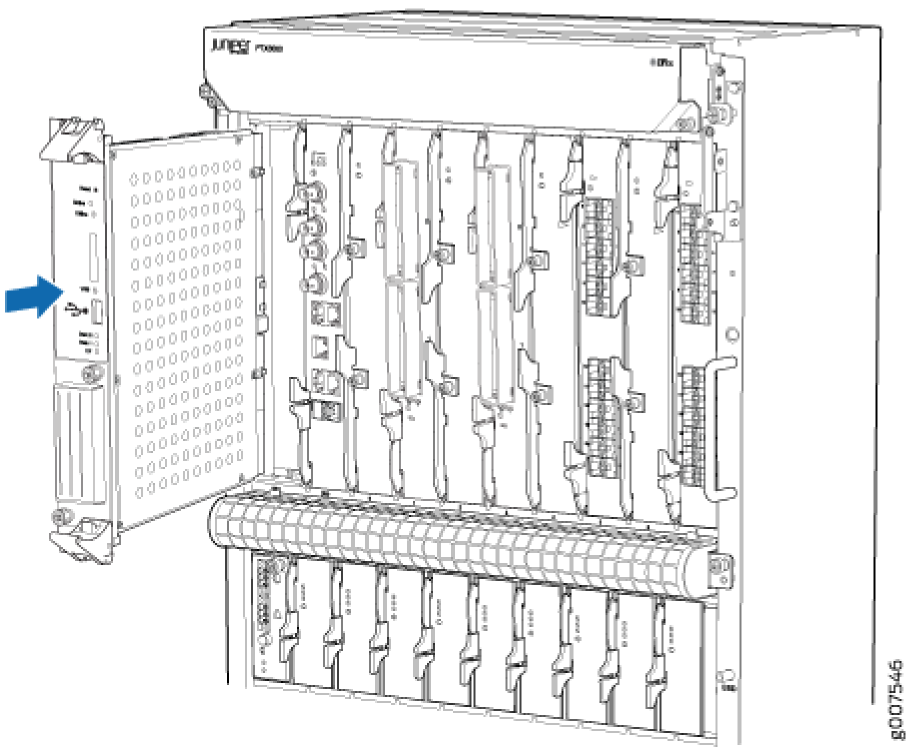
5. Slide the Routing Engine into the chassis until you feel resistance.
6. Press the Routing Engine's faceplate until it engages the connectors.
7. Press both the ejector handles inward to seat the Routing Engine.

   The Routing Engine might require several minutes to boot. If the PTX3000 is powered on and the Routing Engine's corresponding Control Board is functioning normally, the Routing Engine comes online automatically.
8. Verify that the Routing Engine is installed correctly and functioning properly:

   - Verify that the green **Online** LED is lit steadily.
   - Verify the status of the Routing Engine by using the **show chassis routing-engine** command.

   For more information about the commands, see the Junos OS manuals.

Figure 121: Installing a Routing Engine



Replacing a CompactFlash Card in a PTX3000 Routing Engine

IN THIS SECTION

Removing a CompactFlash Card from a PTX3000 Routing Engine

The CompactFlash card is located in the slot labeled **CompactFlash** on the Routing Engine faceplate. To remove the CompactFlash card (see Figure 3):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Determine whether the host subsystem is functioning as the primary or as the backup, using one of these methods:
   - Check the **MASTER** LED on the Control Board. If the blue **MASTER** LED is lit, the host subsystem is functioning as the primary.
   - Issue the following CLI command. The primary Routing Engine is designated `Current state` in the `Current state` field:

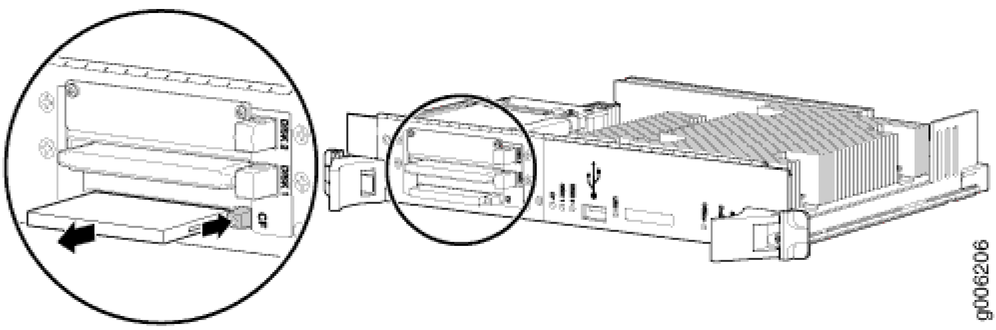
   ```
   user@host> show chassis routing-engine
   Routing Engine status:
     Slot 0:
       Current state                  Master
   ...
   ```
3. If the host subsystem is functioning as the primary, switch it to be the backup using the `request chassis routing-engine master switch` command.
4. From the primary Routing Engine, issue the `request system power-off other-routing-engine` to power down the backup Routing Engine.
5. Verify that the **Online**, **Disk 1**, and **CF** LEDs on the backup Routing Engine faceplate are off.
6. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

7. Remove the cover from the Routing Engine slots by loosening the captive screws on the corners of the cover, using a number 1Phillips (+) screwdriver if necessary.

> **CAUTION**: Do not remove the cover if any of the LEDs are lit.

8. Press the eject button on the right side of the CompactFlash card slot to release the CompactFlash card.
9. The CompactFlash card pops partially out of the slot. Grasp the card and pull it completely out of the slot.
10. Place the CompactFlash card on the antistatic mat.

Figure 122: Removing a Routing Engine CompactFlash Card



Installing a CompactFlash Card in a PTX3000 Routing Engine

To install a CompactFlash card (see Figure 123 on page 278):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Remove the cover from the Routing Engine slots by loosening the captive screws on the corners of the cover, using a number 1 Phillips (+) screwdriver if necessary.
3. Insert the CompactFlash card into the CompactFlash card slot on the Routing Engine, with the logo facing up.

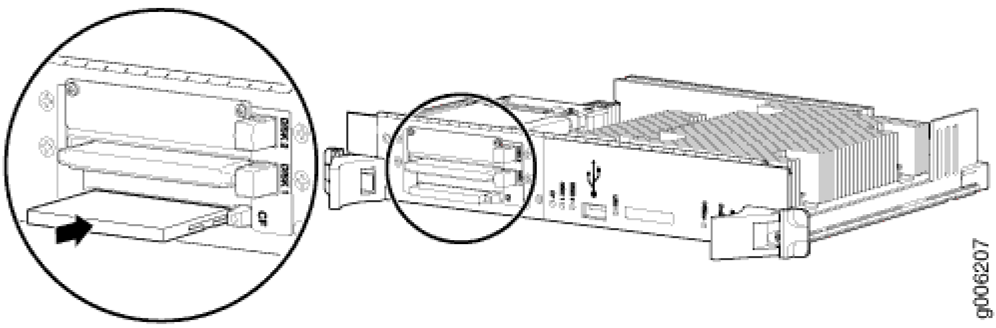
> **CAUTION**: Be sure to insert the CompactFlash card with the label facing up. Inserting the CompactFlash card incorrectly might damage the Routing Engine.

4. Press the card firmly all the way into the slot.
5. Reinstall the Routing Engine cover, and tighten the screws on the corners of the cover to secure it to the Routing Engine.

6. From the primary Routing Engine, issue the `request system power-on other-routing-engine` command to power on the Routing Engine.

> **NOTE**: You might get an error message and be prompted for a keystroke. After you press the keystroke, it might take up to 10 minutes for the Routing Engine to reset and for the router to boot from the solid-state drive.

Figure 123: Installing a Routing Engine CompactFlash Card



Copying Junos OS to the CompactFlash Card in a PTX3000 Routing Engine

After installing the CompactFlash card for the first time, you must copy the software from the Routing Engine's solid-state drive (SSD) to the CompactFlash card.

To copy software to the CompactFlash card:

1. On the console or other management device connected to the Routing Engine, enter CLI operational mode, and copy the currently running and active file system partitions on the router to standby partitions on the CompactFlash card. Issue the `request system snapshot partition` command.
2. Wait until a message appears on the console confirming that the snapshot partition procedure is complete.
3. Issue the `request system reboot` command to reboot the router's software.

4. Issue the `show system boot-messages` command to verify that the CompactFlash card is listed as the primary boot device. The output lists the devices mounted. The CompactFlash card is located at `ad0`.

Replacing a Solid-State Drive in a PTX3000 Routing Engine

IN THIS SECTION

Removing a Solid-State Drive from a PTX3000 Routing Engine

The solid-state drive (SSD) is located in the slot labeled **Disk 1** on the Routing Engine faceplate.

> **NOTE**: The **Disk 2** slot is not currently supported.

To remove an SSD from a Routing Engine (see Figure 5):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Determine whether the host subsystem is functioning as the primary or as the backup, using one of these methods:
   - Check the **MASTER** LED on the Control Board. If the blue **MASTER** LED is lit, the host subsystem is functioning as the primary.
   - Issue the following CLI command. The primary Routing Engine is designated `Master` in the `Current state` field:

     ```
     user@host> show chassis routing-engine
     Routing Engine status:
       Slot 0:
         Current state                  Master
     ...
     ```

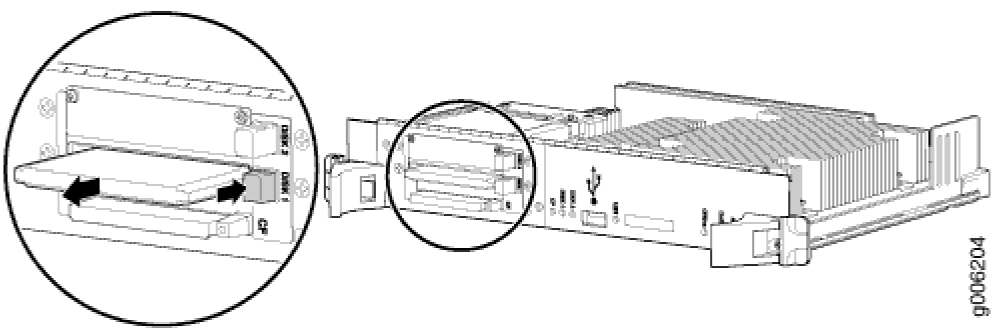
3. If the host subsystem is functioning as the primary, switch it to be the backup by using the `request chassis routing-engine master switch` command.
4. From the primary Routing Engine, issue the `request system power-off other-routing-engine` command to power off the backup Routing Engine.

5. Verify that the **Online**, **Disk 1**, and **CF** LEDs on the backup Routing Engine faceplate are off.
6. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
7. Remove the cover from the Routing Engine slots by loosening the captive screws on the corners of the cover, using a number 1 Phillips (+) screwdriver if necessary.

> **CAUTION**: Do not remove the cover if any of the LEDs on the Routing Engine faceplate are lit.

8. Press the eject button on the right side of the **Disk 1** slot to release the SSD.
9. The SSD pops partially out of the slot. Grasp the SSD and carefully slide it completely out of the slot.
10. Place the SSD on the antistatic mat.

Figure 124: Removing a Routing Engine SSD



Installing a Solid-State Drive in a PTX3000 Routing Engine

To install an SSD in a Routing Engine (see Figure 125 on page 281):

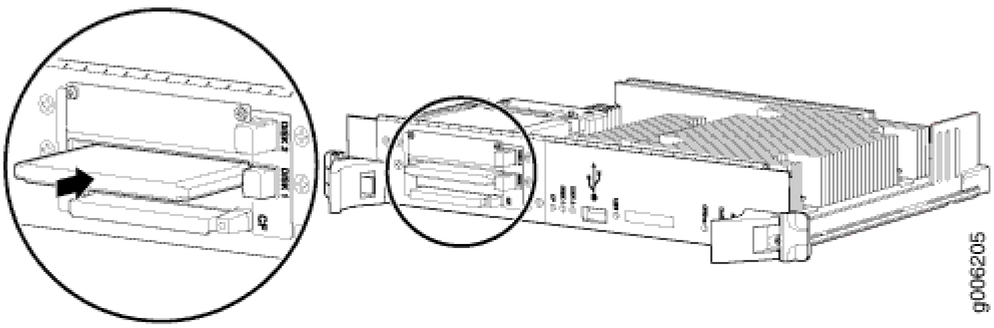
1. Insert the SSD into the **Disk 1** slot on the Routing Engine, with the label facing down.

   > **CAUTION**: Be sure to insert the SSD with the label facing down. Inserting the SSD incorrectly might damage the Routing Engine.

   Slide the SSD into the slot until you feel resistance, carefully ensuring that it is correctly aligned.
2. Reinstall the Routing Engine cover and tighten the screws on the corners of the cover to secure it to the Routing Engine.

3. From the primary Routing Engine, issue the `request system power-on other-routing-engine` command to power on the Routing Engine.

Figure 125: Installing a Routing Engine SSD



Copying Junos OS to the Solid-State Drive in a PTX3000 Routing Engine

After installing a solid-state drive (SSD) for the first time, you must copy the software from the Routing Engine's CompactFlash card to the SSD.

To copy software to the SSD:

1. On the console or other management device connected to the Routing Engine, enter CLI operational mode.
2. Partition the SSD. Issue the `request system partition hard-disk` command.
3. Wait until a message appears on the console confirming that the partition procedure is complete.
4. Reboot the router's software. Issue the `request system reboot` command.
5. Back up the currently running and active file system partitions on the router to standby partitions that are not running. Issue the `request system snapshot` command.
6. Wait until a message appears on the console confirming that the snapshot procedure is complete.
7. Reboot the router's software again. Issue the `request system reboot` command.
8. Verify that the SSD is listed as the secondary boot device, by issuing the `show system boot-messages` command. The output lists the devices mounted. The SSD is identified in the output as `ad1`.

RELATED DOCUMENTATION

request system snapshot

request system partition hard-disk

request system power-off

request system reboot

request chassis routing-engine master

show chassis routing-engine

show system boot-messages

Maintaining the PTX3000 Control Boards

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the Control Boards.

Action

On a regular basis:

- Look at the LEDs on the Control Board faceplates to see information about the Control Boards.

  During normal operations:

  - The green **OK** LED on the Control Board faceplate is lit.
  - The yellow **FAIL** LED on the Control Board faceplate is not lit.

- Issue the `show chassis environment cb` command to verify that the Control Boards are operating properly.

  For more information about this command, see the Junos OS manuals.

Replacing a PTX3000 Control Board

IN THIS SECTION

The PTX3000 has two Control Boards. One Control Board is located to the right of each Routing Engine. Each Control Board weighs 3.1 lb (1.4 kg).

Taking the PTX3000 Host Subsystem Offline

Before you replace a Control Board or a Routing Engine, you must take the host subsystem offline. The host subsystem is taken offline and brought online as a unit. Be aware of how taking the host subsystem offline will affect the PTX3000.

If there is only one host subsystem, taking the host subsystem offline shuts down the PTX3000. If the Control Board to be replaced is associated with the Routing Engine currently functioning as the primary Routing Engine, switch to the backup before removing the Control Board.

CAUTION: Before you replace a Control Board, you must take the host subsystem offline.

To take a host subsystem offline:

1. Determine whether the host subsystem is functioning as the primary or as the backup by issuing the `show chassis routing-engine` command. The primary Routing Engine is designated `Master` in the `Current state` field.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 36 degrees C / 96 degrees F
    CPU temperature             60 degrees C / 140 degrees F
    DRAM                      16365 MB (16365 MB installed)
```

```
    Memory utilization            6 percent
    CPU utilization:
      User                        1 percent
      Background                  0 percent
      Kernel                     17 percent
      Interrupt                   0 percent
      Idle                       81 percent
    Model                           RE-DUO-2600
    Serial ID                       P737A-002791
    Start time                      2013-05-06 18:54:48 PDT
    Uptime                          21 hours, 5 minutes, 36 seconds
    Last reboot reason              0x1:power cycle/failure
    Load averages:                  1 minute   5 minute  15 minute
                                        0.12       0.19       0.16
```

2. If the host subsystem is functioning as the primary, switch it to backup by using the following CLI command:

```
user@host> request chassis routing-engine master switch
warning: Traffic will be interrupted while the PFE is re-initialized
Toggle mastership between Routing Engines ? [yes,no] (no) yes

Resolving mastership...
Complete. The other Routing Engine becomes the master.
```

If the Routing Engines are running the same Junos OS release and are configured for graceful switchover, the standby Routing Engine immediately assumes Routing Engine functions and there is no interruption to packet forwarding. Otherwise, packet forwarding halts while the standby Routing Engine becomes the primary and the Packet Forwarding Engine components reset and connect to the new primary Routing Engine. For information about configuring graceful switchover, see the High Availability User Guide.

NOTE: PTX3000 performance might change if the standby Routing Engine's configuration differs from the former primary's configuration. For the most predictable performance, configure the two Routing Engines identically, except for parameters unique to a Routing Engine, such as the hostname defined at the `[edit system]` hierarchy level and the management interface (`em0` or equivalent) defined at the `[edit interfaces]` hierarchy level.

To configure Routing Engine-specific parameters and still use the same configuration on both Routing Engines, include the appropriate configuration statements under the `re0` and `re1` statements at the `[edit groups]` hierarchy level and use the `apply-groups` statement. For instructions, see *Applying a Junos OS Configuration Group*.

3. To halt the PTX3000:

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

*** FINAL System shutdown message from user@host ***
System going down IMMEDIATELY
Terminated
...
syncing disks... 11 8 done
The operating system has halted.
Please press any key to reboot.
```

NOTE: The `request system halt` command halts all Routing Engines on the control plane from which it was issued. To reboot a Routing Engine that has been halted, you must connect through the console.

The command shuts down the Routing Engine cleanly, so its state information is preserved. For more information about the command, see *request system halt*.

NOTE: The SIBs might continue forwarding traffic for approximately 5 minutes after the `request system halt` command has been issued.

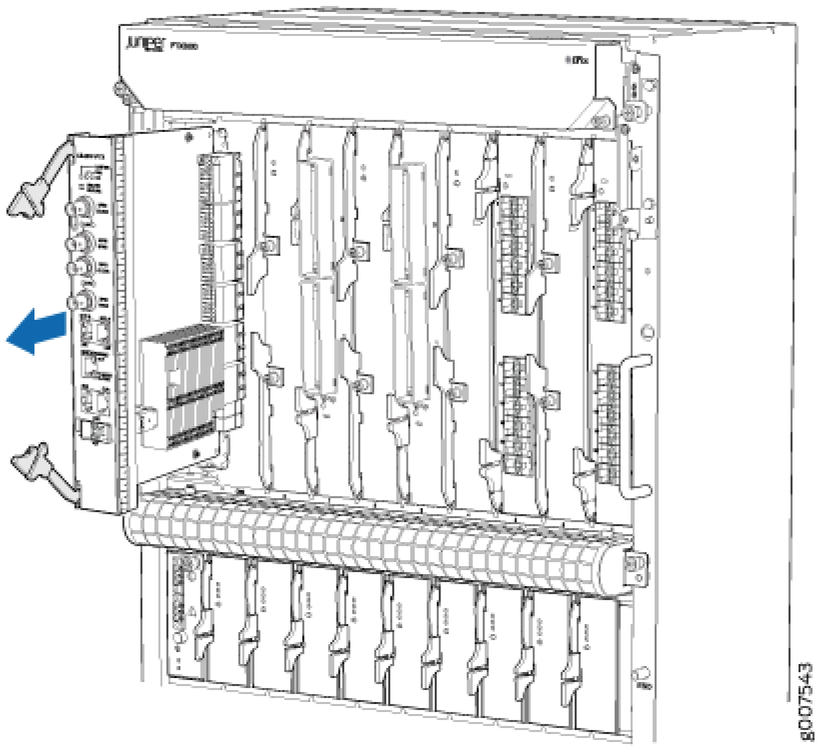
Removing a PTX3000 Control Board

To remove a Control Board (see Figure 126 on page 286):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. .
3. Label and disconnect the cables.
4. Release the latches on the ejector handles on the top and bottom of the Control Board.
5. Move the ejector handles outward to unseat the Control Board.
6. Place one hand underneath the Control Board to support it and slide it completely out of the chassis. Place it on the antistatic mat.

CAUTION: Do not stack hardware components on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 126: Removing a Control Board



Installing a PTX3000 Control Board

To install a Control Board (see Figure 127 on page 287):

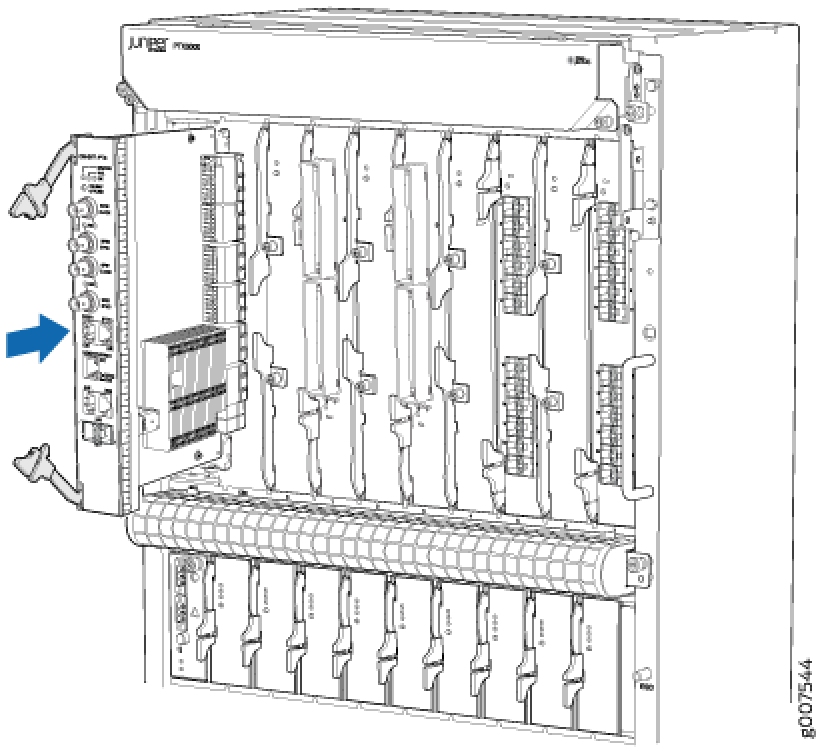
1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point.
2. Carefully align the bottom and then the top edges of the Control Board with the guides inside the chassis.
3. Slide the Control Board into the chassis, carefully ensuring that it is correctly aligned.
4. Reconnect the cables.
5. To verify that the Control Board is installed correctly and functioning normally:

   - Connect an Ethernet cable to the **HOST/ETHERNET** port on the Control Board. If the host subsystem is operational, the **ACT** port LED is lit to indicate Ethernet activity. If you can run the

CLI from a management device attached to the Control Board, the Control Board is installed correctly.

- Verify that the green **OK** LED on the Control Board faceplate is lit steadily green. The green **OK** LED should light be lit a few minutes after the Control Board is installed.
- Verify that the **FAIL** LED on the Control Board faceplate is not lit. If the **FAIL** LED is lit steadily, remove and install the Control Board again. If the **FAIL** LED still lights steadily, the Control Board is not functioning properly. Contact your customer support representative.
- To verify that the Control Board is `Online`, use the `show chassis environment cb` command.

Figure 127: Installing a Control Board



RELATED DOCUMENTATION

show chassis environment cb

Maintaining the PTX3000 RCB

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the RCB.

Action

On a regular basis:

- Check the LEDs on the RCB. During normal operation, the ONLINE LED on each RCB is lit green, indicating that the RCB is functional.
- Issue the `show chassis routing-engine` command to verify that the RCBs are operating properly.

Replacing the PTX3000 RCB

IN THIS SECTION

Taking the PTX3000 Host Subsystem Offline

Before you replace a Routing and Control Board (RCB), you must take the host subsystem offline. The host subsystem is taken offline and brought online as a unit. Be aware of how taking the host subsystem offline affects the PTX3000.

If there is only one host subsystem, taking the host subsystem offline shuts down the PTX3000.

To take a host subsystem offline:

1. Determine whether the host subsystem is functioning as the primary or as the backup by issuing the `show chassis routing-engine` command. The primary Routing Engine is designated `Master` in the `Current state` field.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 36 degrees C / 96 degrees F
    CPU temperature             60 degrees C / 140 degrees F
    DRAM                      16365 MB (16365 MB installed)
    Memory utilization           6 percent
    CPU utilization:
      User                       1 percent
      Background                 0 percent
      Kernel                    17 percent
      Interrupt                  0 percent
      Idle                      81 percent
    Model                          RE-DUO-2600
    Serial ID                      P737A-002791
    Start time                     2013-05-06 18:54:48 PDT
    Uptime                         21 hours, 5 minutes, 36 seconds
    Last reboot reason             0x1:power cycle/failure
    Load averages:                 1 minute   5 minute  15 minute
                                       0.12       0.19       0.16
```

2. If the host subsystem is functioning as the primary, switch it to be the backup by using the following CLI command:

```
user@host> request chassis routing-engine master switch
warning: Traffic will be interrupted while the PFE is re-initialized
Toggle mastership between Routing Engines ? [yes,no] (no) yes

Resolving mastership...
Complete. The other Routing Engine becomes the master.
```

If the Routing and Control Boards are running the same Junos OS release and are configured for graceful switchover, the standby RCB immediately assumes Routing Engine functions and there is no interruption to packet forwarding. Otherwise, packet forwarding halts while the standby RCB becomes the primary and the Packet Forwarding Engine components reset and connect to the new primary RCB. For information about configuring graceful switchover, see the High Availability User Guide.

> **NOTE**: PTX3000 performance might change if the standby RCB's configuration differs from the former primary's configuration. For the most predictable performance, configure the two Routing Engines identically, except for parameters unique to a Routing Engine, such as the hostname defined at the `[edit system]` hierarchy level and the management interface (`em0` or equivalent) defined at the `[edit interfaces]` hierarchy level.
>
> To configure Routing Engine-specific parameters and still use the same configuration on both Routing Engines, include the appropriate configuration statements under the `re0` and `re1` statements at the `[edit groups]` hierarchy level and use the `apply-groups` statement. For instructions, see *Applying a Junos OS Configuration Group*.

3. To halt the PTX3000:

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

*** FINAL System shutdown message from user@host ***
System going down IMMEDIATELY
Terminated
...
syncing disks... 11 8 done
The operating system has halted.
Please press any key to reboot.
```

> **NOTE**: The `request system halt` command halts all Routing Engines on the control plane from which it was issued. To reboot a Routing Engine that has been halted, you must connect through the console.

The command shuts down the Routing Engine cleanly, so its state information is preserved. For more information about the command, see *request system halt*.

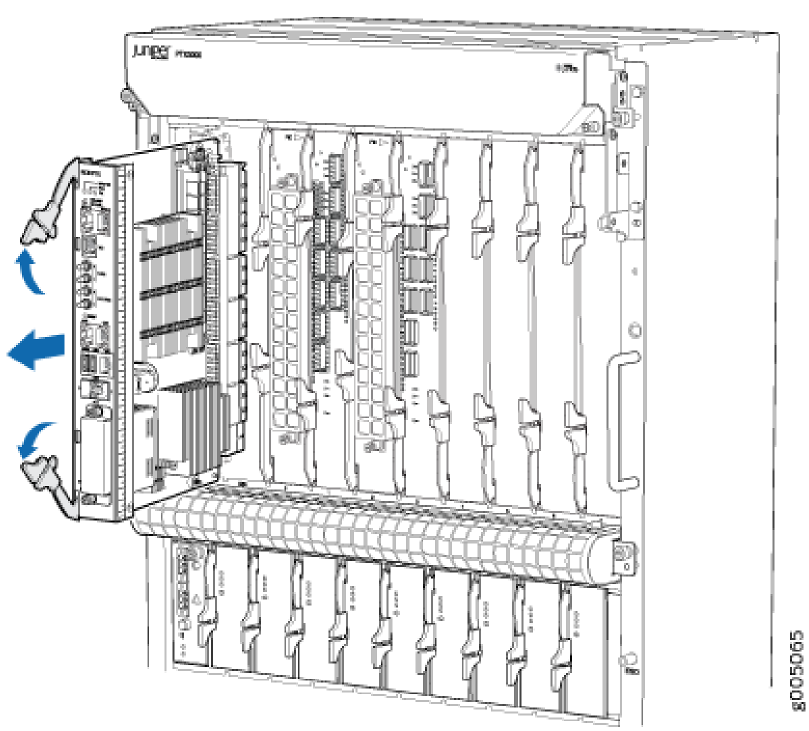
Removing a PTX3000 RCB

To remove an RCB (see Figure 128 on page 291):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Label and disconnect the cables.
4. Release the latches on the ejector handles on the top and bottom of the RCB.
5. Move the ejector handles outward to unseat the RCB.
6. Place one hand underneath the RCB to support it and slide it completely out of the chassis. Place it on the antistatic mat.

> **CAUTION**: Do not stack hardware components on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 128: Removing an RCB

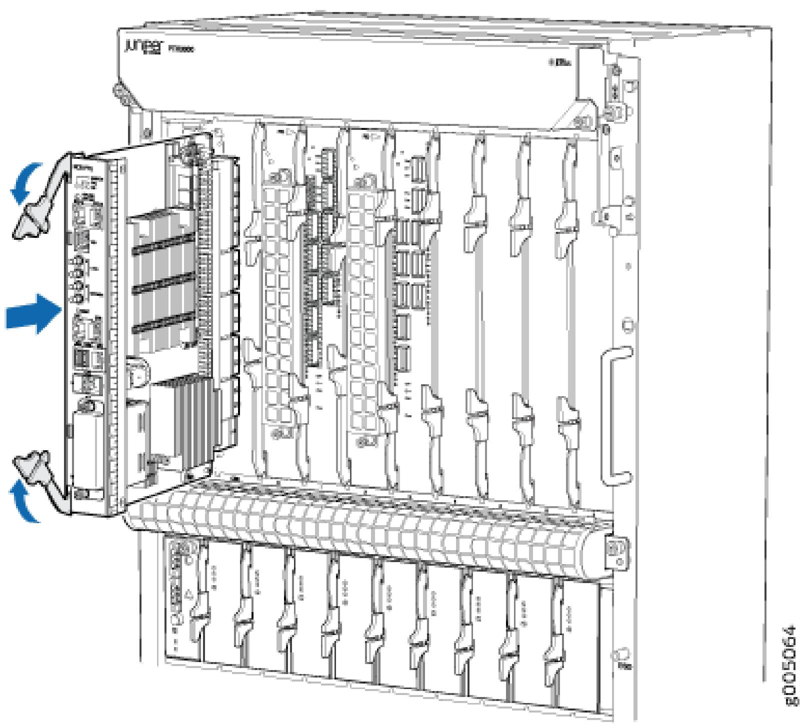


Installing a PTX3000 RCB

To install an RCB (see Figure 129 on page 292):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point.
2. Carefully align the bottom and then the top edges of the RCB with the guides inside the chassis.
3. Slide the RCB into the chassis, carefully ensuring that it is correctly aligned.
4. Reconnect the cables.
5. To verify that the RCB is installed correctly and functioning normally:
   - Verify that the green **OK** LED on the RCB faceplate is lit steadily green. The green **OK** LED should light be lit a few minutes after the Control Board is installed.
   - Verify that the **FAIL** LED on the RCB faceplate is not lit. If the **FAIL** LED is lit steadily, remove and install the RCB again. If the **FAIL** LED still lights steadily, the RCB is not functioning properly. Contact your customer support representative.
   - To verify that the RCB is `Online`, use the `show chassis environment cb` command.

Figure 129: Installing an RCB



Replacing the SSD Cards in the PTX3000 RCB

IN THIS SECTION

Removing a Solid-State Drive from an RCB

The solid-state drive (SSD) is located in the slot labeled **SSD0** and **SSD1** on the Routing and Control Board faceplate.

To remove an SSD from an RCB (see Figure 11):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Determine whether the host subsystem is functioning as the primary or as the backup, using one of these methods:
   - Check the **MASTER** LED on the RCB. If the blue **MASTER** LED is lit, the host subsystem is functioning as the primary.
   - Issue the following CLI command. The primary RCB is designated `Master` in the `Current state` field:

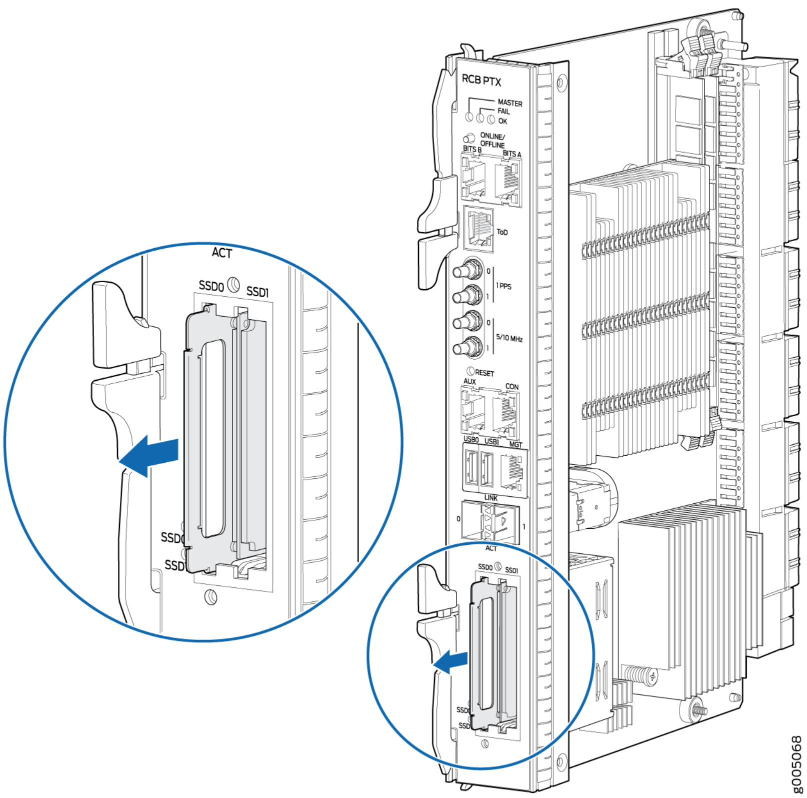
   ```
   user@host> show chassis routing-engine
   Routing Engine status:
     Slot 0:
       Current state                  Master
   ...
   ```

3. If the host subsystem is functioning as the primary, switch it to be the backup by using the `request chassis routing-engine master switch` command.
4. From the primary RCB, issue the `request vmhost power-off other-routing-engine` command to power off the backup RCB.
5. Verify that the **SSD0** and **SSD1** LEDs on the backup RCB faceplate are off.
6. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
7. Remove the cover on the SSD slots by loosening the captive screws on the corners of the cover, using a number 1 Phillips (+) screwdriver if necessary.

CAUTION: Do not remove the cover if any of the LEDs on the RCB faceplate are lit.

8. Take out the SSD from the slot.
9. Place the SSD on the antistatic mat.

Figure 130: Removing an SSD from a Routing and Control Board



Installing a Solid-State Drive in a PTX3000 RCB

To install an SSD in an RCB (see Figure 131 on page 295):

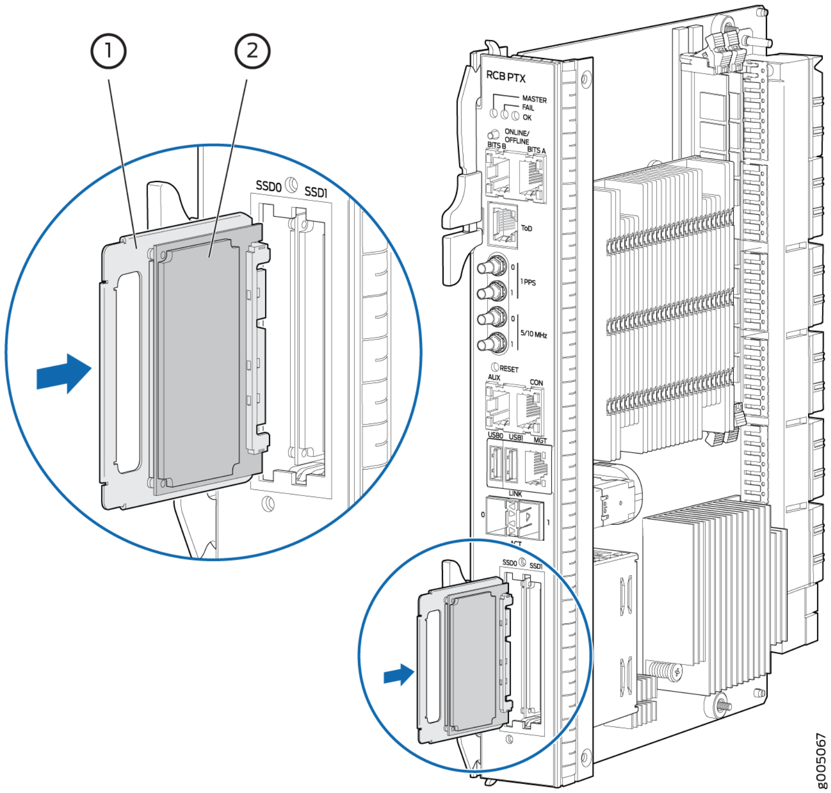
1. Insert the SSD into the **SSD0** slot on the RCB, with the label facing down.

   CAUTION: Be sure to insert the SSD with the label facing down. Inserting the SSD incorrectly might damage the RCB.

   Slide the SSD into the slot until you feel resistance, carefully ensuring that it is correctly aligned.
2. Reinstall the RCB cover and tighten the screws on the corners of the cover to secure it to the RCB.

3. From the primary RCB, issue the `request chassis cb online slot` *`slot-number`* and the `request system power-on other-routing-engine` commands to power on the RCB.
4. Junos OS is copied from the USB disk or the LAN into the SSDs.

Figure 131: Installing an SSD in the RCB



RELATED DOCUMENTATION

request system snapshot

request system partition hard-disk

request system power-off

request system reboot

request chassis routing-engine master

show chassis routing-engine

show system boot-messages

Maintaining the PTX3000 RCB Companion Card

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the RCB companion card.

Action

On a regular basis:

- Check the LED on the companion card. During normal operation, the **STATUS** LED on each companion card is lit green, indicating that the companion card is functional.
- Issue the `show chassis hardware` command to verify that the companion card is operating properly.

Replacing the PTX3000 RCB Companion Card

IN THIS SECTION

You can install up to two Routing and Control Board (RCB) companion cards in the PTX3000. RCB companion cards install in the **RE0** and **RE1** slots to the left of each RCBs. The RCB companion cards do not function if an RCB is not present.

The RCB companion cards are used only for communication between two RCBs in a redundant host subsystem. If you are installing a single host subsystem with no backup RCB, you do not need to install RCB companion cards. Install Routing Engine blanks to ensure proper cooling.

NOTE: If you remove the companion card or if it fails, you cannot do a graceful routing engine switchover (GRES).

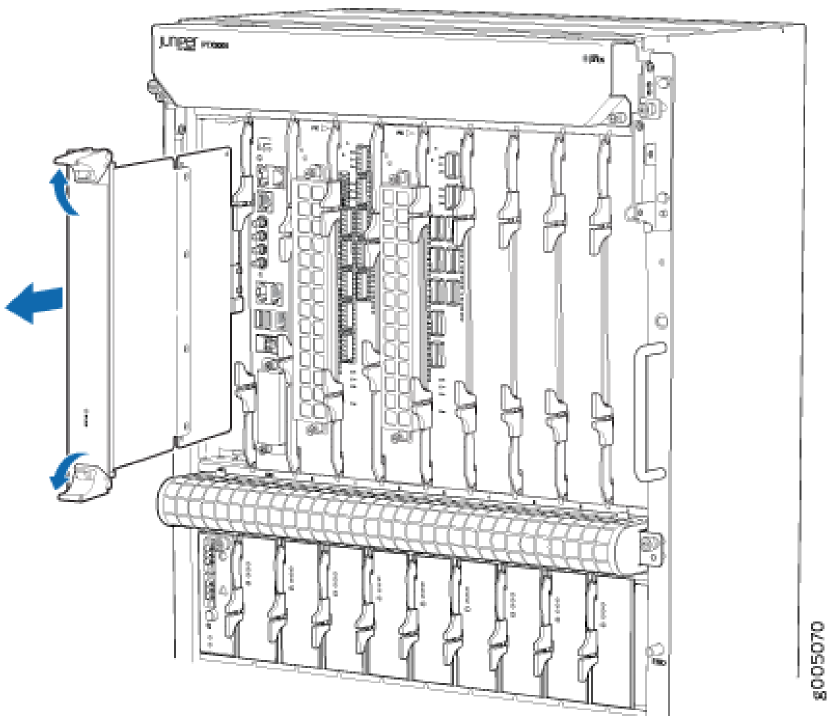
Removing a PTX3000 RCB Companion Card

To remove a RCB companion card (see Figure 13):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Release the latches on the ejector handles on the top and bottom of the RCB companion card.
4. Move the ejector handles outward to unseat the RCB ccompanion card.
5. Place one hand underneath the RCB companion card to support it and slide it completely out of the chassis. Place it on the antistatic mat.

CAUTION: Do not stack hardware components on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 132: Removing a RCB Companion Card



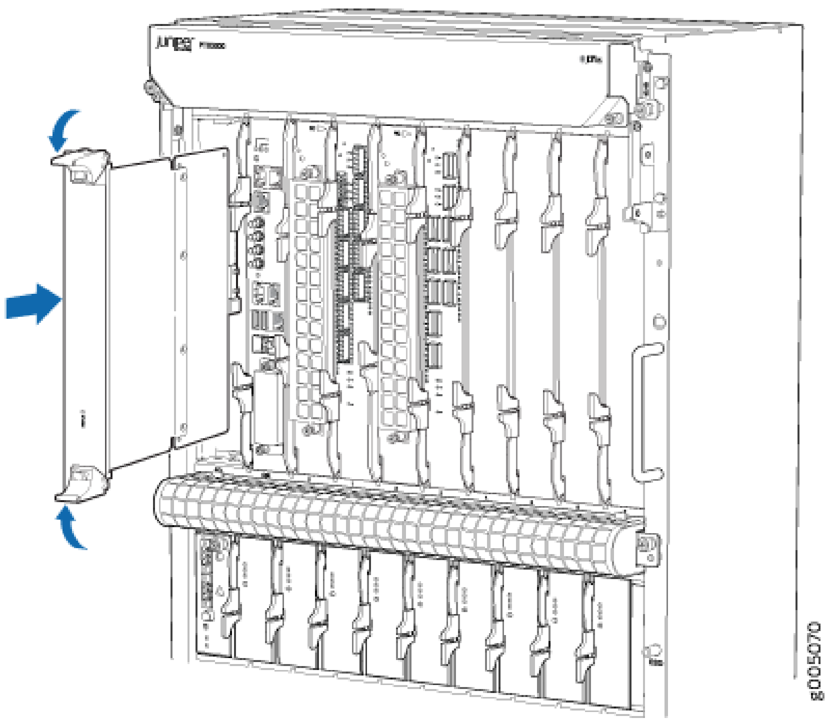
Installing a PTX3000 RCB Companion Card

To install a RCB companion card (see Figure 133 on page 299):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point.
2. Carefully align the bottom and then the top edges of the RCB companion card with the guides inside the chassis.
3. Slide the RCB companion card into the chassis, carefully ensuring that it is correctly aligned.
4. To verify that the RCB companion card is installed correctly and functioning normally:
   - Verify that the green **STATUS** LED on the RCB companion card faceplate is lit steadily green. The green **STATUS** LED should light be lit a few minutes after the RCB companion card is installed.
   - Verify that the output of the `show chassis alarm` command does not have any `FRU Absent` alarm for the RCB-CC card.

- To verify that the RCB companion card is `Online`, use the `show chassis environment` command.

Figure 133: Installing a RCB Companion Card



Replacing a PTX3000 Management Console or Auxiliary Cable

IN THIS SECTION

Removing a PTX3000 Management Console or Auxiliary Cable

To remove a cable from the console or auxiliary port:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.

2. Turn off the power to the console or auxiliary device.
3. Pull the cable connector straight out of the port.
4. Disconnect the cable from the console or auxiliary device.

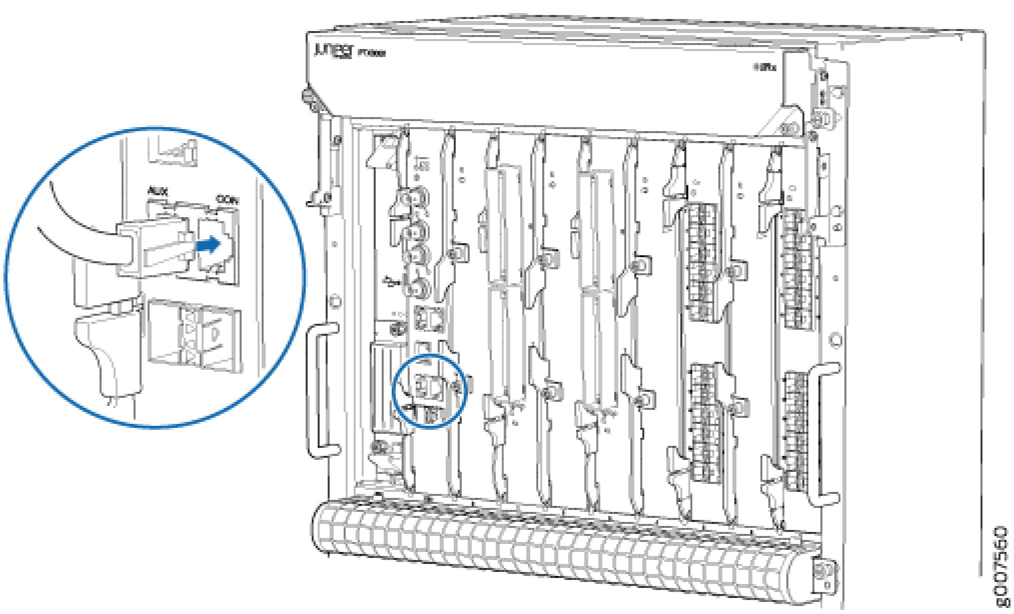
Installing a PTX3000 Management Console or Auxiliary Cable

Attach one or more management console or auxiliary devices to the Routing Engine ports on each Control Board or Routing and Control Board (RCB) for management and service operations (see Figure 134 on page 300).

To connect the cables to a management console or auxiliary device:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. If necessary, turn off the power to the console or auxiliary device.
3. Plug one end (shown in Figure 134 on page 300) of a copper cable with RJ-45 connectors into the **CON** or **AUX** port on the Control Board or RCB.
4. Attach the other end of the cable to the console or auxiliary device.

Figure 134: Connecting to the Console or Auxiliary Port on the Control Board or RCB



Replacing a PTX3000 Management Ethernet Cable

IN THIS SECTION

Removing a PTX3000 Management Ethernet Cable

To remove a management Ethernet cable:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Press the tab on the connector and pull the connector straight out of the management Ethernet port (see Figure 17). Figure 16 shows the connector.

> **NOTE**: The management Ethernet port is labeled **HOST/ETHERNET** on a Control Board. The port is labeled **MGT** on a Routing and Control Board (RCB).

3. Disconnect the cable from the network device.

Figure 135: Management Ethernet Cable Connector

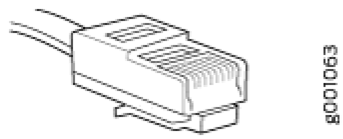
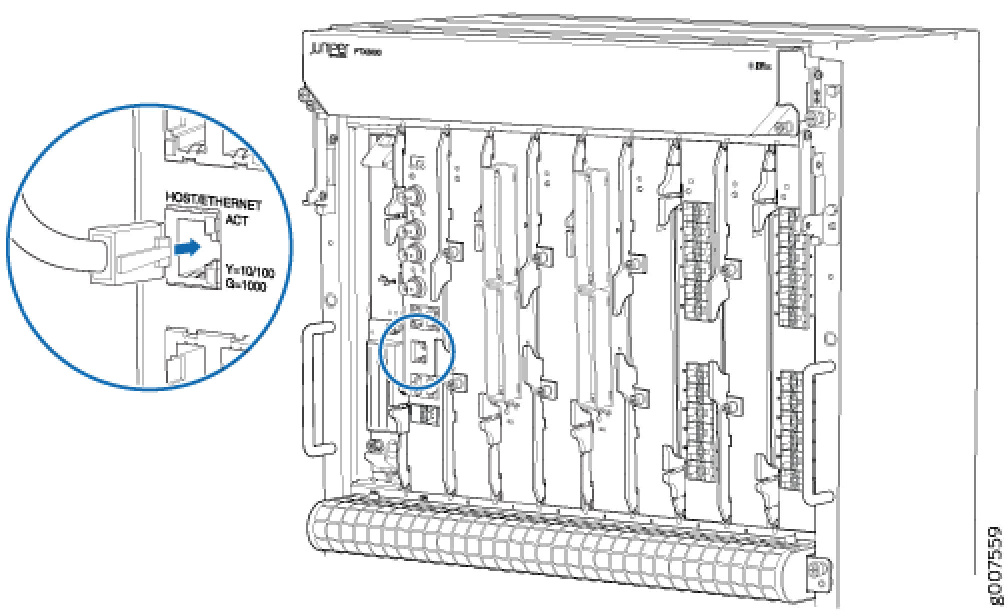


Figure 136: Management Ethernet Port on the Control Board or RCB



Installing a PTX3000 Management Ethernet Cable

To install a management Ethernet cable:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

   > ⚠ **CAUTION**: During the initial installation before the chassis is grounded, you must connect to an approved site ESD point. See the instructions for your site.

2. Plug one end of a UTP Category 5 Ethernet cable into the management Ethernetport on the Control Board or RCB.

NOTE: The management Ethernet port is labeled **HOST/ETHERNET** on a Control Board. The port is labeled **MGT** on a Routing and Control Board (RCB).

3. Plug the other end of the cable into the network device.

Replacing a PTX3000 GPS External Clocking Device Cable on a Control Board

IN THIS SECTION

Removing a GPS Cable for an External Clocking Device

To remove a cable with BNC connectors from a **GPS0 CLOCK** or **GPS1 CLOCK** port on the Control Board:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Disconnect the cable from the GPS external clocking device.
3. Disconnect the cable from the **GPS0 CLOCK** or **GPS1 CLOCK** port on the Control Board.

Installing a GPS Cable for an External Clocking Device

To connect a GPS cable with BNC connectors to an **GPS0 CLOCK** or **GPS1 CLOCK** port on the Control Board:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Plug one end of the cable into the appropriate **GPS0 CLOCK** or **GPS1 CLOCK** port on the Control Board.
3. Plug the other end of the cable into the GPS external clocking device.
4. Verify that the **LNK** LED for the port is lit steadily green.

5. Issue the `show chassis synchronization` command to check the status of the port.

```
user@host> show chassis synchronization
Clock Synchronization Status :
  Clock module on CB 0
    Current state             : Online - Master
    Current clock state       : holdover
      Selected for            : 21 hours, 3 minutes, 8 seconds
      Selected since          : 2013-05-06 18:56:16 PDT
      Deviation (in ppm)      : -0.00
      Last deviation (in ppm): -0.00
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
                             (in ppm)     (in ppm)
      gps-0-10mhz primary    unknown      unknown          unknown
Clock Synchronization Status :
  Clock module on CB 1
    Current state             : Online - Standby
    Current clock state       : locked to master CB
      Selected for            : 1 hour, 36 minutes, 45 seconds
      Selected since          : 2013-05-07 14:22:39 PDT
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
                             (in ppm)     (in ppm)
      gps-0-10mhz primary    unknown      unknown          unknown
```

Replacing a PTX3000 BITS External Clocking Device Cable

IN THIS SECTION

Removing a PTX3000 BITS External Clocking Device Cable

To remove a cable with RJ-45 connectors from a **BITS A** or **BITS B** port on the Control Board or the Routing and Control Board (RCB):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Disconnect the cable from the external clocking device.
3. Disconnect the cable from the **BITS A** or **BITS B** port on the Control Board or RCB.

Installing a PTX3000 BITS External Clocking Device Cable

To connect a cable with RJ-45 connectors to an **BITS A** or **BITS B** port on the Control Board or RCB:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Plug one end of the cable into the appropriate **BITS A** or **BITS B** port on the Control Board or RCB.
3. Plug the other end of the cable into external clocking device.
4. Verify that the **LNK** LED for the port is lit steadily green.
5. Issue the `show chassis synchronization` command to check the status of the port.

```
user@host> show chassis synchronization
Clock Synchronization Status :
  Clock module on CB 0
    Current state            : Online - Master
    Current clock state      : holdover
      Selected for           : 21 hours, 3 minutes, 8 seconds
      Selected since         : 2013-05-06 18:56:16 PDT
      Deviation (in ppm)     : -0.00
      Last deviation (in ppm): -0.00
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
                             (in ppm)     (in ppm)
      gps-0-10mhz primary    unknown      unknown          unknown
Clock Synchronization Status :
  Clock module on CB 1
    Current state            : Online - Standby
    Current clock state      : locked to master CB
      Selected for           : 1 hour, 36 minutes, 45 seconds
      Selected since         : 2013-05-07 14:22:39 PDT
    Configured sources
      Source      Priority   Deviation    Last deviation   Status
```

```
                        (in ppm)     (in ppm)
  gps-0-10mhz primary   unknown      unknown           unknown
```

RELATED DOCUMENTATION

Maintaining the PTX3000 Switch Interface Boards

IN THIS SECTION

Maintaining the PTX3000 Switch Interface Boards

IN THIS SECTION

Purpose

For optimum performance, verify the status of the Switch Interface Boards (SIBs).

Action

On a regular basis:

- Check the LEDs on the SIB faceplate and craft interface.

  During normal operations:

  - The green **OK** LED on the SIB faceplate is lit.
  - The yellow **FAIL** LED on the SIB faceplate is not lit.

- Issue the `show chassis fabric topology` command. During normal operations, the output for the command shows that the state of the online SIBs and FPCs links are in the `OK` state.

- Issue the `show chassis environment sib` command. For more information about the commands, see the Junos OS manuals.

Replacing a PTX3000 Switch Interface Board

IN THIS SECTION

Removing a PTX3000 Switch Interface Board

Nine SIBs are installed in the PTX3000. The SIBs are located in the slots marked **SIB0** through **SIB8**. Each SIB-SFF-PTX-240 weighs 1.5 lb (0.7 kg). Each SIB3-SFF-PTX weighs 1.9 lb (0.9 kg).

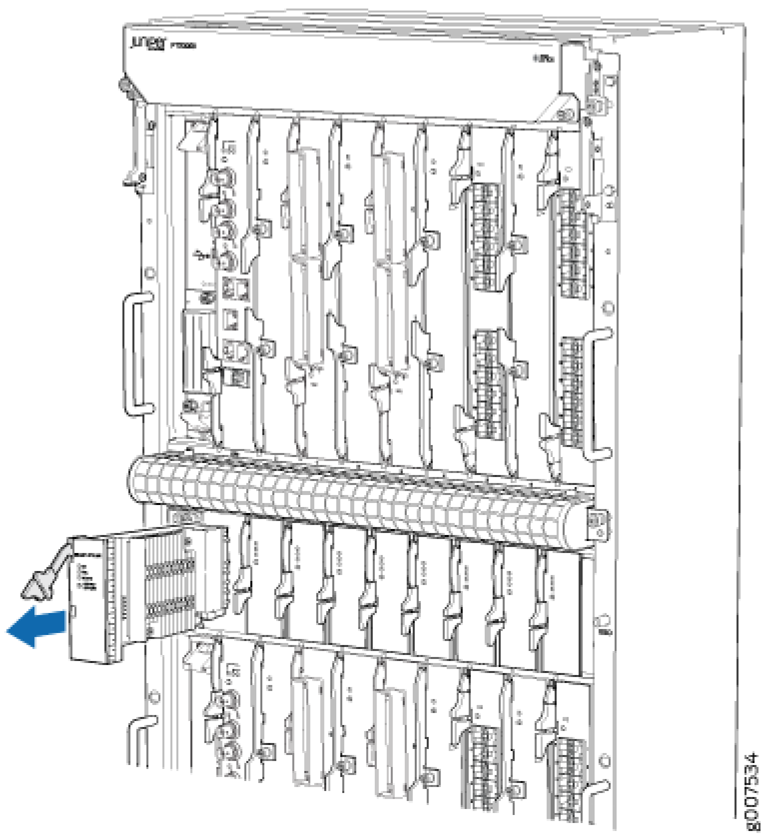
To remove a SIB (see Figure 1):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2.
3. Open the ejector handle to unseat the SIB.

4. Grasp the ejector handle, pull firmly, and slide the SIB about three-quarters of the way out of the chassis.
5. Place one hand underneath the SIB to support it and slide it completely out of the chassis. Place it on the antistatic mat.

> **CAUTION**: Do not stack hardware components on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 137: Removing a SIB



Installing a PTX3000 Switch Interface Board

> **NOTE**: FPC-SFF-PTX-T FPCs are not supported in a PTX3000 with SIB3-SFF-PTX SIBs.

NOTE: If you are upgrading from SIB-SFF-PTX-240 SIBs to SIB3-SFF-PTX SIBs, we recommend that you perform the procedure described in "Upgrading to SIB3-SFF-PTX SIBs in an Operational PTX3000" on page 310.

NOTE: Third-generation FPCs (FPC3-SFF-PTX) are supported only in a PTX3000 with SIB3-SFF-PTX SIBs. Third-generation FPCs and FPC-SFF-PTX-P1-A first-generation FPCs can interoperate with each other in the same system.

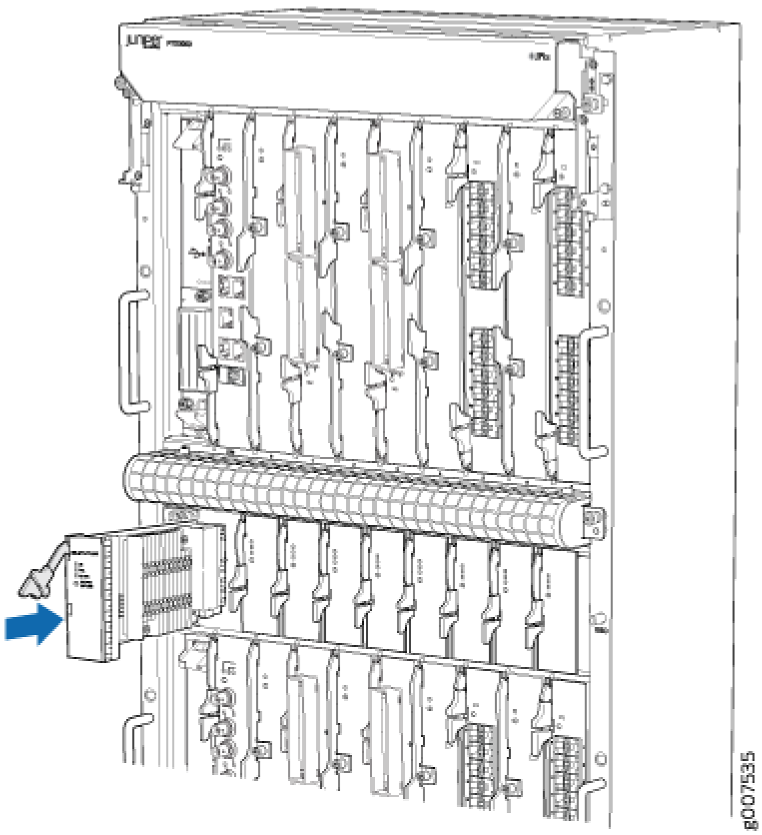
Each SIB-SFF-PTX-240 weighs 1.5 lb (0.7 kg). Each SIB3-SFF-PTX weighs 1.9 lb (0.9 kg). To install a SIB (see Figure 138 on page 310):

1.
2. Place one hand underneath the SIB to support it.
3. Slide the SIB into the chassis, carefully ensuring that it is correctly aligned.
4. Grasp the ejector handle and press it inward to seat the SIB until the ejectors latch into the SIB.
5. Bring the SIB online by using one of the following methods:
   - Press and hold the **ONLINE/OFFLINE** button on the SIB faceplate. The green **OK** LED on the faceplate begins to blink. Hold the button down until the LED blinks.

- Issue the following CLI command on the PTX3000:

```
user@host> request chassis sib online slot 0
```

Figure 138: Installing a SIB



Upgrading to SIB3-SFF-PTX SIBs in an Operational PTX3000

Before you begin to upgrade an operational PTX3000 to SIB3-SFF-PTX SIBs:

- Upgrade Junos OS on the PTX3000 to Junos OS Release 15.1F6 or later, or Junos OS Release 16.1R2 or later. For information about upgrading Junos OS, see the *Junos OS Software Installation and Upgade Guide*.

- Unpack the new SIBs and verify the parts received. You can purchase an upgrade kit from Juniper Networks (PTX3K-FPC3-UPG-KIT) that includes nine SIB3-SFF-PTX SIBs.

- Ensure that you have an antistatic bag for each of the old SIBs that you remove from the PTX3000.

> **NOTE**: Third-generation FPCs provide additional features when the `enhanced-mode` statement is configured at the `[edit chassis network-services]` hierarchy level. By default, the `enhanced-mode` statement is disabled. If you plan to configure the `enhanced-mode` statement, keep in mind the following guidelines:
>
> - After you configure the `enhanced-mode` statement and commit the configuration, you must reboot the router.
> - If the `enhanced-mode` statement is configured, only third-generation FPCs are powered on. Other FPCs cannot be brought online.
> - If the `enhanced-mode` statement is not configured, third-generation FPCs do not support advanced features.

This topic describes how to upgrade an operational PTX3000 to SIB3-SFF-PTX SIBs.

> **NOTE**: FPC-SFF-PTX-T FPCs are not supported in a PTX3000 with SIB3-SFF-PTX SIBs.

> **NOTE**: Third-generation FPCs (FPC3-SFF-PTX) are supported only in a PTX3000 with SIB3-SFF-PTX SIBs. Third-generation FPCs and FPC-SFF-PTX-P1-A first-generation FPCs can interoperate with each other in the same system.

To upgrade an operational PTX3000 to SIB3-SFF-PTX SIBs:

1. Issue the following commands to verify the current state of the PTX3000, and the SIBs and FPCs currently installed in the system. If there are errors or alarms, do not proceed until you resolve the issues.

   - `show chassis alarms`—View the overall condition of the PTX3000. Resolve any alarms before proceeding.
   - `show chassis fabric fpcs`—Check the switch fabric links between the FPCs and the SIBs. The value of the `Fabric management FPC state` field should be `Links ok`. The `Link error` state indicates that the link between the SIB and FPC has CRC errors. However, the link is still eligible to carry traffic.
   - `show chassis fabric sibs`—Check the switch fabric links between the SIBs and FPCs. The value of the `Fabric management SIB state` field should be `Links ok`. The `Link error` state indicates that the link between the SIB and the FPC is not operational.

TIP: If there are errors, the `show chassis fabric topology` command shows more details about the current fabric plane and link state. See "Troubleshooting the PTX3000 Switch Interface Boards" on page 403 for more information.

2. Reset the interface statistics by using the `clear interface statistics all` command so that you can easily determine whether any traffic drops are occurring during the procedure. Use the `show interfaces statistics` command to determine whether there are any errors.
3. Include the `fabric upgrade-mode default` statement in the configuration of the PTX3000 at the `[edit chassis]` hierarchy level. See *upgrade-mode* for more information.

```
[edit]
user@host# set chassis fabric upgrade-mode default
```

NOTE: The `fabric upgrade-mode default` statement enables the router to continue forwarding traffic with different types of SIBs installed in the chassis. After the upgrade is complete you must delete the statement from the configuration.

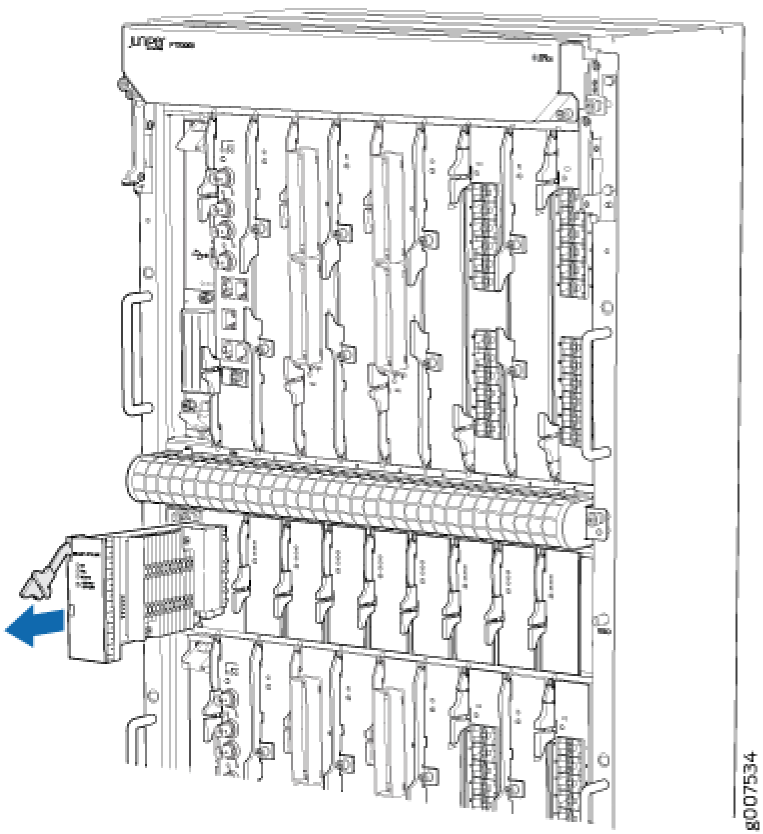
4. Commit the configuration on both the primary and the backup Routing Engines.

```
[edit]
user@host# commit synchronize
```

5. Use the `show configuration chassis` operational mode command to verify that upgrade mode is set.
6.
7. Take one of the old SIBs offline by using the `request chassis sib offline slot` *`slot-number`* command. Leave the remaining SIBs online.
8. Remove the offline SIB (see Figure 139 on page 313):
   a. Open the ejector handle to unseat the SIB.
   b. Grasp the ejector handle, pull firmly, and slide the SIB about three-quarters of the way out of the chassis.
   c. Place one hand underneath the SIB to support it and slide it completely out of the chassis. Place it on the antistatic mat.

> ⚠ **CAUTION**: Do not stack hardware components on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

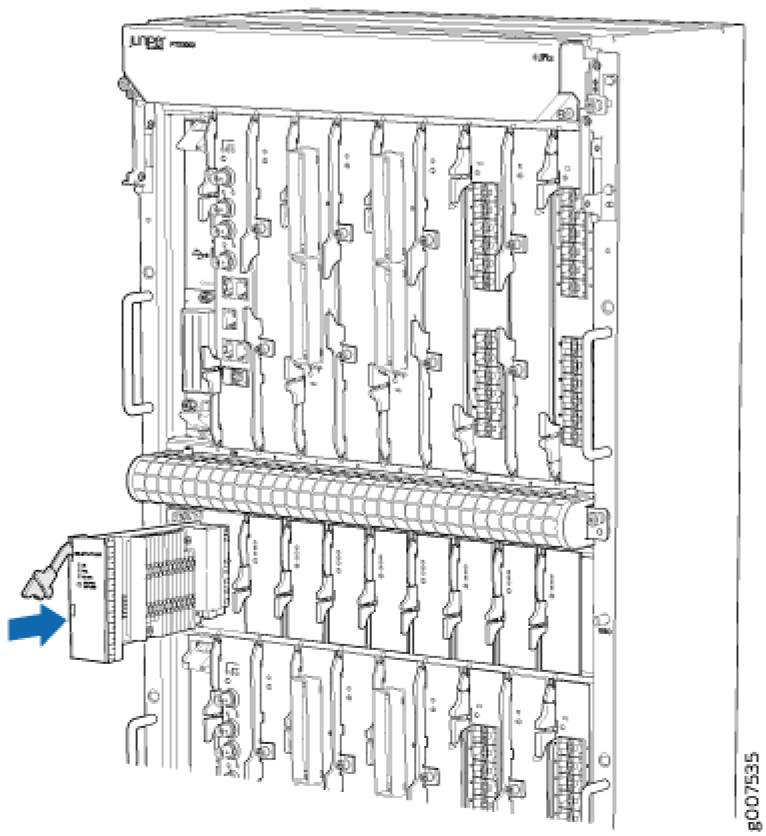
Figure 139: Removing an Old SIB-SFF-PTX-240 SIB



9. Install the new SIB3-SFF-PTX SIB (see Figure 140 on page 314):
   a. Place one hand underneath the SIB to support it.
   b. Slide the SIB into the chassis, carefully ensuring that it is correctly aligned.

c. Grasp the ejector handle and press it inward to seat the SIB until the ejectors latch into the SIB.

Figure 140: Installing a New SIB3-SFF-PTX SIB



10. Bring the new SIB3-SFF-PTX SIB online by using the `request chassis sib online slot` *`slot-number`* command.
11. When the new SIB is online, check for any link errors or traffic drops with the following commands:
    - `show chassis alarms`—Ensure there are no active alarms.
    - `show chassis sibs` —The value of the `state` field should be `Online`, indicating that the SIBs are operational and running.
    - `show interfaces statistics` and `show pfe statistics traffic`—Ensure that there are no traffic drops.

NOTE: If link errors or traffic drops occur at any point during the upgrade, you can reverse the upgrade procedure and return the PTX3000 to its original state by taking the new SIB3-SFF-PTX SIBs offline and replacing them with the original SIBs, one at a time. After the original SIBs are installed, use the commands mentioned above to verify that there are no longer any link errors or traffic drops. Finally, delete the `fabric upgrade-mode default` statement from the configuration of the PTX3000 at the `[edit chassis]` hierarchy level, and commit the configuration change.

12. Repeat Step 7 through Step 11 until you have replaced each of the old SIBs with the new SIB3-SFF-PTX SIBs.
13. Delete the `fabric upgrade-mode default` statement from the configuration of the PTX3000 at the `[edit chassis]` hierarchy level.

```
[edit]
user@host#delete chassis fabric upgrade-mode
```

14. Commit the configuration on both the primary and the backup Routing Engines.

```
[edit]
user@host# commit synchronize
```

15. Check again for any issues with the following commands:

    - `show chassis alarms`
    - `show chassis fabric fpcs`
    - `show chassis fabric sibs`
    - `show interfaces statistics`
    - `show pfe statistics traffic`

NOTE: After you upgrade to SIB3-SFF-PTX SIBs, you can install third-generation FPCs (FPC3-SFF-PTX) in the PTX3000 by using the normal FPC installation procedure (see "Replacing a PTX3000 FPC" on page 318).

SEE ALSO

enhanced-mode

upgrade-mode

show chassis alarms

show chassis fabric fpcs

show chassis fabric sibs

show chassis fabric topology

clear interfaces statistics

PTX3000 FPC Description | 92

RELATED DOCUMENTATION

PTX3000 Switch Interface Board Description | 87
PTX3000 Switch Interface Board LEDs | 89
Troubleshooting the PTX3000 Switch Interface Boards | 403

Prevention of Electrostatic Discharge Damage

Maintaining PTX3000 Interface Modules

IN THIS SECTION

Maintaining the PTX3000 FPCs

IN THIS SECTION

Purpose

For optimum PTX3000 performance, verify the condition of the FPCs.

Action

On a regular basis:

- Check the **STATUS** LED on the FPC. During normal operation the green **STATUS** LED located at the top of the FPC is lit steadily when the FPC is online. The green **STATUS** LED blinks during startup.

    -

- Issue the CLI `show chassis fpc` command to check the status of installed FPCs. The value `Online` in the `State` column indicates that the FPC is functioning normally.

- Issue the CLI `show chassis environment fpc` command to check the temperature and power of the installed FPCs. In the displayed command output, the temperature values should be below the preconfigured thresholds. The power values provide Information about the voltage supplied to the FPC. The left column displays the required power, in volts. The right column displays the measured power, in millivolts.

- Issue the `show chassis fabric topology` command. During normal operations, the output for the command shows that the state of the online SIB and FPC links are in the `OK` state.

Replacing a PTX3000 FPC

IN THIS SECTION

Removing a PTX3000 FPC

The PTX3000 holds up to eight FPCs, which are installed vertically in the front of the chassis. A first-generation FPC (FPC-SFF-PTX-P1 and FPC-SFF-PTX-T) weighs 5.9 lb (2.7 kg). A third-generation FPC (FPC3-SFF-PTX) weighs 10.5 lb (4.8 kg).

Each FPC slot not occupied by an FPC must be covered by a blank panel. A blank panel weighs 1.3 lb (0.6 kg).

To remove an FPC (see Figure 1):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2.
3. Use one of the following methods to take the FPC offline:
   - Press and hold the **ONLINE/OFFLINE** FPC button on the FPC faceplate. The green **OK** LED next to the button begins to blink. Hold the button down until the LED goes out.
   - Issue the following CLI command:

   ```
   user@host>request chassis fpc slot slot-number offline
   ```
4. Power off the FPC. By default, an FPC is configured to restart.

   To configure an FPC to stay offline and prevent it from restarting, include the `power off` statement at the `[edit chassis fpc fpc-slot-number]` hierarchy level. For more information, see the *power* CLI reference documentation.
5. Verify that the **STATUS** LED on the FPC faceplate is off.
6. Simultaneously open the ejector handles outward to unseat the FPC.
7. Grasp the handles and slide the FPC straight out of the card cage halfway.
8. Place one hand around the front of the FPC and the other hand under it to support it. Slide the FPC completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.

CAUTION: The weight of the FPC is concentrated in the back end. Be prepared to accept the full weight as you slide the FPC out of the chassis.

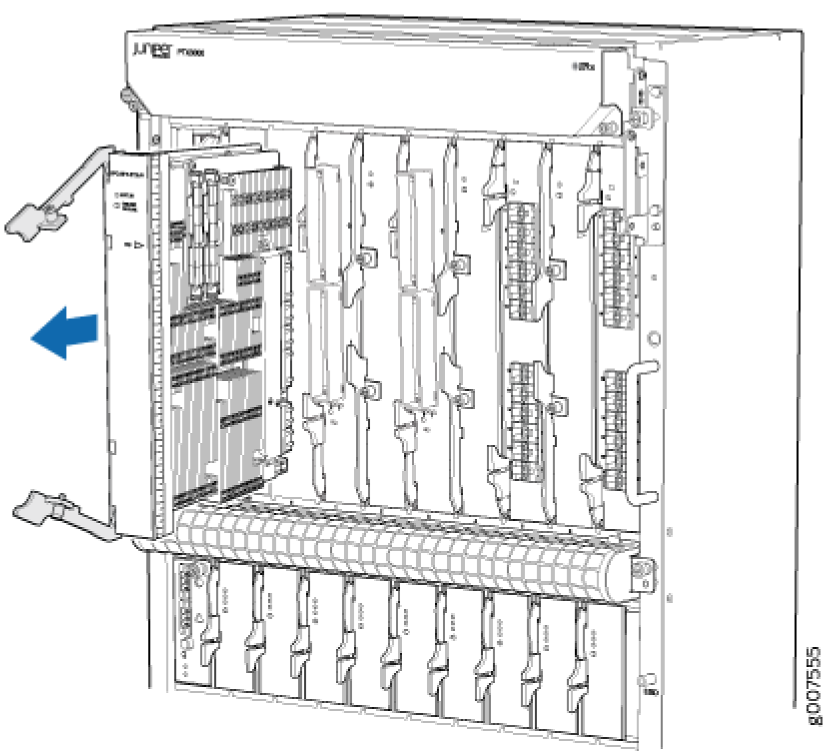
When the FPC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.

Do not stack FPCs on top of one another after removal. Place each one individually in an electrostatic bag or on its own antistatic mat on a flat, stable surface.

9. If you are not reinstalling an FPC into the emptied FPC slot within a short time, install a blank panel over the slot to maintain proper airflow in the FPC card cage.

CAUTION: After removing an FPC from the chassis, wait at least 30 seconds before reinserting it, removing an FPC from a different slot, or inserting an FPC into a different slot.

Figure 141: Removing an FPC



NOTE: Figure 1 shows a first-generation FPC being removed from the chassis. The procedure is identical for a third-generation FPC.

Installing a PTX3000 FPC

NOTE: FPC-SFF-PTX-T FPCs are not supported in a PTX3000 with SIB3-SFF-PTX SIBs.

NOTE: Third-generation FPCs (FPC3-SFF-PTX) are supported only in a PTX3000 with SIB3-SFF-PTX SIBs. Third-generation FPCs and FPC-SFF-PTX-P1-A first-generation FPCs can interoperate with each other in the same system.

NOTE: Third-generation FPCs support additional features when the `enhanced-mode` statement is configured at the `[edit chassis network-services]` hierarchy level. By default, the `enhanced-mode` statement is disabled. If you plan to configure the `enhanced-mode` statement, keep in mind the following guidelines:

- After you configure the `enhanced-mode` statement and commit the configuration, you must reboot the router.
- If the `enhanced-mode` statement is configured, only third-generation FPCs are powered on. Other FPCs cannot be brought online.
- If the `enhanced-mode` statement is not configured, third-generation FPCs do not support advanced features.

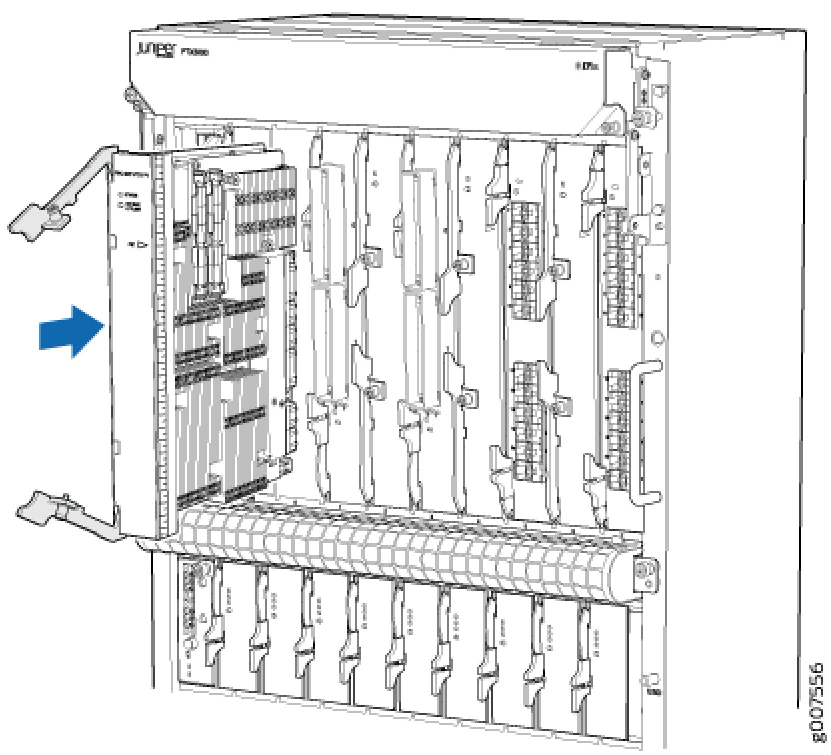
A first-generation FPC (FPC-SFF-PTX-P1 and FPC-SFF-PTX-T) weighs 5.9 lb (2.7 kg). A third-generation FPC (FPC3-SFF-PTX) weighs 10.5 lb (4.8 kg). To install an FPC (see Figure 142 on page 321):

1.
2. Place the FPC on an antistatic mat.
3. Locate the slot in the FPC card cage in which you plan to install the FPC.
4. Inspect the FPC to verify that the connectors are not misaligned or damaged.
5. Orient the FPC vertically with the component side facing to the right. Be sure the FPC is right-side up, with the components on the right of the FPC.

CAUTION: When the FPC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.

6. Lift the FPC into place and carefully align the bottom and top of the FPC with the guides inside the card cage.

Figure 142: Installing an FPC



NOTE: Figure 142 on page 321 shows a first-generation FPC being installed in the chassis. The procedure is identical for a third-generation FPC.

7. Slide the FPC a few inches into the slot, and gently rest the bottom edge of the FPC on the bottom edge of the slot opening.

CAUTION: Take care not to bend or otherwise damage the power connector prongs.

8. Slowly slide the FPC into the slot until you feel resistance.

9. Grasp the ejector handle and press it toward the FPC to seat the FPC.
10. Power on the FPC. Include the `power on` statement at the [`edit chassis fpc` *`slot-number`*] hierarchy level.

```
user@host# set chassis fpc slot-number power on
```

For more information, see the *power* CLI reference documentation.
11. Verify that the **STATUS** LED is lit steadily green.

> **CAUTION**: After the **STATUS** LED is lit steadily, wait at least 30 seconds before removing the FPC again, removing an FPC from a different slot, or inserting an FPC in a different slot.

You can also verify correct FPC and PIC functioning by issuing the `show chassis fpc` and `show chassis fpc pic-status` commands, as described in "Maintaining the PTX3000 FPCs" on page 317.

RELATED DOCUMENTATION

request chassis fpc

Maintaining the PTX3000 PICs and PIC Cables

IN THIS SECTION

Maintaining the PTX3000 PICs

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the PICs.

Action

On a regular basis:

- Check the LEDs on PIC faceplates. The meaning of the LED states differs for various PICs. For more information, see the PTX Series Interface Module Reference. If the FPC that houses the PIC detects a PIC failure, the FPC generates an alarm message to be sent to the Routing Engine.

  A PIC LED lit green indicates that the PIC is functioning normally.

- Issue the CLI `show chassis fpc pic-status` command. The PIC slots in an FPC are numbered from **0** through **1**, top to bottom.

Maintaining the PTX3000 PIC Cables

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the cables.

Action

- Use the cable management system (shown in "PTX3000 Cable Management System" on page 22) to support cables and prevent cables from dislodging or developing stress points.

- Place excess cable out of the way in the cable management system. Do not allow fastened loops of cable to dangle from the connector or cable management system, because this stresses the cable at the fastening point. Putting fasteners on the loops helps to maintain their shape.

- Keep the cable connections clean and free of dust and other particles, which can cause drops in the received power level. Always inspect cables and clean them if necessary before connecting an interface.

- Label both ends of the cables to identify them.

- When you unplug a fiber-optic cable from a transceiver, always place a rubber safety plug over the transceiver on the faceplate and on the end of the cable.

- Anchor fiber-optic cable to avoid stress on the connectors. When attaching fiber to a transceiver, be sure to secure the fiber so it is not supporting its own weight as it hangs to the floor. Never let fiber-optic cable hang free from the connector.

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

- Frequent plugging and unplugging of fiber-optic cable into and out of optical instruments, such as analyzers, can cause damage to the instruments that is expensive to repair. Instead, 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 easy and inexpensive to replace.

- Keep fiber-optic cable connections clean. Small microdeposits of oil and dust in the canal of the transceiver or cable connector could cause loss of light, reducing signal power and possibly causing intermittent problems with the optical connection.

Replacing a PTX3000 PIC

IN THIS SECTION

The following procedures describe how to remove and install a PIC in the PTX3000.

Video: Replacing a PIC in a PTX3000 Router

To replace a PIC:

Removing a PTX3000 PIC

Each PICs is located in the slot to the right of its associated FPC. A PIC weighs approximately 5 lb (2.3 kg). PICs are hot-insertable and hot-removable. When you remove a PIC, the PTX3000 continues to function, although the PIC interfaces being removed no longer function.

To remove a PIC (see Figure 5):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the PIC. Have ready a rubber safety cap for each transceiver and cable.
2. Attach an electrostatic discharge ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Use one of the following methods to take the PIC offline:
   - Press and hold the recessed online/offline button on the PIC faceplate until the **STATUS** LED is no longer lit (about 5 seconds).
   - Issue the following CLI command:

```
user@host> request chassis pic fpc-slot fpc-slot pic-slot 0 offline
```

> **NOTE**: In the CLI, the *pic-slot* is represented as `0` regardless of the PIC slot number on the chassis. For *fpc-slot*, specify the FPC located to the left of the PIC you are removing. For example, specify *fpc-slot* `0` for the PIC in PIC slot **1**. For more information, see "PTX3000 PIC Description" on page 103.

4. Label the cables connected to the PIC so that you can later reconnect each cable to the correct port.
5. Disconnect the cables from the PIC. Immediately cover each transceiver and the end of each fiber-optic cable with a rubber safety cap.

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

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

6. Using a number 1 Phillips (+) screwdriver, loosen the two inner captive screws on the upper or lower cable management system.
7. Move the cover to access the cable management system.
   - For a PIC in the upper card cage, lift the upper cable management system cover up (Figure 3).
   - For a PIC in the lower card cage, lower the lower cable management system cover (Figure 4).
8. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points (Figure 6). Secure the cable so that it is not supporting its own weight as it hangs to the floor.

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

9. Simultaneously open the ejector handles outward to unseat the PIC.
10. Grasp the handles and slide the PIC straight out of the card cage halfway, and place one hand underneath the PIC.
11. Slide the PIC out of the chassis, and place it in the electrostatic bag or on the antistatic mat.

12. If you are not reinstalling a PIC into the emptied PIC slot within a short time, install a blank panel over the PIC slot to maintain proper airflow in the card cage.

Figure 143: Upper Cable Management System

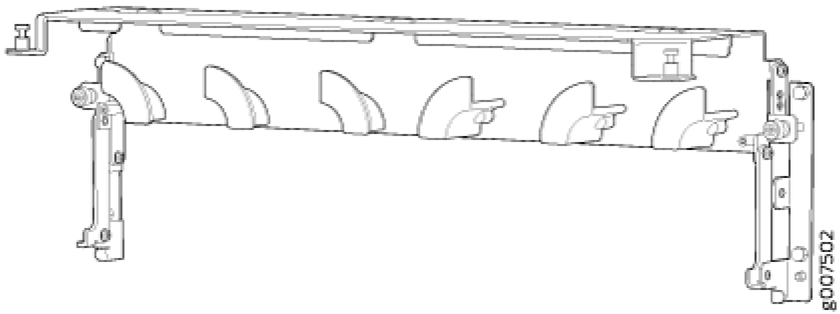


Figure 144: Lower Cable Management System

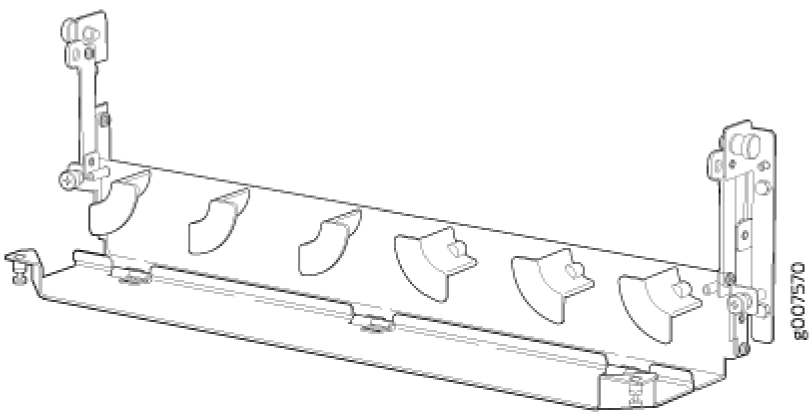


Figure 145: Removing a PIC

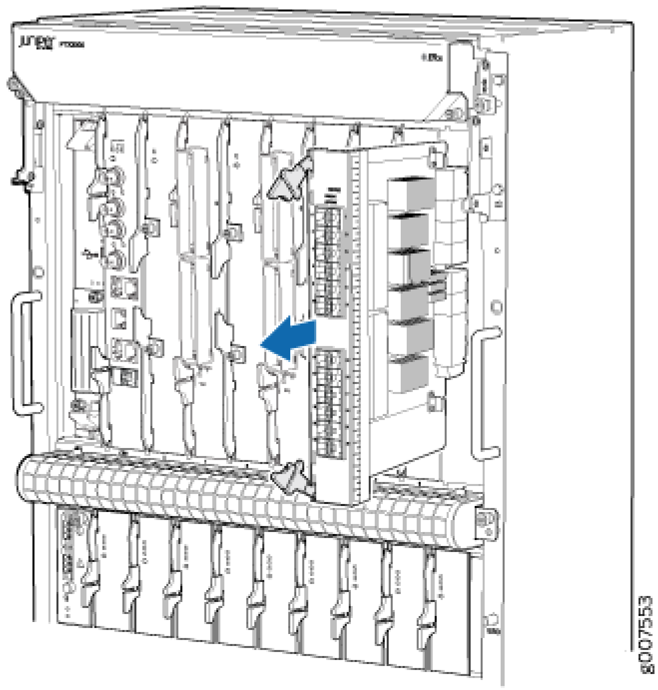
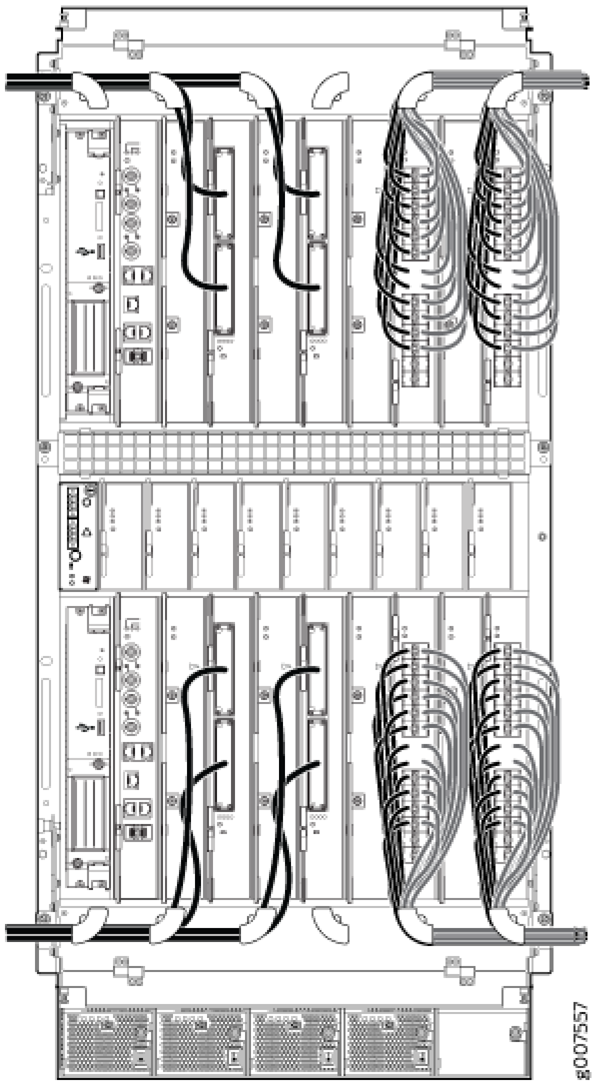


Figure 146: Arranging the PIC Cable in the Cable Management System



Installing a PTX3000 PIC

To install a PIC (see Figure 7):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Verify that there is a rubber safety cap over each fiber-optic transceiver on the faceplate. Install a cap if necessary.
3. Align the notches in the connector at the rear of the PIC with the notches in the PIC slot and then slide the PIC in until it lodges firmly.

CAUTION: Slide the PIC straight into the slot to avoid damaging the components on the bottom of the PIC.

4. Grasp both ejector handles and press them inward until the ejectors latch into the PIC.
5. Remove the rubber safety cap from each fiber-optic transceiver and the end of each fiber-optic cable.

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

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

6. Using the cable labels, reconnect the cables to the correct port on the PIC (see Figure 8).
7. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points (Figure 9). Secure the cable so that it is not supporting its own weight as it hangs to the floor.

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

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

8. Move the cover over the cable management system.
   - For a PIC in the upper card cage, lower the cover down over the upper cable management system (Figure 10).
   - For a PIC in the lower card cage, lift the cover up over the lower cable management system (Figure 11).
9. Using a number 1 Phillips (+) screwdriver, tighten the two inner captive screws to secure the cover to the cable management system.

10. Use one of the following methods to bring the PIC online:

    - Press and hold the recessed online/offline button on the PIC faceplate until the **STATUS** LED is no longer lit (about 5 seconds).

    - Issue the following CLI command

```
user@host> request chassis pic fpc-slot fpc-slot pic-slot 0 online
```

> **NOTE**: In the CLI, the *pic-slot* is represented as `0` regardless of the PIC slot number on the chassis. For *fpc-slot*, specify the FPC located to the left of the PIC. For example, specify *fpc-slot* `0` for the PIC in PIC slot **1**. For more information, see "PTX3000 PIC Description" on page 103.

11. Verify that the PIC is functioning normally by issuing the following command.

```
user@host> show chassis fpc pic-status fpc-slot
```

Figure 147: Installing a PIC

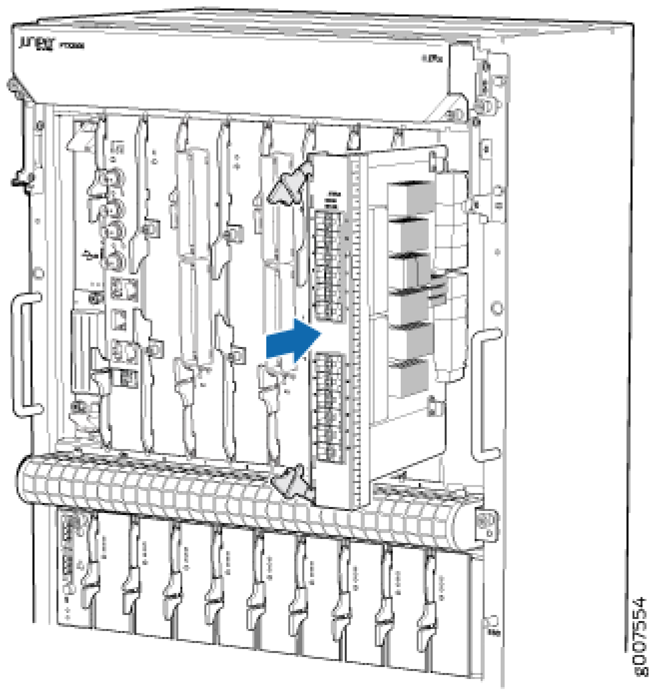


Figure 148: Connecting PIC Cables

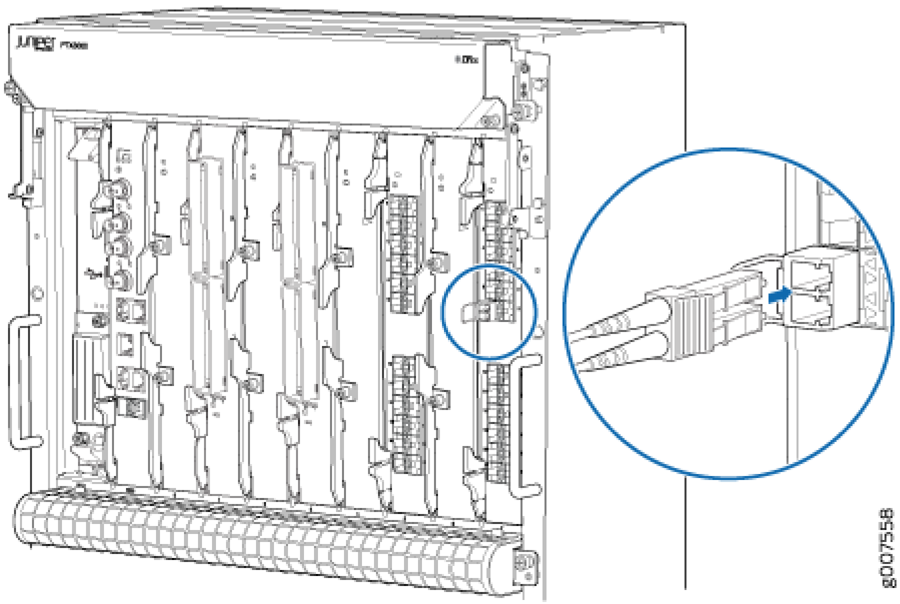


Figure 149: Arranging the PIC Cable in the Cable Management System

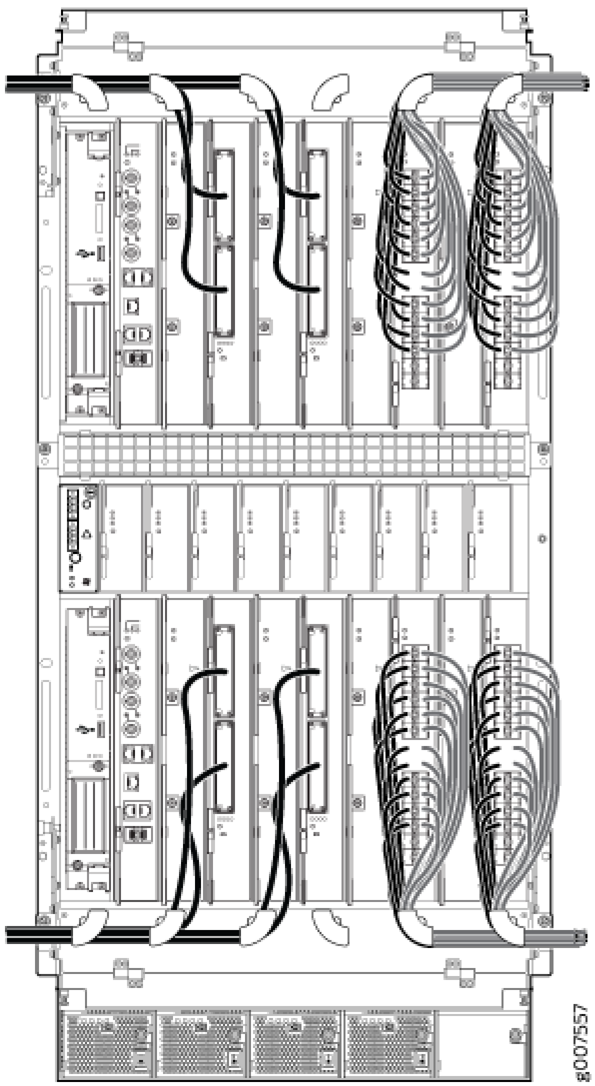


Figure 150: Upper Cable Management System

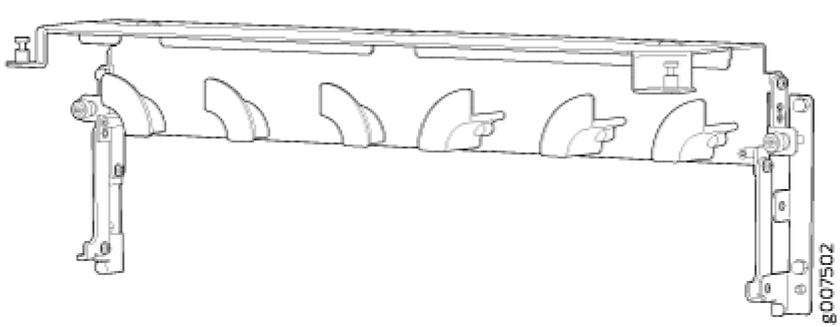
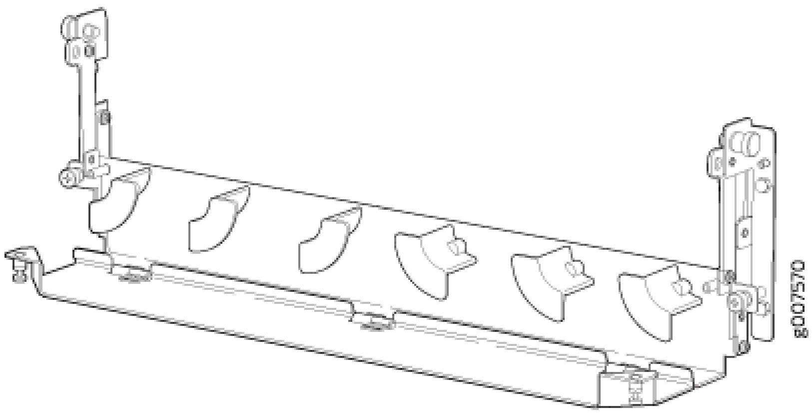


Figure 151: Lower Cable Management System



RELATED DOCUMENTATION

request chassis pic

show chassis fpc

Replacing a PTX3000 PIC Cable

IN THIS SECTION

Removing a PTX3000 PIC Cable

Removing and installing PIC cables does not affect PTX3000 function, except that a PIC does not receive or transmit data while its cable is disconnected. To remove a PIC cable:

1. Have ready a rubber safety cap for each cable and transceiver.
2. If removing all cables connected to the PIC, use one of the following methods to take the PIC offline:
   - Press the online/offline button on the faceplate of the PIC.

- Issue the following CLI command:

```
user@host> request chassis pic fpc-slot fpc-slot pic-slot 0 offline
```

NOTE: In the CLI, the *pic-slot* is represented as `0` regardless of the PIC slot number on the chassis. For *fpc-slot*, specify the FPC located to the left of the PIC you are removing. For example, specify *fpc-slot* `0` for the PIC in PIC slot **1**. For more information, see "PTX3000 PIC Description" on page 103.

3. Unplug the cable from the port. Immediately cover each transceiver and the end of each cable with a rubber safety cap.

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

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

4. Using a number 1 Phillips (+) screwdriver, loosen the two inner captive screws on the upper or lower cable management system.
5. Move the cover to access the cable management system.
   - For a PIC cable in the upper card cage, lift the upper cable management system cover up (Figure 12).
   - For a PIC cable in the lower card cage, lower the lower cable management system cover (Figure 13).
6. Remove the cable from the cable management system.

7. Detach the cable from the destination port.

Figure 152: Upper Cable Management System

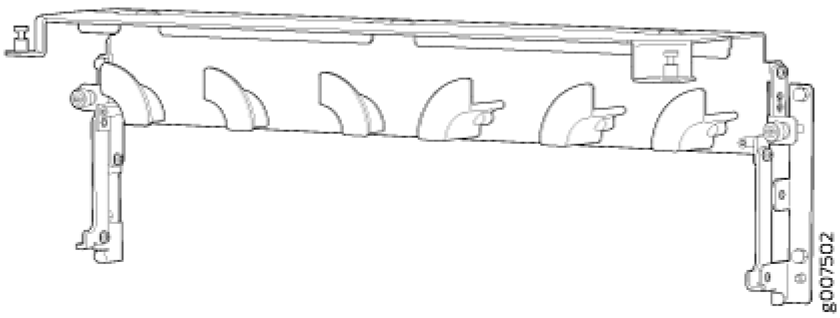
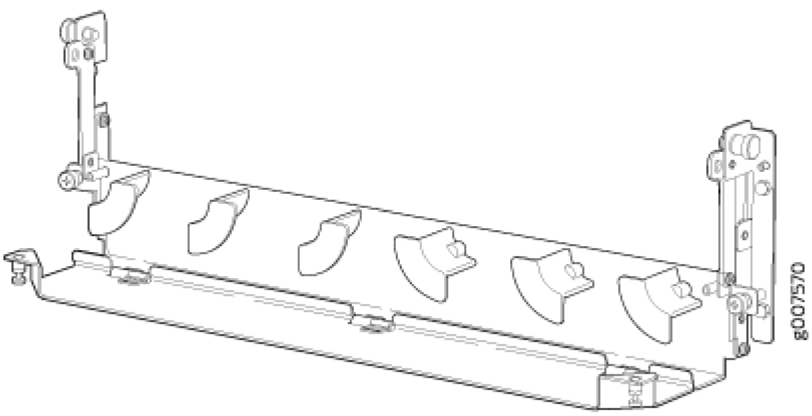


Figure 153: Lower Cable Management System



Installing a PTX3000 PIC Cable

To install a PIC cable (see Figure 154 on page 340):

1. Have ready a length of the type of cable used by the PIC. For cable specifications, see the PTX Series Interface Module Reference.
2. Remove the rubber safety plug from the PIC port.

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

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

3. Insert the cable connector into the cable connector port on the PIC faceplate.
4. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor.

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

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

5. Insert the other end of the cable into the destination port.
6. Repeat the previous steps for any additional cables.
7. Move the cover over the cable management system.
   - For a PIC in the upper card cage, lower the cover down over the upper cable management system (Figure 12).
   - For a PIC in the lower card cage, lift the cover up over the lower cable management system (Figure 13).
8. Using a number 1 Phillips (+) screwdriver, tighten the two inner captive screws to secure the cover to the cable management system.
9. If the PIC is offline (the **STATUS** LED is not lit steadily green), use one of the following methods to bring the PIC online:
   - Press the PIC offline/online button until the **STATUS** LED on the PIC faceplate is lit steadily green.
   - Issue the following CLI command:

```
user@host>request chassis pic fpc-slot fpc-slot pic-slot 0 online
```

NOTE: In the CLI, the *`pic-slot`* is represented as `0` regardless of the PIC slot number on the chassis. For *`fpc-slot`*, specify the FPC located to the left of the PIC to which you are connecting. For example, specify *fpc-slot* `0` for the PIC in PIC slot **1**. For more information, see "PTX3000 PIC Description" on page 103.

10. Verify that the PIC is functioning normally by issuing the following command.

```
user@host> show chassis fpc pic-status fpc-slot
```

Figure 154: Connecting PIC Cables

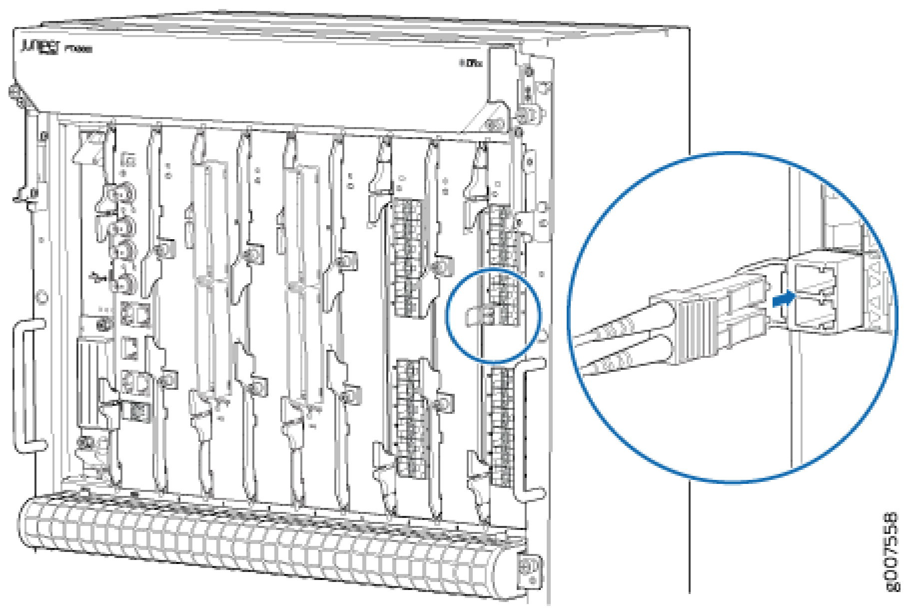
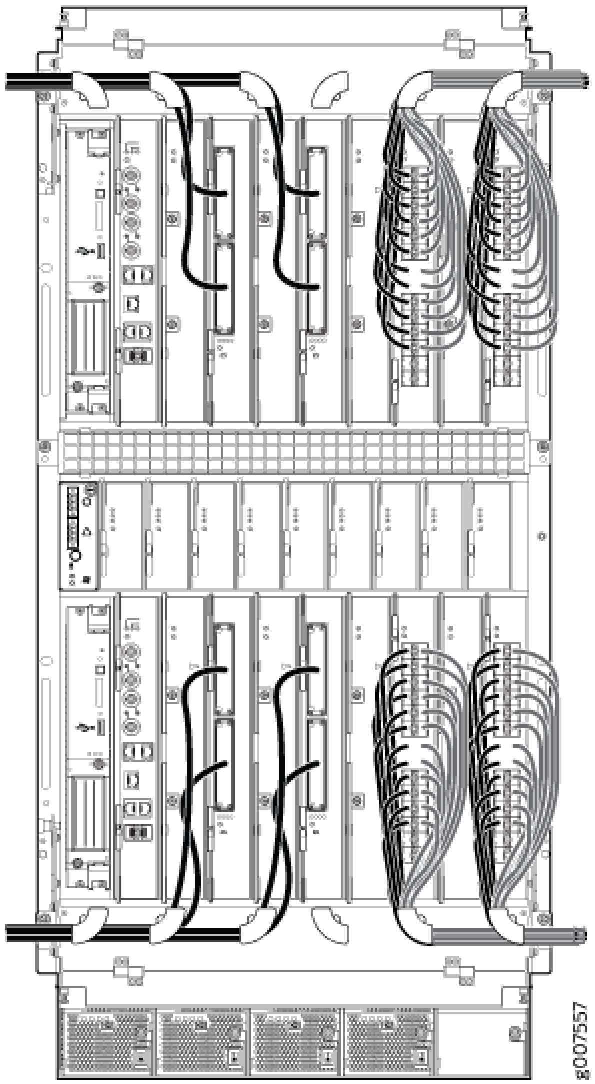


Figure 155: Arranging the PIC Cable in the Cable Management System



RELATED DOCUMENTATION

request chassis pic

show chassis fpc

Maintaining the PTX3000 IPLCs and IPLC Cables

IN THIS SECTION

Maintaining the PTX3000 IPLCs

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the IPLCs.

Action

On a regular basis:

- Check the **STATUS** LED on the IPLC. During normal operation, the green **STATUS** LED located at the top of the IPLC is lit steadily when the IPLC is online. The green **STATUS** LED blinks during startup.

  -

- Issue the `show chassis fpc` command to check the status of installed IPLCs. The value `Online` in the `State` column indicates that the IPLC is functioning normally.

- Issue the CLI `show chassis environment fpc` command to check the temperature and power of the installed IPLCs. In the displayed command output, the temperature values should be below the preconfigured thresholds. The power values provide Information about the voltage supplied to the IPLC. The left column displays the required power, in volts. The right column displays the measured power, in millivolts.

Maintaining the PTX3000 IPLC Cables

IN THIS SECTION

Purpose

For optimum performance, verify the condition of the cables.

Action

- Use the cable management system (shown in "PTX3000 Cable Management System" on page 22) to support cables and prevent cables from dislodging or developing stress points.
- Place excess cable out of the way in the cable management system. Do not allow fastened loops of cable to dangle from the connector or cable management system, because this stresses the cable at the fastening point. Putting fasteners on the loops helps to maintain their shape.
- Keep the cable connections clean and free of dust and other particles, which can cause drops in the received power level. Always inspect cables and clean them, if necessary, before connecting an interface.
- Label both ends of the cables to identify them.
- When you unplug a fiber-optic cable from a connector, always place a rubber safety plug on the end of the cable and make sure that the connector cover is closed.
- Anchor fiber-optic cable to avoid stress on the connectors. When attaching fiber-optic cables to a connector, be sure to secure the fiber so it does not support its own weight as it hangs to the floor. Never let fiber-optic cable hang free from the connector.
- Avoid bending fiber-optic cable beyond its bend radius. An arc smaller than a few inches can damage the cable and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cable into and out of optical instruments, such as analyzers, can cause damage to the instruments that is expensive to repair. Instead, 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 easy and inexpensive to replace.

- Keep fiber-optic cable connections clean. Small microdeposits of oil and dust in the canal of the transceiver or cable connector can cause loss of light, reducing signal power and thereby causing intermittent problems with the optical connection.

Replacing a PTX3000 IPLC

IN THIS SECTION

Removing a PTX3000 IPLC

The PTX3000 accommodates up to 16 integrated photonic line cards (IPLCs) (up to eight base module and eight expansion modules), which are installed vertically in the front of the chassis. An IPLC base module weighs 6.3 lb (2.85 kg) and an IPLC expansion module weighs 3.3 lb (1.49 kg). The IPLC base module and expansion module are installed in any of the FPC or PIC slots.

Each unoccupied FPC or PIC slot must be covered by a blank panel. A blank panel weighs 1.3 lb (0.6 kg).

To remove an IPLC:

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Use one of the following methods to take the IPLC offline:
    - Press and hold the **ON/OFF** button on the IPLC faceplate. The green **STATUS** LED begins to blink. Hold the button down (about 5 seconds) until the LED goes out.
    - Issue the following CLI command:

    ```
    user@host> request chassis fpc slot slot-number offline
    ```
4. Label the cables connected to the IPLC so that you can later reconnect each cable to the correct port.
5. Disconnect the cables from the IPLC. Immediately cover each end of each fiber-optic cable with a rubber safety cap.

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

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

6. Using a number 1 Phillips (+) screwdriver, loosen the two inner captive screws on the upper or lower cable management system.
7. Move the cover to access the cable management system.
   - For an IPLC in the upper card cage, lift the upper cable management system cover up (Figure 16).
   - For an IPLC in the lower card cage, lower the lower cable management system cover (Figure 17).
8. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points (Figure 19). Secure the cable so that it is does not support its own weight as it hangs to the floor.

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

9. Power off the IPLC. By default, an IPLC is configured to restart.

   To configure an IPLC to stay offline and prevent it from restarting, include the `power off` statement at the `[edit chassis fpc` *`slot-number`*`]` hierarchy level. For more information, see the *power* CLI reference documentation.
10. Verify that the **STATUS** LED on the IPLC faceplate is off.
11. Squeeze the ejector latches and open the ejector handles outward to unseat the IPLC. See Figure 18.
12. Grasp the handles and slide the IPLC straight out of the card cage halfway.
13. Place one hand around the front of the IPLC and the other hand under it to support it. Slide the IPLC completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.
14. If you are not reinstalling an IPLC into the emptied FPC or PIC slot within a short time, install a blank panel over the slot to maintain proper airflow in the FPC card cage or PIC slot.

CAUTION: After removing an IPLC from the chassis, wait at least 30 seconds before reinserting an IPLC in the same slot, removing an IPLC from a different slot, or inserting an IPLC into a different slot.

Figure 156: Upper Cable Management System

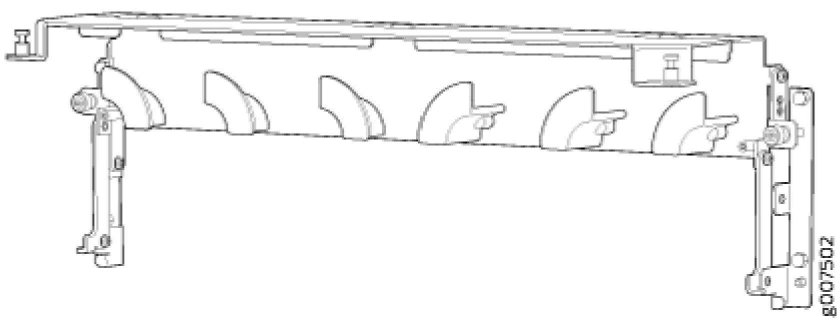


Figure 157: Lower Cable Management System

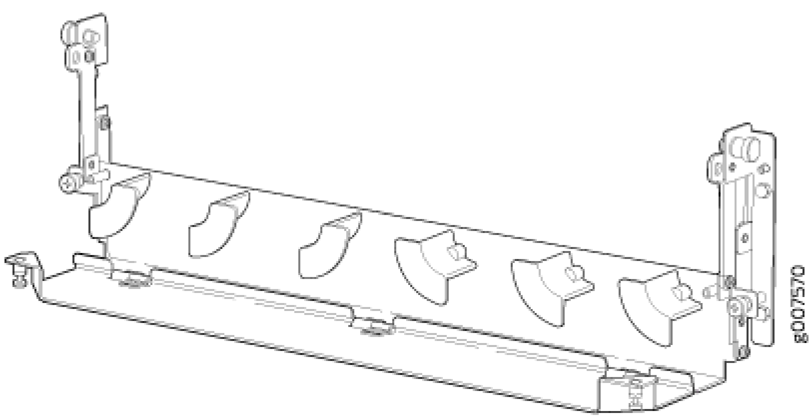


Figure 158: Removing an IPLC

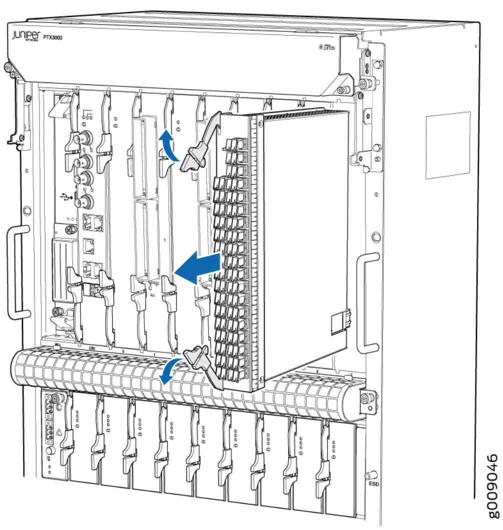
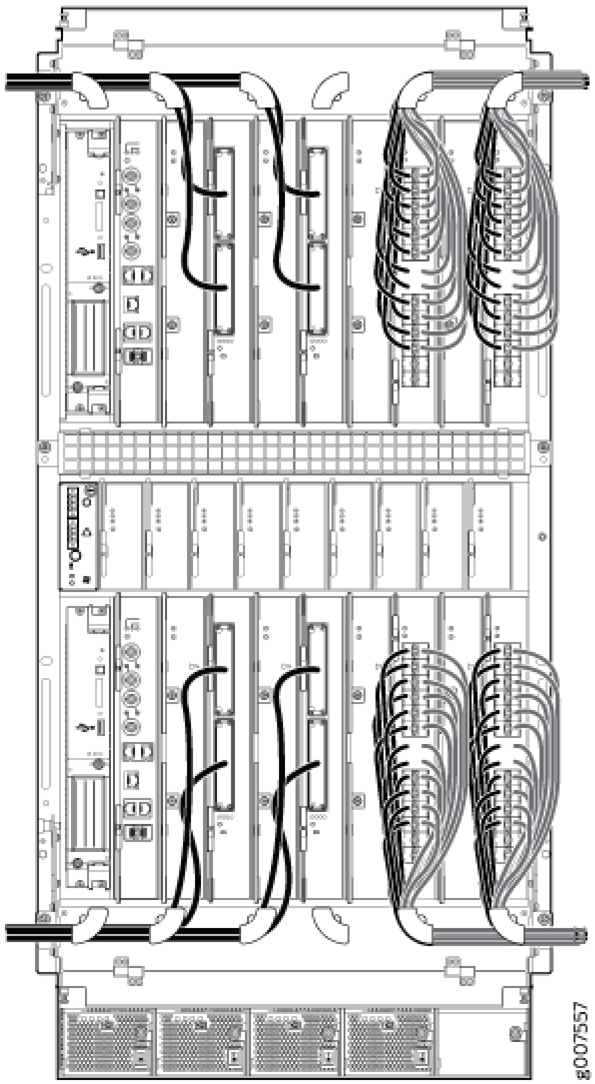


Figure 159: Arranging the Cables in the Cable Management System



> **NOTE**: The IPLC cables are arranged similar to the PIC cables shown in Figure 19.

Installing a PTX3000 IPLC

To install an IPLC (see Figure 160 on page 351):

1. To prevent damage to the equipment caused by static discharge, attach an ESD grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Place the IPLC on an antistatic mat.
3. Verify that there is a rubber safety cap over each fiber-optic connector on the faceplate.

4. Locate the FPC or PIC slot which you plan to install the IPLC. The IPLC is installed in any FPC or PIC slot.
5. Inspect the IPLC to verify that the connectors are not misaligned or damaged.
6. Orient the IPLC vertically with the circuit board on the left and the model number facing up.

> **CAUTION**: When the IPLC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.

7. Lift the IPLC into place and carefully align the bottom and top of the IPLC with the guides inside the card cage.
8. Slide the IPLC a few inches into the slot, and gently rest the bottom edge of the IPLC on the bottom edge of the slot opening.

> **CAUTION**: Take care not to bend or otherwise damage the power connector prongs.

9. Open the ejector holding the ejector handles apart, and slide the IPLC into the slot until you feel resistance. See Figure 160 on page 351.
10. Grasp the ejector handle and press it toward the IPLC to seat the IPLC. Press the handles toward each other to close it and hear the latches click.
11. Lift the cap from the connector and remove the rubber safety cap from each end of each fiber-optic cable.

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

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

12. If you are reinstalling an IPLC, using the cable labels, reconnect the cables to the correct port on the IPLC (see Figure 161 on page 351). If you are installing for the first time, then connect the cables to the ports on the IPLC.

13. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points (Figure 19). Secure the cable so that it does not support its own weight as it hangs to the floor.

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

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

14. Move the cover over the cable management system.

    - For an IPLC in the upper card cage, lower the cover down over the upper cable management system (Figure 163 on page 353).

    - For an IPLC in the lower card cage, lift the cover up over the lower cable management system (Figure 164 on page 353

15. Using a number 1 Phillips (+) screwdriver, tighten the two inner captive screws to secure the cover to the cable management system.

16. Power on the IPLC. Include the `power on` statement at the [`edit chassis fpc` *`slot-number`*] hierarchy level.

```
user@host# set chassis fpc slot-number power on
```

    For more information, see the *power* CLI reference documentation.

17. Verify that the **STATUS** LED is lit steadily green.

CAUTION: After the **STATUS** LED is lit steadily, wait at least 30 seconds before removing the IPLC again, removing an IPLC from a different slot, or inserting an IPLC in a different slot.

Figure 160: Installing an IPLC

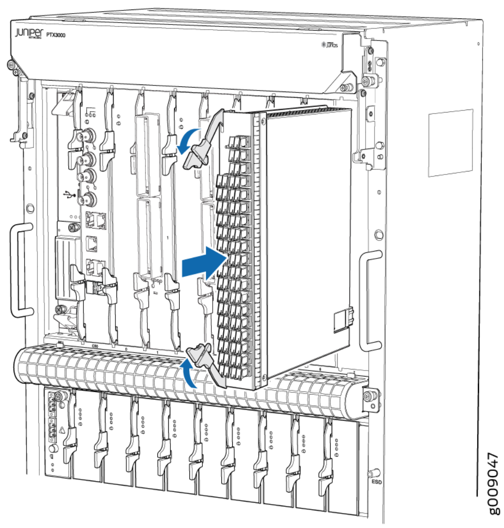


Figure 161: Installing an IPLC Cable with LC Connectors

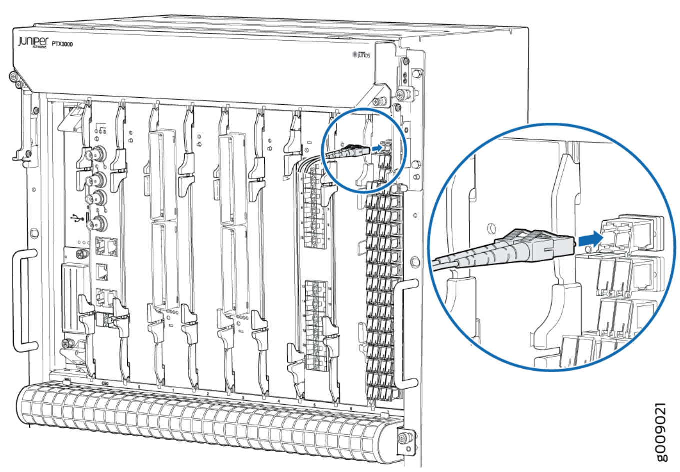
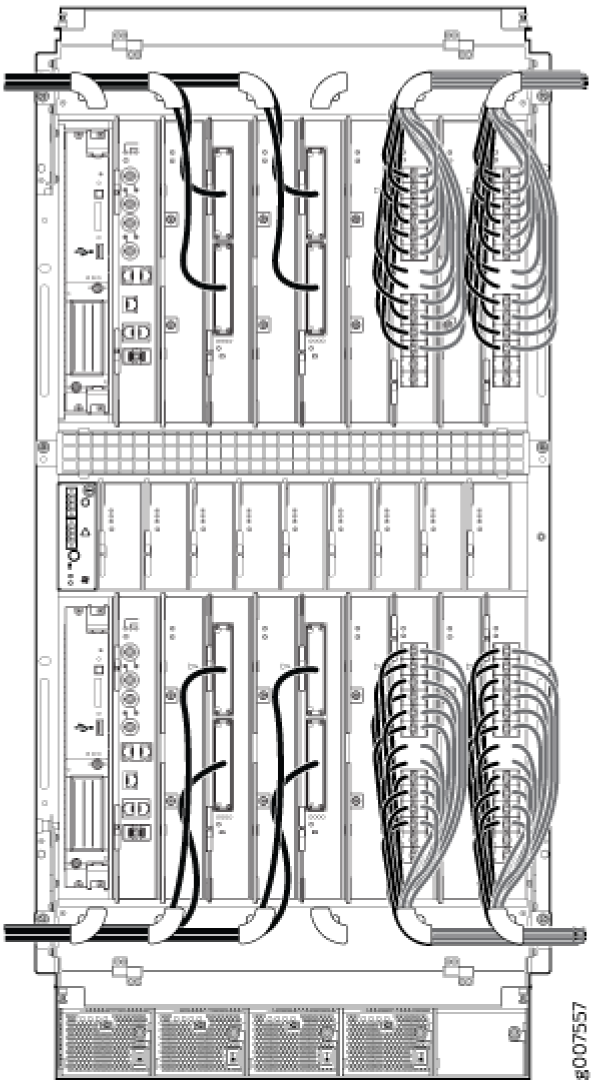


Figure 162: Arranging the Cables in the Cable Management System



The IPLC cables are arranged similar to the PIC cables shown in Figure 162 on page 352.

Figure 163: Upper Cable Management System

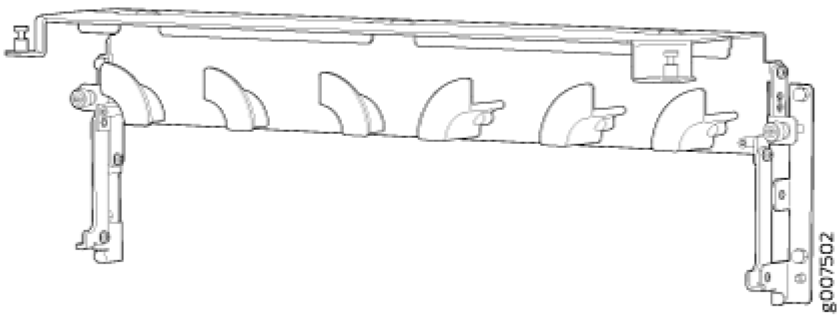
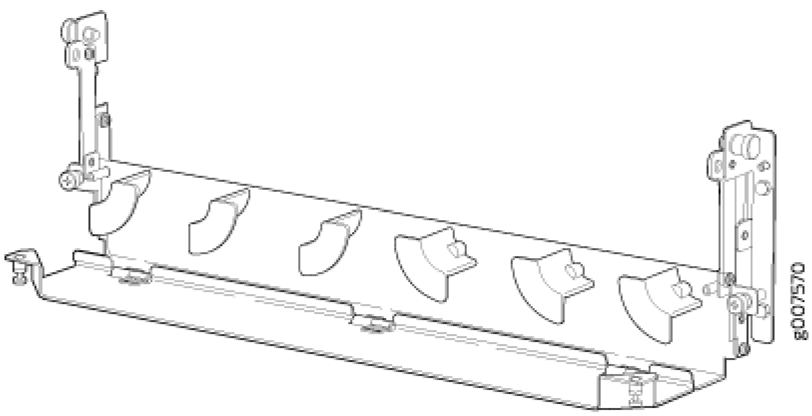


Figure 164: Lower Cable Management System



You can also verify correct IPLC functioning by issuing the `show chassis fpc` commands, as described in "Maintaining the PTX3000 IPLCs and IPLC Cables" on page 342.

RELATED DOCUMENTATION

request chassis fpc

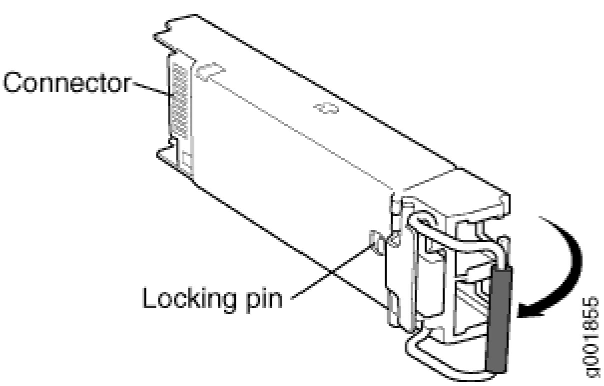
Replacing a PTX3000 PIC SFP+, QSFP+, or QSFP28 Transceiver

IN THIS SECTION

Removing a PTX3000 PIC SFP+, QSFP+, or QSFP28 Transceiver

Small form-factor pluggable plus (SFP+), quad SFP+ (QSFP+), and 4 x 28-Gbps QSFP (QSFP28) transceivers are transceivers that can be supported by a PTX3000 PIC. The pluggable transceivers are hot-insertable and hot-removable. Removing an pluggable transceiver does not interrupt PIC functioning, but the removed transceiver no longer receives or transmits data. Figure 25 shows an example of a pluggable transceiver.

Figure 165: Small Form-Factor Pluggable Plus (SFP+) Transceiver



To remove a pluggable transceiver:

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

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

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

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

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

6. Unsrew the screws on the CFP transceiver. Pull the transceiver out of the PIC and place it on the antistatic mat or in the electrostatic bag.

Installing a PTX3000 PIC SFP+, QSFP+, or QSFP28 Transceiver

To install a replacement pluggable transceiver:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Verify that a rubber safety cap covers the transceiver, installing one if necessary.
3. Orient the transceiver over the port in the PIC so that the connector end will enter the slot first and the transceiver connector faces the appropriate direction.
4. Slide the transceiver into the slot. If there is resistance, remove the transceiver and flip it so that the connector faces the other direction.
5. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

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

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

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

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

7. Verify that any status LEDs on the PIC faceplate indicate that the PIC is functioning correctly. For more information about the PIC LEDs, see the PTX Series Interface Module Reference. You can also verify PIC functioning by issuing the `show chassis fpc pic-status` command.

Replacing a PTX3000 PIC CFP Transceiver

IN THIS SECTION

Removing a PTX3000 PIC CFP Transceiver

C form-factor pluggable (CFP) transceivers are hot-insertable and hot-removable. Removing a transceiver does not interrupt PIC functioning, but the removed transceiver no longer receives or transmits data.

To remove a CFP transceiver (see Figure 26):

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

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

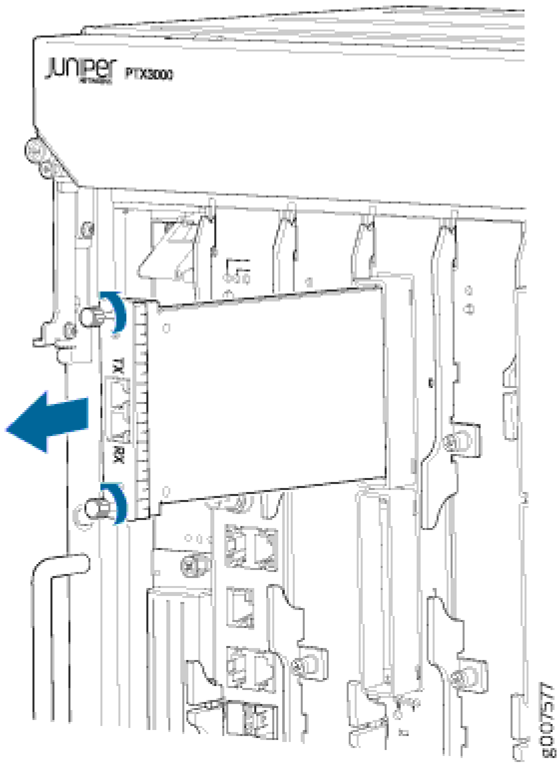
   CAUTION: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.

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

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

6. Unscrew the screws from the CFP transceiver faceplate to unseat the CFP transceiver from the PIC. Pull the CFP transceiver out of the PIC and place it on the antistatic mat or in the electrostatic bag.

Figure 166: Removing a CFP Transceiver from a PIC



Installing a PTX3000 PIC CFP Transceiver

To install a replacement CFP transceiver (see Figure 27):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Verify that a rubber safety cap covers the CFP transceiver, installing one if necessary.
3. Orient the CFP over the port in the PIC so that the connector end will enter the slot first and the CFP connector faces the appropriate direction.
4. Slide the CFP into the slot. If there is resistance, remove the CFP and flip it so that the connector faces the other direction.
5. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

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

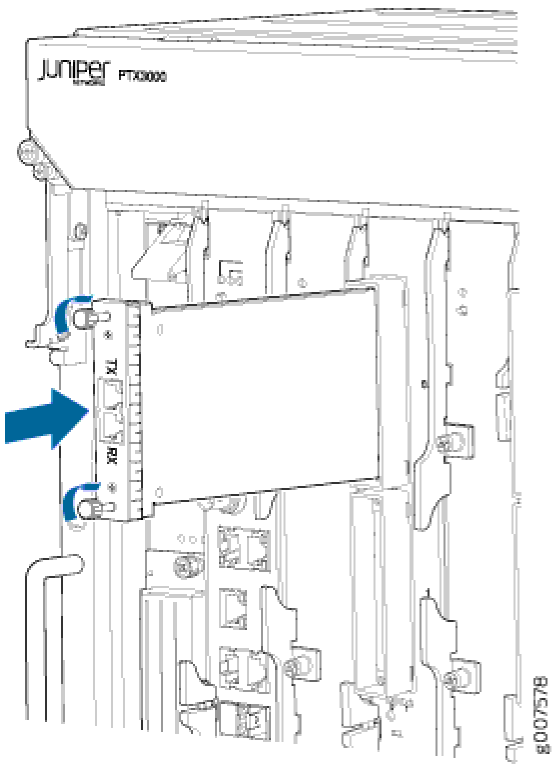
6. Arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor.

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

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

7. Verify that any status LEDs on the PIC faceplate indicate that the CFP is functioning correctly. For more information about the PIC LEDs, see the PTX Series Interface Module Reference. You can also verify PIC functioning by issuing the `show chassis fpc pic-status` command.

Figure 167: Installing a CFP in a PIC



RELATED DOCUMENTATION

PTX3000 FPC Description | 92

PTX3000 PIC Description | 103

PTX3000 IPLC Description | 115

Troubleshooting the PTX3000 FPCs | 409

Troubleshooting the PTX3000 PICs and PIC Cables | 414

Troubleshooting the PTX3000 IPLCs | 415

Prevention of Electrostatic Discharge Damage

5

CHAPTER

Troubleshooting Hardware

Troubleshooting the PTX3000

IN THIS SECTION

PTX3000 Troubleshooting Resources Overview

To troubleshoot a PTX3000, you use the Junos OS CLI, alarms, devices connected to the alarm relay contacts, and LEDs on both the components and craft interface.

- LEDs—When the Routing Engine detects an alarm condition, it lights the red or yellow alarm LED on the craft interface as appropriate. In addition, you can also use LEDs on the faceplate of a component and the **FANTRAY** LEDs on the craft interface to troubleshoot the PTX3000.

- Alarm devices connected to the alarm relay contact—When a red or yellow alarm occurs, it trips the corresponding alarm relay contact.

- CLI—The CLI is the primary tool for controlling and troubleshooting hardware, Junos OS, routing protocols, and network connectivity. CLI commands display information from routing tables, information specific to routing protocols, and information about network connectivity derived from the ping and traceroute utilities. For information about using the CLI to troubleshoot Junos OS, see the appropriate Junos OS configuration guide.

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

PTX3000 LED Overview

IN THIS SECTION

Craft Interface LEDs

The craft interface displays system status messages and enables you to troubleshoot the PTX3000. See "PTX3000 Craft Interface LEDs" on page 26.

LEDs on the craft interface include:

- Red (major) and yellow (minor) alarm LEDs—One large red circular LED and one large yellow triangular LED indicate two levels of alarm conditions. You can determine the cause of the alarm condition by looking at the `show chassis alarms` command.

- **FANTRAY** LEDs—One bicolor green and red LED for each fan tray labeled **0** and **1** that indicates the status of each fan tray.

Component LEDs

The following LEDs are located on various PTX3000 components and display the status of those components:

- Control Board LEDs—Three LEDs on each Control Board faceplate—**ACTIVE**, **OK**, and **FAIL**— indicate the status of that Control Board. Two port LEDs—**HOST/ETHERNET** and **ACT**—indicate the port speed and status. **LNK** LEDs indicate the status of the clocking ports—**BITS A** and **BITS B**.

  See "PTX3000 Control Board LEDs" on page 65.

- FPC LEDs—Each FPC has a **STATUS** LED that indicate the status of that FPC.
- PIC LEDs—Each port on each PIC has an LED that indicates the status of the port.

  See the PTX Series Interface Module Reference.

- PSM LEDs—Four LEDs on each PSM faceplate—Input
  (
) **1**, input
  (
) **2**, **OK**, and fault
  (
  ⚠
)— indicate the status of that PSM.

  See "PTX3000 Power Supply Module LEDs" on page 43 .

- SIB LEDs—Three LEDs on each SIB faceplate—**ACTIVE**, **OK**, and **FAIL**—indicate the status of that SIB.

  See "PTX3000 Switch Interface Board LEDs" on page 89.

PTX3000 Alarm Messages Overview

When the Routing Engine detects an alarm condition, it lights the red or yellow alarm LED on the craft interface as appropriate and trips the corresponding alarm relay contact. To view a more detailed description of the alarm cause, issue the `show chassis alarms` CLI command:

```
user@host> show chassis alarms
9 alarms currently active
Alarm time               Class  Description
2013-05-07 13:45:08 PDT  Minor  FPC 12 SIB Link Error
2013-05-07 13:45:07 PDT  Minor  FPC 8 SIB Link Error
2013-05-07 13:45:06 PDT  Minor  FPC 6 SIB Link Error
2013-05-07 13:45:05 PDT  Minor  FPC 10 SIB Link Error
2013-05-07 13:45:04 PDT  Minor  FPC 2 SIB Link Error
2013-05-07 13:45:03 PDT  Minor  FPC 0 SIB Link Error
2013-05-07 13:45:02 PDT  Minor  FPC 4 SIB Link Error
2013-05-07 13:45:01 PDT  Minor  FPC 14 SIB Link Error
2013-05-07 13:35:17 PDT  Minor  Host 1 Boot from alternate media
```

Chassis alarm messages indicate a problem with a chassis component such as the cooling system or power supplies.

SEE ALSO

System-Wide Alarms and Alarms for Each Interface Type

Troubleshooting the PTX3000 Cooling System

IN THIS SECTION

Troubleshooting the PTX3000 Fan Trays

IN THIS SECTION

Problem

Description

The following alarms and LEDs indicate a problem with the fan trays:

- An alarm indicates that a fan failed or a fan tray is missing.
- An LED for a fan tray on the craft interface is lit red.

In Table 1, the text in the CLI Message column appears in the output of the `show chassis alarms` command.

Table 56: Fan Tray Alarms

Alarm Type	CLI Message	Alarm Condition	Recovery
Red	*fan-name* `Failure`	A fan has failed.	Replace the fan tray.
	`Too many fans missing or failing`	A fan tray is missing or too many fan trays have failed.	Reinstall the fan tray in the chassis.
Yellow	*fan-name* `Removed`	A fan tray has been removed.	Reinstall the fan tray in the chassis.

Solution

To troubleshoot the fan trays:

1. Find the source of the problem by looking at the display on the craft interface. The number of alarm conditions, as well as the source of each alarm, appears on the screen.

2. Issue the `show chassis alarms` command to get information about the source of an alarm condition:

   ```
   user@host> show chassis alarms
   ```

3. If the craft interface display lists only one failed fan and the other fans are functioning normally, the fan is probably faulty and you need to replace the failed fan tray.

4. Place your hand near the exhaust vents at the rear of the chassis to determine whether the fans are pushing air out of the chassis.

   - Zone 0: The air exhausts from the top rear of the chassis.
   - Zone 1: The exhaust vent is located at the bottom rear of the chassis.
   - Power system: The air exhausts from the rear of the power supply modules (PSMs).

5. Use the `show chassis environment fan` command to verify that the status of each fan is `OK`.

NOTE: `Fan Tray 0` and `Fan Tray 1` in the command output cool zone 0 and zone 1, respectively.

```
user@host> show chassis environment fan

      Fan Tray 0 status:
  FTC I2CS Voltage:
    12.0 V                     12180
    3.3 V                       3280
    1.2 V                       1210
  FTC I2CS temperature       30 degrees C / 86 degrees F
Fan Tray 1 status:
  FTC I2CS Voltage:
    12.0 V                     12180
    3.3 V                       3308
    1.2 V                       1214
  FTC I2CS temperature       29 degrees C / 84 degrees F
```

6. Use the `show chassis zones` command to verify the status of each cooling zone.

```
user@host> show chassis zones

ZONE 0 Status
    Driving FRU                 FPC 2 TL0
    Temperature                 73 degrees C / 163 degrees F
    Condition                   OK
    Num Fans Missing            0
    Num Fans Failed             0
    Fan Duty Cycle              0

ZONE 1 Status
    Driving FRU                 SIB 8 TF
    Temperature                 76 degrees C / 168 degrees F
    Condition                   WARM TEMP
    Num Fans Missing            0
    Num Fans Failed             0
    Fan Duty Cycle              0
```

7. Use the `show chassis zones detail` command to verify the status of each component in cooling zone 0 and cooling zone 1.

```
user@host> show chassis zones detail

ZONE 0 Status
Item                   Status                Measurement
CB 0                   OK
Routing Engine 0       OK
FPC 0                  Absent
FPC 2                  OK
PIC                    Absent
FPC 4                  OK
PIC                    OK
FPC 6                  OK
Fan Tray 0             OK                    Spinning at 40% fan tray speed

ZONE 1 Status
Item                   Status                Measurement
CB 1                   OK
Routing Engine 1       OK
SIB 0                  OK
SIB 1                  OK
SIB 2                  OK
SIB 3                  OK
SIB 4                  OK
SIB 5                  Absent
SIB 6                  Absent
SIB 7                  OK
SIB 8                  WARM TEMP
FPC 8                  OK
PIC                    Absent
FPC 10                 Offline
FPC 12                 OK
PIC                    Absent
FPC 14                 OK
PIC                    Absent
Fan Tray 1             OK                    Spinning at 40% fan tray speed
```

SEE ALSO

PTX3000 Craft Interface LEDs | 26

Troubleshooting Temperature Alarms

IN THIS SECTION

Problem

Description

Yellow (minor) and red (major) alarms indicate that the temperature for a router component exceeds the preconfigured `temperature warm` or `temperature hot` threshold. When the temperature of a component exceeds the preconfigured maximum `Fire Shutdown` threshold, the PTX3000 is powered off immediately.

In Table 57 on page 369, the text in the CLI Message column appears in the output of the `show chassis alarms` command.

Table 57: Temperature Alarms

Alarm Type	CLI Message	Alarm Condition	Recovery
Red	`Temperature sensor failure`	A temperature sensor failed.	Contact JTAC.
	`cb-number` `Temperature Hot`	The Control Board temperature exceeded the hot temperature threshold. If this condition persists, the Control Board shuts down.	• Issue the `show chassis environment cb` *`slot-number`* command.

Table 57: Temperature Alarms *(Continued)*

Alarm Type	CLI Message	Alarm Condition	Recovery
	`FPC` *`FPC-number`* `PIC` *`PIC-number`* `Temperature Hot`	The FPC temperature exceeded the hot temperature threshold. If this condition persists, the FPC shuts down.	• Issue the `show chassis fpc` command. • Verify that the room temperature is within acceptable limits. • Verify that there is sufficient airflow. • Verify that the cooling system in the chassis is operating properly.
	`sib-number` `Temperature Hot`	The SIB temperature exceeded the hot temperature threshold. If this condition persists, the SIB shuts down.	• Issue the `show chassis sib` command. • Verify that the room temperature is within acceptable limits. • Verify that there is sufficient airflow. • Verify that the cooling system in the chassis is operating properly.
Yellow	*`cb-number`* `Temperature Warm`	The Control Board temperature exceeded the warm temperature threshold.	• Issue the `show chassis environment cb` *`slot-number`* command. • Verify that the fans have not failed. • Verify that fans are running at appropriate speed. • Issue the `show chassis routing-engine` command.
	`sib-number` `Temperature Warm`	The SIB temperature exceeded the warm temperature threshold.	• Verify that the fans have not failed. • Verify that fans are running at appropriate speed. • Issue the `show chassis sib` command. • Verify that there is sufficient airflow to the fan trays.

Table 57: Temperature Alarms *(Continued)*

Alarm Type	CLI Message	Alarm Condition	Recovery
	`FPC` *`FPC-number`* `PIC` *`PIC-number`* `Temperature Warm`	The FPC temperature exceeded the warm temperature threshold.	• Verify that the fans have not failed. • Verify that fans are running at the appropriate speed. • Issue the `show chassis fpc` command

Solution

To troubleshoot temperature alarms:

1. Find the source of the problem. Issue the `show chassis alarms` command to get information about the source of an alarm condition:

```
user@host> show chassis alarms
```

2. Verify that there is sufficient airflow. See "PTX3000 Clearance Requirements for Airflow and Hardware Maintenance" on page 135 and "Maintaining PTX3000 Cooling System Components" on page 241.

   Place your hand near the exhaust vents at the rear of the chassis to determine whether the fans are pushing air out of the chassis.

   - Zone 0: The air exhausts from the top rear of the SIBs.
   - Zone 1: The exhaust vent is located at the bottom rear of the chassis.
   - Power system: The air exhausts from the power supply modules (PSMs).

3. Verify that the cooling system in the chassis is operating properly. See "Troubleshooting the PTX3000 Cooling System" on page 365.

4. Verify that the room temperature is within acceptable limits. Use the `show chassis temperature-thresholds` to show the temperature thresholds for various components.

NOTE: `Exhaust A` and `Exhaust B` correspond to temperature sensors located on the Control Boards.

```
user@host> show chassis temperature-thresholds

                          Fan speed      Yellow alarm      Red alarm      Fire Shutdown
                         (degrees C)      (degrees C)     (degrees C)      (degrees C)
Item                     Normal  High   Normal  Bad fan   Normal  Bad fan     Normal
Routing Engine 0           70     75      90       87      102       97        115
CB 0 Exhaust A             60     65      78       75       85       80         95
CB 0 Exhaust B             60     65      78       75       85       80         95
CB 1 Exhaust A             60     65      78       75       85       80         95
CB 1 Exhaust B             60     65      78       75       85       80         95
```

5. Check the temperature of components that are monitored for temperature alarms by issuing the `show chassis environment monitored` command. For more information about temperature alarms, see Table 57 on page 369.

   Verify that the status of each component is `OK`.

   The output is similar to the following:

```
user@host> show chassis environment monitored

Class Item                           Status     Measurement
      Routing Engine 0 CPU           OK         60 degrees C / 140 degrees F
      Routing Engine 1 CPU           OK         57 degrees C / 134 degrees F
      CB 0 Exhaust A                 OK         26 degrees C / 78 degrees F
      CB 0 Exhaust B                 OK         27 degrees C / 80 degrees F
      CB 1 Exhaust A                 OK         28 degrees C / 82 degrees F
      CB 1 Exhaust B                 OK         32 degrees C / 89 degrees F
      SIB 0 Exhaust                  OK         41 degrees C / 105 degrees F
      SIB 0 TF                       OK         50 degrees C / 122 degrees F
      SIB 1 Exhaust                  OK         42 degrees C / 107 degrees F
      SIB 1 TF                       OK         49 degrees C / 120 degrees F
      SIB 2 Exhaust                  OK         42 degrees C / 107 degrees F
      SIB 2 TF                       OK         50 degrees C / 122 degrees F
      SIB 3 Exhaust                  OK         41 degrees C / 105 degrees F
      SIB 3 TF                       OK         53 degrees C / 127 degrees F
      SIB 4 Exhaust                  OK         34 degrees C / 93 degrees F
```

```
      SIB 4 TF                       OK          42 degrees C / 107 degrees F
      SIB 7 Exhaust                  OK          50 degrees C / 122 degrees F
      SIB 7 TF                       OK          68 degrees C / 154 degrees F
      SIB 8 Exhaust                  OK          61 degrees C / 141 degrees F
      SIB 8 TF                       OK          75 degrees C / 167 degrees F
      FPC 2 Exhaust                  OK          40 degrees C / 104 degrees F
      FPC 2 Intake                   OK          39 degrees C / 102 degrees F
      FPC 2 TL0                      OK          73 degrees C / 163 degrees F
      FPC 2 TQ0                      OK          66 degrees C / 150 degrees F
      FPC 2 TL1                      OK          58 degrees C / 136 degrees F
      FPC 2 TQ1                      OK          50 degrees C / 122 degrees F
      FPC 4 Exhaust                  OK          36 degrees C / 96 degrees F
      FPC 4 Intake                   OK          43 degrees C / 109 degrees F
      FPC 4 TL0                      OK          58 degrees C / 136 degrees F
      FPC 4 TQ0                      OK          54 degrees C / 129 degrees F
      FPC 4 TL1                      OK          58 degrees C / 136 degrees F
      FPC 4 TQ1                      OK          50 degrees C / 122 degrees F
      FPC 8 Intake                   OK          44 degrees C / 111 degrees F
      FPC 8 Exhaust                  OK          47 degrees C / 116 degrees F
      FPC 8 TL0                      OK          70 degrees C / 158 degrees F
      FPC 8 TQ0                      OK          60 degrees C / 140 degrees F
      FPC 8 TL1                      OK          74 degrees C / 165 degrees F
      FPC 8 TQ1                      OK          63 degrees C / 145 degrees F
      FPC 12 Intake                  OK          30 degrees C / 86 degrees F
      FPC 12 Exhaust                 OK          48 degrees C / 118 degrees F
      FPC 12 TL0                     OK          47 degrees C / 116 degrees F
      FPC 12 TQ0                     OK          56 degrees C / 132 degrees F
      FPC 12 TL1                     OK          57 degrees C / 134 degrees F
      FPC 12 TQ1                     OK          60 degrees C / 140 degrees F
      FPC 14 Intake                  OK          42 degrees C / 107 degrees F
      FPC 14 Exhaust                 OK          51 degrees C / 123 degrees F
      FPC 14 TL0                     OK          61 degrees C / 141 degrees F
      FPC 14 TQ0                     OK          57 degrees C / 134 degrees F
      FPC 14 TL1                     OK          51 degrees C / 123 degrees F
      FPC 14 TQ1                     OK          48 degrees C / 118 degrees F
```

```
user@host> show chassis environment monitored

Class Item                           Status      Measurement
      Routing Engine 0               OK          52 degrees C / 125 degrees F
      Routing Engine 0 CPU           OK          51 degrees C / 123 degrees F
```

```
    Routing Engine 1              OK         46 degrees C / 114 degrees F
    Routing Engine 1 CPU          OK         50 degrees C / 122 degrees F
    CB 0 Intake                   OK         45 degrees C / 113 degrees F
    CB 0 Exhaust                  OK         33 degrees C / 91 degrees F
    CB 1 Intake                   OK         39 degrees C / 102 degrees F
    CB 1 Exhaust                  OK         35 degrees C / 95 degrees F
    SIB 0 TMP75                   OK         51 degrees C / 123 degrees F
    SIB 0 PF                      OK         55 degrees C / 131 degrees F
    SIB 1 TMP75                   OK         60 degrees C / 140 degrees F
    SIB 1 PF                      OK         63 degrees C / 145 degrees F
    SIB 2 TMP75                   OK         56 degrees C / 132 degrees F
    SIB 2 PF                      OK         57 degrees C / 134 degrees F
    SIB 3 TMP75                   OK         53 degrees C / 127 degrees F
    SIB 3 PF                      OK         54 degrees C / 129 degrees F
    SIB 4 TMP75                   OK         53 degrees C / 127 degrees F
    SIB 4 PF                      OK         52 degrees C / 125 degrees F
    SIB 5 TMP75                   OK         55 degrees C / 131 degrees F
    SIB 5 PF                      OK         56 degrees C / 132 degrees F
    SIB 6 TMP75                   OK         63 degrees C / 145 degrees F
    SIB 6 PF                      OK         69 degrees C / 156 degrees F
    SIB 7 TMP75                   OK         68 degrees C / 154 degrees F
    SIB 7 PF                      OK         77 degrees C / 170 degrees F
    SIB 8 TMP75                   OK         62 degrees C / 143 degrees F
    SIB 8 PF                      OK         66 degrees C / 150 degrees F
    FPC 4 Exhaust                 OK         64 degrees C / 147 degrees F
    FPC 4 PE0                     OK         71 degrees C / 159 degrees F
    FPC 4 PE1                     OK         75 degrees C / 167 degrees F
    FPC 4 PFE0-HMC0-DIE           OK         65 degrees C / 149 degrees F
    FPC 4 PFE0-HMC0-TOP           OK         64 degrees C / 147 degrees F
    FPC 4 PFE0-HMC0-BOT           OK         68 degrees C / 154 degrees F
    FPC 4 PFE0-HMC1-DIE           OK         69 degrees C / 156 degrees F
    FPC 4 PFE0-HMC1-TOP           OK         66 degrees C / 150 degrees F
    FPC 4 PFE0-HMC1-BOT           OK         68 degrees C / 154 degrees F
    FPC 4 PFE0-HMC2-DIE           OK         71 degrees C / 159 degrees F
    FPC 4 PFE0-HMC2-TOP           OK         68 degrees C / 154 degrees F
    FPC 4 PFE0-HMC2-BOT           OK         72 degrees C / 161 degrees F
    FPC 4 PFE1-HMC0-DIE           OK         76 degrees C / 168 degrees F
    FPC 4 PFE1-HMC0-TOP           OK         73 degrees C / 163 degrees F
    FPC 4 PFE1-HMC0-BOT           OK         78 degrees C / 172 degrees F
    FPC 4 PFE1-HMC1-DIE           OK         75 degrees C / 167 degrees F
    FPC 4 PFE1-HMC1-TOP           OK         74 degrees C / 165 degrees F
    FPC 4 PFE1-HMC1-BOT           OK         77 degrees C / 170 degrees F
    FPC 4 PFE1-HMC2-DIE           OK         76 degrees C / 168 degrees F
```

```
FPC 4 PFE1-HMC2-TOP              OK          74 degrees C / 165 degrees F
FPC 4 PFE1-HMC2-BOT              OK          80 degrees C / 176 degrees F
PIC Ambient                      OK          43 degrees C / 109 degrees F
PIC Framer ASIC0                 OK          42 degrees C / 107 degrees F
PIC Framer ASIC1                 OK          46 degrees C / 114 degrees F
PIC Framer ASIC2                 OK          50 degrees C / 122 degrees F
PIC Framer ASIC3                 OK          49 degrees C / 120 degrees F
FPC 12 Exhaust                   OK          50 degrees C / 122 degrees F
FPC 12 PE0                       OK          73 degrees C / 163 degrees F
FPC 12 PE1                       OK          63 degrees C / 145 degrees F
FPC 12 PFE0-HMC0-DIE             OK          74 degrees C / 165 degrees F
FPC 12 PFE0-HMC0-TOP             OK          79 degrees C / 174 degrees F
FPC 12 PFE0-HMC0-BOT             OK          79 degrees C / 174 degrees F
FPC 12 PFE0-HMC1-DIE             OK          73 degrees C / 163 degrees F
FPC 12 PFE0-HMC1-TOP             OK          74 degrees C / 165 degrees F
FPC 12 PFE0-HMC1-BOT             OK          76 degrees C / 168 degrees F
FPC 12 PFE0-HMC2-DIE             OK          70 degrees C / 158 degrees F
FPC 12 PFE0-HMC2-TOP             OK          66 degrees C / 150 degrees F
FPC 12 PFE0-HMC2-BOT             OK          71 degrees C / 159 degrees F
FPC 12 PFE1-HMC0-DIE             OK          59 degrees C / 138 degrees F
FPC 12 PFE1-HMC0-TOP             OK          62 degrees C / 143 degrees F
FPC 12 PFE1-HMC0-BOT             OK          66 degrees C / 150 degrees F
FPC 12 PFE1-HMC1-DIE             OK          53 degrees C / 127 degrees F
FPC 12 PFE1-HMC1-TOP             OK          54 degrees C / 129 degrees F
FPC 12 PFE1-HMC1-BOT             OK          54 degrees C / 129 degrees F
FPC 12 PFE1-HMC2-DIE             OK          57 degrees C / 134 degrees F
FPC 12 PFE1-HMC2-TOP             OK          57 degrees C / 134 degrees F
FPC 12 PFE1-HMC2-BOT             OK          62 degrees C / 143 degrees F
PIC Ambient                      OK          54 degrees C / 129 degrees F
PIC Framer ASIC0                 OK          60 degrees C / 140 degrees F
PIC Framer ASIC1                 OK          53 degrees C / 127 degrees F
PIC Framer ASIC2                 OK          42 degrees C / 107 degrees F
PIC Framer ASIC3                 OK          40 degrees C / 104 degrees F
```

NOTE: `Exhaust A`, `Exhaust B`, `TL`*n*, `TQ`*n*, and `Exhaust` correspond to temperature sensors located on the respective hardware component.

6. Use the `show chassis environment routing-engine` command to check the temperature of each Routing Engine.

```
user@host> show chassis environment routing-engine
Routing Engine 0 status:
  State                      Online Master
  CPU Temperature            60 degrees C / 140 degrees F
Routing Engine 1 status:
  State                      Online Standby
    CPU Temperature            57 degrees C / 134 degrees F
```

7. Use the `show chassis environment cb` command to check the temperature of each Control Board.

NOTE: `Exhaust A` and `Exhaust B` correspond to temperature sensors located on the Control Boards.

```
user@host> show chassis environment cb

CB 0 status:
  State                      Online Master
  Intake Temperature         48 degrees C / 118 degrees F
  Exhaust Temperature        36 degrees C / 96 degrees F
  Power 1
    1.2 V                       1199
  Power 2
    1.05 V                      1049
    3.3 V                       3300
  Power 3
    0.9 V                        919
    1.0 V                        999
  Power 4
    1.0 V                        999
  Power 5
    12.0 V RE                    902
  Power 6
    0.75 V                       589
    1.05 V                      1044
    1.1 V                       1102
    1.2 V bias                  1195
```

```
    1.5 V                       1498
    1.8 V                       1804
    1.8 V bias                  1817
    2.5 V                       2510
    3.3 V bias                  3296
    3.9 V                       3910
    5.0 V                       4950
  Power 7
    12.0 V                      7097
    12.0 V *                   12221
  Bus Revision                18
  FPGA Revision               9
CB 1 status:
  State                       Online Standby
  Intake Temperature          39 degrees C / 102 degrees F
  Exhaust Temperature         40 degrees C / 104 degrees F
  Power 1
    1.2 V                       1199
  Power 2
    1.05 V                      1050
    3.3 V                       3299
  Power 3
    0.9 V                        919
    1.0 V                        999
  Power 4
    1.0 V                        999
  Power 5
    12.0 V RE                    903
  Power 6
    0.75 V                       589
        1.05 V                      1044
    1.1 V                       1092
    1.2 V bias                  1192
    1.5 V                       1488
    1.8 V                       1798
    1.8 V bias                  1807
    2.5 V                       2494
    3.3 V bias                  3296
    3.9 V                       3925
    5.0 V                       4930
  Power 7
    12.0 V                      6644
    12.0 V *                   12281
```

```
  Bus Revision                 18
  FPGA Revision                9
```

8. Use the `show chassis environment sib` command to check the temperature of each SIB.

> **NOTE**: `Intake`, `Exhaust`, and `Junction` correspond to temperature sensors located on the SIBs.

```
user@host> show chassis environment sib

SIB 0 status:
  State                        Online
  TMP75 Temperature            42 degrees C / 107 degrees F
  PF Temperature               43 degrees C / 109 degrees F
  PCIE Switch Temperature      69 degrees C / 156 degrees F
  Power 1
    2.5 V                         2458
    3.3 V bias                    3299
  Power 2
    1.0 V                         1000
    1.0 V *                       1000
  Power 3
    0.9 V                          897
    0.9 V PFE0                     898
  Power 4
    0.9 V PEX                      899
    0.9 V PFE1                     899
  Power 5
    12.0 V                        2820
    12.0 V *                     12383
  Power 6
    1.0 V PFE0                     998
    1.5 V                         1500
    1.8 V                         1790
    6.5 V bias                    6520
SIB 1 status:
  State                        Online
  TMP75 Temperature            41 degrees C / 105 degrees F
  PF Temperature               41 degrees C / 105 degrees F
  PCIE Switch Temperature      67 degrees C / 152 degrees F
  Power 1
```

```
    2.5 V                      2460
    3.3 V bias                 3299
  Power 2
    1.0 V                       999
    1.0 V *                    1000
  Power 3
    0.9 V                       899
    0.9 V PFE0                  900
  Power 4
    0.9 V PEX                   899
    0.9 V PFE1                  899
  Power 5
    12.0 V                     2820
    12.0 V *                  12383
  Power 6
    1.0 V PFE0                  998
    1.5 V                      1500
    1.8 V                      1798
    6.5 V bias                 6504
SIB 2 status:
  State                     Online
  TMP75 Temperature         41 degrees C / 105 degrees F
  PF Temperature            41 degrees C / 105 degrees F
  PCIE Switch Temperature   65 degrees C / 149 degrees F
  Power 1
    2.5 V                      2462
    3.3 V bias                 3299
  Power 2
    1.0 V                      1000
    1.0 V *                    1000
  Power 3
    0.9 V                       899
    0.9 V PFE0                  900
  Power 4
    0.9 V PEX                   899
    0.9 V PFE1                  899
  Power 5
    12.0 V                     2820
    12.0 V *                  12444
  Power 6
    1.0 V PFE0                 1000
    1.5 V                      1498
    1.8 V                      1798
```

```
    6.5 V bias                  6512
    ...
```

9. Use the `show chassis environment fpc` command to check the temperature of each FPC.

NOTE: `PMB`, `Intake`, `Exhaust A`, `Exhaust B`, `TL`*n*, and `TQ`*n* correspond to temperature sensors located on the FPCs.

```
user@host> show chassis environment fpc
FPC 0 status:
  State                       Online
  Exhaust Temperature         54 degrees C / 129 degrees F
  Intake Temperature          50 degrees C / 122 degrees F
  PE0 Temperature             57 degrees C / 134 degrees F
  PE1 Temperature             58 degrees C / 136 degrees F
  PFE0-HMC0-DIE Temperature   44 degrees C / 111 degrees F
  PFE0-HMC0-TOP Temperature   49 degrees C / 120 degrees F
  PFE0-HMC0-BOT Temperature   52 degrees C / 125 degrees F
  PFE0-HMC1-DIE Temperature   38 degrees C / 100 degrees F
  PFE0-HMC1-TOP Temperature   49 degrees C / 120 degrees F
  PFE0-HMC1-BOT Temperature   57 degrees C / 134 degrees F
  PFE0-HMC2-DIE Temperature   42 degrees C / 107 degrees F
  PFE0-HMC2-TOP Temperature   53 degrees C / 127 degrees F
  PFE0-HMC2-BOT Temperature   56 degrees C / 132 degrees F
  PFE1-HMC0-DIE Temperature   47 degrees C / 116 degrees F
  PFE1-HMC0-TOP Temperature   56 degrees C / 132 degrees F
  PFE1-HMC0-BOT Temperature   59 degrees C / 138 degrees F
  PFE1-HMC1-DIE Temperature   44 degrees C / 111 degrees F
  PFE1-HMC1-TOP Temperature   56 degrees C / 132 degrees F
  PFE1-HMC1-BOT Temperature   60 degrees C / 140 degrees F
  PFE1-HMC2-DIE Temperature   45 degrees C / 113 degrees F
  PFE1-HMC2-TOP Temperature   52 degrees C / 125 degrees F
  PFE1-HMC2-BOT Temperature   59 degrees C / 138 degrees F
  Power
    MAIN  3.3v                  3269
    MAIN  1.2v                  1175
    CPU   1.8v                  1808
    MAIN  1.5v                  1502
    MAIN  1.1v                  1066
    CPU   pnnv                   970
```

```
    CPU  pvccv                970
    CPU  vddqv               1502
    FPC   1.2v               1200
    FPC   1.0v                999
    FPC   2.5v               2499
    FPC   3.3v               3300
    PE0 1 0.9v                898
    PE0 2 0.9v                899
    PE0 3 0.9v                901
    PE0 4 0.9v                901
    PE0 5 0.9v                899
    PE0 1.2v                 1199
    PE0 H 0.9v                900
    PE0 1 1.0v                999
    PE1 2 1.0v               1000
    PE1 1 0.9v                898
    PE1 2 0.9v                898
    PE1 3 0.9v                899
    PE1 4 0.9v                899
    PE1 5 0.9v                899
    PE1 1.2v                 1200
    PE1 H 0.9v                899
    PE1 1 1.0v                999
    PE1 2 1.0v               1000
    FPC  12.0v              12281
    PIC  12.0v              12221
FPC 2 status:
  State                       Online
  Exhaust Temperature         60 degrees C / 140 degrees F
  Intake Temperature          63 degrees C / 145 degrees F
  PE0 Temperature             64 degrees C / 147 degrees F
  PE1 Temperature             67 degrees C / 152 degrees F
  PFE0-HMC0-DIE Temperature  54 degrees C / 129 degrees F
  PFE0-HMC0-TOP Temperature  61 degrees C / 141 degrees F
  PFE0-HMC0-BOT Temperature  67 degrees C / 152 degrees F
  PFE0-HMC1-DIE Temperature  53 degrees C / 127 degrees F
  PFE0-HMC1-TOP Temperature  61 degrees C / 141 degrees F
  PFE0-HMC1-BOT Temperature  63 degrees C / 145 degrees F
  PFE0-HMC2-DIE Temperature  58 degrees C / 136 degrees F
  PFE0-HMC2-TOP Temperature  70 degrees C / 158 degrees F
  PFE0-HMC2-BOT Temperature  72 degrees C / 161 degrees F
  PFE1-HMC0-DIE Temperature  59 degrees C / 138 degrees F
  PFE1-HMC0-TOP Temperature  71 degrees C / 159 degrees F
```

```
  PFE1-HMC0-BOT Temperature  79 degrees C / 174 degrees F
  PFE1-HMC1-DIE Temperature  66 degrees C / 150 degrees F
  PFE1-HMC1-TOP Temperature  79 degrees C / 174 degrees F
  PFE1-HMC1-BOT Temperature  80 degrees C / 176 degrees F
  PFE1-HMC2-DIE Temperature  65 degrees C / 149 degrees F
  PFE1-HMC2-TOP Temperature  80 degrees C / 176 degrees F
  PFE1-HMC2-BOT Temperature  80 degrees C / 176 degrees F
  Power
    MAIN  3.3v                 3268
    MAIN  1.2v                 1174
    CPU   1.8v                 1815
    MAIN  1.5v                 1497
    MAIN  1.1v                 1067
    CPU   pnnv                 1035
    CPU  pvccv                 1035
    CPU  vddqv                 1502
    FPC   1.2v                 1199
    FPC   1.0v                  999
    FPC   2.5v                 2499
    FPC   3.3v                 3299
    PE0 1 0.9v                  898
    PE0 2 0.9v                  900
    PE0 3 0.9v                  898
    PE0 4 0.9v                  899
    PE0 5 0.9v                  899
    PE0 1.2v                   1199
    PE0 H 0.9v                  899
    PE0 1 1.0v                 1000
    PE1 2 1.0v                 1001
    PE1 1 0.9v                  897
    PE1 2 0.9v                  897
    PE1 3 0.9v                  898
    PE1 4 0.9v                  898
    PE1 5 0.9v                  899
    PE1 1.2v                   1200
    PE1 H 0.9v                  899
    PE1 1 1.0v                 1000
    PE1 2 1.0v                 1001
    FPC  12.0v                12221
    PIC  12.0v                12221
...
```

10. Use the `show chassis environment` command to verify that the status of each component is `OK`.

```
user@host> show chassis environment

Class Item                          Status     Measurement
Temp  PSM 0                         Absent
      PSM 1                         OK         22 degrees C / 71 degrees F
      PSM 2                         Absent
      PSM 3                         OK         22 degrees C / 71 degrees F
      PSM 4                         Check
      Routing Engine 0              OK         36 degrees C / 96 degrees F
      Routing Engine 0 CPU          OK         60 degrees C / 140 degrees F
      Routing Engine 1              OK         38 degrees C / 100 degrees F
      Routing Engine 1 CPU          OK         57 degrees C / 134 degrees F
      CB 0 Intake                   OK         36 degrees C / 96 degrees F
      CB 0 Exhaust A                OK         26 degrees C / 78 degrees F
      CB 0 Exhaust B                OK         27 degrees C / 80 degrees F
      CB 1 Intake                   OK         44 degrees C / 111 degrees F
      CB 1 Exhaust A                OK         28 degrees C / 82 degrees F
      CB 1 Exhaust B                OK         32 degrees C / 89 degrees F
      SIB 0 Exhaust                 OK         41 degrees C / 105 degrees F
      SIB 0 TF                      OK         49 degrees C / 120 degrees F
      SIB 0 PCIE Switch             OK         68 degrees C / 154 degrees F
      SIB 1 Exhaust                 OK         42 degrees C / 107 degrees F
      SIB 1 TF                      OK         48 degrees C / 118 degrees F
      SIB 1 PCIE Switch             OK         73 degrees C / 163 degrees F
      SIB 2 Exhaust                 OK         42 degrees C / 107 degrees F
      SIB 2 TF                      OK         50 degrees C / 122 degrees F
      SIB 2 PCIE Switch             OK         74 degrees C / 165 degrees F
      SIB 3 Exhaust                 OK         41 degrees C / 105 degrees F
      SIB 3 TF                      OK         53 degrees C / 127 degrees F
      SIB 3 PCIE Switch             OK         68 degrees C / 154 degrees F
      SIB 4 Exhaust                 OK         33 degrees C / 91 degrees F
      SIB 4 TF                      OK         42 degrees C / 107 degrees F
      SIB 4 PCIE Switch             OK         60 degrees C / 140 degrees F
      SIB 7 Exhaust                 OK         50 degrees C / 122 degrees F
      SIB 7 TF                      OK         68 degrees C / 154 degrees F
      SIB 7 PCIE Switch             OK         82 degrees C / 179 degrees F
      SIB 8 Exhaust                 OK         62 degrees C / 143 degrees F
      SIB 8 TF                      OK         76 degrees C / 168 degrees F
      SIB 8 PCIE Switch             OK         94 degrees C / 201 degrees F
      FPC 2 PMB Exhaust             OK         51 degrees C / 123 degrees F
```

```
FPC 2 PMB Intake              OK          50 degrees C / 122 degrees F
FPC 2 PMB CPU                 OK          86 degrees C / 186 degrees F
FPC 2 Exhaust                 OK          40 degrees C / 104 degrees F
FPC 2 Intake                  OK          39 degrees C / 102 degrees F
FPC 2 TL0                     OK          73 degrees C / 163 degrees F
FPC 2 TQ0                     OK          66 degrees C / 150 degrees F
FPC 2 TL1                     OK          57 degrees C / 134 degrees F
FPC 2 TQ1                     OK          50 degrees C / 122 degrees F
FPC 4 PMB Exhaust             OK          39 degrees C / 102 degrees F
FPC 4 PMB Intake              OK          37 degrees C / 98 degrees F
FPC 4 PMB CPU                 OK          48 degrees C / 118 degrees F
FPC 4 Exhaust                 OK          36 degrees C / 96 degrees F
FPC 4 Intake                  OK          43 degrees C / 109 degrees F
FPC 4 TL0                     OK          58 degrees C / 136 degrees F
FPC 4 TQ0                     OK          54 degrees C / 129 degrees F
FPC 4 TL1                     OK          58 degrees C / 136 degrees F
FPC 4 TQ1                     OK          50 degrees C / 122 degrees F
FPC 8 PMB Intake              OK          53 degrees C / 127 degrees F
FPC 8 PMB Exhaust             OK          47 degrees C / 116 degrees F
FPC 8 PMB CPU                 OK          76 degrees C / 168 degrees F
FPC 8 Intake                  OK          44 degrees C / 111 degrees F
FPC 8 Exhaust                 OK          47 degrees C / 116 degrees F
FPC 8 TL0                     OK          70 degrees C / 158 degrees F
FPC 8 TQ0                     OK          60 degrees C / 140 degrees F
FPC 8 TL1                     OK          74 degrees C / 165 degrees F
FPC 8 TQ1                     OK          63 degrees C / 145 degrees F
FPC 12 PMB Intake             OK          31 degrees C / 87 degrees F
FPC 12 PMB Exhaust            OK          28 degrees C / 82 degrees F
FPC 12 PMB CPU                OK          41 degrees C / 105 degrees F
FPC 12 Intake                 OK          29 degrees C / 84 degrees F
FPC 12 Exhaust                OK          48 degrees C / 118 degrees F
FPC 12 TL0                    OK          47 degrees C / 116 degrees F
FPC 12 TQ0                    OK          56 degrees C / 132 degrees F
FPC 12 TL1                    OK          57 degrees C / 134 degrees F
FPC 12 TQ1                    OK          60 degrees C / 140 degrees F
FPC 14 PMB Intake             OK          53 degrees C / 127 degrees F
FPC 14 PMB Exhaust            OK          53 degrees C / 127 degrees F
FPC 14 PMB CPU                OK          76 degrees C / 168 degrees F
FPC 14 Intake                 OK          42 degrees C / 107 degrees F
FPC 14 Exhaust                OK          51 degrees C / 123 degrees F
FPC 14 TL0                    OK          61 degrees C / 141 degrees F
FPC 14 TQ0                    OK          57 degrees C / 134 degrees F
FPC 14 TL1                    OK          51 degrees C / 123 degrees F
```

```
        FPC 14 TQ1                    OK         48 degrees C / 118 degrees F
        FPM I2CS                      OK         24 degrees C / 75 degrees F
  Fans  Fan Tray 0 Fan 1              OK         5400 RPM
        Fan Tray 0 Fan 2              OK         5640 RPM
        Fan Tray 0 Fan 3              OK         5400 RPM
        Fan Tray 0 Fan 4              OK         5400 RPM
        Fan Tray 0 Fan 5              OK         5520 RPM
        Fan Tray 0 Fan 6              OK         5400 RPM
        Fan Tray 0 Fan 7              OK         5160 RPM
        Fan Tray 0 Fan 8              OK         6240 RPM
        Fan Tray 0 Fan 9              OK         6120 RPM
        Fan Tray 0 Fan 10             OK         6360 RPM
        Fan Tray 0 Fan 11             OK         6360 RPM
        Fan Tray 0 Fan 12             OK         6360 RPM
        Fan Tray 0 Fan 13             OK         6360 RPM
        Fan Tray 0 Fan 14             OK         6360 RPM
        Fan Tray 1 Fan 1              OK         5400 RPM
        Fan Tray 1 Fan 2              OK         5520 RPM
        Fan Tray 1 Fan 3              OK         5400 RPM
        Fan Tray 1 Fan 4              OK         5400 RPM
        Fan Tray 1 Fan 5              OK         5400 RPM
        Fan Tray 1 Fan 6              OK         5160 RPM
        Fan Tray 1 Fan 7              OK         5400 RPM
        Fan Tray 1 Fan 8              OK         6120 RPM
        Fan Tray 1 Fan 9              OK         6120 RPM
        Fan Tray 1 Fan 10             OK         6360 RPM
        Fan Tray 1 Fan 11             OK         6360 RPM
        Fan Tray 1 Fan 12             OK         6240 RPM
        Fan Tray 1 Fan 13             OK         6480 RPM
        Fan Tray 1 Fan 14             OK         6360 RPM
```

NOTE: `Exhaust A`, `Exhaust B`, `TL`*n*, `TQ`*n*, `Intake`, and `Exhaust` correspond to temperature sensors located on the respective hardware component.

RELATED DOCUMENTATION

PTX3000 Craft Interface LEDs | 26

Troubleshooting the PTX3000 Power Supply Modules

IN THIS SECTION

Problem

Description

The following alarms and LEDs indicate a problem with the power supply modules during normal operations:

- One or both of the green input **1** and input **2** LEDs are off, indicating that the input is not receiving voltage.
- The green **OK** LED on a PSM is off when a PSM output has failed or is not receiving voltage, or the PSM power switch is on standby.
- The fault (⚠) LED on a PSM is lit when a PSM has failed, is not properly installed, or is not receiving sufficient voltage.

In Table 58 on page 387, the text in the CLI Message column appears in the output of the `show chassis alarms` command.

Table 58: PSM Alarms

Alarm Type	CLI Message	Alarm Condition	Recovery
Red (major)	`PSM` *`psm-number`* `Not OK`	The specified PSM has failed. An input might be bad, or the input might be incorrectly connected. The PSM or the chassis might have exceeded the temperature thresholds, a fan might have failed, and so on.	1. Use the `show chassis environment psm` for more information about the failure. 2. Check that the inputs for the PSM are correctly connected. 3. Reinstall the PSM to clear alarms. 4. If the input is correctly connected, replace the PSM.
	`PSM` *`psm-number`* `Not Recognized`	The PTX3000 does not support the power supply module.	Replace the PSM with a supported PSM.
	`No Redundant Power for FPC`	One or more FPCs do not have redundant power supply modules. See Table 59 on page 388. If nonredundant PSMs that provide power to the FPCs fail, the FPCs will lose service.	If the minimum number of required PSM are not installed as indicated in "PTX3000 Power System Description" on page 36: • Verify that both inputs on the PSMs are connected and operational. • Install the required PSM. • Remove FPCs and PICs. If a PSM fails, fix or replace the PSM.

Table 59: Minimum Number of Power Supply Modules for Nonredundant Power

Number of PSMs	Nonredundant Power to the FPCs and PICs
1	Nonredundant power to a maximum of one FPC and one PIC
2	Nonredundant power to a maximum of four FPCs and four PICs
3 to 5	Nonredundant power to a maximum of eight FPCs and eight PICs

Solution

To troubleshoot a PSM:

1. Issue the `show chassis alarms` command to check for alarms.
2. Issue the `show chassis power` command to check the power usage in watts for all PSMs.

```
user@host> show chassis power

Chassis Power        Input(V)      Used(W)

Total Power                         1453
  PSM 0
    Input 1               0            0
    Input 2               0            0
  PSM 1
    Input 1              50          701
    Input 2               0            0
  PSM 2
    Input 1               0            0
    Input 2               0            0
  PSM 3
    Input 1              51          752
    Input 2               0            0
  PSM 4
    Input 1               0            0
    Input 2               0            0
```

3. Issue the `show chassis power detail` command to check the power usage in watts for hardware components such as FPCs, fan trays, Routing Engines, Control Boards, SIBs, and craft interface.

```
user@host> show chassis power detail

Chassis Power        Input(V)      Used(W)

Total Power                         1447
  PSM 0
    Input 1               0            0
    Input 2               0            0
  PSM 1
    Input 1              50          701
    Input 2               0            0
  PSM 2
    Input 1               0            0
    Input 2               0            0
  PSM 3
    Input 1              50          746
    Input 2               0            0
  PSM 4
    Input 1               0            0
    Input 2               0            0

Item                 Used(W)
  Fan Tray 0             38
  Fan Tray 1             27
  RE0/CB0                95
  RE1/CB1                94
  SIB 0                  41
  SIB 1                  42
  SIB 2                  40
  SIB 3                  42
  SIB 4                  45
  SIB 5                   0
  SIB 6                   0
  SIB 7                  44
  SIB 8                  47
  FPC 0                   0
    PIC 0                 0
  FPC 2                 203
    PIC 0                 0
```

```
FPC 4                  187
  PIC 0                  0
FPC 6                    0
  PIC 0                  0
FPC 8                    0
  PIC 0                  0
FPC 10                   0
  PIC 0                  0
FPC 12                 184
  PIC 0                  0
FPC 14                   0
  PIC 0                  0
```

4. If you cannot determine the cause of the problem or need additional assistance, contact JTAC.

SEE ALSO

PTX3000 Power Supply Module LEDs | 43

Troubleshooting the PTX3000 Routing Engines

IN THIS SECTION

Problem

Description

The following indicate a problem with the Routing Engine:

- An alarm indicates that a host subsystem has been removed or failed.
- The **ONLINE** LED on the Routing Engine faceplate is lit steadily red.

Solution

1. Issue the `show chassis alarms` command to check for alarms.

2. Check the **ONLINE** LED on the Routing Engine faceplate. If the **ONLINE** LED is red, issue the `chassis routing-engine` command to check the status of the Routing Engine.

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 35 degrees C / 95 degrees F
    CPU temperature             60 degrees C / 140 degrees F
    DRAM                      16365 MB (16365 MB installed)
    Memory utilization           6 percent
    CPU utilization:
      User                       2 percent
      Background                 0 percent
      Kernel                    17 percent
      Interrupt                  1 percent
      Idle                      81 percent
    Model                          RE-DUO-2600
    Serial ID                      P737A-002791
    Start time                     2013-05-06 18:54:48 PDT
    Uptime                         20 hours, 51 minutes
    Last reboot reason             0x1:power cycle/failure
    Load averages:                 1 minute   5 minute  15 minute
                                       0.25       0.25       0.19
Routing Engine status:
  Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    Temperature                 37 degrees C / 98 degrees F
    CPU temperature             56 degrees C / 132 degrees F
    DRAM                      16365 MB (16365 MB installed)
    Memory utilization           6 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
```

```
    Idle                      100 percent
  Model                           RE-DUO-2600
  Serial ID                       P737A-002215
  Start time                      2013-05-07 14:24:59 PDT
  Uptime                          1 hour, 20 minutes, 38 seconds
  Last reboot reason              0x1:power cycle/failure
  Load averages:                  1 minute   5 minute  15 minute
                                      0.00       0.00       0.00
```

3. Use the `show chassis alarms command` to display Routing Engine alarms.

SEE ALSO

PTX3000 Routing Engine LEDs | 60

Troubleshooting the PTX3000 Control Boards

IN THIS SECTION

Problem

Description

The following alarms and LEDs indicate a problem with a Control Board:

- A red (major) alarm indicates that the Control Board has failed or has been removed.
- A yellow (minor) alarm indicates that the Ethernet switch in the Control Board has failed.
- The yellow **FAIL** LED on the Control Board faceplate is lit.
- The green **OK** LED on the Control Board faceplate is not lit.

- The red host subsystem **FAIL** LED on the craft interface is lit.
- The green host subsystem **OK** LED on the craft interface is not lit.

In Table 60 on page 393, the text in the CLI Message column appears in the output of the `show chassis alarms` command.

Table 60: Chassis Alarm Messages for the Control Boards

Alarm Type	CLI Message	Alarm Condition	Recovery
Red	`CB` *`cb-number`* `Failure`	A Control Board failed.	Replace the Control Board.
	`CB` *`cb-number`* `Removed`	A Control Board has been removed.	Reinstall the Control Board.
	`CCG` *`CCG-number`* `External-A LOS`	On the **BITS A** port configured to be the primary or secondary clocking source, loss of signal has occurred.	Reconnect the cable to the port.
	`CCG` *`CCG-number`* `External-B LOS`	On the **BITS B** port configured to be the primary or secondary clocking source, loss of signal has occurred.	Reconnect the cable to the port.
Yellow	`CB` *`cb-number`* `Ethernet Switch Failure`	The Ethernet switch on the Control Board has failed.	Replace the Control Board.

In Table 61 on page 393, the text in the CLI Message column appears in the output of the `show chassis alarms` command.

Table 61: Chassis Alarm Messages for Host Subsystems

Alarm Type	CLI Message
Red	`Host` *`host-number`* `Removed`
Yellow	`Host` *`host-number`* `Failure`

Solution

To troubleshoot the Control Boards:

1. Check the LEDs on the faceplate of each Control Board.
2. Use the CLI to check for alarms. Issue the `show chassis alarms` command to view the alarms.
3. Issue the `show chassis environment cb` command.

```
user@host> show chassis environment cb
CB 0 status:
  State                      Online Master
  Intake Temperature         35 degrees C / 95 degrees F
  Exhaust A Temperature      25 degrees C / 77 degrees F
  Exhaust B Temperature      27 degrees C / 80 degrees F
  Power 1
    1.2 V                     1201 mV
    1.5 V                     1506 mV
    1.8 V                     1810 mV
    2.5 V                     2521 mV
    3.9 V                     3886 mV
  Power 2
    1.0 V                      999 mV
    3.3 V                     3300 mV
  Power 3
    1.0 V *                    999 mV
  Power 4
    12.0 V *                 12281 mV
  Power 5
    1.2 V bias                1202 mV
    3.3 V bias                3324 mV
  Bus Revision               75
  FPGA Revision              28
CB 1 status:
  State                      Online Standby
  Intake Temperature         44 degrees C / 111 degrees F
  Exhaust A Temperature      28 degrees C / 82 degrees F
  Exhaust B Temperature      31 degrees C / 87 degrees F
  Power 1
    1.2 V                     1195 mV
    1.5 V                     1501 mV
    1.8 V                     1809 mV
```

```
    2.5 V                     2511 mV
    3.9 V                     3926 mV
  Power 2
    1.0 V                     1000 mV
    3.3 V                     3300 mV
  Power 3
    1.0 V *                    999 mV
  Power 4
    12.0 V *                 12281 mV
  Power 5
    1.2 V bias                1198 mV
    3.3 V bias                3312 mV
  Bus Revision               75
  FPGA Revision              28
V
  Bus Revision               130
```

SEE ALSO

PTX3000 Control Board LEDs | 65

Troubleshooting the PTX3000 RCBs

IN THIS SECTION

Problem

Description

The following indicate a problem with the Routing and Control Board:

- An alarm indicates that a host subsystem has been removed or failed.

- A red (major) alarm indicates that the RCB has failed.
- A yellow (minor) alarm indicates the following fault conditions:
  - The RCB has been removed.
  - The Ethernet switch in the RCB has failed.
  - Over-voltage threshold has occurred.
  - Over-temperature threshold has been reached.
  - Clock failure has occurred.
- The green **OK** LED on the RCB faceplate is not lit.

> **NOTE**: The green **OK** LED on the RCB faceplate is not lit when the RCB is taken offline by the user.

In Table 62 on page 396, the text in the CLI Message column appears in the output of the `show chassis alarms` command.

Table 62: Chassis Alarm Messages for the Routing and Control Board

Alarm Type	CLI Message	Alarm Condition	Recovery
Major	`VMHost RE Secure Boot Disabled`	Secure Boot is not enabled on the RCB.	On the console connected to the RCB: 1. Reboot the RCB by using the `request vmhost reboot` command. 2. Press Esc to go to the BIOS setup menu. 3. Under the Administer Secure Boot menu, click **Secure Boot** to enable it. Save the BIOS change and reboot.

Table 62: Chassis Alarm Messages for the Routing and Control Board *(Continued)*

Alarm Type	CLI Message	Alarm Condition	Recovery
Minor	`VMHost RE Secure BIOS Version Mismatch`	The BIOS version in the BIOSFlash and the jfirmware do not match.	Upgrade the BIOS version by adding the appropriate jfirmware package and then reboot the RCB.
Minor	`Host` *x* `disk drive` *y* `smart error`	RCB booted from the alternative SSD.	Replace the disk with the disk that is similar to junos smartd disk.
Minor	`VMHost` *x* `Boot from alternate disk`	RCB booted from Alternate software set.	Make a snapshot recovery so that the primary disk can be recovered.
Minor	`VMHost` *x* `Boot from alternate set`	RCB booted from Alternate software set	Reinstall the image so that primary partition is recovered.
Minor	`VMHost RE` *x* `host application failed`	At least one of the VM host daemons has failed.	Reinstall Junos OS.
Major (companion card)	`RCB-CC 0 Absent/Powered Off`	RCB companion card has been removed.	Install the companion card.
Red	`CB` *cb-number* `Failure`	A Control Board failed.	Replace the Routing Engine-Control Board.
	`CB` *cb-number* `Removed`	A Control Board has been removed.	Reinstall the RCB.
	`CB` *cb-number* `GPS` *gps-number*`Signal Lost`	Loss of signal has occurred on the specific GPS port.	Reconnect the GPS cable.

Table 62: Chassis Alarm Messages for the Routing and Control Board *(Continued)*

Alarm Type	CLI Message	Alarm Condition	Recovery
	`CCG` *`CCG-number`* `External-A LOS`	On the **BITS A** port configured to be the primary or secondary clocking source, loss of signal has occurred.	Reconnect the cable to the port.
	`CCG` *`CCG-number`* `External-B LOS`	On the **BITS B** port configured to be the primary or secondary clocking source, loss of signal has occurred.	Reconnect the cable to the port.
Yellow	`CB` *`x`* `ESW PFE Port Fail`	One or more (or all) ports of the Ethernet Switch on the RCB are down.	If only one port has a failure, check if the corresponding FPC has a problem. Replace the RCB if multiple or all ports of the switch have failed. • Remove the RCB and re-install it.
	`CB` *`x`* `ESW NON-PFE Port Fail`		

NOTE: When you bring one of the RCBs offline by using the `request chassis cb slot` *`slot-number`* `offline` command, the `request vmhost power-off other routing-engine` command is triggered and a graceful shutdown of the VM host occurs. As a result, you cannot run the `request vmhost power-off other routing-engine` and `request chassis cb slot` *`slot-number`* `offline` commands on the other Routing Engine as it is not reachable.

Table 63 on page 399 lists the possible Routing Engine switchover conditions when RCB0 is the primary Routing Engine and RCB1 is the backup Routing Engine.

Table 63: Routing Engine Switchover Conditions

Command/Action	RCB0 State	RCB1 State	Description
request vmhost power-off other-routing-engine	Online Primary	Offline	RCB0 shuts down the other routing engine, RCB1.
request vmhost halt other-routing-engine	Online Primary	Online Standby	RCB0 halts the VM host on RCB1. RCB1 is in standby mode. To power off RCB1, you must use the `request chassis cb slot1 offline` command.
request chassis cb offline slot 1	Online Primary	Offline	RCB1 is powered off from RCB0.
CB1 button press	Online Primary	Offline	RCB1 is powered off.
request vmhost power-off	Offline	Online Primary	RCB0 is powered off and RCB1 is the primary. Thus graceful Routing Engine switchover occurs.
request vmhost halt	Online Standby	Online Primary	RCB0 is in standby mode and RCB1 becomes the primary. Thus graceful Routing Engine switchover occurs.
CB0 button press	Offline	Online Primary	RCB0 is powered off and RCB1 is the primary. Thus graceful Routing Engine switchover occurs.

If the other Routing Engine is not in power-off or halted state, but in an error condition, graceful Routing Engine switchover is not possible using the CLI. This error condition needs manual intervention to ensure that backup Routing Engine is ready to acquire the primary role.

> **NOTE**: Graceful Routing Engine Switchover (GRES) between the RE-DUO-C2600-16G Routing Engine and the RCB is not supported as both the Routing Engines are running on different software. The RE-DUO-C2600-16G Routing Engine runs on Junos OS and the RCB works on Junos OS running as a virtual machine over a Linux-based host (VM host).

NOTE: The connection between the RCB and the backplane is configured to work at 10GBASE-KR. If a switchover happens between the RE-DUO-C2600-16G Routing Engine and the RCB, the newly-installed RCB is able to connect to the other RCB over 10-Gigabit Ethernet links on the backplane.

Solution

1. Issue the `show chassis alarms` command to check for alarms.
2. Check the **ONLINE** LED on the Routing Engine-Control Board faceplate. If the **ONLINE** LED is red, issue the `chassis routing-engine` command to check the status of the RCB.

```
user@host> show chassis routing-engine

Routing Engine status:
  Slot 0:
    Current state                  Backup
    Election priority              Master (default)
    DRAM                      16343 MB (16384 MB installed)
    Memory utilization          37 percent
    5 sec CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
      Idle                     100 percent
    1 min CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
      Idle                      98 percent
    5 min CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      57 percent
    15 min CPU utilization:
```

```
        User                       0 percent
        Background                 0 percent
        Kernel                     0 percent
        Interrupt                  0 percent
        Idle                      24 percent
      Model                          RE-PTX-2X00x6
      Serial ID                      BUILTIN
      Start time                     2016-06-28 01:12:40 PDT
      Uptime                         1 hour, 59 minutes, 16 seconds
      Last reboot reason             0x2000:hypervisor reboot
      Load averages:                 1 minute   5 minute  15 minute
                                         0.32       0.22       0.24
  Routing Engine status:
    Slot 1:
      Current state                  Master
      Election priority              Backup (default)
      DRAM                      16343 MB (16384 MB installed)
      Memory utilization          38 percent
      5 sec CPU utilization:
        User                       2 percent
        Background                 0 percent
        Kernel                     4 percent
        Interrupt                  0 percent
        Idle                      94 percent
      Model                          RE-PTX-2X00x6
      Serial ID                      BUILTIN
      Start time                     2016-06-28 01:13:36 PDT
      Uptime                         1 hour, 58 minutes, 19 seconds
      Last reboot reason             0x2000:hypervisor reboot
      Load averages:                 1 minute   5 minute  15 minute
                                                                      0.25       0.38
  0.40
```

3. Use the `show chassis alarms command` to display Routing Engine alarms.

If the SSDs do not have a valid Junos OS image, use a USB disk to install an image on the SSDs.

NOTE: The Routing and Control Board has a battery which is discharged only when the board is powered off, and the battery has a life of 3.6 years. Therefore, a board which has been powered off either continuously or cumulatively for 3 years or more is at risk of suffering a dead battery.

This results in the Real Time Clock (RTC) getting reset and the BIOS setting such as the boot order stored in the CMOS getting cleared.

SEE ALSO

PTX3000 Routing and Control Board LEDs | 74

Troubleshooting the RCB Companion Card

IN THIS SECTION

Problem

Description

The following indicate a problem with the RCB companion card:

- **STATUS** LED on the companion card is off.
- The `Fru Absent alarm` message indicates the absence of the companion card. See Table 64 on page 402.

Table 64: Chassis Alarm Messages for the RCB Companion Card

Alarm Type	CLI Message	Alarm Condition	Recovery
Minor (companion card)	`Fru Absent alarm`	Companion card is absent.	Install the companion card.

SEE ALSO

PTX3000 Routing and Control Board Companion Card LED | 81

Troubleshooting the PTX3000 Switch Interface Boards

IN THIS SECTION

Problem

Description

The following LED states and alarms indicate a problem with a SIB:

- Table 65 on page 403 describes the LED states.
- Table 66 on page 404 describes the SIB alarms.

Table 65 on page 403 describes the SIB LED trouble states.

Table 65: Troubleshooting SIB LEDs

Label	Color	State	Description
OK	–	Off	SIB is offline or not seated properly.
FAIL	Yellow	On steadily	SIB has failed.

In Table 66 on page 404, the text in the CLI Message column appears in the output from the `show chassis alarms` command.

Table 66: Troubleshooting SIB Alarms

Alarm Type	CLI Message	Alarm Condition	Recovery
Red (major)	`SIB` *`sib-number`* `Fault`	A SIB has failed. This might affect traffic-forwarding capacity.	Restart the SIB. If this does not fix the issue, contact JTAC.
Yellow (minor)	`SIB` *`sib-number`* `FPC Link Error`	The SIB has detected link errors between the SIB and FPCs. This error may affect FPC traffic forwarding.	To isolate the problem: 1. Restart the SIB and then the FPC. This may affect the traffic. 2. If the problem persists, replace the SIB. 3. If the problem still persists, replace the particular FPC that was associated with the link error. 4. If you are unable to isolate the problem, contact JTAC. JTAC has to analyze the logs to determine further action.
	SIB *sib-number* Cell Drop error	The SIB has detected fabric cell drops. This might affect traffic-forwarding capacity	Restart the SIB. If this does not fix the issue, contact JTAC.
	`SIB` *`sib-number`* `Not Online`	The SIB is not in an active state. This might affect the traffic-forwarding capacity.	Bring the SIB online. Issue the `request chassis sib online slot` *`slot-number`* command. If this does not fix the issue, contact JTAC.
	`SIB` *`sib-number`* `Absent`	A SIB has been removed.	Reinstall the SIB in the chassis.

Solution

To troubleshoot the SIBs:

1. Note the status of the LEDs on the faceplate of each SIB.

2. Verify that the SIB is properly seated in the backplane. Check that each ejector handle has been latched firmly.

3. Use the CLI to check for alarms. Issue the `show chassis alarms` command to view the alarms.

```
show chassis alarms
1 alarms currently active
Alarm time               Class  Description
2012-11-02 15:17:41 PDT  Major  SIB 3 Absent
```

4. Check the status of the SIBs. Issue the `show chassis sib` and `show chassis environment sib` commands.

```
user@host> show chassis sib
Slot  State         Fabric links       Errors
 0    Online             Active        None
 1    Online             Active        None
 2    Online             Active        None
 3    Empty              Unused        None
 4    Online             Active        None
 5    Online             Active        None
 6    Online             Active        None
 7    Online             Active        None
 8    Online             Active        None
```

```
user@host> show chassis environment sib
SIB 0 status:
  State                        Online
  TMP75 Temperature            46 degrees C / 114 degrees F
  PF Temperature               47 degrees C / 116 degrees F
  PCIE Switch Temperature      69 degrees C / 156 degrees F
  Power 1
    2.5 V                         2463 mV
    3.3 V bias                    3300 mV
  Power 2
    1.0 V                         1000 mV
    1.0 V *                       1000 mV
  Power 3
    0.9 V                          898 mV
    0.9 V PFE0                     899 mV
```

```
  Power 4
    0.9 V PEX                    899 mV
    0.9 V PFE1                   900 mV
  Power 5
    12.0 V                      2820 mV
    12.0 V *                   12444 mV
  Power 6
    1.0 V PFE0                  1006 mV
    1.5 V                       1500 mV
    1.8 V                       1798 mV
    6.5 V bias                  6536 mV
...
```

5. Use the information gathered in the previous steps with the information in Table 65 on page 403 and Table 66 on page 404 to determine the proper course of action.

SEE ALSO

PTX3000 Switch Interface Board LEDs | 89

Troubleshooting the PTX3000 Switch Fabric

IN THIS SECTION

Problem

Description

The switching plane in the PTX3000 consists of the SIBs and the FPCs. A link that is in a down or error state indicates a problem with the switching planes.

Solution

To troubleshoot the switching planes:

1. Verify that all nine SIBs and all installed FPCs are online. Use the `show chassis fabric summary` command to check for errors.

```
user@host> show chassis fabric summary
FRU         State          Errors

SIB0        Online         Link Errors
SIB1        Online         None
SIB2        Online         None
SIB3        Online         None
SIB4        Online         None
SIB5        Online         None
SIB6        Online         None
SIB7        Online         None
SIB8        Online         None

FPC0        Empty
FPC1        Empty
FPC2        Online         None
FPC3        Empty
FPC4        Online         None
FPC5        Empty
FPC6        Present
FPC7        Empty
FPC8        Online         None
FPC9        Empty
FPC10       Offline
FPC11       Empty
FPC12       Online         None
FPC13       Empty
FPC14       Online         None
FPC15       Empty
```

If a SIB or FPC is `Offline`, see "Troubleshooting the PTX3000 FPCs" on page 409 and "Troubleshooting the PTX3000 Switch Interface Boards" on page 403 to correct the problem before proceeding.

2. Use the `show chassis fabric topology` command to query the state of the links.

```
user@host> show chassis fabric topology

 In-link  : FPC# FE# TQ# (TQ-TX sub-chnl #) ->
            SIB# TF#_FCORE# (TF-RX port#, TF-RX sub-chn#, TF-RX inst#)

 Out-link : SIB# TF#_FCORE# (TF-TX port#, TF-TX sub-chn#, TF-TX inst#) ->
            FPC# FE# TQ# (TQ-RX sub-chnl #)
SIB 0 FCHIP 0 FCORE 0 :
-----------------------
          In-links               State            Out-links              State
--------------------------------------------------------------------------------
FPC00FE0TQ0(00)->S00F0_0(7,0,07) Down    S00F0_0(3,0,11)->FPC00FE0TQ0(00) Down
FPC00FE1TQ1(00)->S00F0_0(7,1,07) Down    S00F0_0(3,1,11)->FPC00FE1TQ1(00) Down
FPC02FE0TQ0(00)->S00F0_0(6,0,06) OK      S00F0_0(2,0,10)->FPC02FE0TQ0(00) OK
FPC02FE1TQ1(00)->S00F0_0(6,1,06) OK      S00F0_0(2,1,10)->FPC02FE1TQ1(00) OK
FPC04FE0TQ0(00)->S00F0_0(5,0,05) OK      S00F0_0(1,0,09)->FPC04FE0TQ0(00) OK
FPC04FE1TQ1(00)->S00F0_0(5,1,05) OK      S00F0_0(1,1,09)->FPC04FE1TQ1(00) OK
FPC06FE0TQ0(00)->S00F0_0(4,0,04) Down    S00F0_0(0,0,08)->FPC06FE0TQ0(00) Down
FPC06FE1TQ1(00)->S00F0_0(4,1,04) Down    S00F0_0(0,1,08)->FPC06FE1TQ1(00) Down
FPC08FE0TQ0(00)->S00F0_0(4,2,04) OK      S00F0_0(0,2,08)->FPC08FE0TQ0(00) OK
FPC08FE1TQ1(00)->S00F0_0(4,3,04) OK      S00F0_0(0,3,08)->FPC08FE1TQ1(00) OK
FPC10FE0TQ0(00)->S00F0_0(5,2,05) Down    S00F0_0(1,2,09)->FPC10FE0TQ0(00) Down
FPC10FE1TQ1(00)->S00F0_0(5,3,05) Down    S00F0_0(1,3,09)->FPC10FE1TQ1(00) Down
FPC12FE0TQ0(00)->S00F0_0(7,2,07) Error   S00F0_0(3,2,11)->FPC12FE0TQ0(00) Down
FPC12FE1TQ1(00)->S00F0_0(7,3,07) OK      S00F0_0(3,3,11)->FPC12FE1TQ1(00) OK
FPC14FE0TQ0(00)->S00F0_0(7,4,07) OK      S00F0_0(3,4,11)->FPC14FE0TQ0(00) OK
FPC14FE1TQ1(00)->S00F0_0(7,5,07) OK      S00F0_0(3,5,11)->FPC14FE1TQ1(00) OK

SIB 0 FCHIP 0 FCORE 1 :
-----------------------
          In-links               State            Out-links              State
--------------------------------------------------------------------------------
FPC00FE0TQ0(01)->S00F0_1(3,0,11) Down    S00F0_1(7,0,07)->FPC00FE0TQ0(01) Down
FPC00FE1TQ1(01)->S00F0_1(3,1,11) Down    S00F0_1(7,1,07)->FPC00FE1TQ1(01) Down
FPC02FE0TQ0(01)->S00F0_1(2,0,10) OK      S00F0_1(6,0,06)->FPC02FE0TQ0(01) OK
FPC02FE1TQ1(01)->S00F0_1(2,1,10) OK      S00F0_1(6,1,06)->FPC02FE1TQ1(01) OK
FPC04FE0TQ0(01)->S00F0_1(1,0,09) OK      S00F0_1(4,0,04)->FPC04FE0TQ0(01) OK
FPC04FE1TQ1(01)->S00F0_1(1,1,09) OK      S00F0_1(4,1,04)->FPC04FE1TQ1(01) OK
FPC06FE0TQ0(01)->S00F0_1(0,0,08) Down    S00F0_1(4,2,04)->FPC06FE0TQ0(01) Down
FPC06FE1TQ1(01)->S00F0_1(0,1,08) Down    S00F0_1(4,3,04)->FPC06FE1TQ1(01) Down
```

```
FPC08FE0TQ0(01)->S00F0_1(0,2,08) OK      S00F0_1(4,4,04)->FPC08FE0TQ0(01) OK
FPC08FE1TQ1(01)->S00F0_1(0,3,08) OK      S00F0_1(4,5,04)->FPC08FE1TQ1(01) OK
FPC10FE0TQ0(01)->S00F0_1(1,2,09) Down    S00F0_1(5,0,05)->FPC10FE0TQ0(01) Down
FPC10FE1TQ1(01)->S00F0_1(1,3,09) Down    S00F0_1(5,1,05)->FPC10FE1TQ1(01) Down
FPC12FE0TQ0(01)->S00F0_1(2,2,10) OK      S00F0_1(6,2,06)->FPC12FE0TQ0(01) OK
FPC12FE1TQ1(01)->S00F0_1(2,3,10) OK      S00F0_1(6,3,06)->FPC12FE1TQ1(01) OK
FPC14FE0TQ0(01)->S00F0_1(3,2,11) OK      S00F0_1(7,2,07)->FPC14FE0TQ0(01) OK
FPC14FE1TQ1(01)->S00F0_1(3,3,11) OK      S00F0_1(7,3,07)->FPC14FE1TQ1(01) OK
...
```

If the state of the link is `Error` replace the FPC and SIB to determine whether the error still occurs.

TIP: Use the `show chassis fabric topology | match error` command to quickly isolate errors.

3. Display the system log messages to obtain information about link failures. The **/var/log/messages** file is a commonly configured destination for system log messages. To display this file, issue the `show log` command. For example:

```
user@host> show log messages
```

For more information about system log messages, see the System Log Explorer.

Your customer support representative can assist you with using the information in the system log to determine whether you have a faulty SIB or FPC.

Troubleshooting the PTX3000 FPCs

IN THIS SECTION

Problem

Description

The following LED states and alarms indicate a problem with an FPC:

- The **STATUS** LED on the FPC is lit steadily red.
- The **STATUS** LED on the FPC is not lit.

Table 67 on page 410 describes the FPC LED trouble states.

Table 67: Troubleshooting FPC LEDs

Label	Color	State	Description
STATUS	Red	On steadily	FPC has failed.
	–	Off	FPC is offline.

In Table 68 on page 410, the text in the “CLI Message column” appears in the output of the `show chassis alarms` command.

Table 68: Troubleshooting FPC Alarms

Alarm Type	CLI Message	Alarm Condition	Recovery
Yellow (minor)	`Power Budget: No redundant power`	One or more FPCs do not have redundant power. If the PSM that provides power to the FPCs fails, the FPCs will lose service.	Verify the minimum number of required PSMs are installed as indicated in "PTX3000 Power System Description" on page 36. If necessary, install an additional PSM, or replace a failed PSM, or uninstall FPCs and PICs until you reach the number of FPCs your PSMs can support.

Solution

To troubleshoot an FPC:

1. Note the **STATUS** LED state.

2. Verify that the FPC is properly seated in the backplane. Check that each ejector handle has been latched firmly.

3. Use the CLI to check for alarms. Issue the `show chassis alarms` command to view the alarms.

4. Check the status of an FPC by using the following CLI command:

```
user@host> show chassis fpc

                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Empty
  1  Empty
  2  Online            51      4          0       2048        3         56
  3  Empty
  4  Online            39      4          0       2048        3         56
  5  Empty
  6  Present          Absent
  7  Empty
  8  Online            46      4          0       2048        3         56
  9  Empty
 10  Offline         ---Unresponsive---
 11  Empty
 12  Online            27      3          0       2048        3         56
 13  Empty
 14  Online            53      5          0       2048        3         56
 15  Empty
```

5. Use the following option to display more detailed information:

```
user@host> show chassis fpc detail
```

The following examples also specify a slot number, which is optional:

```
user@host> show chassis fpc detail 6
Slot 6 information:
  State                              Present
```

```
user@host> show chassis fpc detail 10
Slot 10 information:
  State                              Offline
  Reason                             Unresponsive
  Uptime                             2 hours, 17 minutes, 45 seconds
```

```
user@host> show chassis fpc detail 8
Slot 8 information:
  State                              Online
  Temperature                     51 degrees C / 123 degrees F (PMB Intake)
  Temperature                     45 degrees C / 113 degrees F (PMB Exhaust)
  Temperature                     72 degrees C / 161 degrees F (PMB CPU)
  Temperature                     42 degrees C / 107 degrees F (Intake)
  Temperature                     45 degrees C / 113 degrees F (Exhaust)
  Temperature                     67 degrees C / 152 degrees F (TL0)
  Temperature                     57 degrees C / 134 degrees F (TQ0)
  Temperature                     71 degrees C / 159 degrees F (TL1)
  Temperature                     60 degrees C / 140 degrees F (TQ1)
  Total CPU DRAM                2048 MB
  Start time                         2013-05-07 10:57:19 PDT
  Uptime                             4 hours, 41 minutes, 21 seconds
```

6. Use the `show chassis fabric summary` command to check the switch fabric.

```
user@host> show chassis fabric summary

FRU         State          Errors

SIB0        Online         Link Errors
SIB1        Online         None
SIB2        Online         None
```

```
SIB3          Online          None
SIB4          Online          None
SIB5          Empty
SIB6          Empty
SIB7          Online          None
SIB8          Online          None

FPC0          Empty
FPC1          Empty
FPC2          Online          None
FPC3          Empty
FPC4          Online          None
FPC5          Empty
FPC6          Present
FPC7          Empty
FPC8          Online          None
FPC9          Empty
FPC10         Offline
FPC11         Empty
FPC12         Online          None
FPC13         Empty
FPC14         Online          None
FPC15         Empty
```

7. Use the information gathered in the previous steps with the information in Table 67 on page 410 and Table 68 on page 410 to determine the proper course of action.

SEE ALSO

PTX3000 FPC LED | 101

show chassis fpc

show chassis fabric summary

Troubleshooting the PTX3000 PICs and PIC Cables

IN THIS SECTION

Problem

Description

A PIC LED lit red indicates a problem with the PIC.

Solution

To troubleshoot a PIC:

1. Check the status of the PIC and each PIC port. Look at the LEDs located on the PIC faceplate. For information about the meaning of LED states on different PICs, see the PTX Series Interface Module Reference.

2. Check the status of a PIC, issuing the `show chassis fpc pic-status` CLI command. In the CLI, all PICs are shown as `PIC 0`.

```
user@host> show chassis fpc pic-status

Slot 0   Online       FPC
  PIC 0  Online       24x 10GE(LWO) SFP+
Slot 2   Present      FPC
Slot 4   Online       FPC
  PIC 0  Online       24x 10GE(LWO) SFP+
Slot 6   Online       FPC
  PIC 0  Online       24x 10GE(LAN) SFP+
Slot 8   Online       FPC
  PIC 0  Online       24x 10GE(LAN) SFP+
Slot 10  Online       FPC
  PIC 0  Online       2x 40GE CFP
Slot 12  Online       FPC
```

```
  PIC 0  Online       2x 100GE CFP
Slot 14  Online       FPC
  PIC 0  Online       24x 10GE(LWO) SFP+
```

SEE ALSO

show chassis fpc

Troubleshooting the PTX3000 IPLCs

IN THIS SECTION

Problem

Description

The following LED states and alarms indicate a problem with an IPLC:

- The **STATUS** LED on the IPLC is lit steadily red.
- The **STATUS** LED on the IPLC is not lit.

Table 69 on page 415 describes the IPLC LED trouble states.

Table 69: Troubleshooting IPLC LED

Label	Color	State	Description
STATUS	Red	On steadily	IPLC has failed.
	–	Off	IPLC is offline.

Solution

To troubleshoot an IPLC:

1. Note the state of the **STATUS** LED.

2. Verify that the IPLC is properly seated in the backplane. Check that each ejector handle has been latched firmly.

3. Use the IPLC to check for alarms. Issue the `show chassis fpc optical properties alarms fpc-slot` *`fpc-slot`* command to view the optical module alarms.

```
user@host> show chassis fpc optical-properties alarms fpc-slot 8

Module Active Alarms
Main Board    IPLC 8 OSC Add LOS alarm is set
Output EDFA   IPLC 8 Output Power alarm is set
Output EDFA   IPLC 8 Out of Gain alarm is set
```

4. Check the status of an IPLC by using the following CLI command:

```
user@host> show chassis fpc

                     Temp  CPU Utilization (%)   CPU Utilization (%)  Memory    Utilization
(%)
Slot State            (C)  Total  Interrupt      1min   5min   15min  DRAM (MB) Heap
Buffer
  0  Online            58     6          0         0      0      0    15010      34          19
  1  Empty
  2  Empty
  3  Empty
  4  Online            49     6          2         0      0      0    15010      30          19
  5  Empty
  6  Online            59     6          0         0      0      0    15010      33          19
  7  Empty
  8  Online            51     0          0         0      0      0      3        15           3
  9  Empty
 10  Empty
 11  Empty
 12  Online            49     4          0         0      0      0    15010      31          19
 13  Empty
```

```
14   Empty
15   Present          Absent
```

5. Use the following option to display more detailed information:

   The following example also specifies a slot number, which is optional:

```
user@host> show chassis fpc detail 8
Slot 8 information:
  State                                Online
  Temperature                       44 degrees C / 111 degrees F (Intake)
  Temperature                       52 degrees C / 125 degrees F (Exhaust)
  Total CPU DRAM                     3 MB
  Start time                           2016-05-06 16:19:32 PDT
  Uptime                               40 minutes, 27 seconds
```

6. Use the information gathered in the previous steps with the information in Table 69 on page 415 to determine the proper course of action.

SEE ALSO

PTX3000 IPLC LED | 126

show chassis fpc

RELATED DOCUMENTATION

PTX3000 Craft Interface LEDs | 26

6

CHAPTER

Contacting Customer Support and Returning the Chassis or Components

Returning the PTX3000 Chassis or Components

IN THIS SECTION

Displaying PTX3000 Component Serial Numbers

Before contacting Juniper Networks, Inc. to request a Return Materials Authorization (RMA), you must find the serial number on the chassis or component. To list all of the PTX3000 components and their serial numbers, enter the following command-line interface (CLI) command:

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1209F07AJC      PTX3000
Midplane         REV 05   750-044645   ACAS0034          Backplane
FPM              REV 05   760-044663   ACAR1818          Front Panel Display
PSM 0            REV 02   740-044980   1ETW3080005       DC 12V Power Supply
PSM 1            REV 02   740-044980   1ETW3080008       DC 12V Power Supply
PSM 2            REV 02   740-044980   1ETW3080010       DC 12V Power Supply
PSM 3            REV 02   740-044980   1ETW3060008       DC 12V Power Supply
PSM 4            REV 02   740-044980   1ETW3080006       DC 12V Power Supply
Routing Engine 0 REV 10   740-026942   P737A-003412      RE-DUO-2600
Routing Engine 1 REV 07   740-026942   P737A-002687      RE-DUO-2600
CB 0             REV 09   750-044656   ACAR0993          Control Board
CB 1             REV 09   750-044656   ACAR0999          Control Board
FPC 4            REV 23   750-044650   ACAR1781          FPC
  CPU            REV 08   711-044647   ACAR2782          PMB
  PIC 0          REV 07   750-045108   BBAZ0027          24x 10GE(LWO) SFP+
```

```
    Xcvr 0       REV 01   740-031980   B10F00045        SFP+-10G-SR
    Xcvr 1       REV 01   740-021308   T09K75122        SFP+-10G-SR
    Xcvr 2       REV 01   740-031980   AHP0524          SFP+-10G-SR
    Xcvr 3       REV 01   740-031980   AJ40JTF          SFP+-10G-SR
    Xcvr 4       REV 01   740-031980   AHS0GYN          SFP+-10G-SR
    Xcvr 5       REV 01   740-031980   AJ403R3          SFP+-10G-SR
    Xcvr 6       REV 01   740-031980   093363A00352     SFP+-10G-SR
    Xcvr 7       REV 01   740-021308   92D709A00411     SFP+-10G-SR
    Xcvr 8       REV 01   740-031980   B10L01355        SFP+-10G-SR
    Xcvr 9       REV 01   740-031980   AJ107XX          SFP+-10G-SR
    Xcvr 10      REV 01   740-031980   AJ403V4          SFP+-10G-SR
    Xcvr 11      REV 01   740-031980   AJ403ZN          SFP+-10G-SR
    Xcvr 12      REV 01   740-031980   AHS0E9R          SFP+-10G-SR
    Xcvr 13      REV 01   740-031980   AJ30C1V          SFP+-10G-SR
    Xcvr 14      REV 01   740-021308   T09G76740        SFP+-10G-SR
    Xcvr 15      REV 01   740-031980   B10F00059        SFP+-10G-SR
    Xcvr 16      REV 01   740-021308   T09K75215        SFP+-10G-SR
    Xcvr 17      REV 01   740-031980   AJ403ZF          SFP+-10G-SR
    Xcvr 18      REV 01   740-031980   AHS0DN3          SFP+-10G-SR
    Xcvr 19      REV 01   740-031980   AJ40E49          SFP+-10G-SR
    Xcvr 20      REV 01   740-021308   T09K74954        SFP+-10G-SR
    Xcvr 21      REV 01   740-021308   T09K75073        SFP+-10G-SR
    Xcvr 22      REV 01   740-031980   AJ403T2          SFP+-10G-SR
    Xcvr 23      REV 01   740-021308   T09G78992        SFP+-10G-SR
FPC 10           REV 17   750-044650   ACAR1044         FPC
  CPU            REV 07   711-044647   ACAR0883         PMB
  PIC 0          REV 14   750-036710   EG3101           2x 40GE CFP
    Xcvr 0       REV 01   740-034554   P10F24065        CFP-40G-LR4
    Xcvr 1       REV 01   740-034554   23Z127N00046     CFP-40G-LR4
FPC 12           REV 23   750-044650   ACAR1778         FPC
  CPU            REV 07   711-044647   ACAR1232         PMB
  PIC 0          REV 18   750-031916   BBAV3520         2x 100GE CFP
    Xcvr 0                NON-JNPR     C22CT7A          CFP-100G-LR4
    Xcvr 1       REV 01   740-032210   C22CSBU          CFP-100G-LR4
SIB 0            REV 17   750-044653   ACAR2374         SIB
SIB 1            REV 12   750-044653   ACAR0050         SIB
SIB 2            REV 17   750-044653   ACAR2364         SIB
SIB 3            REV 17   750-044653   ACAR2376         SIB
SIB 4            REV 17   750-044653   ACAR2358         SIB
SIB 5            REV 17   750-044653   ACAR2367         SIB
SIB 6            REV 17   750-044653   ACAR2365         SIB
SIB 7            REV 17   750-044653   ACAR2360         SIB
SIB 8            REV 17   750-044653   ACAR2369         SIB
```

```
Fan Tray 0        REV 10    760-044659    ACAR2761          Fan Tray (Exhaust)
Fan Tray 1        REV 10    760-044659    ACAR2763          Fan Tray (Exhaust)
```

Most components also have a small rectangular serial number ID label (see Figure 168 on page 421) attached to the component body.

Figure 168: Serial Number ID Label

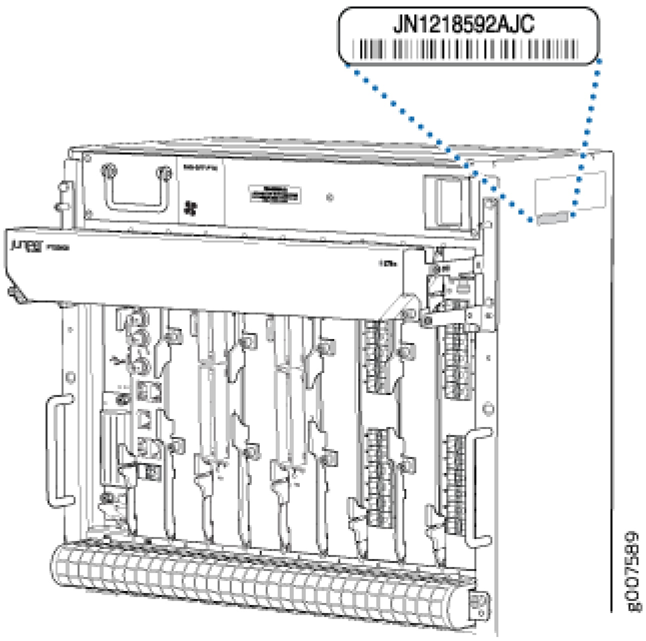
PTX3000 Component Serial Number Locations

IN THIS SECTION

Chassis Serial Number Label

The serial number label is located as shown in Figure 169 on page 422.

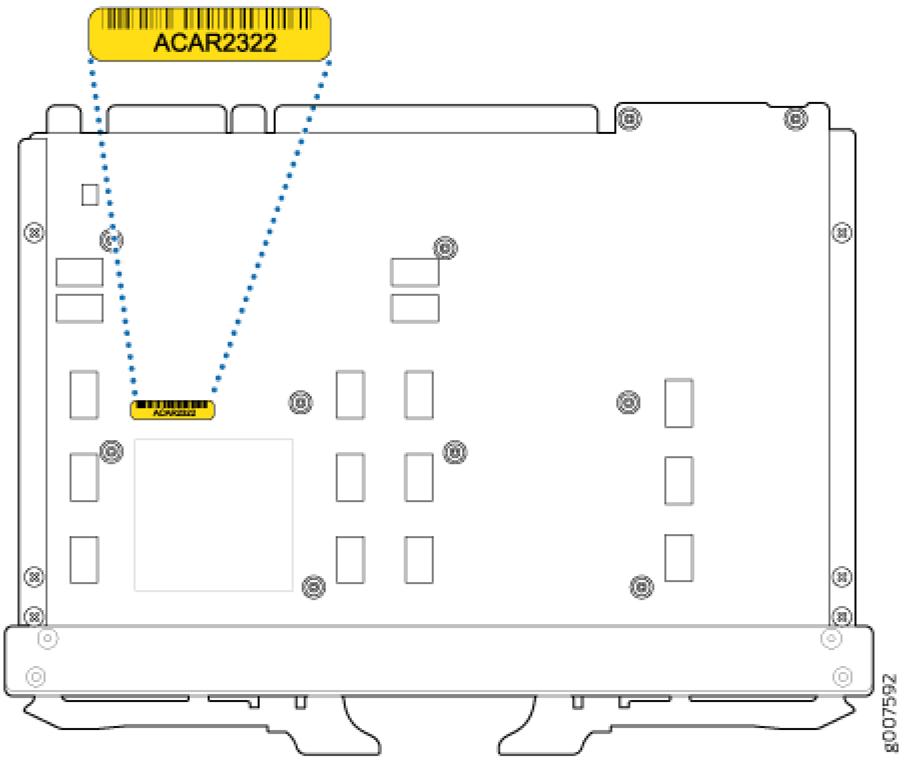
Figure 169: Chassis Serial Number Label



Control Board Serial Number Label

The serial number label is located as shown in Figure 170 on page 423.

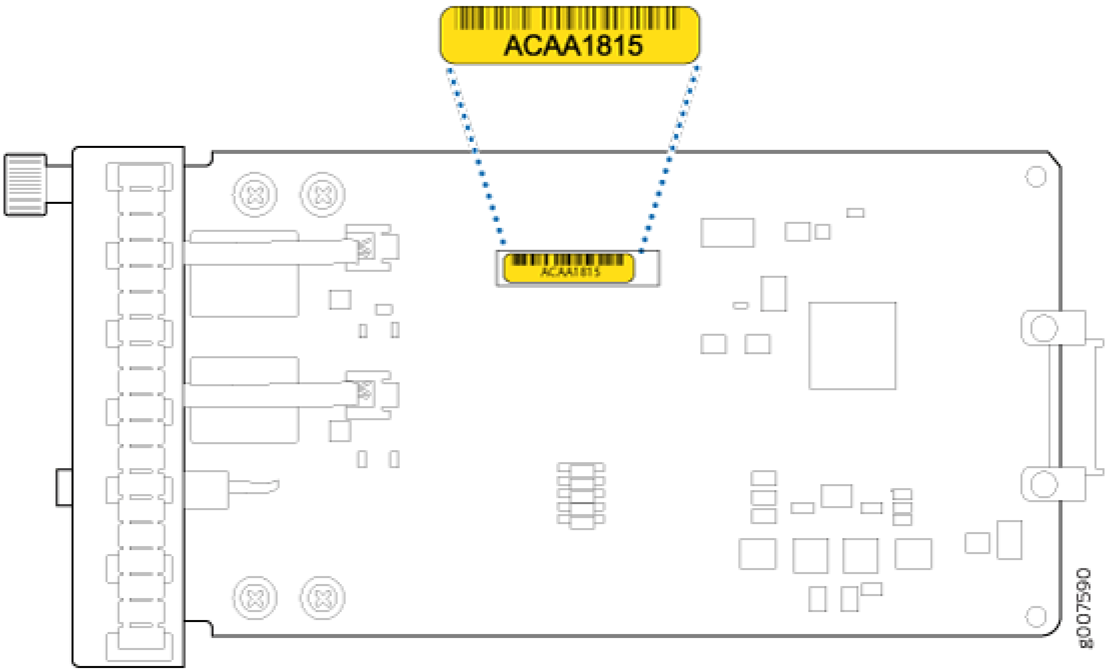
Figure 170: Control Board Serial Number Label



Craft Interface Serial Number Label

The serial number label is located as shown in Figure 171 on page 424.

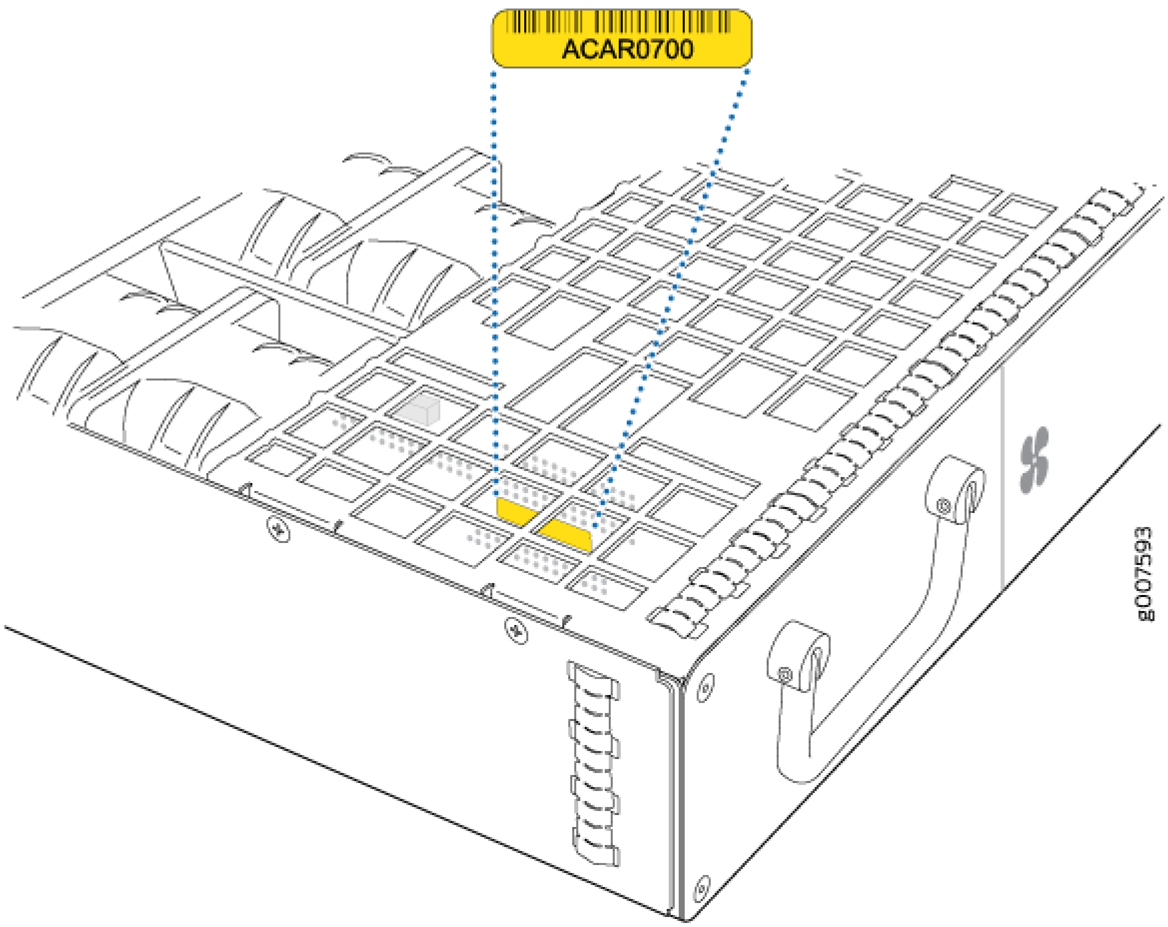
Figure 171: Craft Interface Serial Number Label



Fan Tray Serial Number Label

The serial number label is located as shown in Figure 172 on page 425.

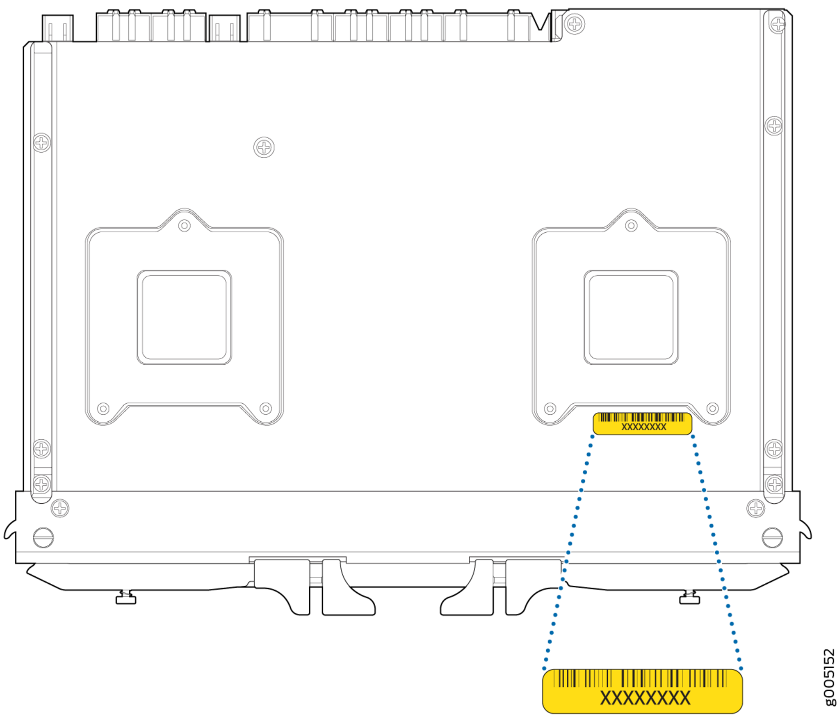
Figure 172: Fan Tray Serial Number Label



FPC Serial Number Label

The serial number label is located as shown in Figure 173 on page 426.

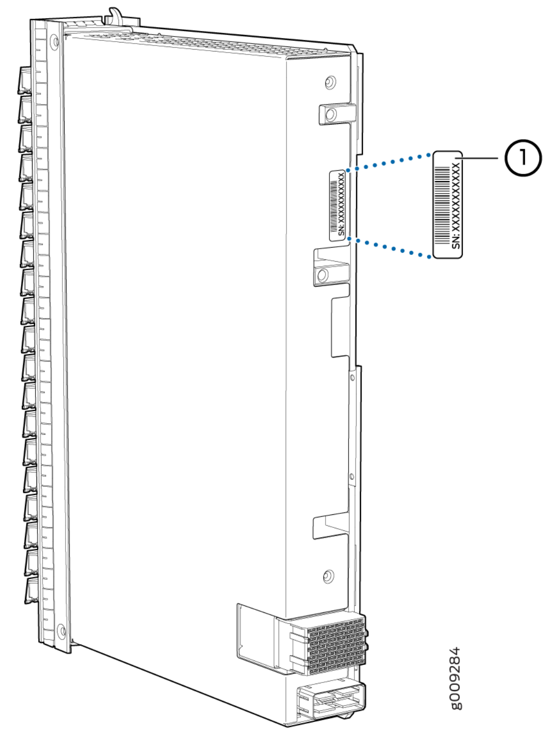
Figure 173: FPC3-SFF-PTX Serial Number Label



IPLC Serial Number Label

The serial number label is located as shown in Figure 174 on page 427.

Figure 174: IPLC Serial Number Label



PIC Serial Number Label

PIC serial number label location varies for each PIC. See Figure 175 on page 428, Figure 176 on page 429, and Figure 177 on page 430 for examples of PIC serial number location.

Figure 175: 10-Gigabit Ethernet PIC Serial Number Label

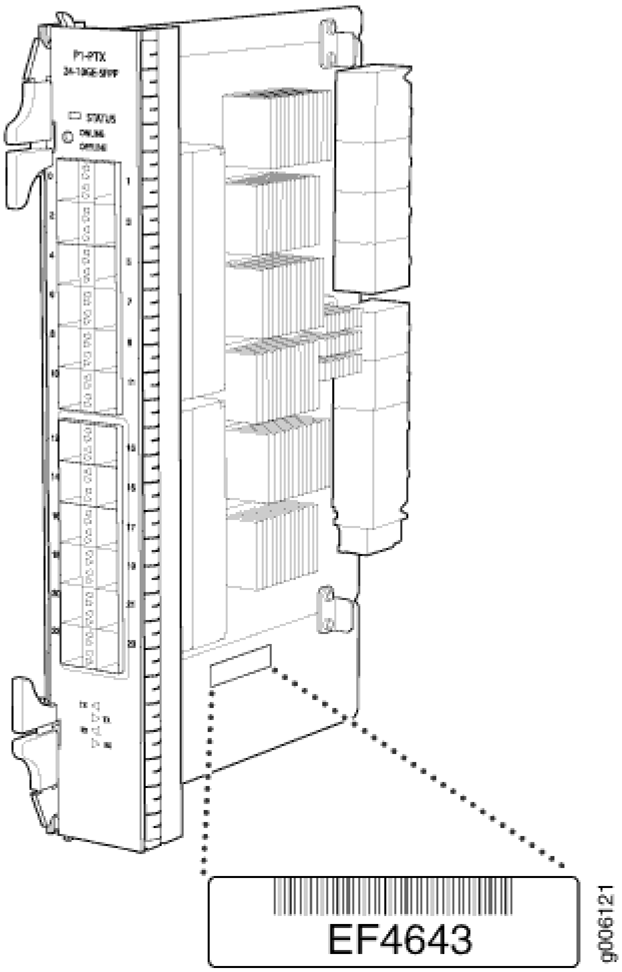


Figure 176: 40-Gigabit Ethernet PIC Serial Number Label

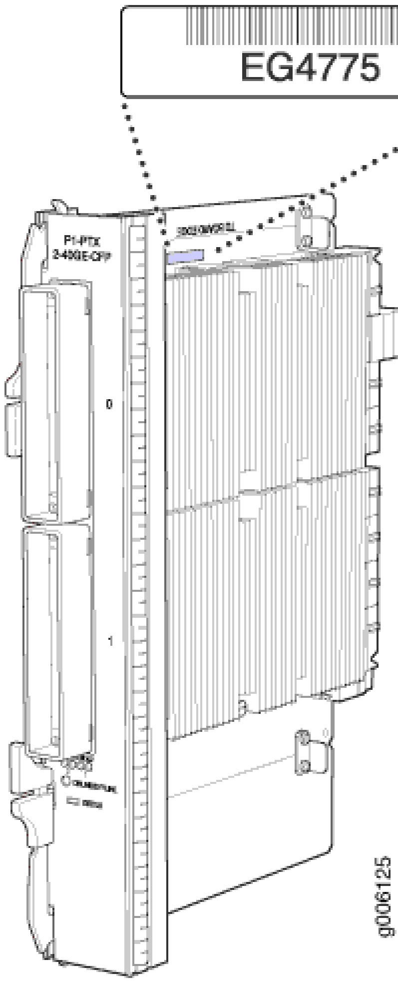
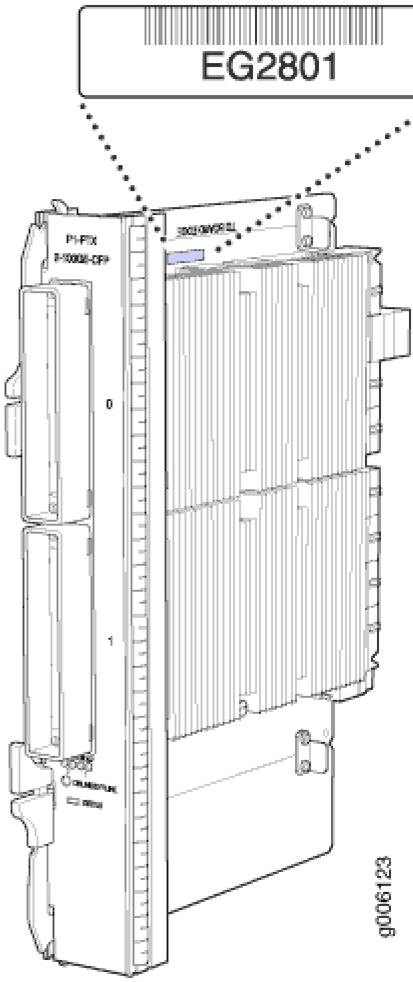


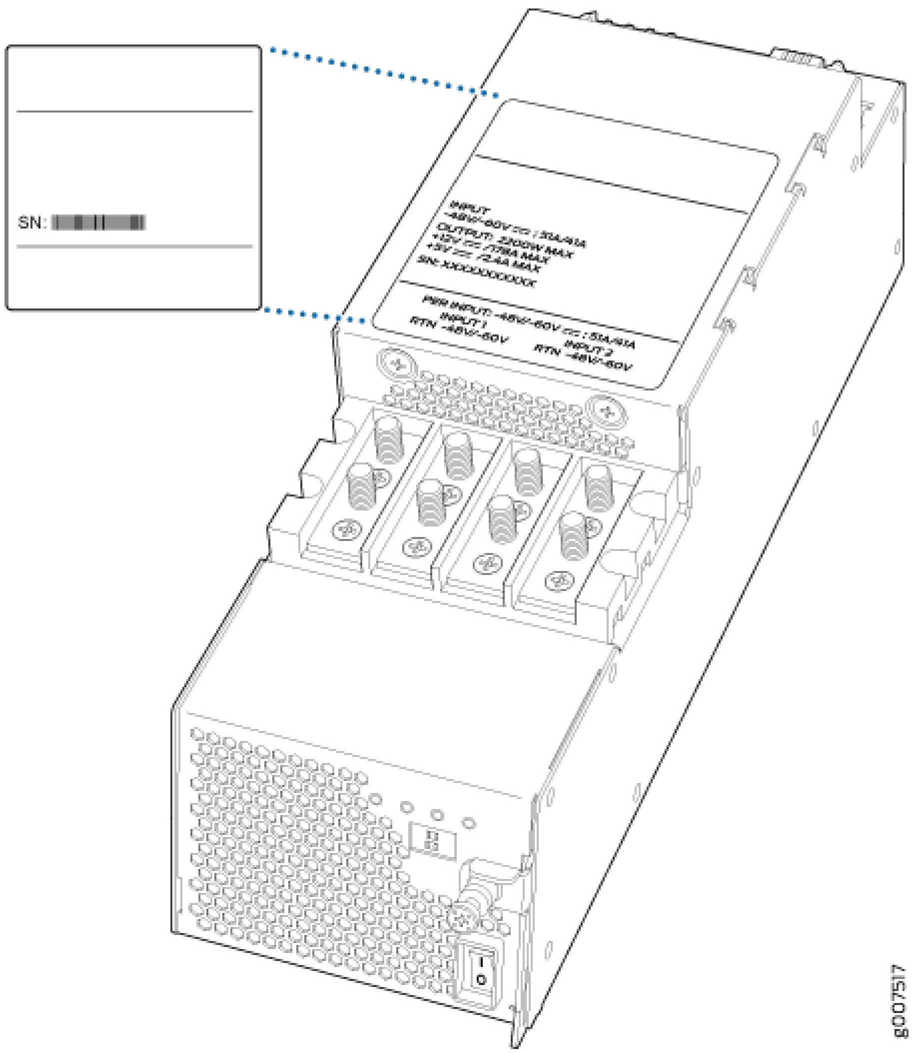
Figure 177: 100-Gigabit Ethernet PIC Serial Number Label



PSM Serial Number Label

The serial number label is located as shown in Figure 178 on page 431.

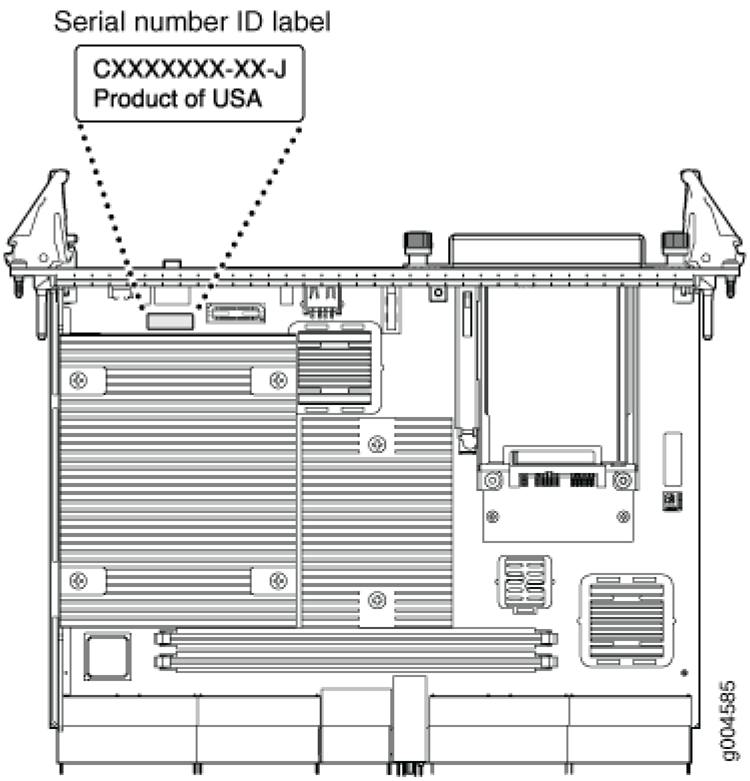
Figure 178: PSM Serial Number Label



Routing Engine Serial Number Label

The serial number label is located as shown in Figure 179 on page 432.

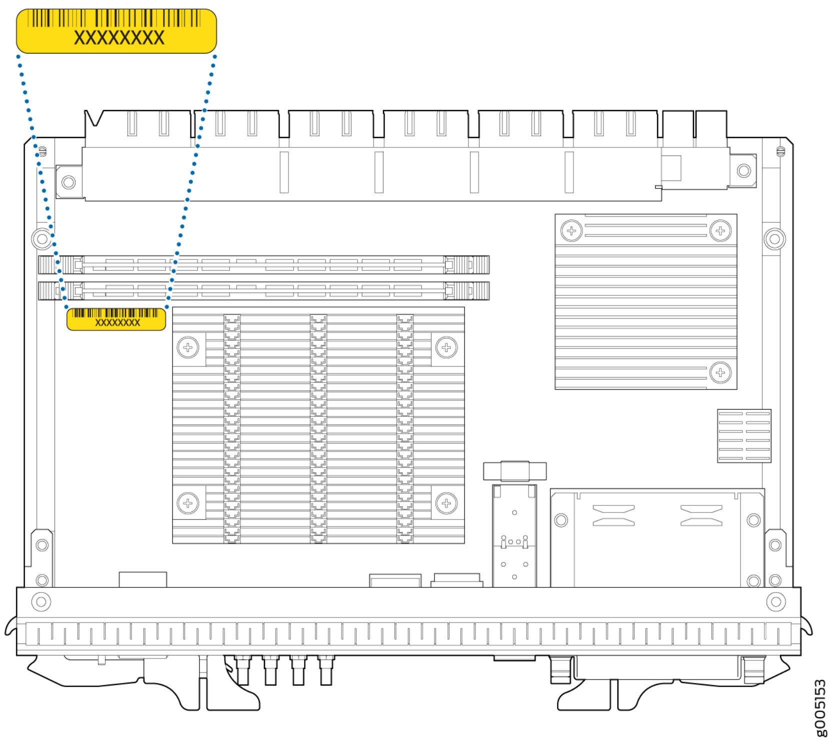
Figure 179: Routing Engine Serial Number Label



RCB Serial Number Label

The serial number label is located as shown in Figure 180 on page 433.

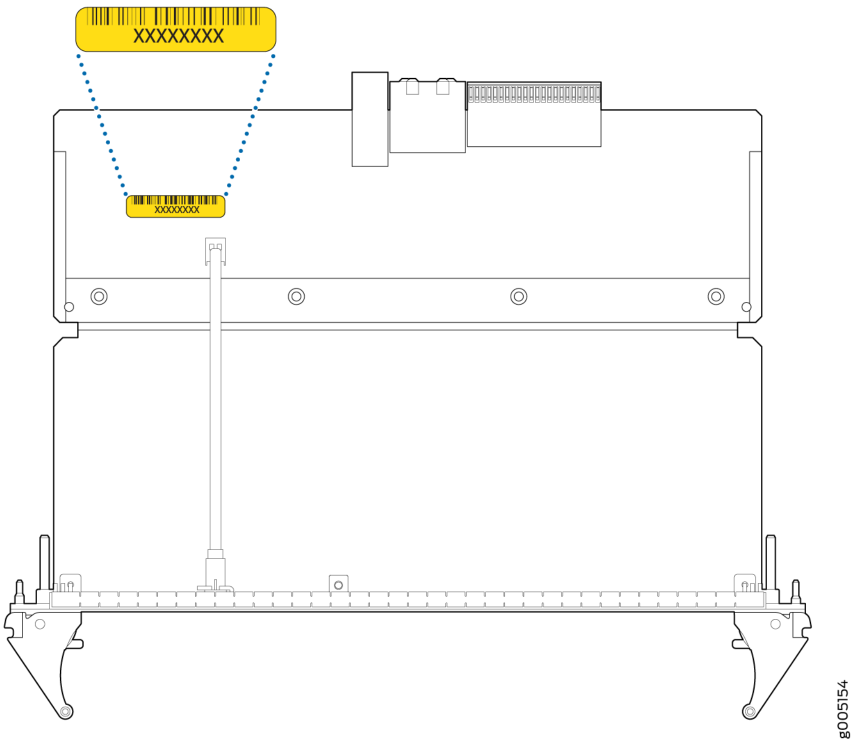
Figure 180: RCB Serial Number Label



RCB Companion Card Serial Number Label

The serial number label is located as shown in Figure 181 on page 434.

Figure 181: RCB Companion Card Serial Number Label



SIB Serial Number Label

The serial number label is located as shown in Figure 182 on page 435 and Figure 183 on page 436.

Figure 182: SIB-SFF-PTX-240 Serial Number Label

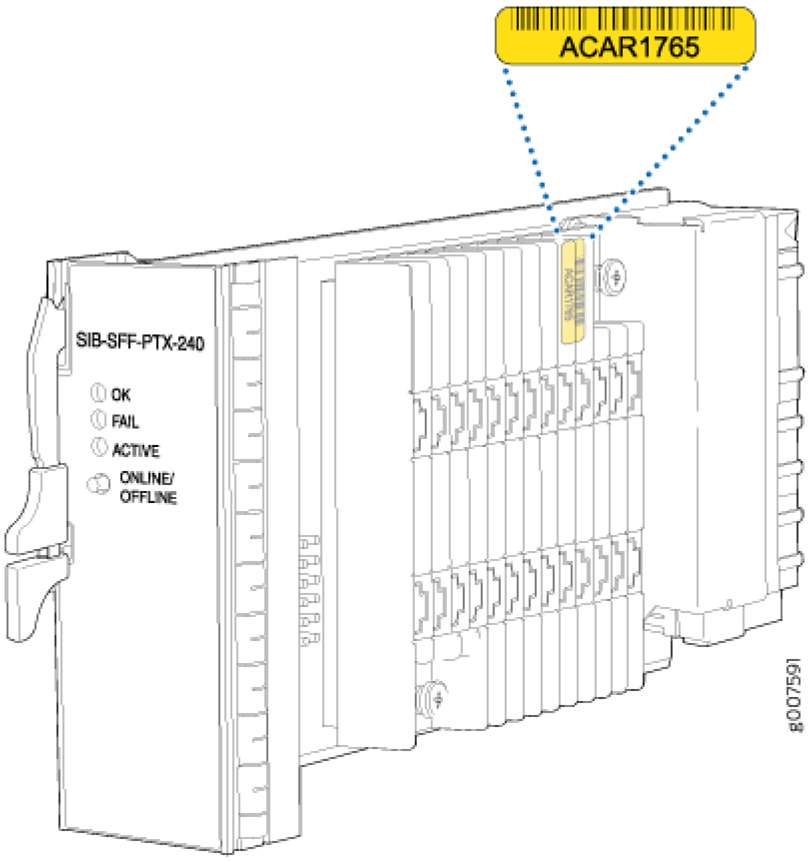
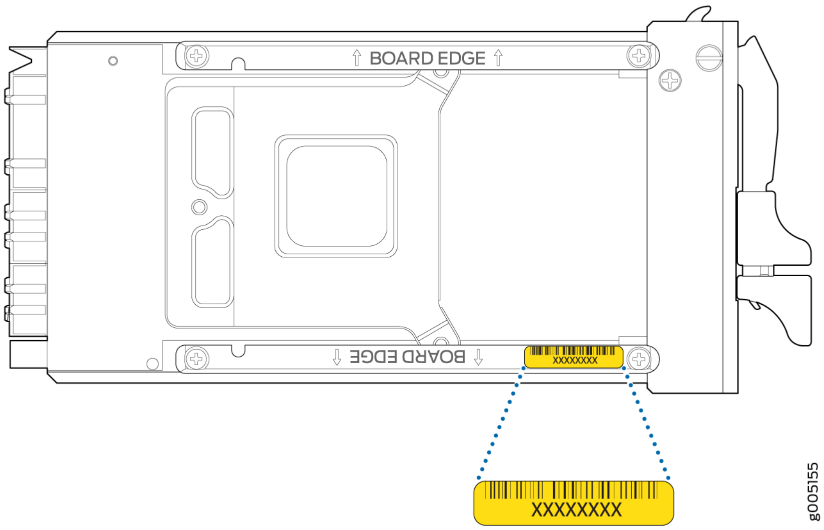


Figure 183: SIB3-SFF-PTX Serial Number Label



Contact Customer Support to Obtain a Return Material Authorization

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

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

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

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

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

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

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

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

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

Tools and Parts Required to Remove Components from a PTX3000

To remove components from the PTX3000 or the PTX3000 from a rack, you need the following tools and parts:

- 2.5-mm flat-blade (–) screwdriver, for detaching alarm relay terminal block
- 10 mm nut driver
- Blank panels to cover empty slots
- Electrostatic bag or antistatic mat, for each component
- Electrostatic discharge (ESD) grounding wrist strap
- Flat-blade (–) screwdriver
- Mechanical lift (for the chassis)
- Phillips (+) screwdrivers, numbers 1 and 2
- Rubber safety cap for fiber-optic interfaces and cable
- Wire cutters

Packing the PTX3000 for Shipment

To pack the PTX3000 for shipment:

1. Retrieve the shipping crate and packing materials in which the PTX3000 was originally shipped. If you do not have these materials, contact your Juniper Networks representative about approved packaging materials.

   TIP: You can order a replacement shipping container from Juniper Networks. The PTX3000 shipping container model number is PKG-PTX3000-S.

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. On the console or other management device connected to the primary Routing Engine, enter CLI operational mode. To power off the PTX3000, see "Powering Off the PTX3000" on page 225.
4. Disconnect power from the PTX3000. For instructions, see the procedure to disconnect power in"Replacing a PTX3000 DC PSM" on page 264.
5. Remove the cables that connect to all external devices.
6. Remove all Field Replaceable Units (FRUs) from the PTX3000.
7. Remove the front doors, if they are installed on the upper or lower card cage.
8. Remove the PTX3000 from the rack. Place the mechanical lift platform under the PTX3000, unscrew and remove the mounting screws from the rack, and move the PTX3000 to the shipping crate.
9. Place the PTX3000 in the shipping crate or onto the pallet. If on a pallet, bolt the chassis to the pallet.
10. Cover the chassis with an ESD bag and place the packing foam on top of and around the PTX3000.
11. Replace the accessory box on top of the packing foam.
12. Securely tape the box closed or place the crate cover over the PTX3000.
13. Write the RMA number on the exterior of the box to ensure proper tracking.

Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

- When you return components, make sure that they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
- Use the original shipping materials if they are available.

- Place individual components in antistatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.

CAUTION: Do not stack any of the hardware components.

RELATED DOCUMENTATION

Prevention of Electrostatic Discharge Damage

7

CHAPTER

Safety and Compliance Information

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

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

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

Fire Suppression

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

Fire Suppression Equipment

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

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers). The primary ingredient in these fire extinguishers is monoammonium phosphate, which is very sticky and difficult to clean. In addition, in the presence of minute amounts of moisture, monoammonium phosphate can become highly corrosive and corrodes most metals.

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

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

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

Installation Instructions Warning

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

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

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

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

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

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

Advarsel Les installasjonsinstruksjonene før systemet kobles til strømkilden.

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

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

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

Chassis and Component Lifting Guidelines

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

Restricted Access Warning

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

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

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

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

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

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

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

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

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

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

Ramp Warning

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

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

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

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

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

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

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

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

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

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

Rack-Mounting and Cabinet-Mounting Warnings

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

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

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

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

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

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

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

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

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

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

- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.

- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.

- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

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

- Der Juniper Networks switch muß in einem Gestell installiert werden, das in der Gebäudestruktur verankert ist.

- Wenn diese Einheit die einzige im Gestell ist, sollte sie unten im Gestell angebracht werden.

- Bei Anbringung dieser Einheit in einem zum Teil gefüllten Gestell ist das Gestell von unten nach oben zu laden, wobei das schwerste Bauteil unten im Gestell anzubringen ist.

- Wird das Gestell mit Stabilisierungszubehör geliefert, sind zuerst die Stabilisatoren zu installieren, bevor Sie die Einheit im Gestell anbringen oder sie warten.

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

- Il Juniper Networks switch deve essere installato in un telaio, il quale deve essere fissato alla struttura dell'edificio.

- Questa unità deve venire montata sul fondo del supporto, se si tratta dell'unica unità da montare nel supporto.

- Quando questa unità viene montata in un supporto parzialmente pieno, caricare il supporto dal basso all'alto, con il componente più pesante sistemato sul fondo del supporto.

- Se il supporto è dotato di dispositivi stabilizzanti, installare tali dispositivi prima di montare o di procedere alla manutenzione dell'unità nel supporto.

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

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

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

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

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

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

- Cuando este equipo se vaya a instalar en un bastidor parcialmente ocupado, comenzar la instalación desde la parte inferior hacia la superior colocando el equipo más pesado en la parte inferior.

- Si el bastidor dispone de dispositivos estabilizadores, instalar éstos antes de montar o proceder al mantenimiento del equipo instalado en el bastidor.

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

- Juniper Networks switch måste installeras i en ställning som är förankrad i byggnadens struktur.

- Om denna enhet är den enda enheten på ställningen skall den installeras längst ned på ställningen.

- Om denna enhet installeras på en delvis fylld ställning skall ställningen fyllas nedifrån och upp, med de tyngsta enheterna längst ned på ställningen.

- Om ställningen är försedd med stabiliseringsdon skall dessa monteras fast innan enheten installeras eller underhålls på ställningen.

Grounded Equipment Warning

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

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

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

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

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

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

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

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

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

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

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

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

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 184 on page 468) 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).

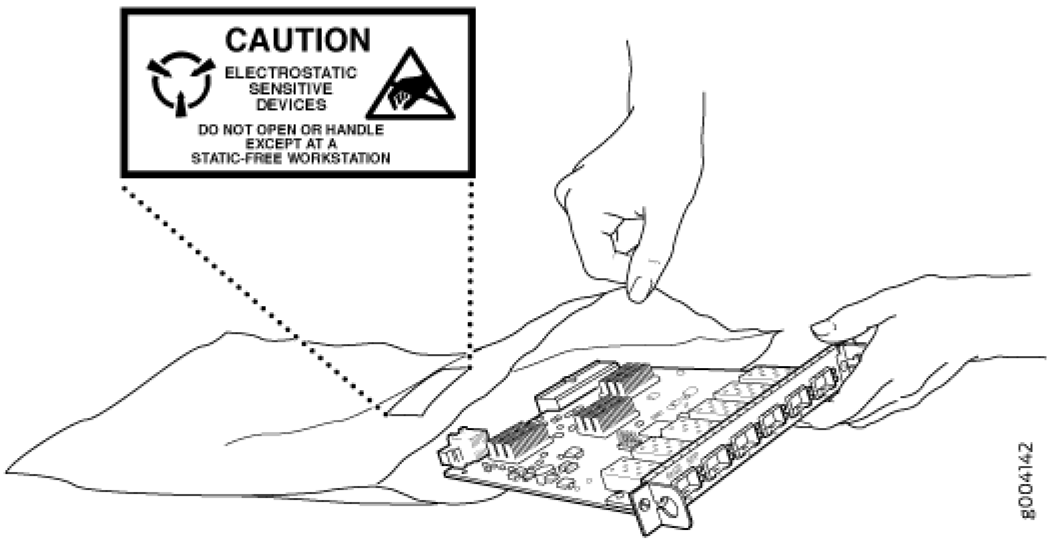
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  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 184 on page 468). If you are returning a component, place it in an antistatic bag before packing it.

Figure 184: 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.

PTX3000 DC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to a DC-powered PTX3000:

- A DC-powered PTX3000 is equipped with a DC terminal block that is rated for the power requirements of a maximally configured PTX3000. To supply sufficient power, terminate the DC input wiring on a facility DC source capable of supplying at least 51 A @ –48 VDC per input for the DC PSM. Incorporate an easily accessible disconnect device into the facility wiring. In the United States and Canada, the –48 VDC facility should be equipped with a circuit breaker rated a minimum of 125% of the power provisioned for the input in accordance with the National Electrical Code in the US and the Canadian Electrical Code in Canada. 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 PTX3000 that is equipped with a DC terminal block is intended only for installation in a restricted access location. In the United States, a restricted access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

NOTE: Primary overcurrent protection is provided by the building circuit breaker. This breaker should protect against excess currents, short circuits, and earth faults in accordance with NEC ANSI/NFPA70.

RELATED DOCUMENTATION

PTX3000 DC Power System Electrical Specifications | 49

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.

Midplane Energy Hazard Warning

WARNING: High levels of electrical energy are distributed across the midplane. Be careful not to contact the midplane connectors, or any component connected to the midplane, with any metallic object while servicing components.

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.

PTX3000 Agency Approvals and Compliance Statements

IN THIS SECTION

PTX3000 Agency Approvals

IN THIS SECTION

The PTX3000 complies with the following standards:

- Safety
  - CAN/CSA-22.2 No. 60950–1–07/UL 60950–1, 2nd Ed., Safety of Information Technology Equipment
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC
  - AS/NZS 3548 Class A (Australia/New Zealand)
  - EN55022 Class A (Europe)
  - FCC Part 15 Class A (USA)
  - VCCI Class A (Japan)
- Immunity
  - EN-61000-3-3 Voltage Fluctuations and Flicker
  - EN-61000-4-2 ESD
  - EN-61000-4-3 Radiated Immunity
  - EN-61000-4-4 EFT

    - EN-61000-4-5 Surge
    - EN-61000-4-6 Low Frequency Common Immunity
- ETSI EN-300386-2 Telecommunication Network Equipment. Electromagnetic Compatibility Requirements

The PTX3000 is designed to comply with the following standard:

- NEBS
    - GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment
    - SR-3580 NEBS Criteria Levels (Level 3 Compliance)
    - GR-63-Core: NEBS, Physical Protection

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements

IN THIS SECTION

Canada

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

European Community

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

Israel

אזהרה

מוצר זה הוא מוצר Class A.
בסביבה ביתית,מוצר זה עלול לגרום הפרעות בתדר רדיו,ובמקרה זה המשתמש עשוי להידרש
לנקוט אמצעים מתאימים.

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

Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The preceding translates as follows:

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

United States

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

Compliance Statements for Environmental Requirements

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

PTX3000 Compliance Statements for NEBS

- The equipment is suitable for installation as part of the Common Bonding Network (CBN).
- The equipment is suitable for installations in Network Telecommunication Facilities.
- 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.
- For Juniper systems with AC power supplies, an external surge protective device (SPD) must be used at the AC power source.

PTX3000 Compliance Statements for Acoustic Noise

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 70dB(A) oder weniger gemäss EN ISO 7779

Translation:

The emitted sound pressure is below 70dB(A) per EN ISO 7779.