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MX10008 Universal Routing Platform Hardware Guide

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Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

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MX10008 Universal Routing Platform Hardware Guide
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Table of Contents

About This Guide | xi

1 **Overview**

MX10008 System Overview | 2

- MX10008 Hardware Overview | **2**
- MX10008 Configurations and Upgrade Options | **15**
- MX10008 Components and Configurations | **22**
- MX10008 Component Redundancy | **25**
- MX10008 Hardware and CLI Terminology Mapping | **26**

MX10008 Chassis | 29

- MX10008 Chassis Physical Specifications | **29**
- Field-Replaceable Units in an MX10008 | **33**
- MX10008 Status Panel LEDs | **35**
- MX10008 Optional Equipment | **39**

MX10008 Cooling System | 40

- MX10008 Cooling System and Airflow | **41**
- MX10008 Fan Tray LEDs and Fan Tray Controller LEDs | **49**

MX10008 Power System | 57

- JNP10K-PWR-AC Power Supply | **58**
- JNP10K-PWR-AC2 Power Supply | **61**
- JNP10K-PWR-DC Power Supply | **62**
- JNP10K-PWR-DC2 Power Supply | **66**
- JNP10K-PWR-AC Power Supply LEDs | **68**
- JNP10K-PWR-AC2 Power Supply LEDs | **69**
- JNP10K-PWR-DC Power Supply LEDs | **71**

JNP10K-PWR-DC2 Power Supply LEDs | 73

MX10008 Routing and Control Board Components and Descriptions | 77

MX10008 Routing and Control Board Description | 78

MX10008 Routing and Control Board LEDs | 81

MX10008 Switch Fabric Board | 85

MX10008 Switch Fabric Board Description | 86

MX10008 Switch Fabric Board LEDs | 89

MX10K-LC2101 Line Card | 90

MX10K-LC480 Line Card | 93

MX10K-LC9600 Line Card | 96

2 Site Planning, Preparation, and Specifications

MX10008 Site Preparation Overview | 102

MX10008 Site Preparation Checklist | 102

MX10008 Environmental Requirements and Specifications | 104

General Site Guidelines | 105

Site Electrical Wiring Guidelines | 106

MX10008 Rack Requirements | 108

MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance | 110

MX10008 Power Planning | 112

Power Requirements for an MX10008 Router | 112

Calculating the Power Consumption of Your MX10008 Configuration | 113

Calculating the Number of Power Supplies Required for Your MX10008 Configuration | 115

JNP10K-PWR-AC Power Specifications | 117

JNP10K-PWR-AC2 Power Specifications | 119

MX10008 Power Cables Specifications | 120

JNP10K-PWR-DC Power Specifications | 129

JNP10K-PWR-DC2 Power Specifications | 130

MX10008 Grounding Cable and Lug Specifications | 131

MX10008 Transceiver and Cable Specifications | 132

MX10008 Optical Transceiver and Cable Support | 132

MX10008 Cable Specifications for Console and Management Connections | 133

Understanding Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 134

Calculating the Fiber-Optic Cable Power Budget for an MX10008 Router | 136

Calculating the Fiber-Optic Cable Power Margin for an MX10008 Router | 136

MX10008 Alarm and Management Cable Specifications and Pinouts | 138

Console Port Connector Pinouts for an MX10008 Router | 139

USB Port Specifications for the MX10008 Router | 140

Management Port Connector Pinouts for the MX10008 Router | 141

RJ-45 Connector Pinouts for the External Clock Ports | 142

3 **Initial Installation and Configuration**

MX10008 Installation Overview | 145

Unpacking the MX10008 Router and Components | 146

Unpacking the MX10008 | 146

Unpacking Line Cards, RCBs, and Switch Fabric Boards | 148

Comparing the MX10008 Order to the Packing List | 150

Register Products—Mandatory to Validate SLAs | 154

Installing the Mounting Hardware | 155

Installing the MX10008 into a Rack | 158

Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift | 158

Manually Mounting an MX10008 in a 4-Post Rack | 161

Installing the Front Door on an MX10008 | 165

Before You Begin | 165

Install the Front Door | 166

Install the Air Filter | 169

Connecting the MX10008 to Power | 172

Connect the MX10008 to Earth Ground | **172**

Connect AC Power to an MX10008 | **174**

Connect DC Power to an MX10008 | **175**

Connecting the MX10008 to External Devices | 176

Connecting an MX10008 to a Network for Out-of-Band Management | **176**

Connecting an MX10008 Router to a Management Console | **177**

Configuring an MX10008 Router | 178

4 **Maintaining Components**

Field-Replaceable Units in an MX10008 | 183

Removing and Installing Routing and Control Boards | 185

Handling and Storing Routing and Control Boards | **185**

Holding Routing and Control Boards | **185**

Storing Routing and Control Boards | **186**

Removing a Routing and Control Board | **186**

Installing a Routing and Control Board | **188**

Removing and Installing MX10008 Cooling System Components | 191

Removing an MX10008 Fan Tray | **192**

Installing an MX10008 Fan Tray | **195**

Removing an MX10008 Fan Tray Controller | **197**

Installing an MX10008 Fan Tray Controller | **199**

Removing and Installing MX10000 Power System Components | 201

How to Remove a JNP10K-PWR-AC Power Supply | **202**

How to Install a JNP10K-PWR-AC Power Supply | **207**

How to Remove a JNP10K-PWR-AC2 Power Supply | **214**

How to Install a JNP10K-PWR-AC2 Power Supply | **218**

How to Remove a JNP10K-PWR-DC Power Supply | **225**

How to Install a JNP10K-PWR-DC Power Supply | **230**

How to Remove a JNP10K-PWR-DC2 Power Supply | **242**

How to Install a JNP10K-PWR-DC2 Power Supply | **246**

Removing and Installing MX10008 Switch Fabric Boards | 257

Handling and Storing MX10008 Switch Fabric Boards | **257**

Holding Switch Fabric Boards | **257**

Storing Switch Fabric Boards | **259**

Removing an MX10008 Switch Fabric Board | **259**

Installing an MX10008 Switch Fabric Board | **263**

Upgrade from JNP10008-SF to JNP10008-SF2 | **268**

Removing and Installing MX10008 MPC Components | 273

How to Handle and Store an MX10008 MPC | **273**

Handling MPCs | **273**

Storing MPCs | **274**

Install an MPC in an MX10008 | **275**

Remove an MPC | **279**

Install the Cable Management System | **283**

Removing and Installing Transceivers and Fiber-Optic Cables | 286

Remove a Transceiver | **287**

Install a Transceiver | **289**

Disconnect a Fiber-Optic Cable from a Router | **291**

Connect a Fiber-Optic Cable to a Router | **292**

Maintain the Fiber-Optic Cables in a Router | **293**

Removing the MX10008 Router | 294

Powering Off an MX10008 Router | **294**

Removing an MX10008 Router From a Four-Post Rack Using a Mechanical Lift | **297**

Manually Removing an MX10008 Router from a 4-Post Rack | **298**

5 Troubleshooting Hardware

Restoring Junos OS | 302

Creating an Emergency Boot Device | 302

Performing a Recovery Installation Using an Emergency Boot Device | 304

Alarm Messages | 306

Understanding Alarms | 306

Interface Alarm Messages | 308

6 Contacting Customer Support and Returning the Chassis or Components

Contact Customer Support | 310

Returning the MX10008 Chassis or Components | 311

Returning a Router or Component for Repair or Replacement | 311

Locating the Serial Number on an MX10008 Router or Component | 312

Listing the Chassis and Component Details Using the CLI | 312

Locating the Chassis Serial Number ID Label on an MX10008 | 319

Locating the Serial Number ID Labels on MX10008 Power Supplies | 320

Locating the Serial Number ID Labels on MX10008 Fan Trays and Fan Tray Controllers | 323

Locating the Serial Number ID Labels on MX10008 Routing and Control Boards | 324

Locating the Serial Number ID Labels on an MX10008 Line Card | 324

Locating the Serial Number ID Labels on an MX10008 Switch Fabric Board (SFB) | 325

Contacting Customer Support to Obtain a Return Materials Authorization for a Router or Component | 325

Packing an MX10008 Router or Component for Shipping | 326

Packing an MX10008 Chassis for Shipping | 327

Packing MX10008 Components for Shipping | 330

7 Safety and Compliance Information

General Safety Guidelines and Warnings | 334

Definitions of Safety Warning Levels | 335

Qualified Personnel Warning | 337

Warning Statement for Norway and Sweden | 337

Fire Safety Requirements | 338

Installation Instructions Warning | 339

MX10008 Chassis Lifting Guidelines | 340

Restricted Access Warning | 340

Ramp Warning | 342

Rack-Mounting and Cabinet-Mounting Warnings | 342

Grounded Equipment Warning | 347

Radiation from Open Port Apertures Warning | 347

Laser and LED Safety Guidelines and Warnings | 348

Maintenance and Operational Safety Guidelines and Warnings | 351

General Electrical Safety Guidelines and Warnings | 357

Action to Take After an Electrical Accident | 359

Prevention of Electrostatic Discharge Damage | 359

AC Power Electrical Safety Guidelines | 361

AC Power Disconnection Warning | 362

DC Power Electrical Safety Guidelines for MX10008 Router | 363

DC Power Disconnection Warning | 364

DC Power Grounding Requirements and Warning | 365

DC Power Wiring Sequence Warning | 366

DC Power Wiring Terminations Warning | 368

Multiple Power Supplies Disconnection Warning | 369

TN Power Warning | 370

Agency Approvals and Compliance Statements | 371

- Agency Approvals for the Router | 371
- Compliance Statements for EMC Requirements for the Router | 372

About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the MX10008 Universal Routing Platform.

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

- MX10008 Quick Start

1

CHAPTER

Overview

MX10008 System Overview | 2

MX10008 Chassis | 29

MX10008 Cooling System | 40

MX10008 Power System | 57

MX10008 Routing and Control Board Components and Descriptions | 77

MX10008 Switch Fabric Board | 85

MX10K-LC2101 Line Card | 90

MX10K-LC480 Line Card | 93

MX10K-LC9600 Line Card | 96

MX10008 System Overview

IN THIS SECTION

- MX10008 Hardware Overview | 2
- MX10008 Configurations and Upgrade Options | 15
- MX10008 Components and Configurations | 22
- MX10008 Component Redundancy | 25
- MX10008 Hardware and CLI Terminology Mapping | 26

The MX10000 line of 5G Universal Routing Platforms give cloud and service providers the performance and scalability needed to outpace increased traffic demands. MX10008 provides 1-Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet, or 400-Gigabit Ethernet modular solutions that support up to 76.8 Tbps of throughput. MX10008 provides redundancy and resiliency. All major hardware components including the power system, the cooling system, and the control board are fully redundant.

MX10008 Hardware Overview

IN THIS SECTION

- Benefits of the MX10008 Router | 3
- Chassis Description | 4
- MX10008 Routing and Control Board | 6
- MX10008 Line Cards | 7
- Switch Fabric Boards | 9
- Cooling System | 10
- MX10008 Power Supplies | 12
- Software on MX10008 | 14

Juniper Networks MX10008 Universal Routing Platform enables cloud and data center operators to transition from 10-Gigabit Ethernet and 40-Gigabit Ethernet networks to 100-Gigabit Ethernet high-performance networks. The 13 rack unit (13 U) modular chassis can provide 76.8 Tbps of throughput and 20 Bpps of forwarding capacity. The MX10008 router has eight slots for the line cards that can support a maximum of 768 100-Gigabit Ethernet ports (4x100 GbE breakout cables), 192 40-Gigabit Ethernet ports, 192 100-Gigabit Ethernet ports, or 192 400-Gigabit Ethernet ports. You can deploy the MX10008 router in an IP edge network.

You can deploy MX10008 in the edge of the network for the following functions:

- Layer 3 Peering
- Data Center Gateway
- VPLS aggregation
- Layer 3 Aggregation
- Video Distribution

The MX10008 router is available in both base and redundant configurations for both AC and DC operation. MX10008 features front to back airflow (also know as airflow out or AFO).

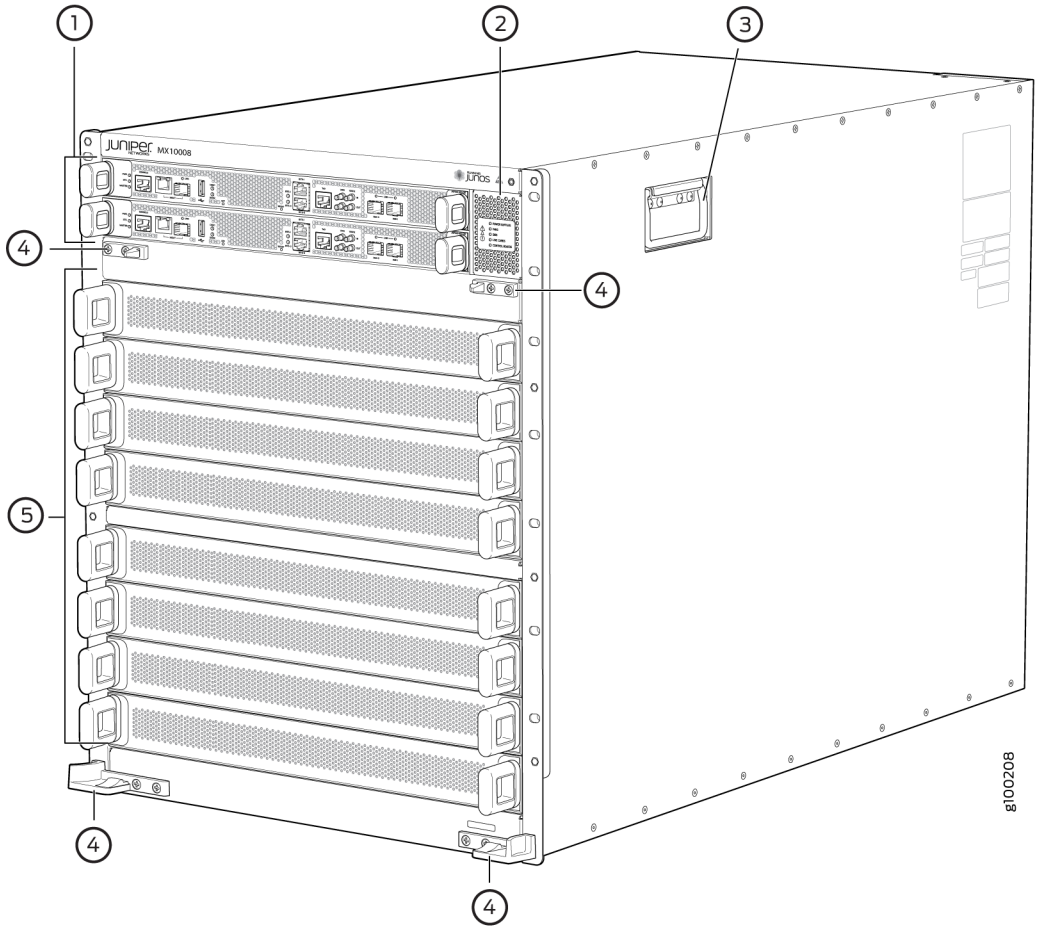
Benefits of the MX10008 Router

- **System capacity**— MX10008 scales to 76.8 Tbps (153.6 Tbps half- duplex) in a single chassis, with support for up to 768 100-Gigabit Ethernet (4x100 GbE breakout cables), 192 40-Gigabit Ethernet, 192 100-Gigabit Ethernet interfaces, or 192 400-Gigabit Ethernet ports.
- **Full-scale IP and MPLS routing**—MX10008 delivers the distributed peering scale of 7 million entries in the forwarding information bases (FIBs, also known as forwarding table) and 80 million routing information base entries (RIBs, also known as routing tables).
- **Source Packet Routing in Networking (SPRING)**—SPRING on MX10008 provides additional flexibility per packet source. SPRING provides features such as network path and node protection to support MPLS fast reroute (FRR) mechanisms, enhanced network programmability, OAM functionality, simplified network signaling, load balancing, and traffic engineering functions.
- **Always-on infrastructure base**—MX10008 is engineered with full hardware redundancy for cooling, switch fabric, and host subsystems—Routing and Control Boards (RCBs)—allowing service providers to meet stringent service-level agreements across the core.
- **Nondisruptive software upgrades**—The Junos operating system on MX10008 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.

Chassis Description

MX10008 is 13 U tall. Up to three MX10008 routers can fit in a standard 39 U rack with adequate cooling and power. All key MX10008 router components are field-replaceable units (FRUs). Figure 1 on page 4 illustrates the key components visible from the front of the chassis.

Figure 1: MX10008 Chassis Front

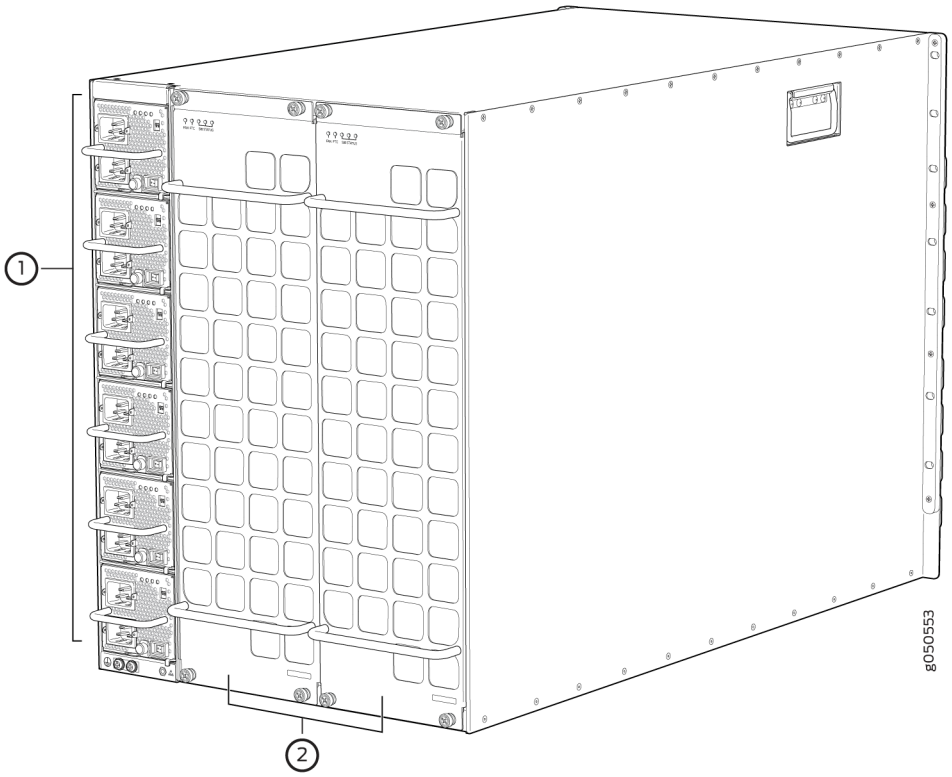


1– Routing and Control Boards	4– Installation holes for the front panel
2– Status LED panel	5– Line card slots 0-7 (numbered top to bottom)
3– Handles	

Some chassis ship with an enhanced power bus to support the power needs of higher wattage line cards. Chassis with the enhanced power bus have a modified Status Panel (see "MX10008 Status Panel LEDs" on page 35).

Figure 2 on page 5 illustrates the components that are visible from the rear of the chassis.

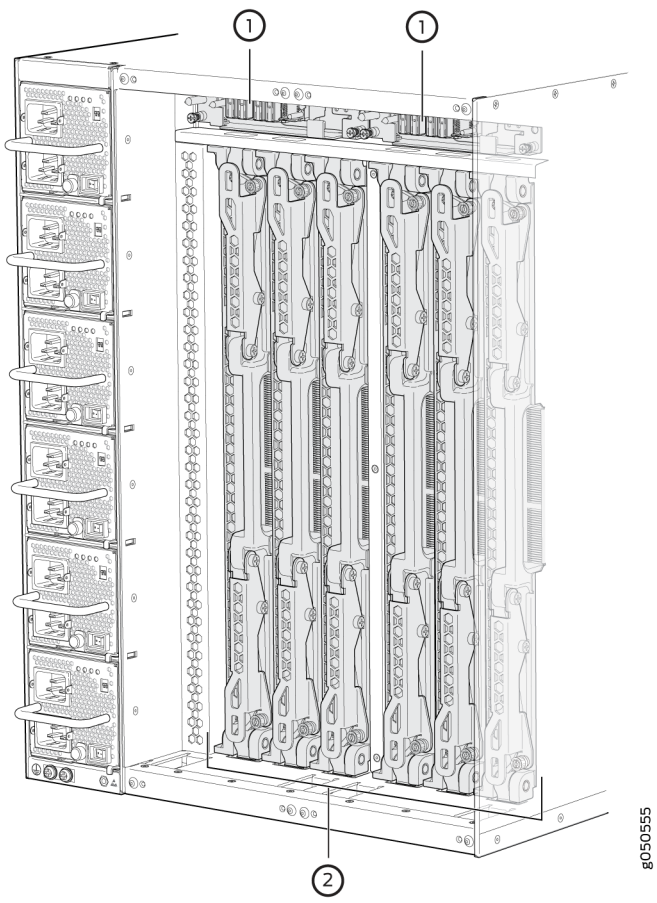
Figure 2: MX10008 Chassis Rear



1– AC or DC power supplies	2– Fan trays with redundant fans

Figure 3 on page 6 illustrates the components that are internal to the chassis.

Figure 3: MX10008 Chassis Internal Components



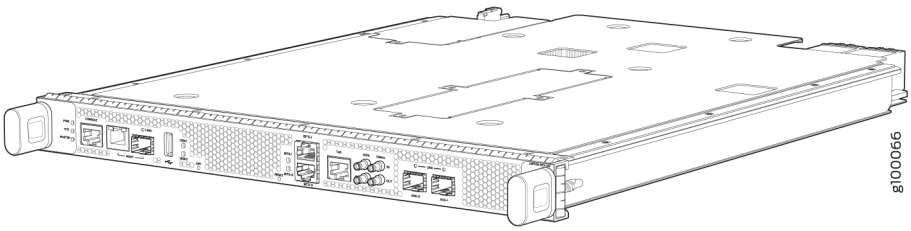
1– Fan tray controllers	2– Switch fabric boards (SFBs)

See "MX10008 Chassis Physical Specifications" on page 29 and "Field-Replaceable Units in an MX10008" on page 183.

MX10008 Routing and Control Board

The Routing and Control board (RCB) (see Figure 4 on page 7) contains a Routing Engine and is responsible for the system management and control in the MX10008. See "MX10008 Routing and Control Board Description" on page 78. RCBs are FRUs that are installed in the front of the chassis in the slots labeled **CB0** and **CB1**. The base configuration has a single RCB while the fully redundant configuration has two RCBs. The RCB also contains Precision Time Protocol ports and two Media Access Control Security (MACsec) capable ports (see "MX10008 Components and Configurations" on page 22).

Figure 4: MX10008 Routing and Control Board



MX10008 Line Cards

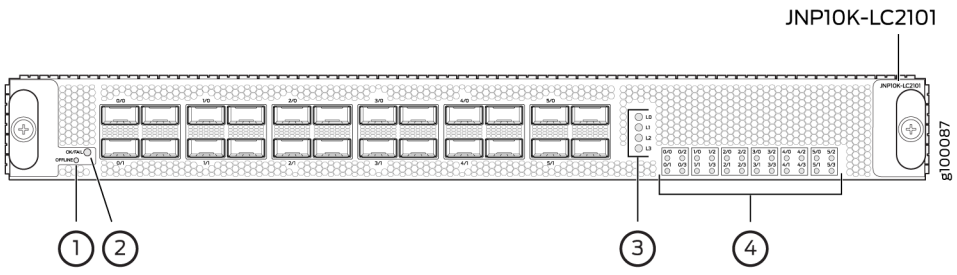
MX10008 has eight horizontal line card slots and supports line rate for each line card. The line cards combine a Packet Forwarding Engine and Ethernet interfaces enclosed in a single assembly. Line cards are FRUs that can be installed in the line card slots labeled **0** through **7** (top to bottom) on the front of the chassis. All line cards are hot-removable and hot-insertable. After the hot insertion, the line card comes online automatically.

The MX10008 router supports the following line cards:

- **MX10K-LC2101**—This line card provides a maximum bandwidth of 2.4Tbps and has six Packet Forwarding Engines, each providing a maximum bandwidth of up to 400 Gbps. The MX10K-LC2101 line card can support 24 100-Gigabit Ethernet ports with a 28-Gbps quad smallform-factor pluggable (QSFP28) transceiver, or 24 40-Gigabit Ethernet ports with a QSFP transceiver. The MX10K-LC2101 line cards also support 10-Gigabit Ethernet interfaces. For 10-Gigabit Ethernet, you must configure the port using the channelization command. Because there is no port-groups option for the 100-Gigabit Ethernet line card, you must use individual port channelization commands.

  Figure 5 on page 7 shows the MX10K-LC2101 line card.

Figure 5: MX10K-LC2101 Line Card

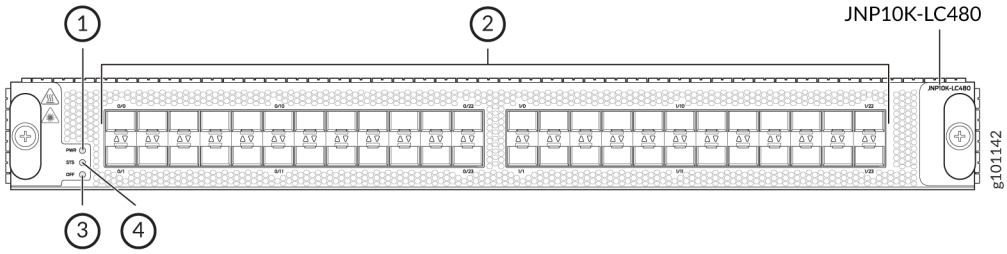


1– OFFLINE button	3– Lane LEDs
2– OK/FAIL LED	4– Port LEDs

- **MX10K-LC480**—The MX10K-LC480 line card is a fixed configuration MPC with 48 ports. Each port supports a speed of 10 Gbps or 1 Gbps, providing the line card a maximum bandwidth of 480 Gbps. The MX10K-LC480 has two Packet Forwarding Engines, each providing a maximum bandwidth of up to 240 Gbps.

  Figure 6 on page 8 shows MX10K-LC480 line card.

Figure 6: MX10K-LC480

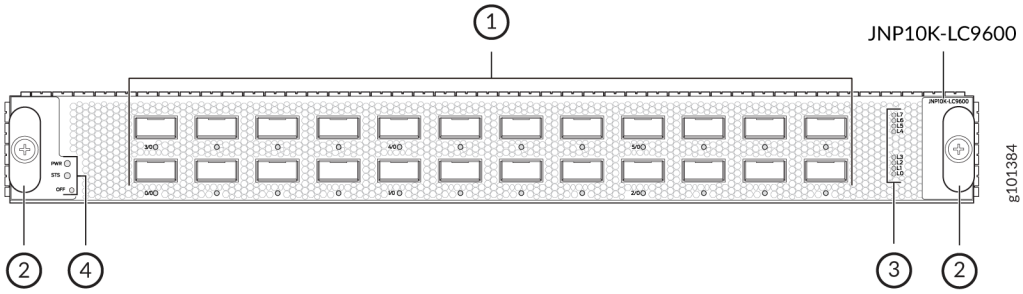


1– Power (**PWR**) LED.	3– Offline/online (**OFF**) button.
2– Port LEDs.	4– Status (**STS**) LED.

- **MX10K-LC9600 Line Card**—The MX10K-LC9600 (Model number: JNP10K-LC9600) is a fixed-configuration 24-port line card, which provides a line rate throughput of 9.6 Tbps. The line card has twenty-four QSFP-DD ports, each capable of supporting a maximum speed of 400 Gbps.

  The MX10K-LC9600 line card combines Packet Forwarding Engine based on Juniper Networks custom ASICs. The line card has six fowarding ASICs, each hosting two Packet Forwarding Engines. The line card has 12 Packet Forwarding Engines, each providing a maximum bandwidth of 800 Gbps.

Figure 7: MX10K-LC9600



1– QSPF Ports	3– Lane LEDs
2– Ejector Handles	4– **PWR**, **STS**, and **OFF** LEDs

Switch Fabric Boards

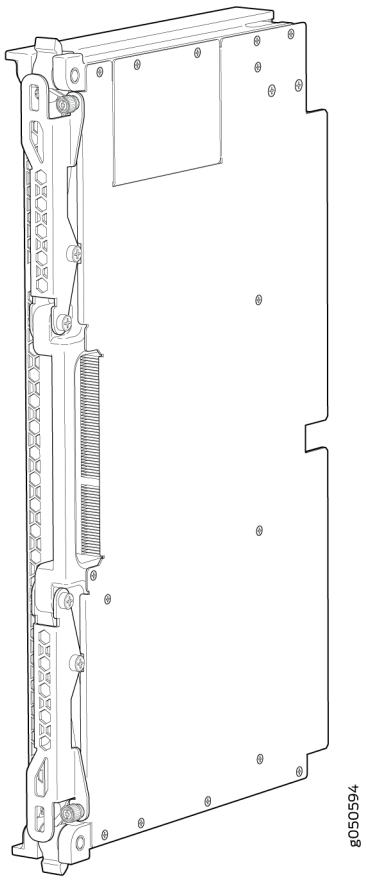
Switch Fabric Boards (SFBs) provide the necessary switching functionality to an MX10008 router. SFBs are installed between the line cards and the fan trays inside of the chassis.

There are two models of SFBs: the JNP10008-SF and the JNP10008-SF2. SFBs installed must be of the same model type in a running chassis. On both models, the SFB has eight connectors that match and connect to a connector on one of the eight line cards, eliminating the need for a backplane.

In a MX10008 router you can install five JNP10008-SFs for the necessary switching functionality and the sixth JNP10008-SF to provide *n*+1 redundancy. When all the six JNP10008-SFs are installed, the MX10008 router has a net switching capacity of 2.4Tbps (bidirectional)

In a MX10008 router if you want to install MX10K-LC9600 line card you must install all the six JNP10008-SF2s to achieve 153.6Tbps (bidirectional) switching capacity. The MX10K-LC9600 line cards are not compatible with the JNP10008-SFs. See "MX10008 Switch Fabric Board Description" on page 86.

Figure 8: MX10008 SFB



Cooling System

The cooling system in an MX10008 router consists of two hot-removable and hot-insertable FRU fan trays and two fan tray controllers.

Two fan tray models (JNP10008-FAN and JNP10008-FAN2) and their associated fan tray controllers (JNP10008-FAN-CTRL and JNP10008-FTC2) are available. The fan trays install vertically on the rear of the chassis and provide front to back chassis cooling. For model differences, see "MX10008 Cooling System and Airflow" on page 41.

Figure 9: Fan Tray JNP10008-FAN

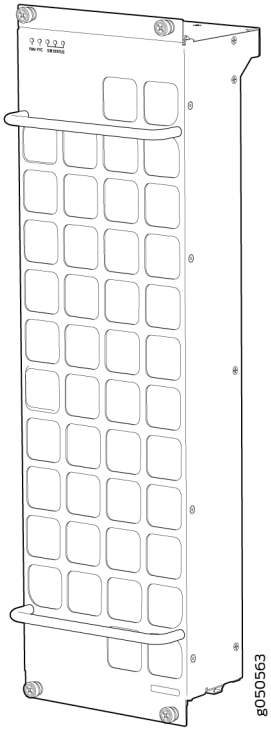


Figure 10: Fan Tray Controller JNP10008-FAN-CTRL

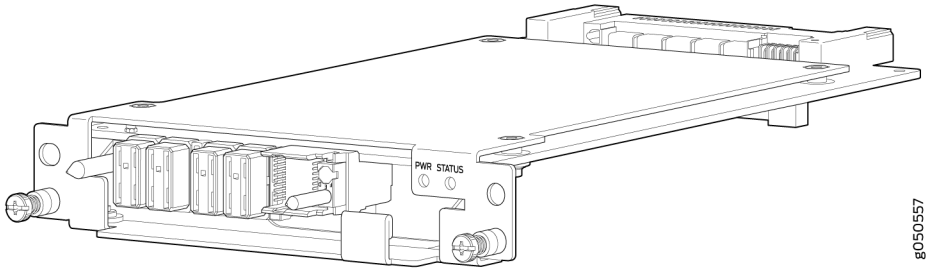
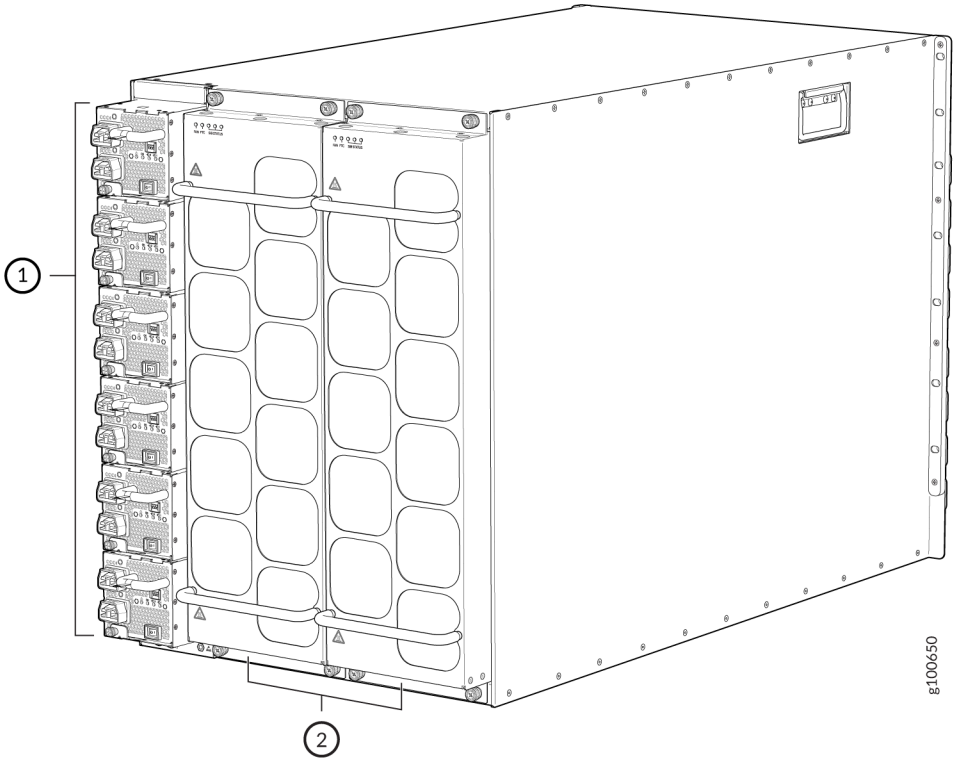
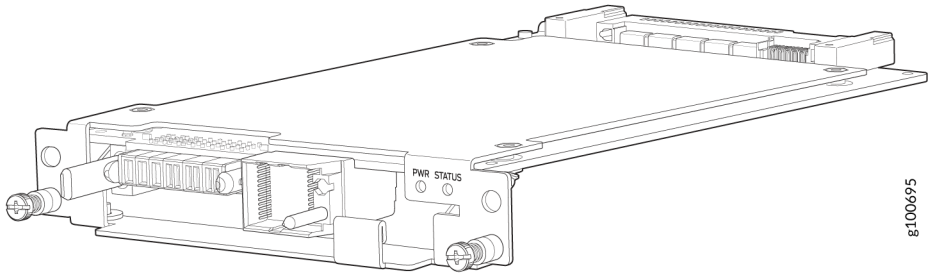


Figure 11: MX10008 Router with JNP10008-FAN2



1– Power Supplies	2– JNP10008-FAN2 - Fan trays

Figure 12: Fan Tray Controller JNP10008-FTC2



MX10008 Power Supplies

Power supplies for the MX10008 router are fully redundant, load-sharing, and hot-removable and hot-insertable FRUs. Each MX10008 router with a base configuration has three power supplies; redundant configurations hold a maximum of six AC, high-voltage alternating current (HVAC), DC, or high-voltage direct current (HVDC) power supplies. Each power supply has an internal fan for cooling. See Figure 13 on page 12 through Figure 16 on page 14.

> ⚠ **CAUTION**: Do not mix power supply models in the same chassis in a running environment. DC and HVDC can coexist in the same chassis during the hot swap of DC for HVDC.

Figure 13: JNP10K-PWR-AC Power Supply

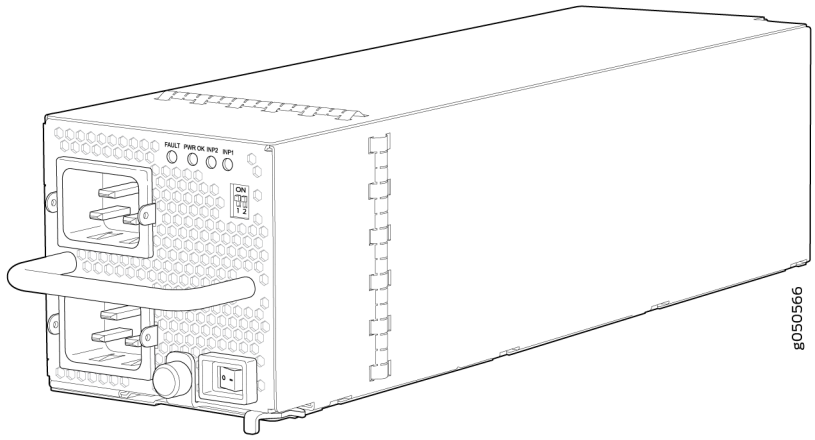


Figure 14: JNP10K-PWR-AC2 Power Supply

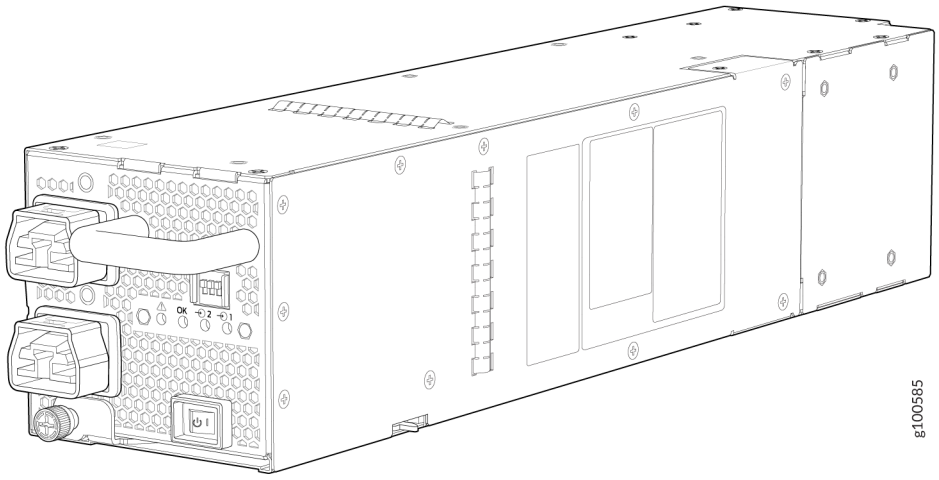


Figure 15: JNP10K-PWR-DC Power Supply

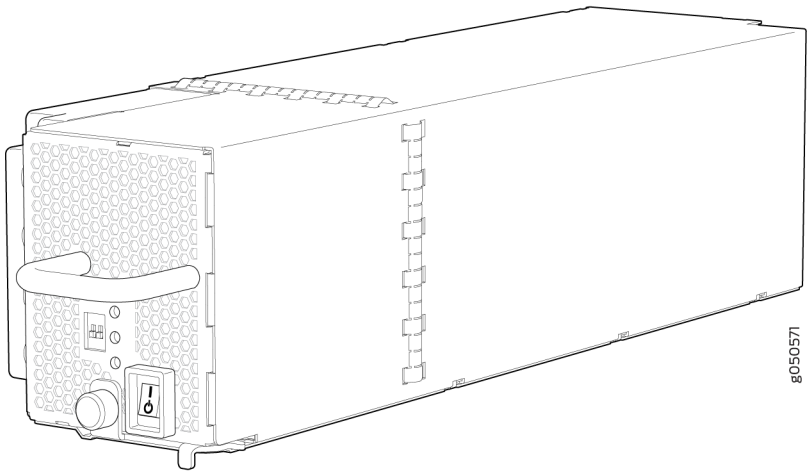


Figure 16: JNP10K-PWR-DC2 Power Supply

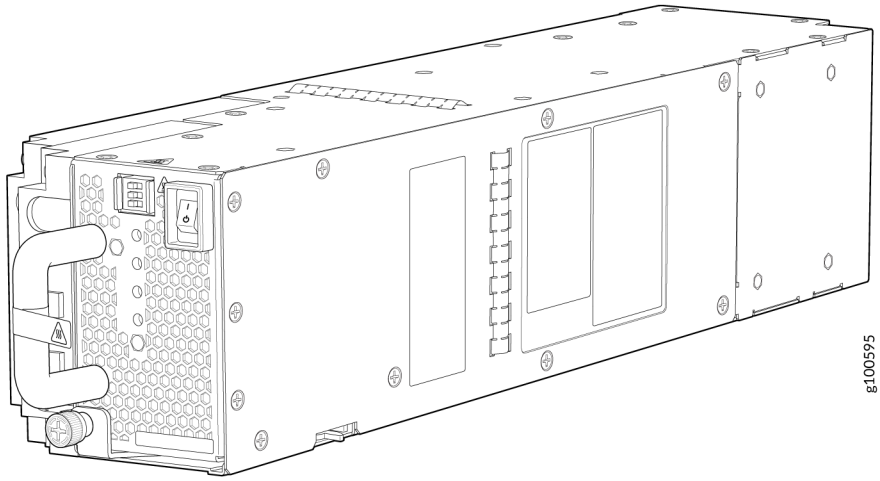


Table 1 on page 14 provides an overview of the differences among the power supplies.

Table 1: Power Supply Overview

Power Supply Model	Input Type	Wattage
JNP10K-PWR AC	AC only	2700 W
JNP10K-PWR-AC2	AC, HVAC, or HVDC	5000 W, single feed; 5500 W, dual feed
JNP10K-PWR DC	DC only	2500 W
JNP10K-PWR-DC2	DC only	2750 W, single feed; 5500 W, dual feed

Software on MX10008

The Juniper Networks MX10008 router runs on Junos OS, which provides Layer 3 routing services. The same Junos OS code base that runs on MX10008 router also runs on all Juniper Networks M Series, MX Series, and T Series routers and SRX Series Services Gateways.

SEE ALSO

Field-Replaceable Units in an MX10008 | 183

MX10008 Optional Equipment | 39

MX10008 Configurations and Upgrade Options

IN THIS SECTION

- MX10008 Configurations | 15
- Upgrade Kits | 19

MX10008 Configurations

Table 2 on page 15 lists the hardware configurations for a MX10008 modular chassis—base (AC and DC versions), redundant (AC and DC versions), and redundant (HVAC, DC, and HVDC)—and the components included in each configuration.

Table 2: MX10008 Hardware Configurations

Router Configuration	Configuration Components
Base AC configuration MX10008-BASE	• Chassis • One RCB (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Three AC power supplies (JNP10K-PWR-AC) • Three power supply covers • Five SFBs (JNP10008-SF) • One SFB cover (JNP10008-SF-BLNK2) • Eight line-card covers

Table 2: MX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Base AC configuration with JNP10K-PWR-AC2 components MX10008-BASE	• Chassis • One RCB (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Three AC power supplies (JNP10K-PWR-AC2) • Three power supply covers • Five SFBs (JNP10008-SF or JNP10008-SF2) • One SFB cover (JNP10008-SF-BLNK2) • Eight line-card covers
Base DC configuration MX10008-BASE	• Chassis • One RCB (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Three DC power supplies (JNP10K-PWR-DC) • Three power supply covers • Five SFBs (JNP10008-SF) • One SFB cover (JNP10008-SF-BLNK2) • Eight line card covers

Table 2: MX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Base DC configuration with JNP10K-PWR-DC2 components MX10008-BASE	• Chassis • One RCB (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Three DC power supplies (JNP10K-PWR-DC2) • Three power supply covers • Five SFBs (JNP10008-SF or JNP10008-SF2) • One SIB cover (JNP10008-SF-BLNK2) • Eight line card covers
Redundant AC configuration MX10008-PREMIUM	• Chassis • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Six AC power supplies (JNP10K-PWR-AC) • Six SFBs (JNP10008-SF) • Eight line card covers

Table 2: MX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Redundant AC configuration with JNP10K-PWR-AC2 components MX10008-PREMIUM	• Chassis • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six AC power supplies (JNP10K-PWR-AC2) • Six SFBs (JNP10008-SF or JNP10008-SF2) • Eight line card covers
Redundant DC configuration MX10008-PREMIUM	• Chassis • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Six DC power supplies (JNP10K-PWR-DC) • Six SFBs (JNP10008-SF) • Eight line card covers
Redundant DC configuration with JNP10K-PWR-DC2 components MX10008-PREMIUM	• Chassis • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six DC power supplies (JNP10K-PWR-DC2) • Six SFBs (JNP10008-SF or JNP10008-SF2) • Eight line card covers

NOTE: You can install up to eight line cards that support any switch fabric compatible line card in the MX10008.

MX10K-LC9600 Line Card is compatible only with JNP10008-SF2 and operates only if JNP10008-FAN2 fan tray and JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies are installed.

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

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

Upgrade Kits

Most of the MX10008 hardware configurations can be upgraded to newer MX10008 router hardware using an upgrade kit. Upgrading requires JNP10008-FAN2 and JNP10008-FTC2 cooling system, and 5550 W power supplies. Depending on whether you already have the newer cooling system and power supplies will determine your upgrade kit. You can use to find the right upgrade kit.

Table 3: Upgrade Kit Matrix

Original Configuration	Upgrading to Configuration	Current Power and Cooling	Order Power Supply Upgrade Kit
MX10008-BASE	PTX10008-BASE3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-B3-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-B3-UPGKIT

Table 3: Upgrade Kit Matrix *(Continued)*

Original Configuration	Upgrading to Configuration	Current Power and Cooling	Order Power Supply Upgrade Kit
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-B3-UPGKIT
MX10008-BASE	PTX10008-PREM2	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P2-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P2-UPGKIT
MX10008-BASE	PTX10008-PREM3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P2-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P3-UPGKIT
MX10008-PREMIUM	PTX10008-BASE3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-B3-UPGKIT

Table 3: Upgrade Kit Matrix *(Continued)*

Original Configuration	Upgrading to Configuration	Current Power and Cooling	Order Power Supply Upgrade Kit
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-B3-UPGKIT
MX10008-PREMIUM	PTX10008-PREM2	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P2-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P2-UPGKIT
MX10008-PREMIUM	PTX10008-PREM3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P3-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P3-UPGKIT

NOTE: You can install up to eight line cards that support any switch fabric compatible line card in the MX10008 router.

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

MX10008 Components and Configurations

Table 4 on page 22 lists the four hardware configurations for an MX10008 modular chassis—base (AC and DC versions), and redundant (AC and DC versions)—and the components included in each configuration.

Table 4: MX10008 Hardware Configurations

Router Configuration	Configuration Components
Base AC configuration MX10008-BASE	• Chassis, including power bus • One Routing and Control Board • One Routing Control Board cover • Two fan tray controllers (JNP10008-FAN-CTRL or JNP10008-FTC2) • Two fan trays (JNP10008-FAN and JNP10008-FAN2) • Three AC power supplies (JNP10K-PWR-AC or JNP10K-PWR-AC2) • Three power supply covers • Five Switch Fabric Boards (SFBs) • One SFB cover • Eight line card covers

Table 4: MX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Base DC configuration MX10008-BASE	• Chassis, including power bus • One Routing and Control Board • One Routing Control Board cover • Two fan tray controllers (JNP10008-FAN-CTRL or JNP10008-FTC2) • Two fan trays (JNP10008-FAN and JNP10008-FAN2) • Three DC power supplies (JNP10K-PWR-DC, JNP10K-PWR-DC2, or JNP10K-PWR-AC2) • Three power supply covers • Five Switch Fabric Boards (SFBs) • One SFB cover • Eight line card covers
Redundant AC configuration MX10008-PREMIUM	• Chassis, including power bus • Two Routing and Control Boards • Two fan tray controllers (JNP10008-FAN-CTRL or JNP10008-FTC2) • Two fan trays (JNP10008-FAN and JNP10008-FAN2) • Six AC power supplies (JNP10K-PWR-AC or JNP10K-PWR-AC2) • Six SFBs • Eight line card covers

Table 4: MX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Redundant DC configuration MX10008-PREMIUM	• Chassis, including power bus • Two Routing and Control Boards • Two fan tray controllers (JNP10008-FAN-CTRL or JNP10008-FTC2) • Two fan trays (JNP10008-FAN and JNP10008-FAN2) • Six DC power supplies (JNP10K-PWR-DC, JNP10K-PWR-DC2, or JNP10K-PWR-AC2) • Six SFBs • Eight line card covers
AC or DC configuration MX10008-PREMIUM	• Chassis, including power bus • Two Routing and Control Boards • Two fan trays and fan tray controllers (JNP10008-FAN2 and JNP10008-FTC2) • Six AC or DC power supplies (JNP10K-PWR-AC2, or JNP10K-PWR-DC2) • Six JNP10008-SF2 SFBs • Eight line card covers

NOTE: You can install up to eight line cards in the router.

MX10K-LC9600 Line Card is compatible only with JNP10008-SF2 and operates only if JNP10008-FAN2 fan tray and JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies are installed.

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

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

MX10008 Component Redundancy

The MX10008 router is designed so that no single point of failure can cause the entire system to fail. The following major hardware components in the redundant configuration provide redundancy:

- Routing and Control Board (RCB)—The RCB consolidates the Routing Engine function with the control plane function in a single unit. The MX10008 router can have one RCB in a base configuration or two RCBs in a redundant configuration. When two RCBs are installed, one functions as the primary and the other functions as the backup. If the primary RCB (or either of its components) fails, the backup can take over as the primary RCB. See "MX10008 Routing and Control Board Description" on page 78.

- Switch Fabric Boards (SFBs)—The MX10008 router has six SFB slots. Five SFBs are required for base operation and the sixth SFB provides *n*+1 redundancy. All six SFBs are active and can sustain full throughput rate. The fabric plane can tolerate one SFB failure without any loss of performance. See "MX10008 Switch Fabric Board Description" on page 86.

- Power supplies—The MX10008 router requires three power supplies for minimum operation. Additional power supplies, provide *n*+1 redundancy for the system. AC, DC, HVAC, and HVDC systems tolerate a single power supply to fail without system interruption. If one power supply fails in a fully redundant system, the other power supplies can provide full power to the MX10008 router indefinitely.

  The MX10008 router also supports source redundancy. Two sets of lugs are provided for the JNP10K-PWR-AC cables, four sets of lugs are provided for the JNP10K-PWR-DC2 cables, and two AC power cords are provided for each JNP10K-PWR-AC2 power supply.

- Cooling system—The fan trays have redundant fans, which are controlled by the fan tray controller. If one of the fans fails, the host subsystem increases the speed of the remaining fans to provide sufficient cooling for the router indefinitely. See "MX10008 Cooling System and Airflow" on page 41.

MX10008 Hardware and CLI Terminology Mapping

This topic describes the hardware terms used in MX10008 router documentation and the corresponding terms used in the Junos OS command-line interface (CLI). See Table 5 on page 26.

Table 5: CLI Equivalents of Terms Used in Documentation for MX10008 Routers

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information
Chassis	JNP10008 [MX10008]	–	Router chassis	MX10008 Chassis Physical Specifications
Routing and Control Board	CB (*n*)	*n* is a value in the range of 0–1. Multiple line items appear in the CLI if more than one RCB is installed in the chassis.		MX10008 Routing and Control Board Description
FPC (*n*)	Abbreviated name of the Flexible PIC Concentrator (FPC) On MX10008, an FPC equates to a line card.	*n* is a value in the range of 0–7. The value corresponds to the line card slot number in which the line card is installed.	Line card (The router does not have actual FPCs—the line cards are the FPC equivalents on the router.)	*Understanding Interface Naming Conventions*
Xcvr (*n*)	Abbreviated name of the transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	MX10008 Optical Transceiver and Cable Support

Table 5: CLI Equivalents of Terms Used in Documentation for MX10008 Routers *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information
PSU (*n*)	One of the following: • JNP10K-PWR-AC • JNP10K-PWR-AC2 • JNP10K-PWR-DC • JNP10K-PWR-DC2	*n* is a value in the range of 0–5. The value corresponds to the power supply slot number.	AC, DC, HVAC, or HVDC power supply	One of the following: • JNP10K-PWR-AC Power Supply • *JNP10K-PWR-AC2 Power Supply* • JNP10K-PWR-DC Power Supply • *JNP10K-PWR-DC2 Power Supply*
Fan tray	JNP10008-FAN or JNP10008-FAN2	–	Fan tray	MX10008 Cooling System and Airflow

Table 5: CLI Equivalents of Terms Used in Documentation for MX10008 Routers *(Continued)*

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

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

SEE ALSO

Configuring an MX10008 Router | **178**

MX10008 Hardware Overview

MX10008 Chassis

IN THIS SECTION

- MX10008 Chassis Physical Specifications | 29
- Field-Replaceable Units in an MX10008 | 33
- MX10008 Status Panel LEDs | 35
- MX10008 Optional Equipment | 39

MX10008 Chassis Physical Specifications

The MX10008 modular chassis is a rigid sheet-metal structure that houses the other router components. You can mount up to three MX10008 routers in a standard 19-in. 4-post rack (42 U) rack provided the rack can handle the combined weight and there is adequate power and cooling. Table 6 on page 29 summarizes the physical specifications of the chassis. See Figure 17 on page 32.

Table 6: MX10008 Router Physical Specifications

Description	Weight	Height	Width	Depth
Chassis, spare	145.2 lb (65.86 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	32 in. (81.28 cm) chassis only
Base AC configuration MX10008-BASE	292 lb (132.5 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-AC power supplies 42.4 in. (107.7 cm) with EMI door

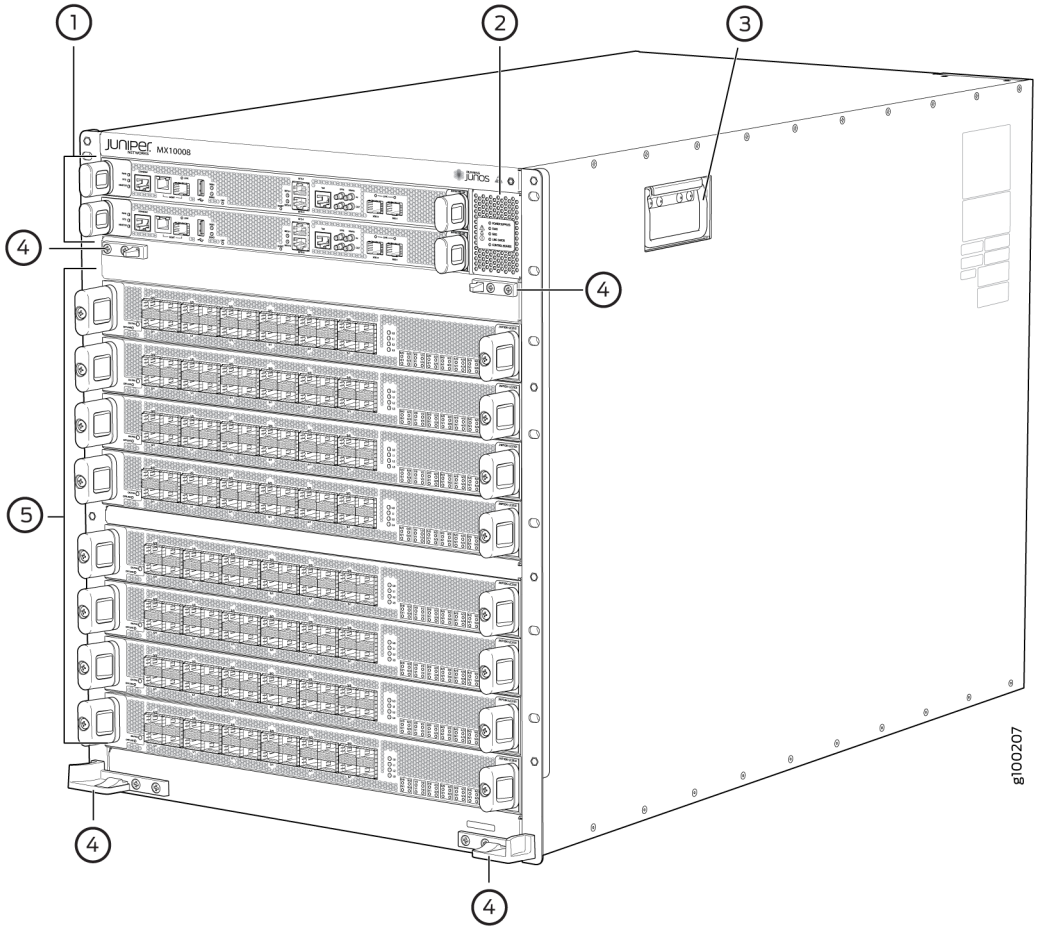
Table 6: MX10008 Router Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
Base AC configuration with JNP10K-PWR-AC2 components MX10008-BASE	292 lb (132.5 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-AC2 power supplies 44.1 in. (112 cm) with EMI door
Base DC configuration MX10008-BASE	290 lb (131.5 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-DC power supplies 42.4 in. (107.7 cm) with EMI door
Base DC configuration with JNP10K-PWR-DC2 components MX10008-BASE	290 lb (131.5 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-DC2 power supplies 44.1 in. (112 cm) with EMI door
Redundant AC configuration MX10008-PREMIUM	332 lb (150.6 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-AC power supplies 42.4 in. (107.7 cm) with EMI door
Redundant AC configuration with JNP10K-PWR-AC2 components MX10008-PREMIUM	332 lb (150.6 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-AC2 power supplies 44.1 in. (112 cm) with EMI door

Table 6: MX10008 Router Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
Redundant DC configuration MX10008-PREMIUM	329 lb (149.23 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-DC power supplies 42.4 in. (107.7 cm) with EMI door
Redundant DC configuration with JNP10K-PWR-DC2 components	329 lb (149.23 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-DC2 power supplies 44.1 in. (112 cm) with EMI door
MX10K-LC2101 Line Card	31.57 lb (14.32 kg)	1.89 in. (48.01 mm)	17.2 in (436.88 mm)	19.05 in. (484 mm) (Excluding FRU Ejector)
MX10K-LC480 Line Card	21.6 lb (9.8 kg)	1.89 in. (48.01 mm)	17.2 in (436.88 mm)	19.05 in. (484 mm) (Excluding FRU Ejector)
MX10K-LC9600 Line Card	27 lb (12.24 kg)	1.89 in. (48.01 mm)	17.2 in (436.88 mm)	19.05 in. (484 mm) (Excluding FRU Ejector)

Figure 17: Front View of MX10008



1– Routing and Control boards	4– Mounting holes for front panel
2– Status panel	5– Line cards
3– Handles	

WARNING: The handles on each side of the chassis facilitate the fine-tune positioning of the chassis on the mounting brackets. Do not use the handles to lift the chassis, even when the chassis is empty. See"Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift" on page 158 or "Manually Mounting an MX10008 in a 4-Post Rack" on page 161 for instructions for properly moving a loaded chassis.

SEE ALSO

MX10008 Rack Requirements | **108**

MX10008 Cooling System and Airflow | 41

MX10008 Components and Configurations | 22

Field-Replaceable Units in an MX10008

Field-replaceable units (FRUs) are router components that you can replace at your site. Routers use these types of FRUs:

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

Table 7 on page 33 lists the FRUs and their types for the MX10008 routers.

Table 7: FRUs in an MX10008 Router

FRU	Type
Power supplies	Hot-insertable and hot-removable.
Fan trays	Hot-insertable and hot-removable.
Fan tray controllers	Hot-insertable and hot-removable.
Routing and Control Board (RCB)	Redundant configuration: • Primary RCB is hot-pluggable. • Backup RCB is hot-insertable and hot-removable. Base configuration: • Removal of the RCB causes the router to shut down. You can install a replacement RCB in the second slot. The system restarts to select a primary and backup. If necessary, you can switch the primary and backup using the `request chassis routing-engine master switch` command. See "MX10008 Components and Configurations" on page 22.

Table 7: FRUs in an MX10008 Router *(Continued)*

FRU	Type
Switch Fabric Boards (SFBs)	Hot-insertable and hot-removable. We recommend that you take the SFBs offline before removing them to avoid traffic loss while the router fabric is being reconfigured. You can take SFBs offline by using the **request chassis sib (offline | online) slot *slot-number*** command.
Line cards	Hot-insertable and hot-removable. We recommend that you take line cards offline before removing them. You can take line cards offline by using the **request chassis fpc slot *slot-number* offline** command. **NOTE**: Line cards are not part of the base configuration or redundant configuration. You must order them separately.
Optical transceivers	Hot-insertable and hot-removable. See "MX10008 Optical Transceiver and Cable Support" on page 132 for the Junos OS release in which the transceivers were introduced.

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

SEE ALSO

MX10008 Components and Configurations | 22

MX10008 Optical Transceiver and Cable Support | 132

MX10008 Status Panel LEDs

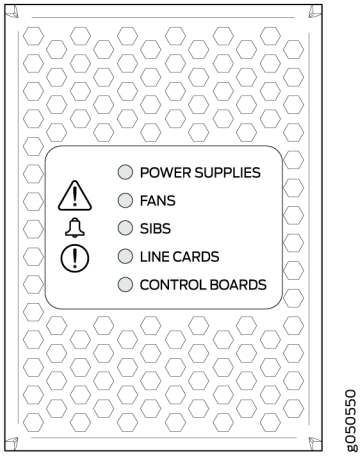
The status panel of the MX10008 routers has two purposes:

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

Some chassis ship with an enhanced power bus to support the power needs of higher wattage line cards.

The status panel indicates chassis status through a set of five bi-color LEDs. See Figure 18 on page 35 for a chassis status panel with the standard power bus.

Figure 18: Status Panel on the Chassis with the Standard Power Bus



Chassis with enhanced power bus has the same set of five bi-color LEDs, but also have an azure blue line to indicate the enhanced power bus (see Figure 19 on page 36).

Figure 19: Status Panel on Chassis with the Enhanced Power Bus

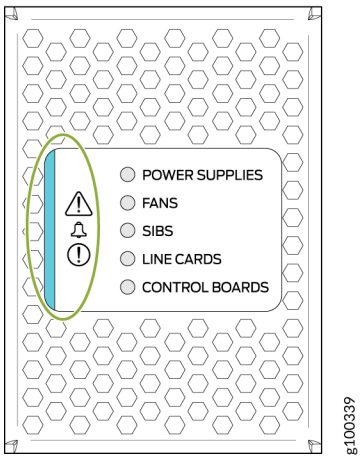


Table 8 on page 36 describes the status panel LEDs.

Table 8: Status Panel LEDs in an MX10008 Router

Name	Color	State	Description
Power supplies	Green	On steadily	All of the power supplies are online and operating normally.
	Yellow	On steadily	One or more of the power supplies has an error.
	None	Off	None of the power supplies is receiving power.
Fans	Green	On steadily	The fans and the fan tray controllers are online and operating normally.
	Yellow	On steadily	There is an error in a fan or in one of the fan tray controllers.
	None	Off	The fan tray controllers and fan trays are not receiving power.

Table 8: Status Panel LEDs in an MX10008 Router *(Continued)*

Name	Color	State	Description
SFBs	Green	On steadily	All installed Switch Fabric Boards (SFBs) are online.
	Yellow	Blinking	There is a hardware error in one or more SFBs.
	None	Off	All the SFBs are offline.
Line cards	Green	On steadily	All installed line cards are online.
	Yellow	Blinking	There is a hardware error in one or more line cards.
	None	Off	All the line cards are offline.
Routing and Control Boards	Green	On steadily	All installed RCBs are online.
	Yellow	Blinking	One or more Routing and Control Boards have an error condition.
	None	Off	The installed Routing and Control Boards ares offline.

Table 8: Status Panel LEDs in an MX10008 Router *(Continued)*

Name	Color	State	Description
Alarms	Red ⚠	On steadily	Major (red)—Indicates a critical situation on the device that has resulted from one of the following conditions. A red alarm condition requires immediate action. • One or more hardware components have failed. • One or more hardware components have exceeded temperature thresholds. • An alarm condition configured on an interface has triggered a critical warning.
	Yellow ⚠	On steadily	Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow alarm condition requires monitoring or maintenance. For example, a missing rescue configuration generates a yellow system alarm.

SEE ALSO

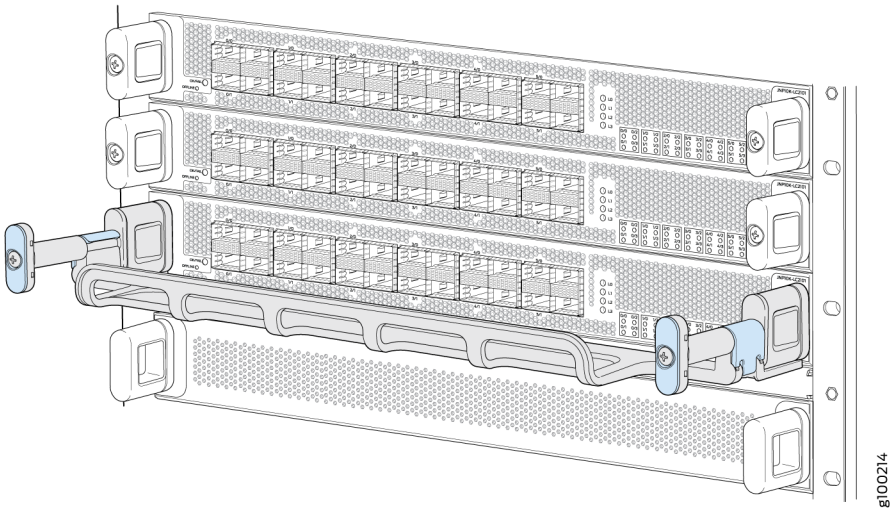
- MX10008 Routing and Control Board Description | **78**
- MX10008 Cooling System and Airflow | **41**
- MX10008 Switch Fabric Board Description | **86**
- JNP10K-PWR-DC Power Supply | **62**
- JNP10K-PWR-AC Power Supply | **58**

MX10008 Optional Equipment

The MX10008 router supports the cable management system as an optional equipment.

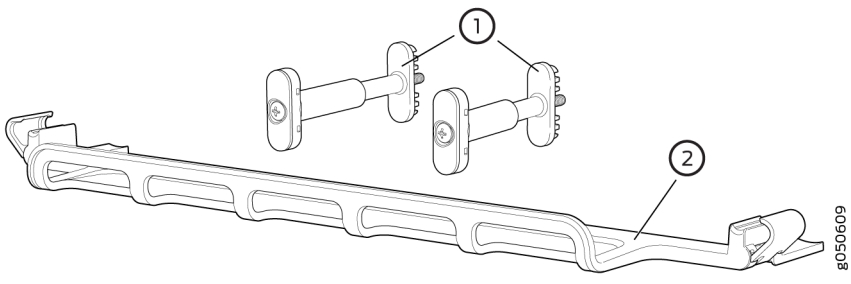
The cable management system (see Figure 20 on page 39) enables you to route optical cables away from the line card ports for better airflow through the chassis. Using this optional system also makes it easier to use cable ties or strips to organize the cabling.

Figure 20: Cable Management System



The cable management system comprises a set of handle extensions and a tray that snaps to the extensions (see Figure 21 on page 39) for an individual line card. The handle extensions can be used with or without the cable tray. It is not necessary to remove the handle extensions if you want to remove a line card.

Figure 21: Cable Management Parts



1– Handle extensions	2– Cable tray

Cables are draped across or under the handle extensions and then secured with cable wraps (see Figure 22 on page 40).

Figure 22: Two Cable Management Systems Installed on MX10008



SEE ALSO

Install the Cable Management System | 283

MX10008 Cooling System

IN THIS SECTION

- MX10008 Cooling System and Airflow | 41
- MX10008 Fan Tray LEDs and Fan Tray Controller LEDs | 49

The MX10008 cooling system components work together to keep all components within the acceptable temperature range. If the maximum temperature specification is exceeded and the system cannot be adequately cooled, the Routing and Control Board shuts down some or all of the hardware components.

MX10008 Cooling System and Airflow

IN THIS SECTION

- Fan Tray | **41**
- Fan Tray Controller | **44**
- Airflow Direction in the MX10008 Router | **48**

The cooling system in an MX10008 chassis consists of dual fan trays with matching dual fan tray controllers.

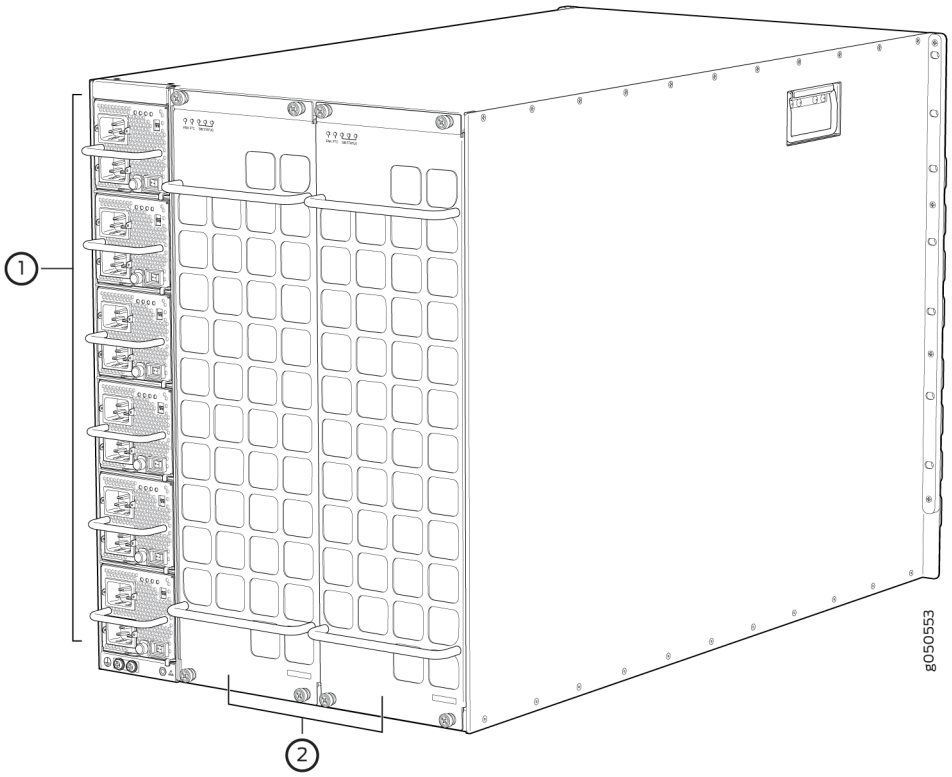
Two fan tray models (JNP10008-FAN and JNP10008-FAN2) and their associated fan tray controllers (JNP10008-FAN-CTRL and JNP10008-FTC2) are available. Fan tray model JNP10008-FAN works with its companion fan tray controller JNP10008-FAN-CTRL. Likewise, fan tray model JNP10008-FAN2 works with fan tray controller JNP10008-FTC2. Each fan tray requires a companion fan controller to be installed and operational to be hot-insertable and hot-removable.

Fan Tray

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

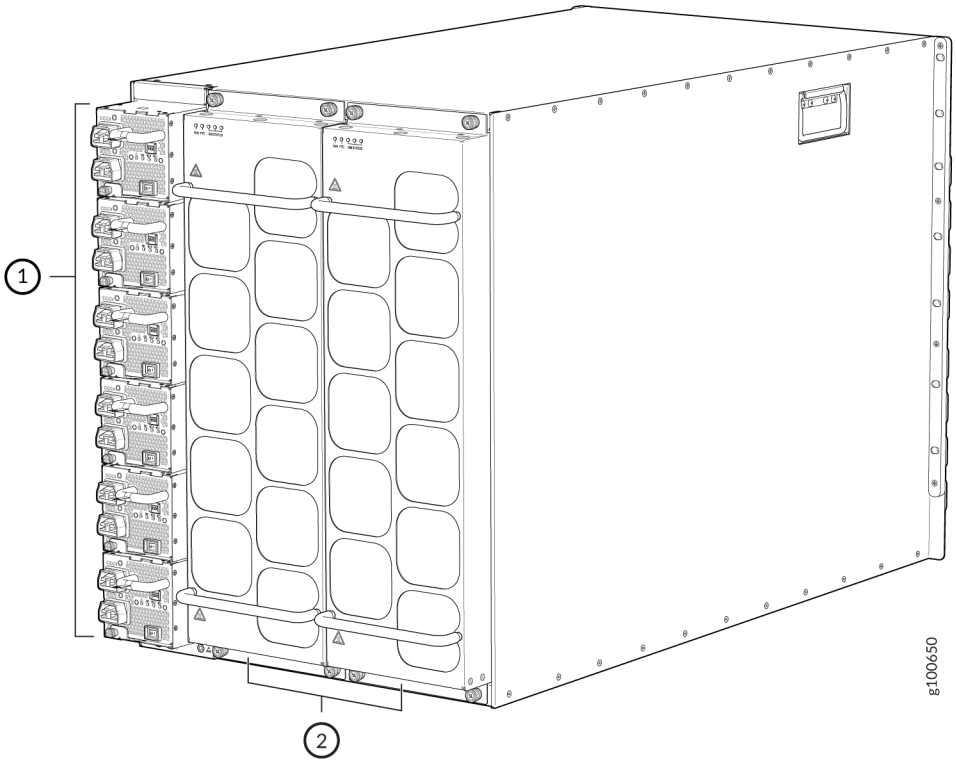
The two fan trays install vertically, side by side, next to the power supplies on the FRU side of the chassis. Two handles on each front faceplate facilitate handling of the fan tray. See Figure 23 on page 42 and Figure 24 on page 43.

Figure 23: Installed JNP10008-FAN, with JNP10K-PWR-AC Power Supplies in an MX10008 Router



1– Power supplies	2– Fan trays

Figure 24: Installed JNP10008-FAN2, with JNP10K-PWR-AC2 Power Supplies in an MX10008 Router



1– Power supplies	2– Fan trays

See Table 9 on page 43 for the physical specifications for the fan trays.

Table 9: Fan Tray Specifications

Specification	JNP10008-FAN	JNP10008-FAN2
Corresponding fan tray controller model	JNP10008-FAN-CTLR	JNP10008-FTC2
Number of fans per fan tray	11	22
Number of fans per chassis	22	44
Fan numbering	0 through 10	0 through 21
Volume flow at 100%	1437.37 CFM per fan tray	1793 CFM per fan tray

Table 9: Fan Tray Specifications *(Continued)*

Specification	JNP10008-FAN	JNP10008-FAN2
Introduced in Junos OS Release	15.1X53-D30	19.2R1-
Height	22.4 in. (56.9 cm)	22.4 in. (56.9 cm)
Width	6.6 in. (16.8 cm)	6.6 in. (16.8 cm)
Depth	4.0 in. (10.2 cm) without handles, 5.2 in. (13.2 cm) with handles	5.5 in. (13.97 cm) without handles, 6.7 in. (17.01 cm) with handles
Weight	11.8 lb (5.4 kg)	20 lb (9.07 kg)

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

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

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

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

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

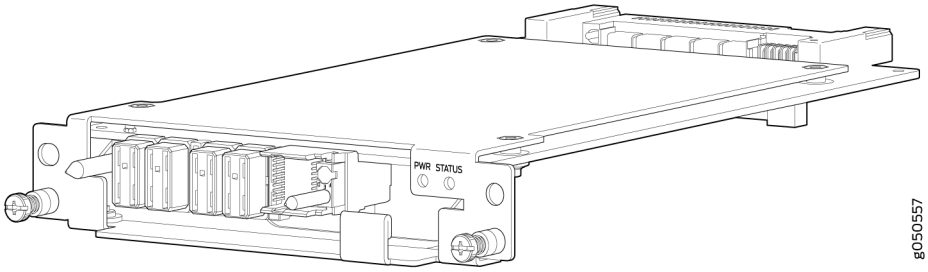
Fan Tray Controller

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

There are two fan tray controller models:

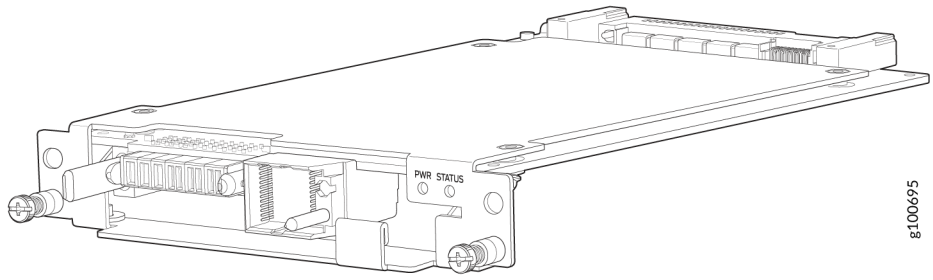
- JNP10008-FAN-CTRL—Supports model JNP10008-FAN; see Figure 25 on page 45.

Figure 25: Fan Tray Controller JNP10008-FAN-CTRL



- JNP10008-FTC2—Supports model JNP10008-FAN2; see Figure 26 on page 45.

Figure 26: Fan Controller JNP10008-FTC2



WARNING: Do not mix the fan tray controller models. Use only the supported fan tray model for each fan tray controller. See Table 10 on page 45.

Table 10: Fan Tray Controller Specifications

Specification	JNP10008-FAN-CTRL	JNP10008-FTC2
Corresponding fan tray model	JNP10008-FAN	JNP10008-FAN2
Chassis supported	Enhanced or standard	Enhanced or standard
Introduced in Junos OS Release	15.1X53-D30	19.2R1

Table 10: Fan Tray Controller Specifications *(Continued)*

Specification	JNP10008-FAN-CTRL	JNP10008-FTC2
Height	1.5 in. (3.81 cm)	1.5 in. (3.81 cm)
Width	6.5 in. (15.24 cm)	6.5 in. (15.24 cm)
Depth	9.3 in. (23.62 cm)	9.4 in. (23.88 cm)
Weight	1.5 lb (0.68 kg)	1.1 lb (0.5 kg)

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

Software controls the fan speed. Under normal operating conditions, the fans in the fan tray run at less than full speed.If one fan tray controller fails or appears missing (such as when an SFB is being replaced) the other fan tray controller sets the fans to full speed. This allows the router to continue to operate normally as long as the remaining fans cool the chassis sufficiently. Use the `show chassis fan` command to see the status of individual fans and fan speed. Here is an example of output from JNP10008-FAN and JNP10008-FAN-CTRL:

```
user@host> show chassis fan
      Item                            Status      RPM     Measurement
      Fan Tray 0 Fan 0          OK       9750    Spinning at normal speed
      Fan Tray 0 Fan 1          OK       9600    Spinning at normal speed
      Fan Tray 0 Fan 2          OK       9750    Spinning at normal speed
      Fan Tray 0 Fan 3          OK       9750    Spinning at normal speed
      Fan Tray 0 Fan 4          OK       9600    Spinning at normal speed
      Fan Tray 0 Fan 5          OK       9750    Spinning at normal speed
      Fan Tray 0 Fan 6          OK       9750    Spinning at normal speed
      Fan Tray 0 Fan 7          OK       9600    Spinning at normal speed
      Fan Tray 0 Fan 8          OK       9600    Spinning at normal speed
      Fan Tray 0 Fan 9          OK       9750    Spinning at normal speed
      Fan Tray 0 Fan 10         OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 0          OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 1          OK       9600    Spinning at normal speed
      Fan Tray 1 Fan 2          OK       9600    Spinning at normal speed
      Fan Tray 1 Fan 3          OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 4          OK       9750    Spinning at normal speed
```

```
      Fan Tray 1 Fan 5          OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 6          OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 7          OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 8          OK       9600    Spinning at normal speed
      Fan Tray 1 Fan 9          OK       9750    Spinning at normal speed
      Fan Tray 1 Fan 10         OK       9450    Spinning at normal speed
```

The following is similar output from a JNP10008-FAN2 and JNP10008-FTC2 system:

```
user@host> show chassis fan
      Item                      Status   RPM     Measurement
      Fan Tray 0 Fan 0          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 1          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 2          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 3          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 4          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 5          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 6          OK       6600    Spinning at normal speed
      Fan Tray 0 Fan 7          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 8          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 9          OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 10         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 11         OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 12         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 13         OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 14         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 15         OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 16         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 17         OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 18         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 19         OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 20         OK       6300    Spinning at normal speed
      Fan Tray 0 Fan 21         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 0          OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 1          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 2          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 3          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 4          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 5          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 6          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 7          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 8          OK       6600    Spinning at normal speed
```

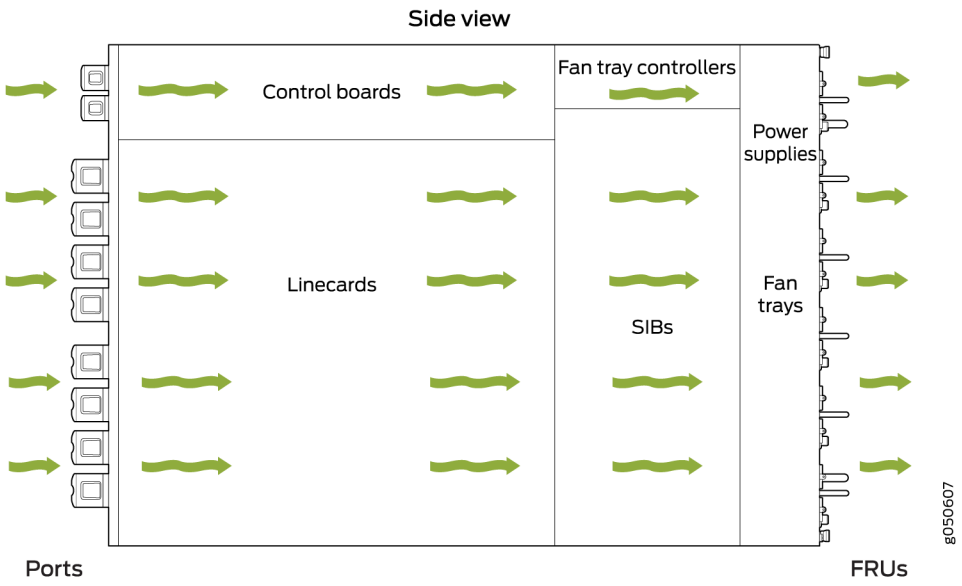
```
      Fan Tray 1 Fan 9          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 10         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 11         OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 12         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 13         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 14         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 15         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 16         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 17         OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 18         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 19         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 20         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 21         OK       7650    Spinning at normal speed

user@host>
```

Airflow Direction in the MX10008 Router

The air intake to cool the chassis is located on the port (line card) side of the chassis. Air flows into the chassis from the ports in the RCBs and line cards, through the switch fabric boards (SFBs), and exits from the fan trays and the power supplies.. See Figure 27 on page 48.

Figure 27: Airflow Through an MX10008 Router



The fan tray continues to operate indefinitely and provide sufficient cooling even when a single fan fails, provided the room temperature is within the operating range. You can check the status of fans by viewing the LEDs on each fan tray. See "MX10008 Fan Tray LEDs and Fan Tray Controller LEDs" on page 49.

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

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

MX10008 Fan Tray LEDs and Fan Tray Controller LEDs

IN THIS SECTION

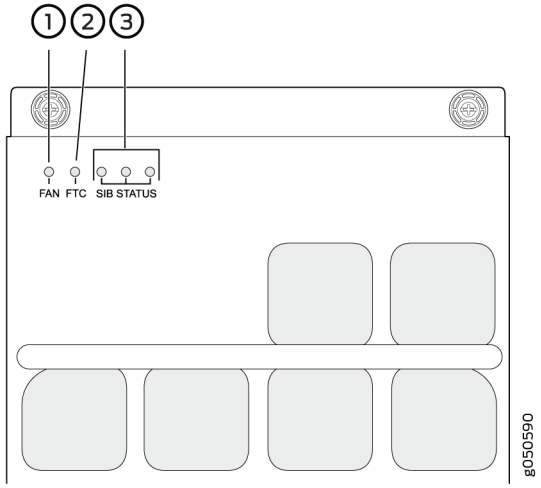
- Fan Tray LEDs | **49**
- Fan Tray Controller LEDs | **55**

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

Fan Tray LEDs

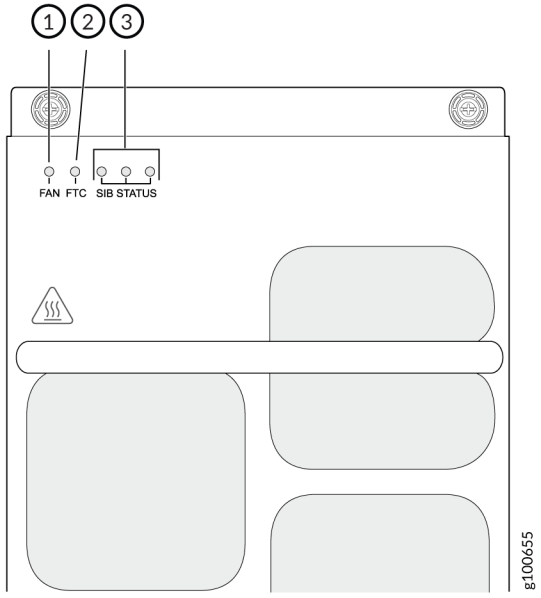
Each of the two fan trays have a set of LEDs that represent the status of the fans in the fan tray, the fan tray controller, and the three Switch Fabric Boards (SFBs). The fan tray LEDs are located in the top left corner of each fan tray. Figure 28 on page 50 shows the location of the LEDs on the JNP10008-FAN fan tray. See Figure 29 on page 50.for the location of LEDs on the JNP10008-FAN2 fan tray.

Figure 28: Fan Tray JNP10008-FAN LEDs on an MX10008 Router



1– Fan status LED	3– SFB status (SFB 0 through SFB 2 for the left fan tray and SFB 3 through 5 for the right fan tray). The hardware label for SFB status is **SIB STATUS**.
2– Fan tray controller status	

Figure 29: Fan Tray JNP10008-FAN2 LEDs on an MX10008 Router



1– Fan status LED	3– SFB status (SFB 0 through SFB 2 for the left fan tray and SFB 3 through 5 for the right fan

	tray). The hardware label for SFB status is **SIB STATUS**.
2– Fan tray controller status	

Table 11 on page 51 describes the functions of the fan tray LEDs.

Table 11: Fan Tray LEDs on an MX10008 Router

Name	Color	State	Description
FAN (fan status)	Green	On steadily	All fans are operating normally. The system has verified that the fan tray is engaged, that the airflow is in the correct direction, and that all fans are operating correctly.
	Green	Blinking	The beacon feature is enabled. This feature is enabled using the `request chassis beacon` command.
	Yellow	Blinking	An error has been detected in one or more fans in the fan tray. Replace the fan tray as soon as possible. Either the fan has failed or it has become disconnected. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace it.
	None	Off	The fan is not receiving power from the fan tray controller.
FTC (fan tray controller status)	Green	On steadily	The fan tray controller is online and is operating normally.
	Green	Blinking	The beacon feature is enabled. This feature is enabled using the `request chassis beacon` command.

Table 11: Fan Tray LEDs on an MX10008 Router *(Continued)*

Name	Color	State	Description
	Yellow	Blinking	An error has been detected in the fan tray controller. Replace the fan tray controller as soon as possible. The fan tray controller is located behind the fan tray above the SFBs. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the fan tray controller.
	None	Off	The fan tray controller is not receiving power.
SIB Status (SFB 0 status)	Green	On steadily	The left-most SFB in the chassis is online.
	Green	Blinking	The beacon feature is enabled. This feature is enabled using the `request chassis beacon` command.
	Yellow	Blinking	An error has been detected in SFB 0. Replace the SFB as soon as possible. The SFB is located behind the left fan tray and is the left-most SFB in the chassis. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SFB.
	None	Off	The SFB is offline.
SIB Status (SFB 1 status)	Green	On steadily	The center SFB behind the left fan tray is online.

Table 11: Fan Tray LEDs on an MX10008 Router *(Continued)*

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

Table 11: Fan Tray LEDs on an MX10008 Router *(Continued)*

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

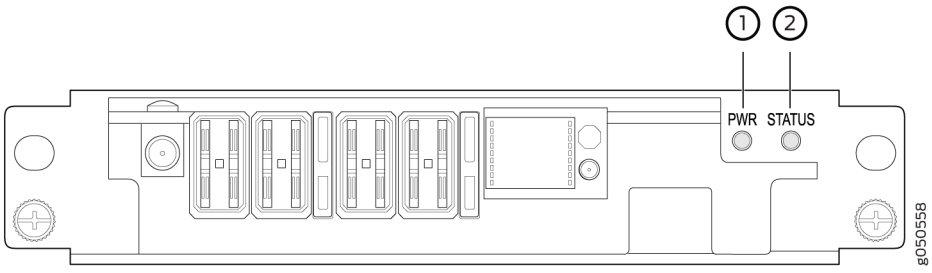
Table 11: Fan Tray LEDs on an MX10008 Router *(Continued)*

Name	Color	State	Description
	Green	Blinking	The beacon feature is enabled. This feature is enabled using the `request chassis beacon` command.
	Yellow	Blinking	An error has been detected in SFB 5. Replace the SFB as soon as possible. The SFB is located behind the right fan tray and is the right-most SFB in the grouping of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SFB.
	None	Off	The SFB is offline.

Fan Tray Controller LEDs

All models of fan tray controller have the same LEDs. The fan tray controller LEDs are only visible when the associated fan tray is removed. The fan tray controller LEDs are located on the right of the controller panel. Figure 30 on page 55 shows the location of the LEDs on the fan tray controller panel.

Figure 30: JNP10008-FAN-CTRL LEDs on an MX10008 Router



1– Fan tray controller power

2– Fan tray controller status

Table 12 on page 56 describes the functions of the fan tray controller LEDs.

Table 12: Fan Tray Controller LEDs on an MX10008 Router

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

SEE ALSO

Installing an MX10008 Fan Tray | **195**

Removing an MX10008 Fan Tray | 192
Installing an MX10008 Fan Tray Controller | 199
Removing an MX10008 Fan Tray Controller | 197

MX10008 Power System

IN THIS SECTION

- JNP10K-PWR-AC Power Supply | 58
- JNP10K-PWR-AC2 Power Supply | 61
- JNP10K-PWR-DC Power Supply | 62
- JNP10K-PWR-DC2 Power Supply | 66
- JNP10K-PWR-AC Power Supply LEDs | 68
- JNP10K-PWR-AC2 Power Supply LEDs | 69
- JNP10K-PWR-DC Power Supply LEDs | 71
- JNP10K-PWR-DC2 Power Supply LEDs | 73

The MX10008 modular routers support AC, DC, high-voltage alternating current (HVAC) and high-voltage direct current (HVDC) by offering the following power supplies:

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

All of the power supplies are hot-insertable and hot-removable, field-replaceable units (FRUs). You can install up to six power supplies in an MX10008 router in the slots labeled **PEM 0** through **PEM 5** (top to bottom) located in the rear of the chassis. You can install the power supplies in any slot.

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

The power supplies support standard or enhanced power bus. To determine whether your system has the standard power bus or the enhanced power bus, see "MX10008 Status Panel LEDs" on page 35. Table 13 on page 58 provides the specifications for these different power supplies.

Table 13: Power Supply Overview

	JNP10K-PWR-AC	JNP10K-PWR-AC2	JNP10K-PWR-DC	JNP10K-PWR-DC2
Maximum output power	2700 W	5000 W or 5500 W when set for high power (30-A); 3000 W when set for low power (20-A)	2500 W	5500 W when set for high power (80-A) or 4400 W when set for low power (60-A)
Inputs	2 (**INP1**, **INP2**)	2 (**INP1**, **INP2**)	2 (**INP1**, **INP2**)	4 (**INPUT 1**, **INPUT 2**)
Compatible power bus	Standard or enhanced	Standard or enhanced	Standard or enhanced	Standard or enhanced

JNP10K-PWR-AC Power Supply

The AC power supply supports 200–240 VAC. The output is 12 VDC; the output power is 2700 W.

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

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

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

The base configuration MX10008 routers are shipped with three power supplies; base configuration MX10016 routers are shipped with five power supplies. Cover panels are installed over the remaining power supply slots. You can add additional power supplies to base configuration routers as necessary. For details about different router configurations, see "MX10008 Components and Configurations" on page 22.

Each JNP10K-PWR-AC power supply weighs 6.8 lb (3.08 kg) and has 2 independent 16 A rated AC inlets on the faceplate. Although each inlet provides sufficient input power to provide full output, always connect to a dedicated AC power feed to provide redundancy. Only one power feed is operational at a time.

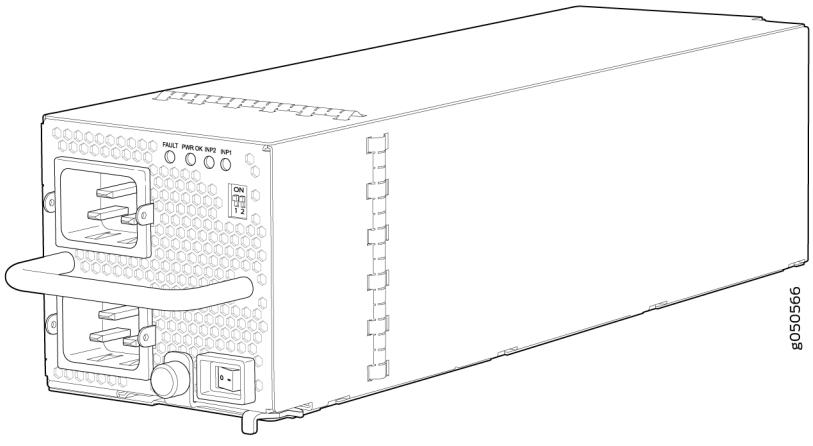
MX10000 routers employ automatic transfer switch (ATS) technology. The system provides 2*n* source redundancy and *n*+1 power supply redundancy, allowing you to use fewer power supplies than you would require in a 2*n* configuration. Should one power source fail, ATS routes the power supply to the alternate source.

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

- **INP1** into a UPS
- **INP2** into the public electricity supply

Each JNP10K-PWR-AC power supply has a power switch with international markings for on (**|**) and off (**O**), a fan, and four LEDs on the faceplate that indicate the status of the power supply. See Figure 31 on page 59.

Figure 31: JNP10K-PWR-AC Power Supply

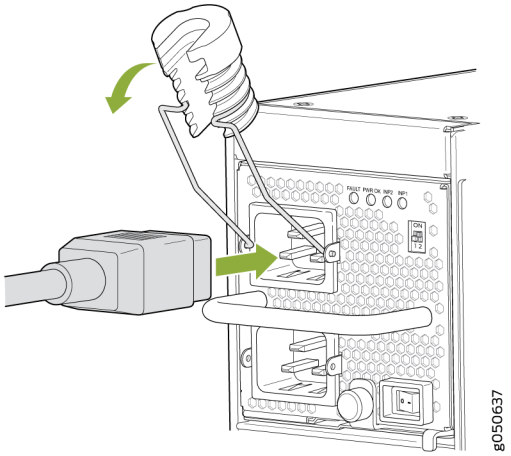


Each JNP10K-PWR-AC power supply comes with two power cord retainers that hold the power cords in place. See Figure 32 on page 60. Each power cord retainer has a clip and an adjustment nut. The ends

of the clip hook into the bracket holes on each side of the AC appliance inlet on the faceplate. The adjustment nut holds the power cord in the correct position. For instructions for installing the power cord retainers, see "Connect AC Power to an MX10008" on page 174.

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

Figure 32: Power Cord Retainer for an JNP10K-PWR-AC Power Supply



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

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

SEE ALSO

JNP10K-PWR-AC Power Specifications | **117**

How to Install a JNP10K-PWR-AC Power Supply | **207**

How to Remove a JNP10K-PWR-AC Power Supply | **202**

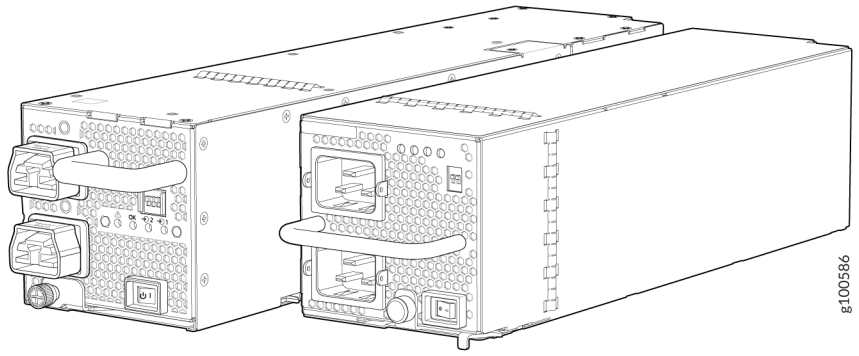
JNP10K-PWR-AC2 Power Supply

The JNP10K-PWR-AC2 power supply is a high-capacity, high-line model that is designed to support either AC or DC systems in either a low power or high power mode. The power supply takes AC input and provides DC output of 12.3 VDC, 5000 W with a single feed and 5500 W with a dual feed. For AC systems, the operating input voltage is 180 to 305 VAC and for DC systems, the operating input voltage is 190 to 410 VDC.

The number of power feeds and whether the power supplies provide high output (30-A) or low output (20-A) power is configured using a set of dual inline package (DIP) switches on the faceplate of the power supply. If one power supply in the chassis is set to low power, the power budget for the chassis is reduced to low power, regardless of their DIP switch settings or the output results in CLI. This design safeguards against accidentally setting the power supply to 30-A in a facility that can only provide 20-A and tripping the facility circuit breaker. We recommend that you do not mix DIP switch settings in your system. See Table 14 on page 62 for the settings for the DIP switches.

The JNP10K-PWR-AC2 fits into the standard power supply bay but when compared to most other models, the JNP10K-PWR-AC2 is longer and protrudes from the bay when fully inserted into the chassis. See Figure 33 on page 61.

Figure 33: Comparison of the JNP10K-PWR-AC2 to the JNP10K-PWR-AC Power Supply



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

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

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

Table 14: Power Input and Output Voltages for JNP10K-PWR-AC2 Power Supplies

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

JNP10K-PWR-DC Power Supply

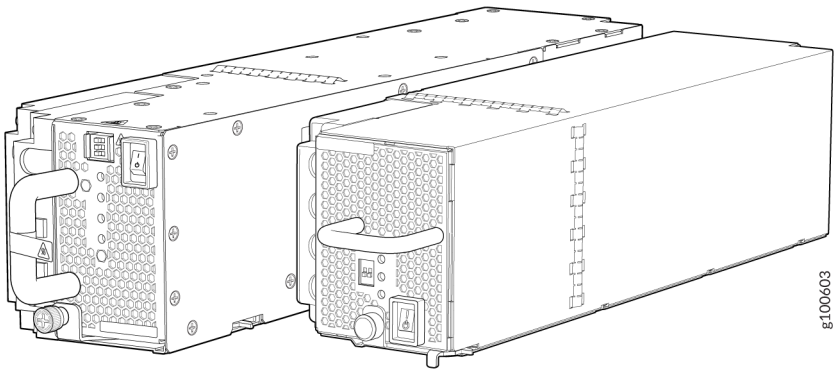
MX10008 routers support three types of DC power supply modules:

- JNP10K-PWR-DC—A 2500-W, 12-VDC dual power supply.
- JNP10K-PWR-DC2—A 5500-W, 12-VDC quad input power supply. For details on this power supply, see "JNP10K-PWR-DC2 Power Supply" on page 66.

- JNP10K-PWR-AC2—An AC, high-voltage alternating current (HVAC,) or high-voltage direct current (HVDC) power supply. In high power mode, this power supply provides 12.3 V, 5000 W with a single feed and 5500 W with dual feeds. For details on this power supply, see "JNP10K-PWR-AC2 Power Supply" on page 61.

All three power supplies fit into a power slot bay, but the JNP10K-PWR-AC2 and JNP10K-PWR-DC2 are longer and protrude from the bay when fully inserted into the chassis. See Figure 34 on page 63.

Figure 34: Size Comparison Between JNP10K-PWR-DC2 and JNP10K-PWR-DC Power Supplies



CAUTION: Do not mix power supply models in the same chassis in a running environment. DC and HVDC can coexist in the same chassis during the hot swap of DC for HVDC.

The DC power supply, JNP10K-PWR-DC, is a 2500-W, 12-VDC, dual input power supply. The output of each DC power supply is 12-VDC. The output power is 2500 W.

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

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

NOTE: DC power supplies are shipped only in the redundant configuration of MX10000 routers. For details about different chassis configurations, see "MX10008 Components and Configurations" on page 22 and *MX10016 Components and Configurations*.

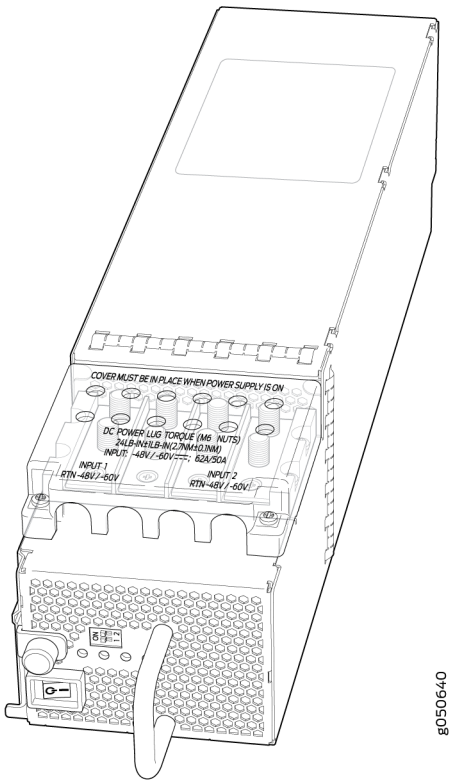
JNP10K-PWR-DC power supplies can use the standard power bus or the enhanced power bus. All MX10016 chassis ship with the enhanced power bus; to determine whether an MX10008 has the standard or enhanced power bus, see "MX10008 Status Panel LEDs" on page 35.

Each JNP10K-PWR-DC power supply weighs approximately 6 lb (2.7 kg) and has two independent pairs of DC input lugs (**Input 1, RTN, –48V/–60V** and **Input 2, RTN, –48V/–60V**) on the faceplate of the power supply. Each inlet requires a dedicated DC power feed. Although each inlet provides sufficient input power to provide full output, always connect to a dedicated DC power feed to provide redundancy. Only one power feed is operational at a time.

DC power models employ electronic A-B input selection. It provides 2*n* source redundancy and *n*+1 power supply redundancy using fewer power supplies than you would require in a 2*n* configuration. Should one power source fail, electronic A-B input selection routes the power supply to the alternate source.

Each JNP10K-PWR-DC power supply has a power switch with international markings for on (**|**) and off (**O**), a fan, and four LEDs on the faceplate that indicate the status of the power supply. See Figure 35 on page 65.

Figure 35: JNP10K-PWR-DC Power Supply



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

Each power supply connects to the combined power rail in an MX10000 router. The power rail distributes the output power produced by the power supplies to different router components. Each DC power supply provides power to all the components in the router.

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

A JNP10K-PWR-DC power supply can operate with only one input DC feed connected. The Routing Control Board only enables the components for which sufficient power is available.

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

SEE ALSO

JNP10K-PWR-DC Power Specifications | 129

How to Install a JNP10K-PWR-DC Power Supply | 230

How to Remove a JNP10K-PWR-DC Power Supply | 225

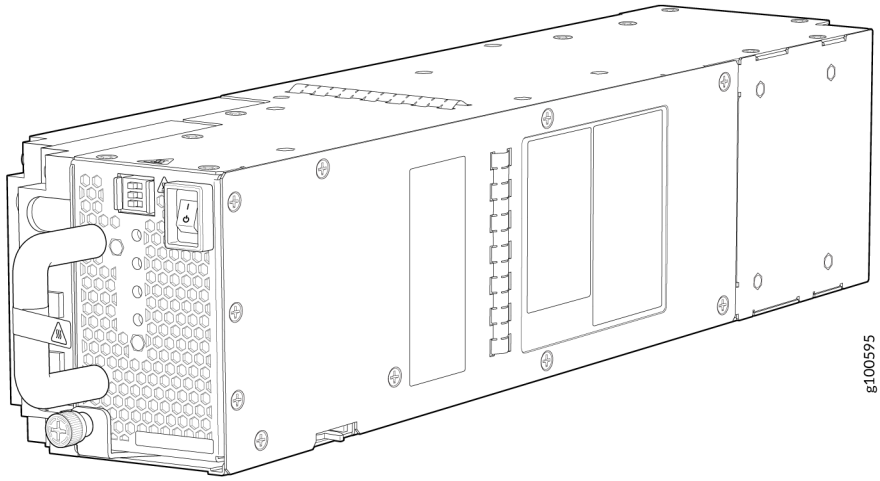
JNP10K-PWR-DC2 Power Supply

The JNP10K-PWR-DC2 power supply (see Figure 36 on page 67) provides two power supplies in a single housing that accepts either 60 A or 80 A using four redundant input power feeds. PS_0 and PS_1 each have redundant input feeds: A0 and/or B0 for PS_0 and A1 and/or B1 for PS_1. The input is configured using a set of dip switches on the power supply faceplate. The output is dependant on the settings of these dip switches. See Table 15 on page 66.

Table 15: Power Input and Output Voltages for JNP10K-PWR-DC2 Power Supplies

INP0 (Switch 1)	INP1 (Switch 2)	H/L (High Input 80 A/Low Input 60A)	Output Power
On	On	On (80 A)	5500 W
On	On	Off (60 A)	4400 W
On	Off	On (80 A)	2750 W
Off	On	On (80 A)	2750 W
On	Off	Off (60 A)	2200 W
Off	On	Off (60 A)	2200 W

Figure 36: JNP10K-PWR-DC2 Power Supply



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

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

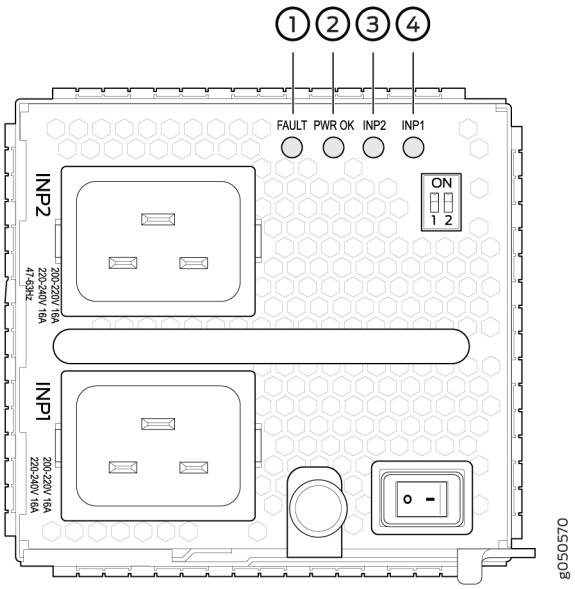
CAUTION: Before you begin installing the router, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the router.

NOTE: DC power supplies are shipped only in the redundant configuration of MX10008 routers. For details about different chassis configurations, see "MX10008 Components and Configurations" on page 22 and *MX10016 Components and Configurations*.

JNP10K-PWR-AC Power Supply LEDs

An AC power supply has four LEDs on its faceplate: **INP1**, **INP2**, **PWR OK**, and **FAULT**. These LEDs display information about the status of the power supply. See Figure 37 on page 68.

Figure 37: LEDs on an JNP10K-PWR-AC Power Supply



1– **FAULT**	3– **INP2**–Source input 1
2– **PWR OK**	4– **INP1**–Source input 0

Table 16 on page 68 describes the LEDs on a JNP10K-PWR-AC power supply.

Table 16: LEDs on a JNP10K-PWR-AC Power Supply

LED	Color	State	Description
INP1 (INP0 in CLI output) or **INP2** (INP1 in CLI output)	Yellow	Blinking	Indicates that the AC power input voltage is not within normal operating range.
	Green	Solid	AC is within operating range (200–240 VAC).
	Dark	Unlit	The power supply is switched off.

Table 16: LEDs on a JNP10K-PWR-AC Power Supply *(Continued)*

LED	Color	State	Description
PWR OK	Green	Solid	DC power output is within normal operating range.
	Yellow	Blinking	AC power output is out of the normal operating range.
FAULT	Dark	Unlit	Power supply is functioning normally.
	Red	Solid	Power supply has failed and must be replaced. Or, only one input is powered and the enabled router for the input that is not powered is set to **ON**. See *Install a JNP10K-PWR-AC Power Supply* for more information about the enable routers.

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

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

SEE ALSO

JNP10K-PWR-AC Power Specifications | **117**

Power Requirements for an MX10008 Router | **112**

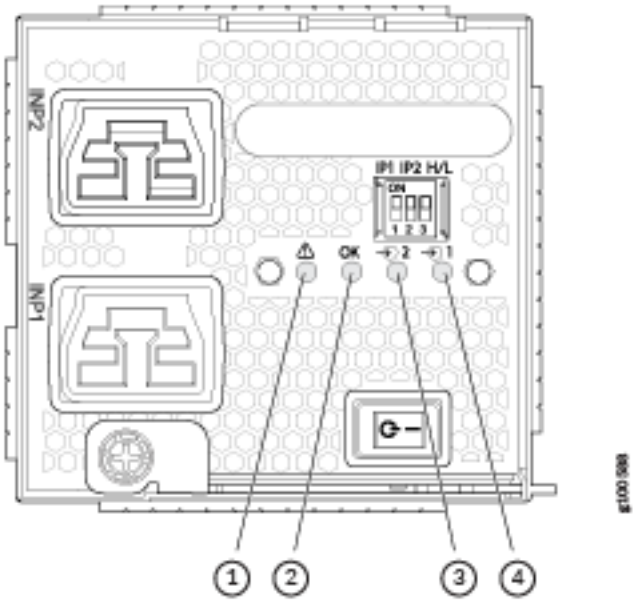
MX10008 Power Cables Specifications | **120**

Connect AC Power to an MX10008 | **174**

JNP10K-PWR-AC2 Power Supply LEDs

The JNP10K-PWR-AC2 power supply has four LEDs on its faceplate: **!**, **OK**, **2**, and **1**. These LEDs display information about the status of the power supply. See Figure 38 on page 70.

Figure 38: LEDs on a JNP10K-PWR-AC2 HVDC Power Supply



1– **!** FAULT	3– **2** INP2–Source input 1
2– **OK** PWR OK	4– **1** INP1–Source input 0

NOTE: Physical markings on the power supply are INP1 and INP2. These markings correspond to INP0 and INP1 in the `show chassis power` output (see Table 17 on page 70).

Table 17: Physical Markings on Chassis Versus Show Chassis Power Command

Physical Marking on JNP10K-PWR-AC2	Show Chassis Power Command
INP1	INP0
INP2	INP1

Table 18 on page 71 describes the LEDs on a JNP10K-PWR-AC2 power supply.

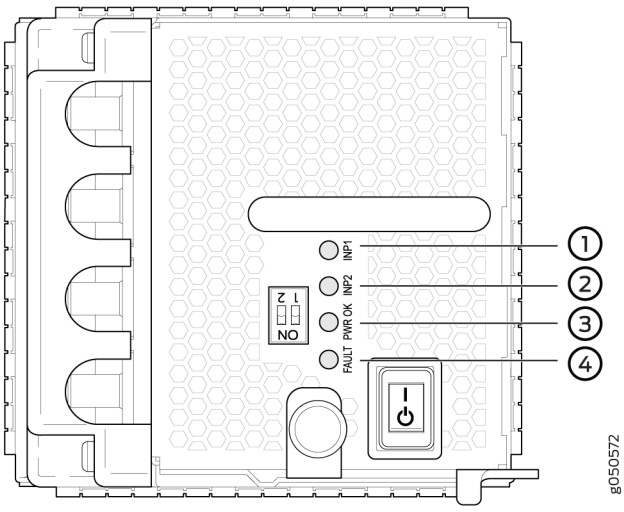
Table 18: Interpreting JNP10K-PWR-AC2 LEDs

LED	Color	State	Description
INP1 or INP0 in CLI output	Yellow	Blinking	The input voltage is present, but is not within normal operating range.
	Green	Solid	The input voltage is present and within normal operating range.
	Unlit	Off	The power supply is switched off; voltage is zero.
INP2 or INP1 in CLI output	Yellow	Blinking	The input voltage is present, but is not within normal operating range.
	Green	Solid	The input voltage is present and within normal operating range.
	Unlit	Off	The power supply is switched off; voltage is zero.
OK	Green	Solid	The power supply output is within normal operating range.
	Yellow	Blinking	The power supply output is out of the power limits or is over-current position.
!	Red	Solid	Power supply has failed and must be replaced.
	Unlit	Off	Power supply is functioning normally.

JNP10K-PWR-DC Power Supply LEDs

The JNP10K-PWR-DC power supply has four LEDs on its faceplate: **INP1**, **INP2**, **PWR OK**, and **FAULT**. These LEDs display information about the status of the power supply. See Figure 39 on page 72.

Figure 39: LEDs on a JNP10K-PWR-DC Power Supply



1– INP1–Source input 0	3– PWR OK
2– INP2–Source input 1	4– FAULT

Table 19 on page 72 describes the LEDs in an MX10008.

Table 19: LEDs on a DC Power Supply in an MX10008

LED	Color	State	Description
INP1 or **INP2**	Yellow	Blinking	Indicates that the DC power input voltage is not within normal operating range.
	Green	Solid	DC power is within operating range (-40 VDC to -72 VDC).
	Unlit	Off	The power supply is switched off.
PWR OK	Green	Solid	DC power output is within normal operating range.
	Yellow	Blinking	DC power output is out of the normal operating range.
FAULT	Red	Solid	Power supply has failed and must be replaced.

Table 19: LEDs on a DC Power Supply in an MX10008 *(Continued)*

LED	Color	State	Description
	Unlit	Off	The power supply is functioning normally. Or, only one input is powered and the enable router for the input that is not powered is set to **ON**. See "Connect DC Power to an MX10008" on page 175 for more information on the enable switches.

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

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

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

SEE ALSO

JNP10K-PWR-DC Power Specifications | **129**

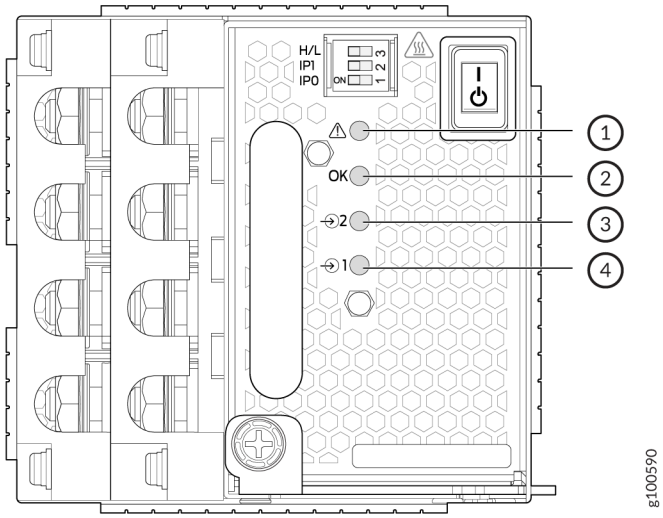
Power Requirements for MX10008 Components

Connect DC Power to an MX10008 | **175**

JNP10K-PWR-DC2 Power Supply LEDs

A JNP10K-PWR-DC2 power supply module has four LEDs on its faceplate: **1**, **2**, **OK**, and the symbol for fault, **!**. These LEDs display information about the status of the power supply. See Figure 40 on page 74.

Figure 40: LEDs on a JNP10K-PWR-DC2 Power Supply



1– !–FAULT	3– 2–Source input 1
2– OK–Power okay	4– 1–Source input 0

You can find out the version of the firmware installed in the power supply from the output of `show system firmware` command. Table 20 on page 74 describes the LEDs on a JNP10K-PWR-DC2 power supply if the firmware installed in the power supply is 300.300.208.208.304 or higher. Table 21 on page 76 describes the LEDs on a JNP10K-PWR-DC2 power supply if the firmware installed in the power supply is lower than 300.300.208.208.304.

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

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

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

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

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

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

Table 21: LEDs on a JNP10K-PWR-DC2 Power Supply (with firmware lower than 300.300.208.208.304 installed in it)

LED	Color	State	Description
1 (INP0 in CLI output) or **2** (INP1 in CLI output)	Orange	Solid	Indicates that the DC power input voltage is not within normal operating range.
	Green	Solid	DC power is within operating range (-40 VDC to -72 VDC).
	Unlit	Off	The power supply is switched off.
OK	Green	Solid	DC power output is within normal operating range.
	Orange	Blinking	The output is out of the limits.
!	Red	Solid	Power supply has failed and must be replaced.

Table 21: LEDs on a JNP10K-PWR-DC2 Power Supply (with firmware lower than 300.300.208.208.304 installed in it) *(Continued)*

LED	Color	State	Description
	Unlit	Off	Power supply is functioning normally. Or, only one input is powered and the enable router for the input that is not powered is set to **ON**. See "Connect DC Power to an MX10008" on page 175 for more information on the enable routers.

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

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

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

MX10008 Routing and Control Board Components and Descriptions

IN THIS SECTION

- MX10008 Routing and Control Board Description | **78**
- MX10008 Routing and Control Board LEDs | **81**

MX10008 Routing and Control Board Description

IN THIS SECTION

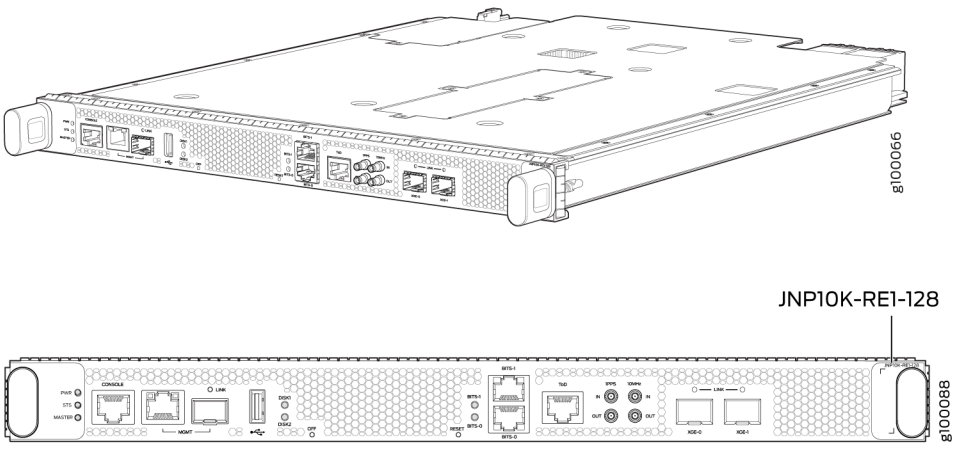
- Routing and Control Board Functions | 79
- Routing and Control Board Components | 79

The MX10008 Routing and Control Board (RCB) is responsible for system management in an MX10008 router (see Figure 41 on page 78). The chassis can run with one or two RCBs. The base configuration ships with one RCB while a redundant configuration ships with two RCBs. When two RCBs are installed, one functions as the primary and the second as a backup. If the primary RCB is removed, the backup becomes the primary if graceful Routing Engine switchover (GRES) is configured.

MX10008 supports the following Routing Engines:

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

Figure 41: Routing and Control Board



This topic covers:

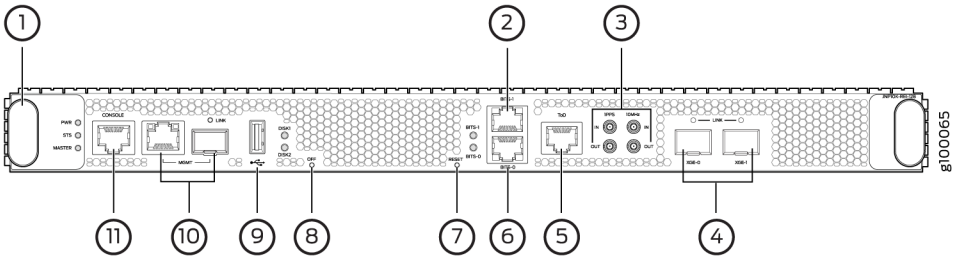
Routing and Control Board Functions

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

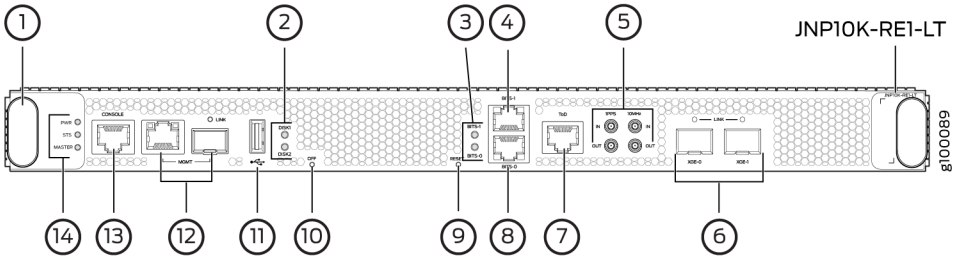
- System control functions such as environmental monitoring
- Routing Layer 2 and Layer 3 protocols
- Communication to all components such as line cards, Switch Fabric Boards (SFBs), and power and cooling
- Transparent clocking
- Alarm and logging functions

Routing and Control Board Components

Figure 42: Routing and Control Board Faceplate



1– Handles	7– Reset button
2– BITS1 clock port	8– Online/Offline button
3– GPS clock ports	9– USB port
4– XGE-0 and XGE-1 JCS ports	10– Management (**MGMT**) ports
5– **ToD**—Time-of-day (TOD) port	11– Console (**CONSOLE**) port
6– BITS0 clock port	



1– Handles	8– BITS0 clock port
2– Solid State Disk (SSD) LEDs	9– Reset button
3– Clock LEDs	10– Online/Offline button
4– BITS1 clock port	11– USB port
5– GPS clock ports	12– Management (**MGMT**) ports
6– XGE-0 and XGE-1 JCS ports	13– Console (**CONSOLE**) port
7– **ToD**—Time-of-day (TOD) port	14– RCB status LEDs

Each RCB consists of the following internal components:

- CPU—Runs Junos OS to maintain the routing tables and routing protocols.
- EEPROM—Stores the serial number of the Routing Engine.
- DRAM—Provides storage for the routing and forwarding tables and for other Routing Engine processes.
- One 10-Gigabit Ethernet interface between the Routing Engine and Switch Fabric Board.
- One USB port—Provides a removable media interface through which you can install Junos OS manually. The Junos OS supports USB versions 3.0, 2.0, and 1.1.
- Management ports—Two ports, one copper (RJ-45 port) and one SFP port provide access to management devices. Use only one of the two management ports at a time.

  Use an RJ-45 connector for the copper port.

  Use a fiber optic connector for the SFP port.

  Do not use copper SFP or SFP-T modules in the SFP port because they are not supported.
- **RESET** button—When pressed, reboots the RCB as detailed below:
  - When pressed for less than 5 seconds for diagnostic purposes, the RCB does not reset. The press event is logged in the RCB FPGA register.
  - When pressed for greater than 5 seconds but less than 10 seconds, the RCB reboots and the reset-reason logs the button press event.
  - When pressed for greater than 10 seconds, the RCB reboots with an option for BIOS recovery.
- LEDs—Provide status of the Routing Engine.
- Online/Offline Button—When the RCB is online and if the button is pressed for more than 4 seconds, the RCB goes offline. When the RCB is offline and if the button is pressed more than 4 seconds, the RCB starts booting.

NOTE: For specific information about Routing Engine components (for example, the amount of DRAM), issue the `show vmhost hardware` command.

SEE ALSO

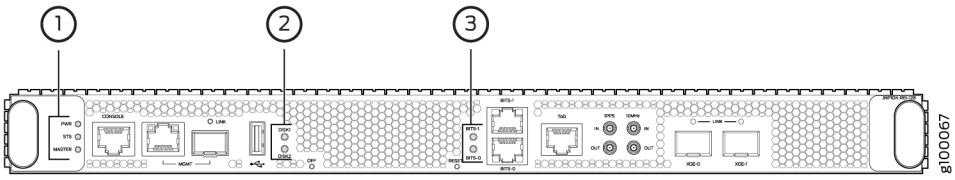
Handling and Storing MX10008 Switch Fabric Boards | 257

Installing a Routing and Control Board | 188

MX10008 Routing and Control Board LEDs

Figure 43 on page 81 shows the LEDs on the Routing and Control Boards (JNP10K-RE1).

Figure 43: Routing and Control Board LEDs



1– Routing and Control Board status panel	3– Clock LEDs–**BITS-0**, and **BITS-1**
2– Solid State Disk (SSD) LEDs—**DISK1** and **DISK2**	

Table 22 on page 81 describes the LEDs on the RCB status panel.

Table 22: Routing and Control Board Status LEDs

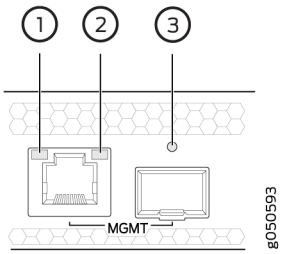
LED	Color	State	Description
PWR	Green	On steadily	RCB is receiving adequate power.
	Yellow	Blinking	An error has been detected in the RCB.

Table 22: Routing and Control Board Status LEDs *(Continued)*

LED	Color	State	Description
	Dark	Unlit	RCB is not powered up.
STS	Green	On steadily	RCB is online and functioning correctly.
	Green	Blinking	The beacon feature is enabled.
	Yellow	On steadily	The RCB is booting.
	Yellow	Blinking	An error has been detected in the RCB.
	Dark	Unlit	The power supply is switched off.
MST	Green	On steadily	The RCB is the primary.
	Dark	Unlit	The RCB is the backup.

Figure 44 on page 82 shows the management port LEDs on the RCB.

Figure 44: Management Port LEDs on an MX10008



1– Status LED (RJ-45)	3– Link LED—Green indicates the link is up; blinking indicates activity (SFP)
2– Activity LED (RJ-45)	

Table 23 on page 83 describes the RJ-45 management port and SFP LEDs.

Table 23: RJ-45 Management Port LEDs on an MX10008 Routing and Control Board

LED	Color	State	Description
Activity/Status LED	Unlit	Off	The port speed is 10 MB.
	Green	Blinking	The port speed is 100 MB.
	Green	On steadily	The port speed is 1000 MB.
LINK	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	A link is established.
		Blinking	There is link activity.
	Yellow	Blinking or flickering	The beacon feature is enabled.

Table 24 on page 83 describes the JCS Port LEDs.

Table 24: JCS Port LEDs on an MX10008 Routing and Control Board

LED	Color	State	Description
LINK LEDs for JCS Ports (**XGE0** and **XGE1**)	Unlit	Off	No transceiver is present.
	Green	On steadily	A link is established. The interface is up.
	Green	Blinking or flickering	The beacon feature is enabled.
	Yellow	Blinking	An error has occurred.

Table 25 on page 84 describes the LEDs for the secondary SATA drives.

Table 25: Routing and Control Board SSD Status LEDs

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

Table 26: Routing and Control Board Clock Status LEDs (Applicable to Junos OS Release 19.2R1 and later versions)

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

Table 26: Routing and Control Board Clock Status LEDs (Applicable to Junos OS Release 19.2R1 and later versions) *(Continued)*

LEDs	Color/State	Description
		The TX status is in squelch mode.
	Off	Both the clock synchronization source and the clock synchronization output are not configured.

Table 27: Routing and Control Board Clock Status LEDs (Applicable to Junos OS versions before 19.2R1)

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

SEE ALSO

Connecting an MX10008 to a Network for Out-of-Band Management | **176**

MX10008 Switch Fabric Board

IN THIS SECTION

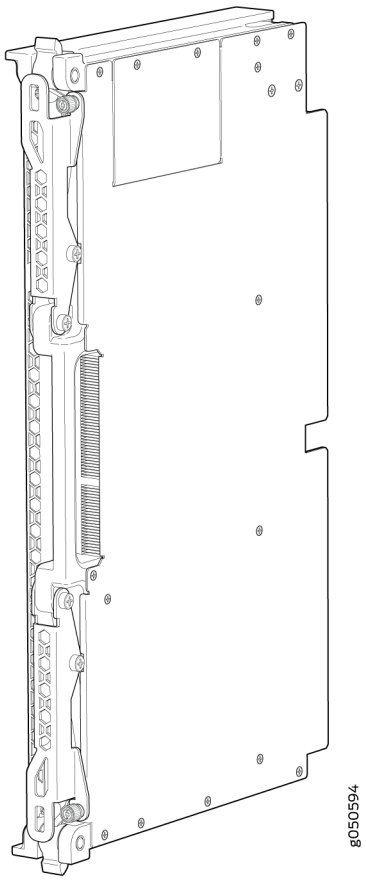
- MX10008 Switch Fabric Board Description | **86**
- MX10008 Switch Fabric Board LEDs | **89**

Switch Fabric Boards (SFBs) create the switch fabric for the MX10008. Each MX10008 contains six SFBs that are installed vertically, mid-chassis, between the line cards and the RCBs in the front and the fan trays in the rear.

MX10008 Switch Fabric Board Description

The SFBs make up the MX10008 switching plane. There are two models of SFBs: the JNP10008-SF and the JNP10008-SF2. Five SFBs are required for operation with the sixth providing N+1 redundancy. SFBs must all be of the same model type in a running chassis. On both models, the SFB has eight connectors on the connecter edge which match and connect to a connector on one of the eight line cards. See Figure 45 on page 86

Figure 45: Switch Fabric Board



NOTE: The fabric connectors on the JNP10008-SF2 SFB are sensitive to debris accumulation. The connectors interface with the connectors on the MX10K-LC9600 line card. The connectors must be kept clean and free of dust and other particles, to ensure high-quality connection between JNP10008-SF2 SFB and MX10K-LC9600 line card.

Table 28 on page 87 shows the specifications of JNP10008-SF and JNP10008-SF2 SFBs supported on MX10008 chassis.

Table 28: SFB Specifications

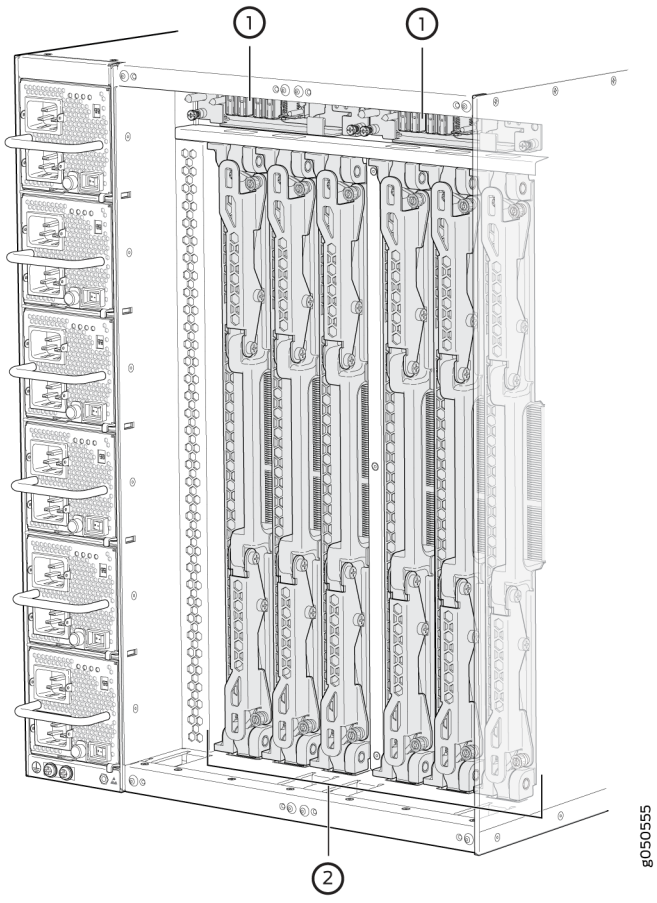
Specification	JNP10008-SF	JNP10008-SF2
Operating system	Junos OS Release 17.2R1 and later	Junos OS Release 21.4R1 and later
Supported line cards	1. MX10K-LC2101 2. MX10K-LC480	1. MX10K-LC2101 2. MX10K-LC480 3. MX10K-LC9600
Number of SIBs required for operation	Base systems require 5 SIBs; redundant systems require 6 SIBs	Based upon the line card installed: 1. MX10K-LC2101-N+1 2. MX10K-LC480-N+3 3. MX10K-LC9600-N+0
Switching Capacity	When all six SFBs are installed, the MX10008 has a net switching capacity of 42 Tbps.	When all six SFBs are installed, the MX10008 has a net switching capacity of 76 Tbps.
Height	19.7 in. (50.04 cm)	19.7 in. (50.04 cm)
Width	1.8 in. (4.57 cm)	1.8 in. (4.57 cm)
Depth	10.4 in. (26.42 cm)	10.4 in. (26.42 cm)

Table 28: SFB Specifications *(Continued)*

Specification	JNP10008-SF	JNP10008-SF2
Weight	14.8 lb (6.71 kg)	16 lb (7.25 kg)

SFBs are hot-removable and hot-insertable field-replaceable units (FRUs). They are not visible from the outside of the router chassis. You must remove one of the fan trays in order to view the SFBs. The SFBs are numbered from left to right **SFB0** to **SFB5**. See Figure 46 on page 88.

Figure 46: SFBs Installed in an MX10008 Router



1– Fan tray controllers	2– Switch Fabric Boards

The fabric interface connectors on the JNP10008-SF2 SFB have preinstalled protective plastic covers which will keep the connectors clean and free of dust and other particles. Remove the protective plastic

covers before you install the JNP10008-SF2 SFB into the router. Save the plastic covers for future use to re-install when you remove the JNP10008-SF2 SFB from the router.

SEE ALSO

Removing and Installing MX10008 Switch Fabric Boards | 257

MX10008 Switch Fabric Board LEDs

The JNP10008-SF SFBs have two status LEDs at the top of each board. See Figure 47 on page 89.

> **NOTE**: JNP10008-SF2 Switch Fabric Boards (SFBs) don't have status LEDs at the top of the board. The SFB LEDs on the fan trays show the status of the JNP10008-SF2 SFB boards.

The SFBs are installed vertically, mid-chassis, between the line cards and the RCBs in the front and the fan trays in the rear you cannot see the SFBs from outside. Each of the two fan trays will have three SFB status LEDs. See "MX10008 Fan Tray LEDs and Fan Tray Controller LEDs" on page 49.

Figure 47: JNP10008-SF SFB LEDs

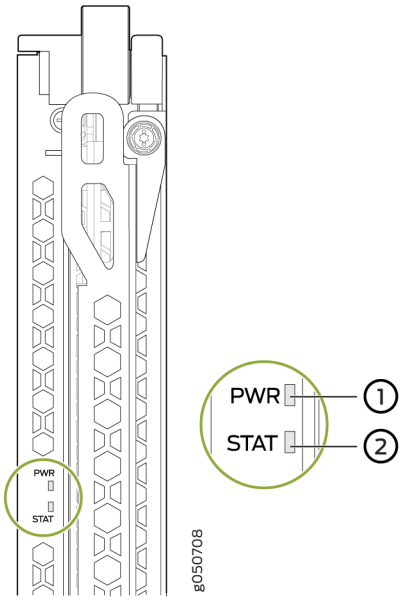


Table 29 on page 90 describes the functions of JNP10008-SF SFB LEDs.

Table 29: JNP10008-SF SFB LEDs

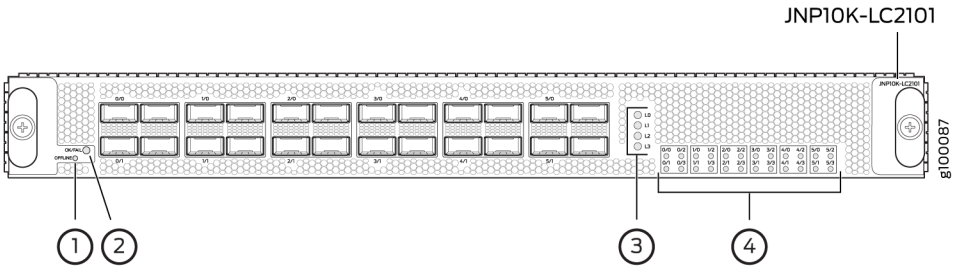
Label	Color	State	Description
PWR	Green	On steadily	The SFB is receiving power.
	Yellow	Blinking	A power fault has occurred.
	Unlit	Off	The SFB is either offline or not receiving power.
STAT	Green	On steadily	The SFB is online and functioning normally.
	Green	Blinking	The beacon feature is enabled.
	Yellow	On steadily	The SFB has failed.
	Unlit	Off	The fan tray controller is having a power problem.

SEE ALSO

Removing and Installing MX10008 Switch Fabric Boards | 257

MX10K-LC2101 Line Card

The MX10K-LC2101 line card is a fixed configuration MPC. It does not contain separate slots for Modular Interface Cards (MICs). The MX10004 routers support four and the MX10008 routers support eight MX10K-LC2101 MPCs. The line card provides a maximum bandwidth of 2.4Tbps and has six Packet Forwarding Engines, each providing a maximum bandwidth of up to 400 Gbps. The line card plugs in to the MX10004, MX10008, and MX10016 routers horizontally at the front of the chassis.



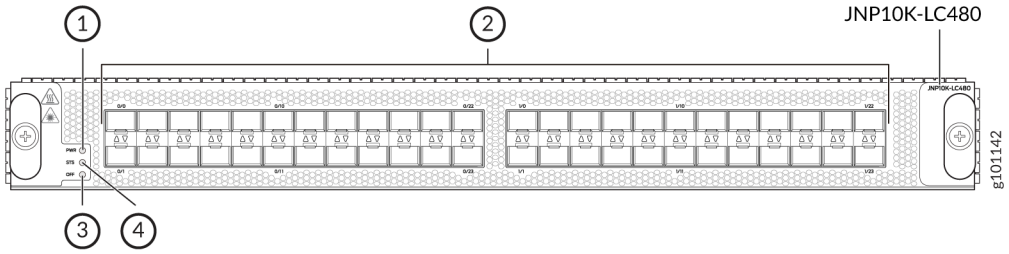
1– **OFFLINE** button	3– Lane LEDs
2– **OK/FAIL** LED	4– Port LEDs

Software release	• Junos OS Release 18.2R1 and later when installed in MX10008 and Mx10016. • Junos OS Release 22.3R1 and later when installed in MX10004.
Description	• Weight: 31.57 lb (14.32 kg) • Model number: JNP10K-LC2101 • Name in the CLI: `JNP10K-LC2101` • Dimensions: Height = 1.89 in. (48.01 mm), Width = 17.2 in (436.88 mm), Depth = 19.05 in. (484 mm) (Exc FRU ejector)
Hardware features	• Fixed-configuration MPC with 10-Gbps, 40-Gbps, and 100-Gbps port speeds. • All the ports are Multi-Rate ports. Each port is capable of supporting either 100 Gbps or 40 Gbps or 10 G (4x10-Gbps with breakout cable). • Line-rate throughput of up to 2.4 Tbps. • Six Packet Forwarding Engines, each providing a maximum bandwidth of 400 Gbps. • EA chipsets for increased scaling for bandwidth, subscribers, and services. • Supports the Switch Fabric Boards, JNP10004-SF2, JNP10008-SF, JNP10008-SF2, and JNP10016-SF. • Supports maximum transmission units (MTUs) from 256 bytes through 16,000 bytes for transit traffic, and 256 bytes through 9,500 bytes for host-bound packets.

Software features	• Supports rate selectability at the port level. • By default, the ports are configured as 10-Gigabit Ethernet ports. • Optical diagnostics and related alarms.
Power requirements	Line-rate throughput of 2.4 Tbps: • Power consumption at different temperatures: 25° C: 1335 W 40° C: 1425 W
LEDs	**OK/FAIL** LED: • Steady green—MPC is functioning normally. • Yellow—MPC has failed. Port LED—**Link** • Off—Port is not enabled. • Green—Port link is up with no alarms or failures. • Red—Port link is down with alarms. **NOTE**: When a QSFP+ port is configured for the 10-Gigabit mode with a breakout cable, the link status for th Gigabit port is indicated with the addition of four LEDs provided on the line card. The lane LEDs for the corresponding port indicates the port status. Like the port status LED, each individual lane LED supports four states as: OFF, AMBER, GREEN, RED. See M and MIC Lane LED Scheme Overview for more details. For the 40-Gigabit mode the lane number LED is not applicable. The port LED indicates the port status, irresp of whichever lane number LED is ON.
Cables and connectors	**TIP**: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers suppo on your Juniper Networks device. The list of supported transceivers for the MX Series is located at MX Series Supported Transceivers.

MX10K-LC480 Line Card

The MX10K-LC480 (Model number: JNP10K-LC480) is a fixed-configuration line card with 48 SFP/SFP+ ports. Each port supports a speed of 10 Gbps or 1 Gbps, providing the line card a maximum bandwidth of 480 Gbps. The MX10K-LC480 has two Packet Forwarding Engines, each providing a maximum bandwidth of 240 Gbps. The line card plugs in to the MX10004, MX10008, and MX10016 routers horizontally at the front of the chassis.



1– Power (**PWR**) LED.	3– Offline/online (**OFF**) button.
2– Port LEDs.	4– Status (**STS**) LED.

Software release	• Junos OS Release 21.2R1 and later when installed in MX10008 and MX10016. • Junos OS Release 22.3R1 and later when installed in MX10004.
Description	• Model number: JNP10K-LC480 • Name in the CLI: `JNP10K-LC480` • Weight: 21.6 lb (9.8 kg) • Dimensions: Height = 1.89 in. (48.01 mm), width = 17.2 in (436.88 mm), depth = 19.05 in. (484 mm) (excluding FRU ejector)

Hardware features	• Fixed-configuration line card with 10-Gbps and 1-Gbps port speeds
	• Line-rate throughput of up to 480 Gbps
	• Two Packet Forwarding Engines, each providing a maximum bandwidth of 240 Gbps
	• EA chipset for increased scaling for bandwidth, subscribers, and services
	• Supports the Switch Fabric Boards JNP10004-SF2, JNP10008-SF, JNP10008-SF2 and JNP10016-SF
	• Interoperates with the JNP10K-LC2101 and JNP10K-LC9600 line cards
	• Operates with the following Routing and Control Boards: JNP10K-RE1, JNP10K-RE1-128, and JNP10K-RE1-LT
	• Operates with the following power supplies and fan trays:
	  • JNK10K-PWR-AC or JNK10K-PWR-DC with the JNP10004-FAN2, JNP10008-FAN or JNP10016-FAN.
	  • JNP10K-PWR-AC2 or JNP10K-PWR-DC2 with JNP10004-FAN2, JNP10008-FAN2 or JNP10016-FAN2.
	In both of the above configurations, the MX10K-LC480 line card adheres to the complete NEBS compliance (NEBS GR63-CORE, GR1089-CORE, and SR3580 compliance).
	• Meets the full NEBS requirement on the MX10004, MX10008, and MX10016 routers
	• Supports a maximum transmission unit (MTU) ranging from 256 bytes through 16,000 bytes for transit traffic and for host-bound packets

Software features	• Default port configuration of 10 Gigabit Ethernet (GbE) • Supports optics diagnostics and related alarms

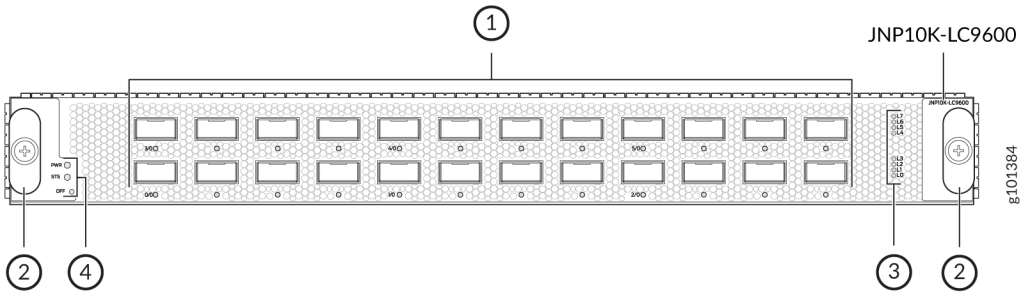
Power requirements	• Power consumption at different temperatures when all ports are configured in 10-Gbps speed: 25° C: 420 W (without MACSec), 430 W (with MACSec) 40° C: 430 W (without MACSec), 450 W (with MACSec) 55° C: 450 W (without MACSec), 480 W (with MACSec) • Power consumption at different temperatures when all ports are configured in 1-Gbps speed: 25° C: 360 W (without MACSec), 370 W (with MACSec) 40° C: 370 W (without MACSec), 390 W (with MACSec) 55° C: 390 W (without MACSec), 420 W (with MACSec)
LEDs	**PWR** LED • Steady green—Line-card power is ok. • Steady red—Line-card power-on has failed. • Off—Line card is not receiving power. **STS** LED • Steady green (blinking green when the beacon or the port location is on)—Line card is online. • Blinking green—The line card is booting. • Steady red (blinking red when the beacon or the port location is on)—Line card is faulty or an alarm has been raised. • Off—Line card is disabled or offline. Port LED • Off—Port does not have a transceiver module. • Steady green (blinking green when the beacon or the port location is on)—Port link is up with no alarms or failures. • Steady amber (blinking amber when the beacon or the port location is on)—Port link is down because the port is disabled through the CLI or the port encountered errors such as loss of signal, local fault, or remote fault.

Cables and connectors	**TIP**: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers that your Juniper Networks device supports. See the list of supported transceivers for the MX Series at MX Series Supported Transceivers. MX10K-LC480 supports 1-Gbps Copper SFP modules in all the ports. You must use shielded RJ45 cables with 1-Gbps copper SFP modules. You must install the MX10K-LC480 line card in the MX10008 and MX10016 routers along with the front panel with filter to meet the EMI Class-A emission standards. The following applies to a router (MX10008 or MX10016) installed with the front panel: • We recommend that you use only 16 ports per line card with copper SFP modules - the last 8 ports on the MIC0 (0/16 through 0/23) and the first 8 ports on the MIC1 (1/0 through 1/7). • The MX10008 router supports a maximum of 128 copper SFP modules of 1 Gbps capacity. • The MX10016 router supports a maximum of 192 copper SFP modules of 1 Gbps capacity. **NOTE**: The 1-Gbps copper SFP modules on the MX10K-LC480 line card do not support Precision Time Protocol (PTP) or Synchronous Ethernet functionality.

MX10K-LC9600 Line Card

The MX10K-LC9600 (Model number: JNP10K-LC9600) is a fixed-configuration 24-port line card that provides a line-rate throughput of 9.6 Tbps. The line card has twenty-four QSFP ports, each capable of supporting a maximum speed of 400 Gbps.

Figure 48: MX10K-LC9600



1– QSPF Ports	3– Lane LEDs
2– Ejector Handles	4– **PWR**, **STS**, and **OFF** LEDs

The MX10K-LC9600 line card combines Packet Forwarding Engines based on custom ASICs by Juniper Networks. The line card has six fowarding ASICs, each hosting two Packet Forwarding Engines.The line card has 12 Packet Forwarding Engines, each providing a maximum bandwidth of 800 Gbps.

You can channelize the ports using breakout cables to speeds of 400 Gbps, 200 Gbps, 100 Gbps, 50 Gbps, 40 Gbps, 25 Gbps, or 10 Gbps.

The 9.6-Tbps line card is designed to operate only with the following components:

- JNP10004-SF2 and JNP10008-SF2 switch fabric
- JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies
- The JNP10008-FAN2 fan tray
- The JNP10008-FTC2 fan tray controller
- JNP10004-FAN2 fan tray
- JNP10004-FTC2 fan tray

NOTE: The fabric connectors on the MX10K-LC9600 line card are sensitive to debris accumulation. The connectors interface with the connectors on the JNP10004-SF2 SFB and the JNP10008-SF2 SFB. The connectors must be kept clean and free of dust and other particles to ensure a high-quality connection between the MX10K-LC9600 line card and the JNP10004-SF2 SFB and the JNP10008-SF2 SFB.

The MX10K-LC9600 line card runs the Juniper Networks Junos OS software on Juniper Networks JNP10K-LC9600 hardware. The MX10K-LC9600 plugs in to the MX10004 and MX10008 routers horizontally at the front of the chassis.

The fabric interface connectors on the MX10K-LC9600 line card have a preinstalled protective plastic dust cover. This cover keeps the connectors clean and free of dust and other particles. Remove the dust cover before you install the line card in the router. Save the plastic cover for future use to re-install when you remove the line card from the router.

The WAN ports on the MX10K-LC9600 line card also have preinstalled protective plastic dust covers. These covers keep the ports clean and free of dust and other particles. Keep these covers installed in any port that is not occupied by an optic module.

Software release	• Junos OS Release 21.4R1 and later when installed in MX10008. • Junos OS Release 22.3R1 and later when installed in MX10004.
Description	• Model number: JNP10K-LC9600 • Name in the CLI: `JNP10K-LC9600` • Weight: 27 lb (12.24 kg) • Dimensions: Height = 1.89 in. (48.01 mm), width = 17.2 in (436.88 mm), depth = 19.05 in. (484 mm) (excluding FRU ejector)

Hardware features	• Is a fixed-configuration line card with 400-Gbps, 200-Gbps, 100-Gbps, 50-Gbps, 40-Gbps, 25-Gbps, or 10-Gbps port speeds.
	• Offers line-rate throughput of up to 9.6 Tbps.
	• Includes twelve Packet Forwarding Engines, each allows for a maximum bandwidth of 800 Gbps.
	• Is compatible with the JNP10004-SF2 and JNP10008-SF2 switch fabric boards.
	• Interoperates with the MX10K-LC2101 and MX10K-LC480 line cards.
	• Operates with the JNP10K-RE1, JNP10K-RE1-LT, and JNP10K-RE1-128G Routing and Control Boards.
	• Operates only with the following power supplies and fan trays:
	  • JNP10K-PWR-AC2
	  • JNP10K-PWR-DC2
	  • JNP10008-FAN2
	  • JNP10008-FTC2
	  • JNP10004-FAN2
	  • JNP10004-FTC2
	• Supports a maximum transmission unit (MTU) of 16,000 bytes for transit traffic and host-bound packets.

Software features	• Supports rate selectability at the port level. • By default, the ports are configured as 400-Gigabit Ethernet ports. • Supports optical diagnostics and related alarms.
Power requirements	Power consumption at different temperatures when all ports are configured in 400-Gbps speed: • 25° C: 1655 W • 40° C: 1770 W

LEDs	**PWR** LED • Steady green—Line-card power is ok. • Steady red—Line-card power-on has failed. • Off—Line card is not receiving power. **STS** LED • Steady green (blinking green when the beacon or the port location is on)—Line card is online. • Blinking green—The line card is booting. • Steady red (blinking red when the beacon or the port location is on)—Line card is faulty or an alarm has been raised. • Off—Line card is disabled or offline. Port LED • Off—Port does not have a transceiver module. • Steady green (blinking green when the beacon or the port location is on)—Port link is up with no alarms or failures. • Steady amber (blinking amber when the beacon or the port location is on)—Port link is down because the port is disabled through the CLI, or the port encountered errors such as loss of signal, local fault, or remote fault. Lane LEDs • The lane LEDs for the corresponding port indicate the port status. • Like the port status LED, each individual lane LED supports four states as: OFF, AMBER, GREEN, and RED.
Cables and connectors	**TIP**: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers that your Juniper Networks device supports. See the list of supported transceivers for the MX Series at MX Series Supported Transceivers.

CHAPTER 2

Site Planning, Preparation, and Specifications

MX10008 Site Preparation Overview | 102

MX10008 Power Planning | 112

MX10008 Transceiver and Cable Specifications | 132

MX10008 Alarm and Management Cable Specifications and Pinouts | 138

MX10008 Site Preparation Overview

IN THIS SECTION

- MX10008 Site Preparation Checklist | **102**
- MX10008 Environmental Requirements and Specifications | **104**
- General Site Guidelines | **105**
- Site Electrical Wiring Guidelines | **106**
- MX10008 Rack Requirements | **108**
- MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance | **110**

MX10008 Site Preparation Checklist

The checklist in Table 30 on page 102 summarizes the tasks you need to perform when preparing a site for an MX10008 installation.

Table 30: Site Preparation Checklist

✓	Item or Task	For More Information
	Environment	
☐	Verify that environmental factors such as temperature and humidity do not exceed router tolerances.	"MX10008 Environmental Requirements and Specifications" on page 104
	Power	
☐	Measure the distance between external power sources and the router installation site.	
☐	Calculate the power consumption and requirements.	"MX10008 Power Planning" on page 112
	Rack	

Table 30: Site Preparation Checklist *(Continued)*

✓	Item or Task	For More Information
☐	Verify that your rack meets the minimum requirements for the installation of the router.	"MX10008 Rack Requirements" on page 108
☐	Plan rack location, including required space clearances.	"MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110
☐	Secure the rack to the floor and building structure.	
	Cables	
☐	Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.	The list of supported transceivers for the MX10008 line cards is located at MX10008 Transceivers and Specifications
☐	Plan the cable routing and management.	
☐	**Hardware Upgrades**	Order upgrade kits or individual components. See "MX10008 Components and Configurations" on page 22.

SEE ALSO

General Safety Guidelines and Warnings | **334**

Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift | **158**

Manually Mounting an MX10008 in a 4-Post Rack | **161**

MX10008 Environmental Requirements and Specifications

The MX10008 router must be installed in a four-post rack. It must be housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

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

Table 31 on page 104 provides the required environmental conditions for normal router operation.

Table 31: MX10000 Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation up to 6000 feet (1829 meters).
Relative humidity	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing. • Short-term operation ensured in relative humidity range of 5% through 93%, noncondensing. **NOTE**: As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.

Table 31: MX10000 Environmental Tolerances *(Continued)*

Description	Tolerance
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C). **NOTE**: The chassis can be temporarily be operated at 45° C at sea level for up to 1% of the time (3.65 days per year). • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C). • Short-term operation ensured in temperature range of 32°F through 104°F (0°C through 40°C) at 6000 ft altitude and 32°F through 114.8°F (0°C through 46°C) at sea-level. **NOTE**: As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install MX10008 router only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

SEE ALSO

MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance | **110**

MX10008 Installation Overview | **145**

General Site Guidelines

This topic applies to hardware devices in the MX10008 routers.

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

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

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

SEE ALSO

Prevention of Electrostatic Discharge Damage | 359

Site Electrical Wiring Guidelines

Table 32 on page 107 describes the factors you must consider while planning the electrical wiring at your site.



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

Table 32: Site Electrical Wiring Guidelines

Site Wiring Factor	Guideline
Signaling limitations	To ensure that signaling functions optimally: • Install wires correctly. Improperly installed wires can emit radio interference. • Do not exceed the recommended distances or pass wires between buildings. The potential for damage from lightning strikes increases if wires exceed recommended distances or if wires pass between buildings. • Shield all conductors. The electromagnetic pulse (EMP) caused by lightning can damage unshielded conductors and destroy electronic devices.
Radio frequency interference (RFI)	To reduce or eliminate the emission of RFI from your site wiring: • Use twisted-pair cable with a good distribution of grounding conductors. • Use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable, if you must exceed the recommended distances.
Electromagnetic compatibility (EMC)	Provide a properly grounded and shielded environment and use electrical surge-suppression devices. Strong sources of electromagnetic interference (EMI) can cause the following damage: • Destruction of the signal drivers and receivers in the device. • Electrical hazards as a result of power surges conducted over the lines into the equipment. **TIP**: If your site is susceptible to problems with EMC, particularly from lightning or radio transmitters, you might want to seek expert advice.



WARNING: The intrabuilding port(s) of the equipment or subassembly is suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use

as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE), and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring

MX10008 Rack Requirements

The MX10008 router chassis are designed to be installed in four-post racks.

Rack requirements consist of:

- Rack type
- Mounting bracket hole spacing
- Rack size and strength
- Rack connection to the building structure

Table 33 on page 108 provides the rack requirements and specifications for the MX10008 router .

Table 33: Rack Requirements for the MX10008

Rack Requirement	Guidelines
Rack type: four-post	Use a four-post rack that provides bracket holes or hole patterns spaced at 1 U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association. You can stack three MX10008 routers if: • The rack is 39 U or greater. • The rack meets the strength requirements to support the weight. • The facility can provide adequate power and cooling.

Table 33: Rack Requirements for the MX10008 *(Continued)*

Rack Requirement	Guidelines
Rack mount kit hole spacing	The holes in the rack mount kit are spaced at 1 U (1.75 in. or 4.45 cm), so that the router can be mounted in any rack that provides holes spaced at that distance.

Rack size and strength	• Ensure that the rack complies with the standards for a 19-in. wide rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association.
	• Use one of the standard rack depths 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 following values are applicable only if you are using an open rack:
	  • 23.62 in. (600 mm)
	  • 30.0 in. (762 mm)
	  • 31.5 in. (800 mm)
	• If you are using a closed rack, it must have sufficient space clearance in front of the chassis to accommodate the EMI door (which extends to about 6 in.). An MX10008 router (chassis + EMI door with filter + fan trays + PSU handle) is 39.4 in. deep.
	• Ensure that the rack rails are spaced widely enough to accommodate the router chassis' external dimensions. The outer edges of the flange extend the chassis width to 19 in. (48.26 cm).
	• Ensure that the rack is strong enough to support the weight of the router and cabling.
	• Ensure that the spacing of rails and adjacent racks allows for proper clearance around the router and rack. See "MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110.

Table 33: Rack Requirements for the MX10008 *(Continued)*

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

SEE ALSO

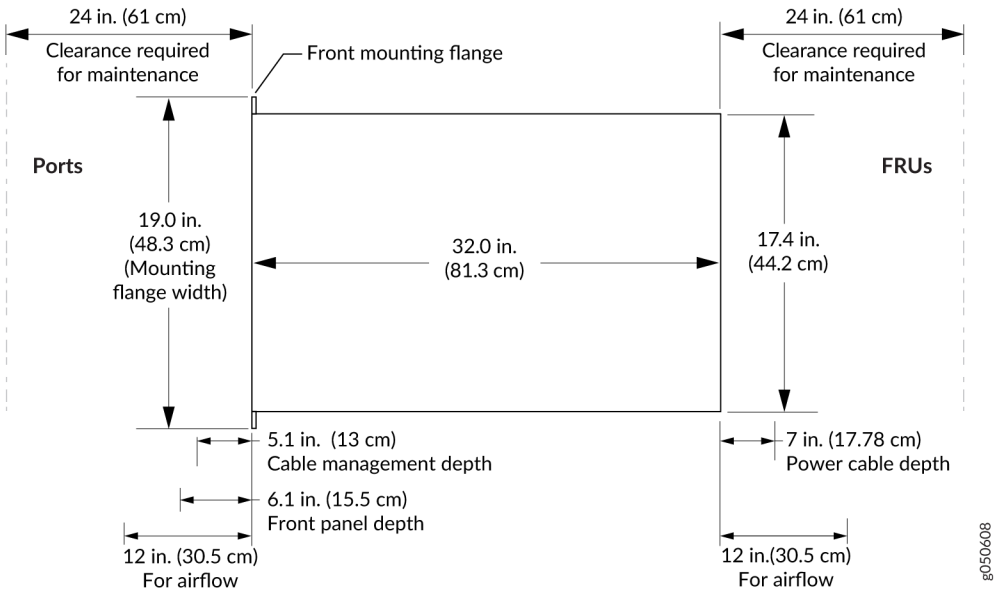
- MX10008 Chassis Physical Specifications | **29**
- Rack-Mounting and Cabinet-Mounting Warnings | **342**
- Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift | **158**
- Manually Mounting an MX10008 in a 4-Post Rack | **161**

MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance

When planning the site for an MX10008 router installation, you must allow sufficient clearance around the installed chassis for cooling and maintenance (see Figure 49 on page 111 for MX10008.

NOTE: A minimum of half-an-inch clear space from the bottom of the chassisis is required for easy removal and insertion of the fan tray.

Figure 49: Depth Clearance Requirements for Airflow and Hardware Maintenance for an MX10008 Chassis



Follow these guidelines:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See "MX10008 Cooling System and Airflow" on page 41 for more information about the airflow through the chassis.
- If you are mounting an MX10008 router in a rack with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.
- Leave at least 24 in. (61 cm) both in front of and behind the MX10008 for service personnel to remove and install hardware components. To be NEBS GR-63 compliant, allow at least 30 in. (76.2 cm) in front of the rack and 24 in. (61 cm) behind the rack.

SEE ALSO

Rack-Mounting and Cabinet-Mounting Warnings | 342

MX10008 Power Planning

IN THIS SECTION

- Power Requirements for an MX10008 Router | 112
- JNP10K-PWR-AC Power Specifications | 117
- JNP10K-PWR-AC2 Power Specifications | 119
- MX10008 Power Cables Specifications | 120
- JNP10K-PWR-DC Power Specifications | 129
- JNP10K-PWR-DC2 Power Specifications | 130
- MX10008 Grounding Cable and Lug Specifications | 131

MX10008 power specifications and requirements are described in the following topics. Use the information to calculate the power consumption for the MX10008 and plan your configuration's power requirements.

Power Requirements for an MX10008 Router

IN THIS SECTION

- Calculating the Power Consumption of Your MX10008 Configuration | 113
- Calculating the Number of Power Supplies Required for Your MX10008 Configuration | 115

Use the information in this topic to calculate power requirements of your MX10008 configuration and the number of power supplies required for different MX10008 router configurations.

NOTE: The calculations in this topic represent the maximum power requirements that you need to budget for your MX10008 router configuration. The actual power consumption of your router

will be less than the calculated results shown here and will vary based on the hardware and software configuration of your router, the amount of traffic passing through the line cards, and environmental variables such as room temperature.

Before you begin these calculations:

- Ensure you understand the different router configurations. See "MX10008 Components and Configurations" on page 22.
- Ensure that you know the power requirements of different router components. See Table 1.

This topic describes these tasks:

Calculating the Power Consumption of Your MX10008 Configuration

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

To calculate maximum system power consumption:

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

   Table 34: Chassis Power Consumption for Standard Configurations

Chassis Component	Base Configuration	Redundant Configuration
Fan tray, JNP10008-FAN	1100 W	1100 W
Fan tray, JNP10008-FAN2	1212 W	1212 W
Routing and Control board (128G/64G) @40° C	175 W/165 W	350 W/330 W
Switch fabric board (SFB)	1000 W	1200 W

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

Table 35: Line Card Power Consumption

Number of Line Cards	MX10K-LC2101 (240 Gigabit Ethernet mode @104° F (40° C))	MX10K-LC2101 (400 Gigabit Ethernet mode @104° F (40° C))	MX10K-LC480(All ports in 10-Gbps speed @104° F (40° C) without MACsec)	MX10K-LC480 (All ports in 10-Gbps speed @104° F (40° C) with MACsec)
1	1175 W	1425 W	430 W	450 W
2	2350 W	2850 W	860 W	900 W
3	3525 W	4275 W	1290 W	1350 W
4	4700 W	5700 W	1720 W	1800 W
5	5875 W	7125 W	2150 W	2250 W
6	7050 W	8550 W	2580 W	2700 W
7	8225 W	9975 W	3010 W	3150 W
8	9400 W	11400 W	3440 W	3600 W

For example, for an MX10008 with eight MX10K-LC2101 line cards, the maximum power consumption @400 Gigabit Ethernet mode is:

= 8* 1425 W= 11400 W

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

   To continue from the previous example, add the wattage from eight cards to a redundant configuration.

   (11400 W) + (2650 W)

   = 14050 W required

Calculating the Number of Power Supplies Required for Your MX10008 Configuration

Use this procedure to calculate the number of power supplies required by your router configuration. The minimum power configuration for MX10008 routers is three power supplies.

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

1. Determine the power available from the power supplies. Table 36 on page 115 shows the power available for installed power supplies.

   Table 36: Total Power Available

Power Supply Module Models	With Three Power Supplies	With Four Power Supplies	With Five Power Supplies
JNP10K-PWR-AC	8100 W	10,800 W	13,500 W
JNP10K-PWR-AC2 dual feed, high power (30-A) setting	16,500 W	22,000 W	27,500 W
JNP10K-PWR-AC2 single feed, high power (30-A) setting	15,000 W	20,000 W	25,000 W
JNP10K-PWR-DC	–	–	12,500 W
JNP10K-PWR-DC2 dual feed, high power (80-A) setting	–	–	27,500 W
JNP10K-PWR-DC2 dual feed, low power (60-A) setting	–	–	22,000 W
JNP10K-PWR-DC2 single feed, high power (80-A) setting	–	–	13,750 W
JNP10K-PWR-DC2 single feed, low power (60-A) setting	–	–	11,000 W

NOTE: The HVAC/HVDC power supply, JNP10K-PWR-AC2, has a set of DIP switches on the faceplate that allows you to configure the power supply for either high power (30 A) or low power (20 A) input mode. If any JNP10K-PWR-AC2.power supply is set to 20 A, then the power budget for all power supplies installed in the system becomes 20 A, regardless if other power supplies are set at 30 A. This design is to prevent overloading of the power supply that is set to 20 A. See Table 62 on page 225 for details on setting the DIP switches.

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

   In the previous examples, we calculated that an MX10008 AC system would require 11800 W with eight line cards. In this example, we calculate the total power available for this configuration:

   = (14050 W) / (2700 W)

   = 5.20

   Round up the result to 6 AC power supplies.

3. Calculate how much power the power supplies need. To determine the power required, multiply the number of power supplies by the power supply wattage and divide by the efficiency of the power supply. The efficiency rate accounts for the loss of energy within the power supply and is 89 percent for MX10008 power supplies.

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

   = 4 (2700 W) / (efficiency rating)

   = (10800 W) / (0.89)

   = 12135 W

   Table 37 on page 116 shows how much power is required for various configurations.

   Table 37: Total Power Required

Number of Power Supplies	AC	DC
3	9102 W	8427 W
4	12135 W	11236 W

Table 37: Total Power Required *(Continued)*

Number of Power Supplies	AC	DC
5	15169 W	14045 W
6	18204 W	16854 W

NOTE: We recommend that you maintain six power supplies in your router at all times. Replace failed power supplies immediately to prevent unexpected failures.

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

RELATED DOCUMENTATION

JNP10K-PWR-AC Power Supply | 58
JNP10K-PWR-DC Power Supply | 62
JNP10K-PWR-AC2 Power Supply | 61
JNP10K-PWR-DC2 Power Supply | 66

JNP10K-PWR-AC Power Specifications

MX10008 redundant configuration router can use either AC or DC power supplies; base configuration routers are AC only.

Table 38 on page 118 lists the power specifications for the AC power supply (JNP10K-PWR-AC) used in an MX10008 chassis.

Table 38: Power Specifications for a JNP10K-PWR-AC Power Supply

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

Table 39 on page 118 shows the physical specifications for an AC power supply.

Table 39: Physical Specifications for a JNP10K-PWR-AC Power Supply

Specification	Value
Height	3.5 in. (8.89 cm)
Width	3.6 in. (9.14 cm)
Depth	14.4 in. (36.58 cm)
Weight	6.8 lb (3.08 kg)

SEE ALSO

JNP10K-PWR-AC Power Supply | 58

JNP10K-PWR-AC Power Supply LEDs | 68

JNP10K-PWR-AC2 Power Specifications

MX10008 redundant configuration router can use either AC or DC power supplies; base configuration routers are AC only. The JNP10K-PWR-AC2 power supply supports AC, HVAC, and HVDC.

Table 40 on page 119 lists the power specifications for the AC power supply (JNP10K-PWR-AC) used in an MX10008 chassis.

Table 40: Power Specifications for a JNP10K-PWR-AC2 Power Supply

Item	Specifications
AC input voltage	180–305 VAC
DC input voltage	190–410 VDC
Input current rating	28.5 A
DC output power	12.3 V, 5500 W with dual feed and 5000 W with single feed

Table 41 on page 119 shows the physical specifications for a JNP10K-PWR-AC2 power supply.

Table 41: Physical Specifications for a JNP10K-PWR-AC2 Power Supply

Specification	Value
Height	3.5 in. (8.89 cm)
Width	3.6 in. (9.14 cm)
Depth	15.1 in. (38.35 cm)
Weight	11.4 lb (5.17 kg)

MX10008 Power Cables Specifications

IN THIS SECTION

- JNP10K-PWR-AC Power Cable Specifications | **120**
- JNP10K-PWR-AC2 Power Cable Specifications | **124**
- JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input | **127**

Each AC power supply has two independent 16 A rated AC inlets on the faceplate. Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the router. An AC power cord connects each power supply to the power distribution panel.

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

MX10008 AC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) power supplies have specific cord requirements. Use the following sections to determine the cable requirements based on the model of your power supply and any mode settings:

- JNP10K-PWR-AC see "JNP10K-PWR-AC Power Cable Specifications" on page 120
- JNP10K-PWR-AC2 with 20-A input, see "JNP10K-PWR-AC2 Power Cable Specifications" on page 124
- JNP10K-PWR-AC2 with 30-A input, see "JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 127

JNP10K-PWR-AC Power Cable Specifications

Table 42 on page 121 lists the AC power cord specifications for MX10008 routers for various countries and regions.

Table 42: AC Power Cord Specifications for MX10008 Routers

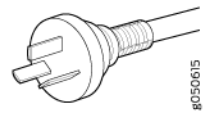
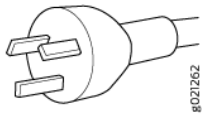
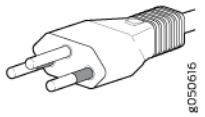
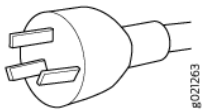
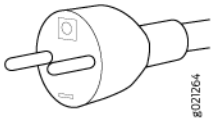
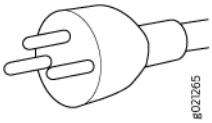
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Argentina	250 VAC, 16 A, 50 Hz	IRAM Type RA/3/20	CBL-EX-PWR-C19-AR	
Australia	250 VAC, 15 A, 50 Hz	AS/NZS 3112 Type SAA/3/15	CBL-EX-PWR-C19-AU	
Brazil	250 VAC, 16 A, 50 Hz	NBR 14136: 2002 Type BR/3/20	CBL-EX-PWR-C19-BR	
China	250 VAC, 16 A, 50 Hz	GB 1002 Type PRC/3/16	CBL-EX-PWR-C19-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C19-EU	
Israel	250 AC, 16 A, 50 Hz	SI 32/1971 Type IL/3	SI 32/1971 Type IL/3	
Italy	250 VAC, 16 A, 50 Hz	CEI 23-16 Type I/3/16	CBL-EX-PWR-C19-IT	

Table 42: AC Power Cord Specifications for MX10008 Routers *(Continued)*

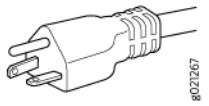
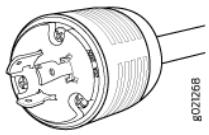
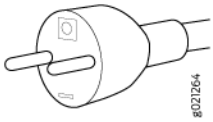
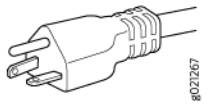
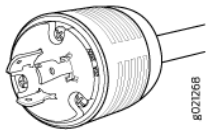
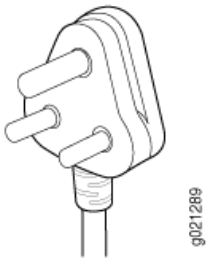
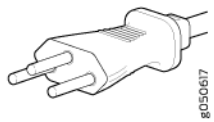
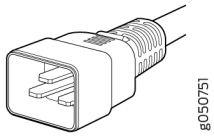
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Japan	250 VAC, 16 A, 60 Hz	NEMA 6–20 Type N6/20	CBL-EX-PWR-C19-JP (default)	
	250 VAC, 16 A, 50 Hz or 60 Hz	NEMA L6–20P Type NEMA Locking	CBL-EX-PWR-C19-JPL	
Korea	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C19-KR	
North America	250 VAC, 16 A, 60 Hz	NEMA 6–20 Type N6/20	CBL-EX-PWR-C19-US (default)	
	250 VAC, 16 A, 50 Hz or 60 Hz	NEMA L6–20P Type NEMA Locking	CBL-EX-PWR-C19-USL	
South Africa	250 VAC, 16 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C19-SA	

Table 42: AC Power Cord Specifications for MX10008 Routers *(Continued)*

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Switzerland	250 VAC, 16 A, 50 Hz	SEV 5934/2 Type 23G	CBL-EX-PWR-C19-SZ	
United Kingdom	250 VAC, 13 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C19-UK	
Worldwide (other)	250 VAC, 16 A, 50 Hz	EN 60320-2-2/1	CBL-EX-PWR-C19-C20	

CAUTION: AC power cords for MX10008 routers are intended for use with these routers only. Do not use the cord for another product.

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。

CAUTION: Power cords must not block access to router components. We recommend that you route all AC power cord cables through the power cord tray provided with the router.

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

JNP10K-PWR-AC2 Power Cable Specifications

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

- 30-A input with 5500 W output

  "JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 127 shows cables and connectors for 30-A input.

- 20-A input with 3000 W output

  Table 43 on page 124 shows cables appropriate for 20-A input.

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

Table 43: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input

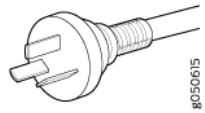
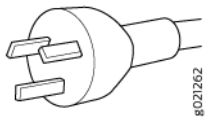
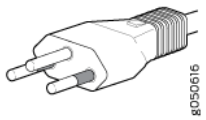
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
Argentina	16 A, 250 VAC	IRAM 2073 Type RA/3	CBL-JNP-SG4-AR	
Australia and New Zealand	15 A, 250 VAC	AS/NZS 3112	CBL-JNP-SG4-AU	
Brazil	16 A, 250 VAC	NBR 14136 Type BR/3	CBL-JNP-SG4-BR	

Table 43: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input *(Continued)*

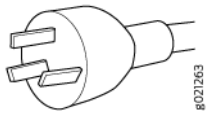
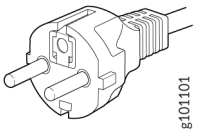
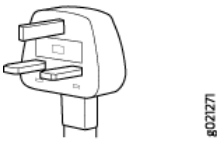
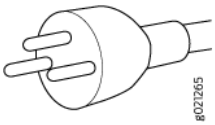
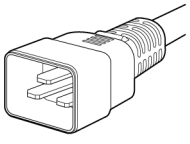
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
China	16 A, 250 VAC	GB2099	CBL-JNP-SG4-CH	
Europe (except Italy, Switzerland, and United Kingdom)	20 A, 250 VAC	CEE 7/7	CBL-JNP-SG4-EU	
Great Britain	13 A, 250 VAC,	BS1363	CBL-JNP-SG4-UK	
India	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Israel	16 A, RA, 250 VAC	SI 32/1971 Type IL/3G	CBL-JNP-SG4-IL	
Italy	16 A, 250 VAC	CEI 23-16	CBL-JNP-SG4-IT	
North America	20 A, 250 VAC	3-5958P4 to IEC 60320 C20	CBL-JNP-SG4-C20	

Table 43: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input *(Continued)*

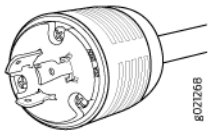
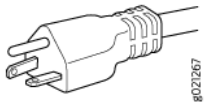
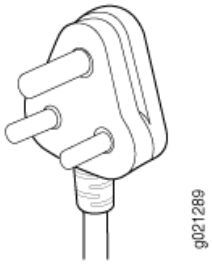
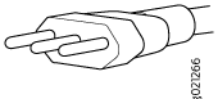
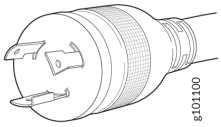
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
	16 A, 250 VAC	Locking NEMA L6-20P	CBL-JNP-SG4-US-L	
		NEMA 6-20P	CBL-JNP-SG4-US	
South Africa	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Switzerland	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-SZ	

Table 44: JNP10K-PWR-AC2 Power Cable Specifications for HVAC Input

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

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

The JNP10K-PWR-AC2 HVAC or HVDC power supplies requires a high voltage cable assembly when set for 30-A input. One end of the cable has an Anderson APP-400 connector, the other end of the cable is bare wire. See Figure 50 on page 127 and Table 45 on page 127. These cables are separately orderable and are not shipped automatically with JNP10K-PWR-AC2 orders. An example of the right-angle cable and connector is shown in Figure 52 on page 128.

For connection to AC systems, Juniper provides a cable with either a NEMA 30-A connector (Figure 50 on page 127) or an IEC 330P6W connector (Figure 51 on page 127).

Figure 50: NEMA 30-A Connector

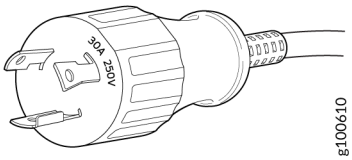


Figure 51: IEC 330P6W Connector

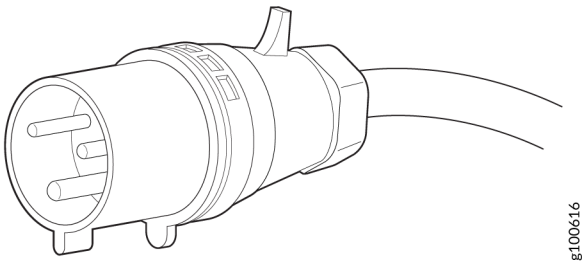


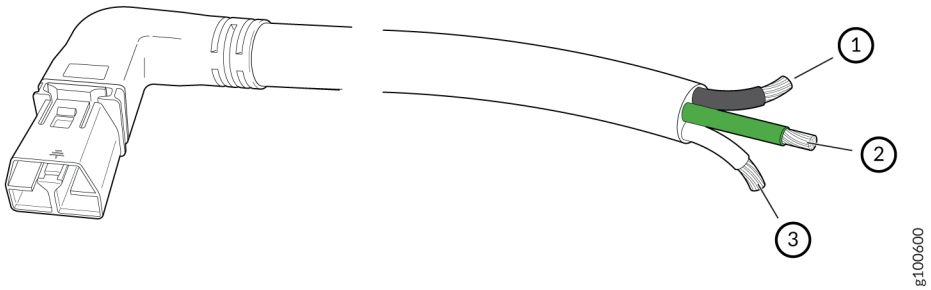
Table 45: 30-A Cabling Options

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

Table 45: 30-A Cabling Options *(Continued)*

	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
AC power cord	Continental Europe	30-A 250 VAC	UL 950 and IEC332P6	Anderson/right-angle to IEC 332P6	CBL-PWR2-332P6W-RA
		30-A 250 VAC	UL 950 and IEC332P6	Anderson/straight to IEC332P6	CBL-PWR2-332P6W
	North America	30-A 240 VAC	IEC330P6	Anderson/right-angle to IEC 330P6	CBL-PWR2-330P6W-RA
		30-A 240 VAC	IEC330P6	Anderson/straight to IEC 330P6	CBL-PWR2-330P6W
		30-A 250 VAC	UL 498, CSA	Anderson/right-angle to L6-30P	CBL-PWR2-L6-30P-RA
		30-A 250 VAC	UL 498, IEC5958P4	Anderson/straight to L6-30P	CBL-PWR2-L6-30P

Figure 52: Right-Angle, Bare Cable with Anderson Connector



1– Black wire–Return (+)	3– White wire–Neutral

2– Green wire-Ground	

JNP10K-PWR-DC Power Specifications

The DC power supply (JNP10K-PWR-DC) is supported in only the MX10008 redundant configuration. Table 46 on page 129 lists the power specifications for the JNP10K-PWR-DC power supply used in an MX10008 chassis.

Table 46: Power Specifications for the JNP10K-PWR-DC Power Supply

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

Table 47 on page 129 shows the physical specifications for a JNP10K-PWR-DC power supply.

Table 47: Physical Specifications of an JNP10K-PWR-DC Power Supply

Specification	Value
Height	3.5 in. (8.89 cm)
Width	3.6 in. (9.14 cm)
Depth	14.4 in. (36.58 cm)
Weight	6 lb (2.72 kg)

SEE ALSO

JNP10K-PWR-DC Power Supply | 62

JNP10K-PWR-DC Power Supply LEDs | 71

JNP10K-PWR-DC2 Power Specifications

JNP10K-PWR-DC2 power supplies are supported in only the MX10008 redundant configuration. Table 48 on page 130 lists the power specifications for the HVDC power supply used in a MX10008 chassis.

Table 48: Power Specifications for the JNP10K-PWR-DC2 Power Supply

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

Table 49 on page 131 shows the physical specifications for a JNP10K-PWR-DC2 power supply.

Table 49: Physical Specifications of a JNP10K-PWR-DC2 Power Supply

Specification	Value
Height	3.5 in. (8.89 cm)
Width	3.6 in. (9.14 cm)
Depth	16.05 in. (40.77 cm)
Weight	8.1 lbs (3.67 kg)

MX10008 Grounding Cable and Lug Specifications

You must install the switch in a restricted-access location and ensure it is adequately grounded at all times. Proper grounding ensures your switch is operating correctly and that it meets safety and electromagnetic interference (EMI) requirements. An MX10008 router, has a 2-hole protective grounding terminal on the rear of the chassis beneath the power supplies for grounding.

For AC powered systems, you must also use the grounding wire in the AC power cord along with the 2-hole lug ground connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the 2-hole protective grounding terminal.



WARNING: To comply with GR-1089 requirements, all intra-building copper cabling used for SFP+, QSFP+, and QSFP28 ports must be shielded and grounded at both ends.



CAUTION: Before router installation begins, a licensed electrician must attach a cable lug to the grounding cables that you supply. See "Connect the MX10008 to Earth Ground" on page 172. A cable with an incorrectly attached lug can damage the router.

Before connecting the router to earth ground, review the following information:

- Two threaded inserts (PEM nuts) are provided on the lower rear of the chassis for connecting the router to earth ground. The grounding points are spaced at 0.63 in. (16 mm) centers.
- The grounding lug required is a Panduit LCD6-10A-L or equivalent (provided). The grounding lug accommodates 6 AWG (13.3 mm^2) stranded wire. If one or more JNP10K-PWR-DC2 power supplies

are installed in the chassis and set for high input (80-A), use the Panduit LCD4-14A-L or equivalent (provided). This lug accommodates 4 AWG (21.1mm^2) stranded wire.

- The grounding cable that you provide for an MX10008 must be the same size or heavier than the input wire of each power supply. Minimum recommendations are 6 AWG (13.3 mm^2) stranded copper wire, Class B; 90° C wire, or as permitted by local code.

SEE ALSO

Connect AC Power to an MX10008 | **174**

Connect DC Power to an MX10008 | **175**

MX10008 Transceiver and Cable Specifications

IN THIS SECTION

- MX10008 Optical Transceiver and Cable Support | **132**
- MX10008 Cable Specifications for Console and Management Connections | **133**
- Understanding Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | **134**
- Calculating the Fiber-Optic Cable Power Budget for an MX10008 Router | **136**
- Calculating the Fiber-Optic Cable Power Margin for an MX10008 Router | **136**

MX10008 Optical Transceiver and Cable Support

The MX10008 router has eight slots for the line cards that can support a maximum of 1152 ports as 10-Gigabit Ethernet ports, 288 ports as 40-Gigabit Ethernet ports, or 240 ports as 100-Gigabit Ethernet ports. Each of the network ports on the port panel supports quad small form-factor pluggable plus (QSFP+) transceivers and QSFP28 transceivers.

The network ports on the MX10008 support QSFP+ and QSFP28 transceivers.

You can find information about the pluggable transceivers supported on your Juniper Networks device by using the Hardware Compatibility Tool. In addition to transceiver and connector type, the optical and cable characteristics—where applicable—are documented for each transceiver. The Hardware

Compatibility Tool enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for the MX10008 is located at https://pathfinder.juniper.net/hct/product/#prd=MX10008.

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

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

SEE ALSO

Supported Transceivers

MX10008 Cable Specifications for Console and Management Connections

Table 50 on page 134 lists the specifications for the cables that connect the MX10008 line of routers to a management device.

NOTE: The MX10008 router can be configured with SFP management ports that support 1000BASE-SX transceivers.

Table 50: Cable Specifications for Console and Management Connections for the MX10008 Router

Port on MX10008 router	Cable Specification	Cable Supplied	Maximum Length	Device Receptacle
Console port	RS-232 (EIA-232) serial cable	One 7-foot (2.13-meter) long RJ-45 patch cable and RJ-45 to DB-9 adapter	7 feet (2.13 meters)	RJ-45
Management port	Category 5 cable or equivalent suitable for 1000BASE-T operation	One 7-foot (2.13-meter) long RJ-45 patch cable	328 feet (100 meters)	RJ-45

SEE ALSO

- Console Port Connector Pinouts for an MX10008 Router | **139**
- Management Port Connector Pinouts for the MX10008 Router | **141**
- Connecting an MX10008 to a Network for Out-of-Band Management | **176**
- Connecting an MX10008 Router to a Management Console | **177**

Understanding Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

- Signal Loss in Multimode and Single-Mode Fiber-Optic Cables | **135**
- Attenuation and Dispersion in Fiber-Optic Cable | **135**

To determine the power budget and power margin needed for fiber-optic connections, you need to understand how signal loss, attenuation, and dispersion affect transmission. The MX10008 router uses various types of network cables, including multimode and single-mode fiber-optic cables.

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

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

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

Attenuation and Dispersion in Fiber-Optic Cable

An optical data link functions correctly provided that modulated light reaching the receiver has enough power to be demodulated correctly. *Attenuation* is the reduction in strength of the light signal during transmission. Passive media components such as cables, cable splices, and connectors cause attenuation. Although attenuation is significantly lower for optical fiber than for other media, it still occurs in both multimode and single-mode transmission. An efficient optical data link must transmit enough light to overcome attenuation.

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

- Chromatic dispersion, which is the spreading of the signal over time caused by the different speeds of light rays.
- Modal dispersion, which is the spreading of the signal over time caused by the different propagation modes in the fiber.

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

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

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

Calculating the Fiber-Optic Cable Power Budget for an MX10008 Router

Calculate the link's power budget when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient power for correct operation. The power budget is the maximum amount of power the link can transmit. When you calculate the power budget, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system do not operate at the worst-case levels.

To calculate the worst-case estimate for the fiber-optic cable power budget (P^B) for the link:

1. Determine values for the link's minimum transmitter power (P_T) and minimum receiver sensitivity (P_R). For example, here, (P_T) and (P_R) are measured in decibels, and decibels are referenced to 1 milliwatt (dBm):

   P_T = –15 dBm

   P_R = –28 dBm

   > **NOTE**: See the specifications for your transmitter and receiver to find the minimum transmitter power and minimum receiver sensitivity.

2. Calculate the power budget (P^B) by subtracting (P_R) from (P_T):

   –15 dBm – (–28 dBm) = 13 dBm

Calculating the Fiber-Optic Cable Power Margin for an MX10008 Router

Before you begin to calculate the power margin:

- Calculate the power budget. See "Calculating the Fiber-Optic Cable Power Budget for an MX10008 Router" on page 136.

Calculate the link's power margin when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient signal power to overcome system losses and still satisfy the minimum input requirements of the receiver for the required performance level. The power margin (P_M)

is the amount of power available after attenuation or link loss (LL) has been subtracted from the power budget (P_B).

When you calculate the power margin, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system do not operate at worst-case levels. A power margin (P_M) greater than zero indicates that the power budget is sufficient to operate the receiver and that it does not exceed the maximum receiver input power. This means the link will work. A (P_M) that is zero or negative indicates insufficient power to operate the receiver. See the specification for your receiver to find the maximum receiver input power.

To calculate the worst-case estimate for the power margin (P_M) for the link:

1. Determine the maximum value for link loss (LL) by adding estimated values for applicable link-loss factors; for example, use the sample values for various factors as provided in Table 51 on page 137 (here, the link is 2 km long and multimode, and the (P_B) is 13 dBm).

   Table 51: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link Loss Value	Sample Link Loss (LL) Calculation Values
Higher-order mode losses	Multimode—0.5 dBm	0.5 dBm
	Single-mode—None	0 dBm
Modal and chromatic dispersion	Multimode—None, if product of bandwidth and distance is less than 500 MHz/km	0 dBm
	Single-mode—None	0 dBm
Connector	0.5 dBm	This example assumes five connectors. Loss for five connectors: 5 (0.5 dBm) = 2.5 dBm.
Splice	0.5 dBm	This example assumes two splices. Loss for two splices: 2 (0.5 dBm) = 1 dBm.
Fiber attenuation	Multimode—1 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: 2 km (1 dBm/km) = 2 dBm.

Table 51: Estimated Values for Factors Causing Link Loss *(Continued)*

Link-Loss Factor	Estimated Link Loss Value	Sample Link Loss (LL) Calculation Values
	Single-mode—0.5 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: 2 km (0.5 dBm/km) = 1 dBm.
Clock Recovery Module (CRM)	1 dBm	1 dBm

NOTE: For information about the actual amount of signal loss caused by equipment and other factors, see your vendor documentation for that equipment.

2. Calculate the (P_M) by subtracting (LL) from (P_B):

   P_B – LL = P_M

   13 dBm – 0.5 dBm [HOL] – 5 (0.5 dBm) – 2 (0.5 dBm) – 2 km (1.0 dBm/km) – 1 dB [CRM] = P_M

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

   P_M = 6 dBm

   The calculated power margin is greater than zero, indicating that the link has sufficient power for transmission. Also, the power margin value does not exceed the maximum receiver input power. Refer to the specifications for your receiver to find the maximum receiver input power.

MX10008 Alarm and Management Cable Specifications and Pinouts

IN THIS SECTION

- Console Port Connector Pinouts for an MX10008 Router | **139**
- USB Port Specifications for the MX10008 Router | **140**

Management Port Connector Pinouts for the MX10008 Router | 141
RJ-45 Connector Pinouts for the External Clock Ports | 142

Console Port Connector Pinouts for an MX10008 Router

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

Table 52 on page 139 provides the pinout information for the RJ-45 console connector. An RJ-45 cable and RJ-45 to DB-9 adapter are supplied with the MX10008.

NOTE: If your laptop or PC does not have a DB-9 plug connector pin and you want to connect your laptop or PC directly to an MX10008 router, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

Table 52: Console Port Connector Pinouts for the MX10008 Router

Pin	Signal	Description
1	RTS Output	Request to send
2	DTR Output TOD Output for PTP applications	Data terminal ready Time of day for Precision Time Protocol (PTP). You can use DTR pins as a TOD universal asynchronous receiver/transmitter (UART) by using breakout cables.
3	TxD Output	Transmit data
4	Signal Ground	Signal ground

Table 52: Console Port Connector Pinouts for the MX10008 Router *(Continued)*

Pin	Signal	Description
5	Signal Ground	Signal ground
6	RxD Input	Receive data
7	DCD Input TOD Output for PTP applications	Data carrier detect Time of day for PTP. You can use DCD pins as a TOD UART by using breakout cables.
8	CTS Input	Clear to send

SEE ALSO

Connecting an MX10008 Router to a Management Console | 177

USB Port Specifications for the MX10008 Router

The following Juniper Networks USB flash drives have been tested and are officially supported for the USB port in the MX10008 router:

- RE-USB-1G-S—1-gigabyte (GB) USB flash drive
- RE-USB-2G-S—2-GB USB flash drive
- RE-USB-4G-S—4-GB USB flash drive



CAUTION: Any USB memory product not listed as supported for the MX10008 router has not been tested by Juniper Networks. The use of any unsupported USB memory product could expose your device to unpredictable behavior. Juniper Networks Technical Assistance Center (JTAC) can provide only limited support for issues related to unsupported hardware. We strongly recommend that you use only supported USB flash drives.

CAUTION: Remove the USB flash drive before upgrading Junos OS or rebooting an MX10008 router. Failure to do so could expose your device to unpredictable behavior.

NOTE: USB flash drives used with the MX10008 router must support USB 2.0 or later.

Management Port Connector Pinouts for the MX10008 Router

The 1000BASE-T RJ-45 management ports use an RJ-45 connector to connect either to the control plane and management network in an MX10008 router, or to a management device for out-of-band management.

Table 53 on page 141 provides the pinout information of the RJ-45 management port connector. An RJ-45 cable is supplied with the MX10008 router.

Table 53: RJ-45 Management Port Connector Pinouts for the MX10008 Router

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

SEE ALSO

MX10008 Routing and Control Board LEDs | 81

MX10008 Routing and Control Board LEDs | 81

RJ-45 Connector Pinouts for the External Clock Ports

The Routing and Control Board (RCB) contains two RJ-45 connectors for building-integrated timing supply (BITS) external clock support. Table 54 on page 142 provides the pinout information of the RJ-45 management port connectors

Table 54: External Clock Pinouts

Pin	Description	Direction
A1	PortA, Rx, Ring	Input
A2	PortA, Rx, Tip	Input
A3	Reserved	–
A4	PortA, Rx, Ring	Output
A5	PortA, Rx, Tip	Output
A6	Reserved	–
A7	Reserved	–
A8	Reserved	–
B1	PortB Rx, Ring	Input
B2	PortB Rx, Tip	Input

Table 54: External Clock Pinouts *(Continued)*

Pin	Description	Direction
B3	Reserved	–
B4	PortB Rx, Ring	Output
B5	PortB Rx, Tip	Output
B6	Reserved	–
B7	Reserved	–
B8	Reserved	–

SEE ALSO

Routing and Control Board Components

CHAPTER 3

Initial Installation and Configuration

MX10008 Installation Overview | 145

Unpacking the MX10008 Router and Components | 146

Installing the Mounting Hardware | 155

Installing the MX10008 into a Rack | 158

Installing the Front Door on an MX10008 | 165

Connecting the MX10008 to Power | 172

Connecting the MX10008 to External Devices | 176

Configuring an MX10008 Router | 178

MX10008 Installation Overview

The MX10008 is a rigid sheet-metal router-chassis that houses the other hardware components such as RCBs, Switch Fabric Boards (SFBs), power supplies, fan trays, and line cards. The router chassis ships in a cardbox box that has a two-layer wooden pallet base. The router chassis is bolted to the pallet base. You can install an MX10008 router in a standard 19 in. (483 mm) equipment rack by using the supplied rack mount kit and the flange that is attached to the chassis.

To install the MX10008:

1. Unpack the router following the instructions in "Unpacking the MX10008" on page 146.
2. Mount the chassis in the rack following either the instructions in "Manually Mounting an MX10008 in a 4-Post Rack" on page 161 or in "Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift" on page 158.

   WARNING: Because of the weight of the chassis, mounting using a mechanical lift is preferred as the easiest and safest method.

3. Install the line cards following the instructions in "Install an MPC in an MX10008" on page 275.
4. Connect the chassis to earth ground by following the instructions in "Connect the MX10008 to Earth Ground" on page 172.
5. Connect power to the power supplies following either the instructions in "Connect AC Power to an MX10008" on page 174 or "Connect DC Power to an MX10008" on page 175.
6. Connect to the network.
   - To connect the router to a network for out-of-band management, follow instructions in "Connecting an MX10008 to a Network for Out-of-Band Management" on page 176.
   - To connect the router to a management console, follow instructions in *Connect a Device to a Management Console Using an RJ-45 Connector*.
7. Configure the router by following the instructions in "Configuring an MX10008 Router" on page 178.
8. Install optional equipment such as the cable management system. See "Install the Cable Management System" on page 283.

RELATED DOCUMENTATION

MX10008 Rack Requirements | 108

MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance | 110

MX10008 Chassis Lifting Guidelines | 340

Unpacking the MX10008 Router and Components

IN THIS SECTION

- Unpacking the MX10008 | 146
- Unpacking Line Cards, RCBs, and Switch Fabric Boards | 148
- Comparing the MX10008 Order to the Packing List | 150
- Register Products—Mandatory to Validate SLAs | 154

Unpacking the MX10008

After you prepare the installation site as described in "MX10008 Site Preparation Checklist" on page 102, you can unpack the router.

NOTE: The chassis is maximally protected inside the shipping box. Do not unpack it until you are ready to begin the installation.

Ensure that you have the following parts and tools available to unpack the MX10008:

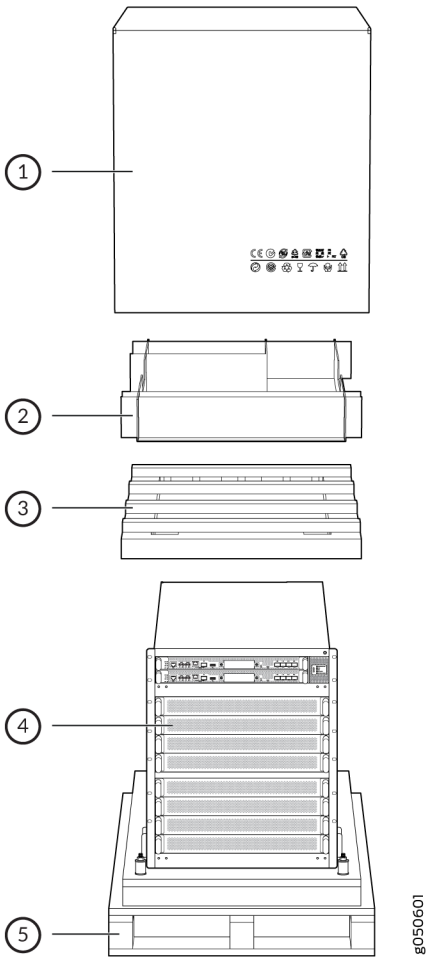
- A 13/32 in. (10 mm) open-end wrench or socket wrench to remove the bracket bolts from the shipping pallet
- A box cutter or a packing knife to slice open the nylon straps and tape that seal the crate and boxes

The chassis ships in a cardboard box that has a two-layer wooden pallet base with foam cushioning between the layers. The router chassis is bolted to the pallet base.

The shipper has the option to either ship the front panel separately or to ship along with the chassis. If the front panel arrives with the chassis, set aside the front panel box until you are ready to verify the contents of the order.

To unpack the chassis (see Figure 53 on page 147):

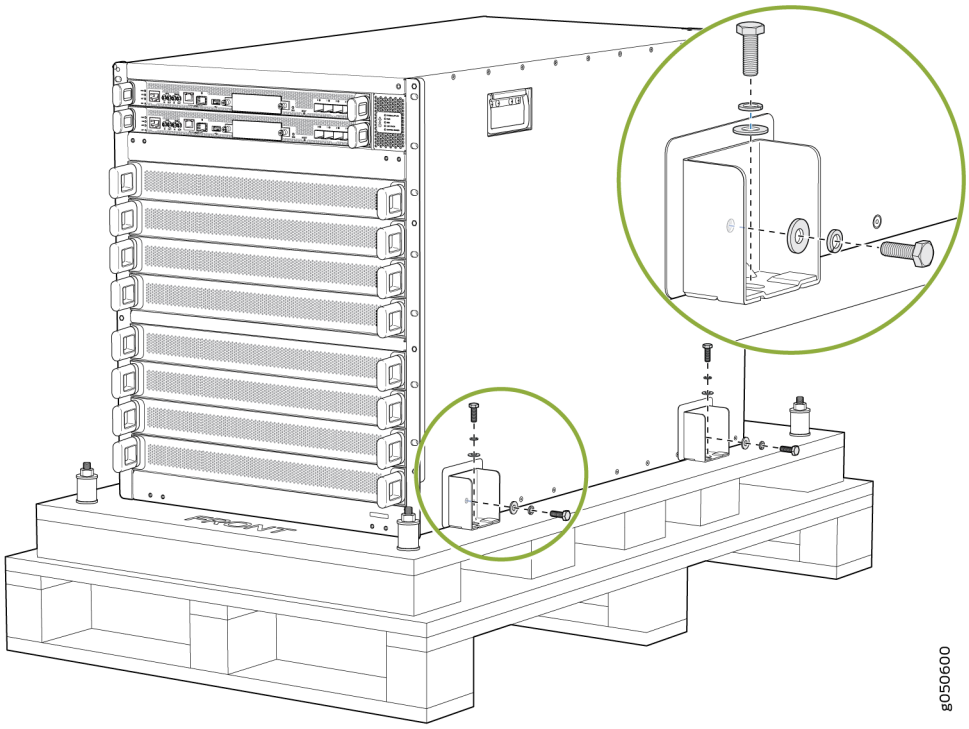
Figure 53: Shipping Crate and Accessory Box



1. Move the shipping box to a staging area as close to the installation site as possible. While the chassis is bolted to the pallet, you can use a forklift or pallet jack to move it. Make sure there is enough space to remove components from the chassis.
2. Position the shipping box with the arrows pointing up.
3. Slice the nylon straps that hold the shipping boxes to the pallet with the box cutter or the packing knife.
4. Lift the shipping box off the chassis.
5. Remove the cardboard accessory box.

6. Remove the foam padding from the top of the box.
7. Remove the plastic cover from the router chassis.
8. Use a 13/32 in. (10 mm) open-end wrench or socket wrench to remove the four sets of bracket bolts that secure the chassis to the shipping pallet (see Figure 54 on page 148).

Figure 54: Bracket Bolt Removal



9. Unpack the accessory box and lay out the contents so that they are ready for use.
10. Verify that your order includes all appropriate parts. See "MX10008 Components and Configurations" on page 22 for information about base configurations and redundant configurations and "Comparing the MX10008 Order to the Packing List" on page 150.
11. Store the brackets and bolts inside the accessory box.
12. Save the shipping box and packing materials in case you need to move or ship the router at a later time.

Unpacking Line Cards, RCBs, and Switch Fabric Boards

Before you unpack a component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- Ensure that you know how to handle and store the component. (See "Handling and Storing MX10008 Switch Fabric Boards" on page 257).

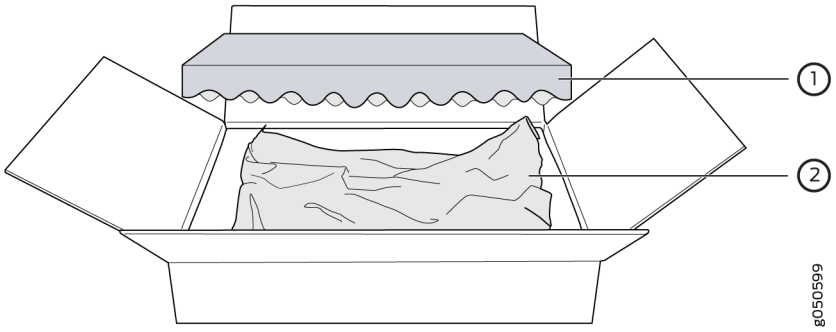
Line cards, additional Routing and Control Boards (RCBs), and Switch Fabric Boards (SFBs) components are field-replaceable units (FRUs) that are shipped separately from the router chassis. The RCBs and line cards are housed in rigid sheet-metal structures. SFBs have an exposed printed circuit board on one side and sheet metal on the other. All these components are shipped in a cardboard carton, secured with packing material.

CAUTION: The components are maximally protected inside the shipping carton. Do not unpack them until you are ready to install the components in the router chassis.

To unpack an RCB, SFB, or line card, (see Figure 55 on page 149):

1. Move the shipping carton to a staging area as close to the installation site as possible.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Pull out the packing material that holds the component in place.
5. Remove the component from the electrostatic bag.
6. Save the shipping carton and packing materials in case you need to move or ship the RCB, SFB, or line card later.

Figure 55: Unpacking a Line Card



1– Foam packing material	2– Paper packaging and electrostatic bag

Comparing the MX10008 Order to the Packing List

Use the following procedure to compare the sales order and packing list against the contents of the chassis shipping crate.

The router chassis shipment includes a packing list. Check the parts you receive in the shipping crate against the items on the packing list. The packing list specifies the part number and description of each part in your order.

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

The following items are shipped separately from the chassis.

- Line cards
- Chassis front panel kit

  NOTE: The chassis front panel kit is a spare part and can be shipped along with the chassis or separately.

- Cable management kit

1. Determine the configuration. The parts shipped depend on the configuration you order.
2. Compare premium redundant configuration orders using Table 55 on page 150.

Table 55: Premium Redundant Configuration Order

Component	MX10008 Quantity
Chassis, including power bus	1
Routing and Control Boards	2
Fan tray controllers	2
Fan trays	2

Table 55: Premium Redundant Configuration Order *(Continued)*

Component	MX10008 Quantity
Power supplies • JNP10K-PWR-AC • JNP10K-PWR-AC2, only available on chassis with the enhanced power bus • JNP10K-PWR-DC • JNP10K-PWR-DC2, only available on chassis with the enhanced power bus	6
Switch Fabric Boards (SFBs)	6
Covers in the line card positions	8
Accessory kit (see Table 57 on page 152)	1
Rack mount kit (see Table 58 on page 153)	1
Front panel kit (see Table 59 on page 154)	1
Documentation Roadmap Card	1

Compare base configuration orders using Table 56 on page 151.

Table 56: Base Configuration Order

Component	MX10008 Quantity
Chassis, including power bus	1
Routing and Control Boards	1
Cover in the RCB slot	1

Table 56: Base Configuration Order *(Continued)*

Component	MX10008 Quantity
Fan tray controllers	2
Fan trays	2
Power supplies	3
SFBs	5
Cover in an SFB position	1
Covers in the power supply positions	3
Cover in the line card positions	8
Accessory kit (see Table 57 on page 152)	1
Rack mount kit (see Table 58 on page 153)	1
Front panel kit, lockable (see Table 59 on page 154)	1
Documentation Roadmap Card	1

3. Compare the contents of the accessory kit with Table 57 on page 152.

Table 57: MX10008 Accessory Kit

Component	AC Configurations Quantity	DC Configurations Quantity
Warranty card	1	1
End-user license agreement (EULA)	1	1

Table 57: MX10008 Accessory Kit *(Continued)*

Component	AC Configurations Quantity	DC Configurations Quantity
RJ-45 Ethernet cable	1	1
RJ-45 to DB9 rollover cable	1	1
Electrostatic discharge (ESD) wrist strap with cable	1	1
Media kit (flash drives, PCMCIA card adapter)	1	1
Chassis ground lug, 2-hole, 10-32, 6 AWG	1	1
Power cord retainer clips (Premium configuration) Power cord retainer clips (Base configuration)	12 6	— —
DC terminal lugs, 2-hole, 10-32, 4 AWG (Premium configuration) DC terminal lugs, 2-hole, 10-32, 4 AWG (Base configuration)	— —	24 12
ESD bags	2	2

4. Compare the contents of the rack mount kit with Table 58 on page 153.

Table 58: MX10008 Rack Mount Kit

Component	Quantity
Phillips flat-head screws, 8-32 x .375 in.	12
Rear brackets	2
Right base bracket	1

Table 58: MX10008 Rack Mount Kit *(Continued)*

Component	Quantity
Left base bracket	1

5. Compare the contents of the front panel kit with Table 59 on page 154.

Table 59: MX10008 Front Panel Kit

Component	Quantity
Front panel	1
Left base bracket	1
Right base bracket	1
Latch brackets	2
Phillips flat-head screws	8
Documentation Roadmap Card	1

Register Products—Mandatory to Validate SLAs

Register all new Juniper Networks hardware products and changes to an existing installed product using the Juniper Networks website to activate your hardware replacement service-level agreements (SLAs).

CAUTION: Register product serial numbers on the Juniper Networks website. Update the installation base data if any addition or change to the installation base occurs or if the installation base is moved. Juniper Networks is not responsible for not meeting the hardware replacement service-level agreement for products that do not have registered serial numbers or accurate installation base data.

Register your product(s) at https://tools.juniper.net/svcreg/SRegSerialNum.jsp.
Update your installation base at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp.

RELATED DOCUMENTATION

MX10008 Components and Configurations | 22

Installing the Mounting Hardware

Ensure that you have the following parts and tools available to install the mounting hardware:

- A Phillips (+) screwdriver, number 1, 2, or 3, depending on the size of your rack screws
- A Phillips (+) screwdriver, number 2, to install the screws that connect the rear and base brackets
- 12 Phillips flat-head screws (provided)
- 14 rack screws appropriate for your rack to attach the mounting hardware to the rack (not provided)

An MX10008 can be installed in a four-post rack or in an open-frame rack. Install the mounting hardware on the rack before installing the router.

To mount the chassis on a four-post rack, you must first install the mounting hardware in the rack. The MX10008 and MX10016 routers come with a four-piece set of brackets that supports the chassis in the rack. This rack mount kit, EX-MOD-RMK-4POST, can be ordered as a spare.

NOTE: An MX10008 cannot be installed in a two-post installation rack.

The main pieces of the rack mount kit are:

- One left base bracket. The bracket is labeled **LEFT FRONT** on the side of the bracket that faces the interior of the rack, near the holes for attaching the bracket to the rack.
- One right base bracket. The bracket is labeled **RIGHT FRONT** on the side of the bracket that faces the interior of the rack, near the holes for attaching the bracket to the rack.

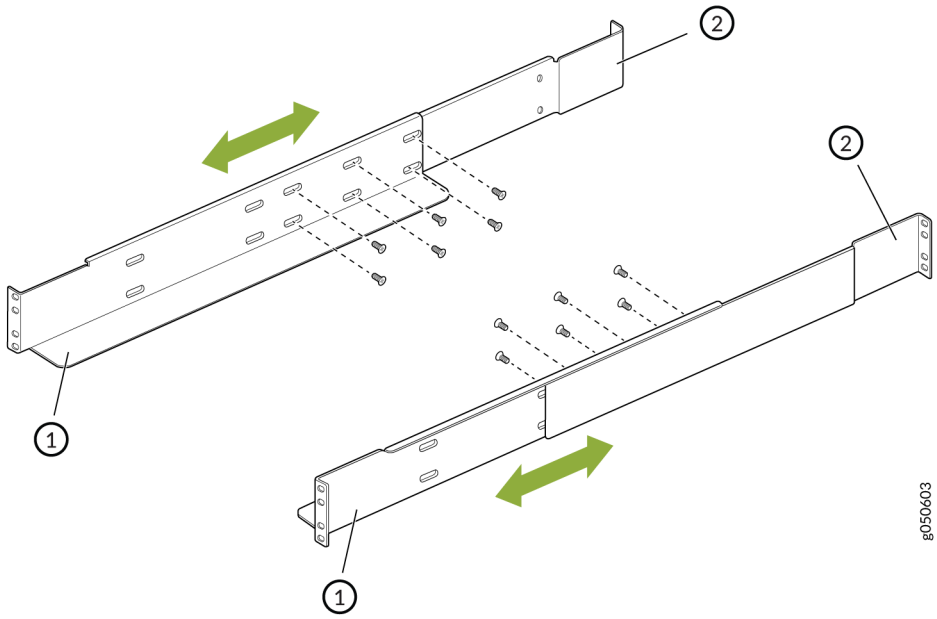
- Two rear brackets. These brackets are labeled **REAR** on the side of the bracket that faces the interior of the rack, near the holes for attaching the bracket to the rack. The rear brackets are interchangeable; you can use either of the rear brackets with the right or left base bracket.

When you install the base and rear brackets, the adjustable portion of the brackets overlap. Use the overlap area to adjust the total bracket length to fit any of the four standard rack sizes: 19 in. (483 mm), 23.62 in. (600 mm), 30 in. (762 mm), or 31.5 in. (800 mm).

To install the mounting hardware in a four-post rack:

1. Remove the mounting brackets from the rack mount kit box.
2. Decide where to place the chassis in the rack. If the rack is empty, mount the router in the lowest possible location. See MX10008 Rack Requirements for the router being installed.
3. Position the left base bracket at the desired position in the left side of the rack and line up its front screw holes with the holes in the rack. Use four mounting screws appropriate for your rack to attach the left base bracket to the rack.
4. Position one of the rear brackets at the left rear of the rack on the same level as the left base bracket, so that the rear bracket overlaps with the left bracket. The screw holes for connecting the base and rear brackets should overlap. Use four mounting screws appropriate for your rack to attach the rear bracket to the rack.
5. Connect left base bracket and rear brackets (see Figure 56 on page 157):
   a. Insert six of the flat-head screws provided with the mounting brackets into the overlapping bracket holes.
   b. Tighten the screws fully (to 12–16 in.-lb torque) using a number 2 Phillips screwdriver.

Figure 56: Mounting Brackets for Four-Post Rack Installation



1– Right and left base brackets	2– Rear brackets

6. Position the right base bracket at the desired position in the right side of the rack opposite the installed left base bracket, so that it is on the same rack level as the left base bracket. If the right and left base brackets are not on the same level, the chassis will rest at an angle in the rack instead of resting flat and level. Line up the right base bracket's front screw holes with the holes in the rack. Use four mounting screws appropriate for your rack to attach the right base bracket to front of the rack.
7. Position the other rear bracket at the right rear of the rack on the same level as the right base bracket, so that the rear bracket overlaps with the right base bracket. The screw holes for connecting the base and rear brackets should overlap. Use four mounting screws appropriate for your rack to attach the rear bracket to the rack.
8. Connect the right base and rear brackets (see Figure 56 on page 157):
   a. Insert six of the screws provided with the mounting brackets into the overlapping bracket holes.
   b. Tighten the screws fully (to 12–16 in.-lb torque) using a number 2 Phillips screwdriver.

Installing the MX10008 into a Rack

IN THIS SECTION

- Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift | **158**
- Manually Mounting an MX10008 in a 4-Post Rack | **161**

Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift

Before you install the router:

- Prepare the site for installation as described in "MX10008 Site Preparation Checklist" on page 102.
- Ensure the site has adequate clearance for both airflow and hardware maintenance as described in "MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110.
- Unpack the router as described in "Unpacking the MX10008" on page 146.
- In a four-post rack, install the mounting hardware at the desired position (see "Installing the Mounting Hardware" on page 155).
- Review chassis lifting guidelines described in "MX10008 Chassis Lifting Guidelines" on page 340.

Ensure that you have the following parts and tools available to install the router:

- A mechanical lift rated for 350 lb (158.8 kg)
- 14 mounting screws appropriate for your rack
- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your mounting screws

Because of the router's size and weight, we strongly recommend using a mechanical lift to install the MX10008.

NOTE: For instructions on installing a router without using a mechanical lift, see "Manually Mounting an MX10008 in a 4-Post Rack" on page 161.

CAUTION: Do not install line cards in the chassis until after you mount the chassis securely on a rack or cabinet.

CAUTION: Before front-mounting the router on a rack or cabinet, have a qualified technician verify that the rack or cabinet is strong enough to support the router's weight and is adequately supported at the installation site.

CAUTION: If you are installing more than one router in a rack or cabinet, install the first router at the bottom of the rack.

To install the router using a mechanical lift (see Figure 57 on page 160):

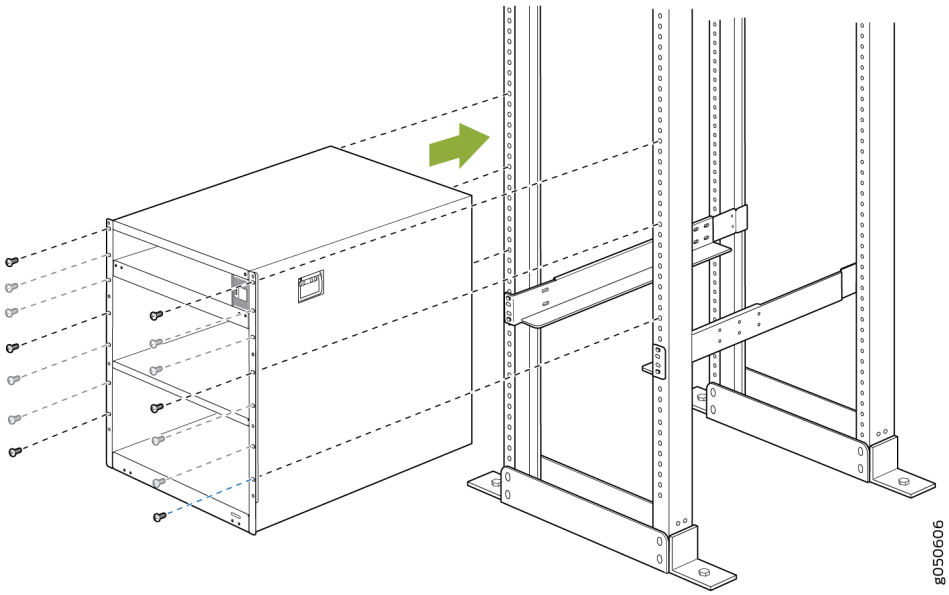
1. Ensure that the rack or cabinet is placed in its permanent location and is secured to the building. Ensure that the installation site allows adequate clearance for both airflow and maintenance. For details, see "MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110.
2. Load the router onto the lift, making sure it rests securely on the lift platform.

Figure 57: Loading the MX10008 into a Rack Using a Mechanical Lift



3. Using the lift, align the router in front of the rack, centering it in front of the base brackets.
4. Lift the chassis approximately 0.75 in. (1.9 cm) above the surface of the base brackets. Align the chassis as close as possible to the base brackets.
5. Carefully slide the chassis onto the adjustable base and rear mounting brackets until the chassis flanges contact the rack rails. The mounting brackets ensure that the holes in the flanges align with the holes in the rack rails. See Figure 58 on page 161.

Figure 58: Attaching the Chassis Flange to the Rack



6. Move the lift away from the rack.
7. Attach the chassis to the rack by installing a mounting screw through the open flange holes and rack, starting from the bottom.
8. Visually inspect the alignment of the router. If the router is installed properly in the rack, all the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side and the router is level.
9. After ensuring that the router is aligned properly, tighten the screws using a screwdriver.
10. After you install the mounting screws and securely bolt the chassis to the rack, reinstall the components in the chassis.

Manually Mounting an MX10008 in a 4-Post Rack

Before you install the router:

1. Prepare the site for installation as described in "MX10008 Site Preparation Checklist" on page 102.
2. Ensure the site has adequate clearance for both airflow and hardware maintenance as described in "MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110.
3. Unpack the router as described in "Unpacking the MX10008" on page 146.
4. Remove all components except the two fan tray controllers from the chassis. See:

- "Removing a Routing and Control Board" on page 186
- "Removing an MX10008 Switch Fabric Board" on page 259
- "Removing an MX10008 Fan Tray" on page 192
- "How to Remove a JNP10K-PWR-DC Power Supply" on page 225 or "How to Remove a JNP10K-PWR-AC Power Supply" on page 202

5. Install the mounting hardware at the desired position (see "Installing the Mounting Hardware" on page 155).
6. Review chassis lifting guidelines as described in "MX10008 Chassis Lifting Guidelines" on page 340.

Ensure that you have the following parts and tools available to install the router:

- 14 mounting screws appropriate for your rack
- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack-mounting screws

If you cannot use a mechanical lift to install the router (the preferred method), you can install it manually.



CAUTION: The chassis weighs approximately 145 lb (66 kg) with only the fan tray controllers installed. Lifting the chassis and mounting it in a rack or cabinet requires at least three people. Make sure the chassis is empty (contains only the backplane) before you lift it.

The chassis has two handles that are designed for subtle positioning of the chassis. Do not lift the chassis by the handles.



CAUTION: Before front-mounting the router in a rack, have a qualified technician verify that the rack is strong enough to support the router's weight and is adequately supported at the installation site.

To install the router in the rack or cabinet (see Figure 60 on page 164):



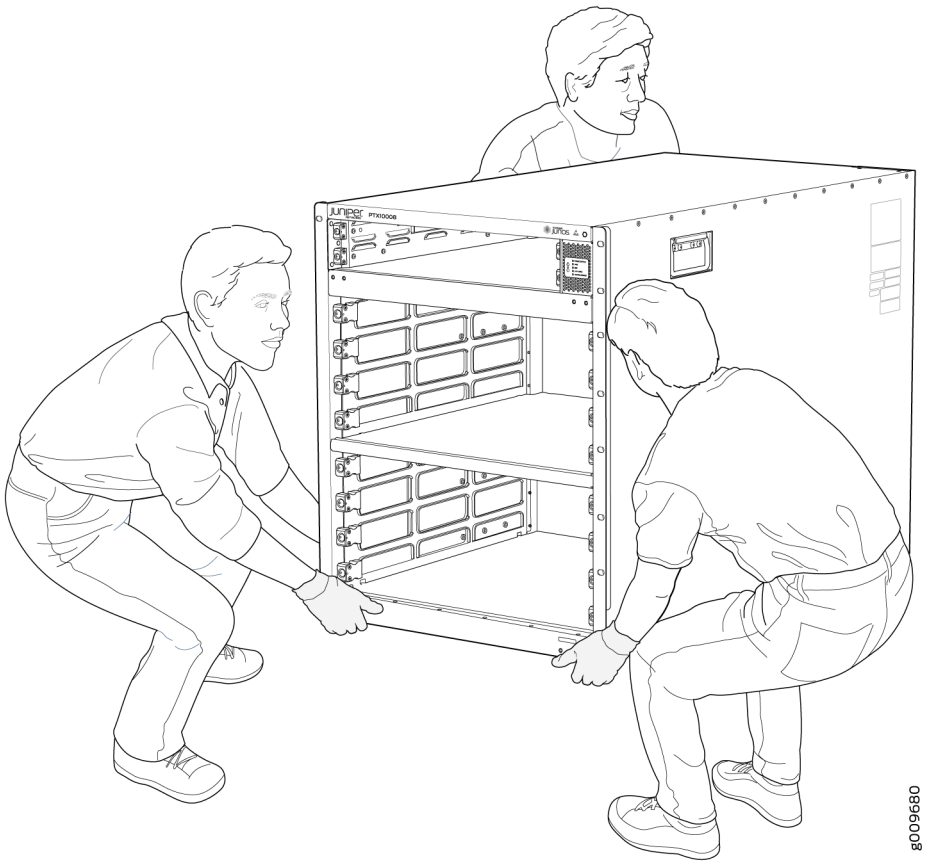
CAUTION: If you are installing more than one router in a rack or cabinet, install the first one at the bottom of the rack. Do not attempt to install a router manually in an upper position in a rack or cabinet.

1. Ensure that the rack or cabinet is placed in its permanent location and is secured to the building.
2. Align the router in front of the rack or cabinet, centering it in front of the adjustable mounting brackets. Use a pallet jack if one is available.

3. With one person on each side and one person in the rear, hold the bottom of the chassis and carefully lift it onto the adjustable base and rear brackets installed in a four-post rack. See Figure 59 on page 163.

> **WARNING**: To prevent injury, keep your back straight and lift with your legs, not your back. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.

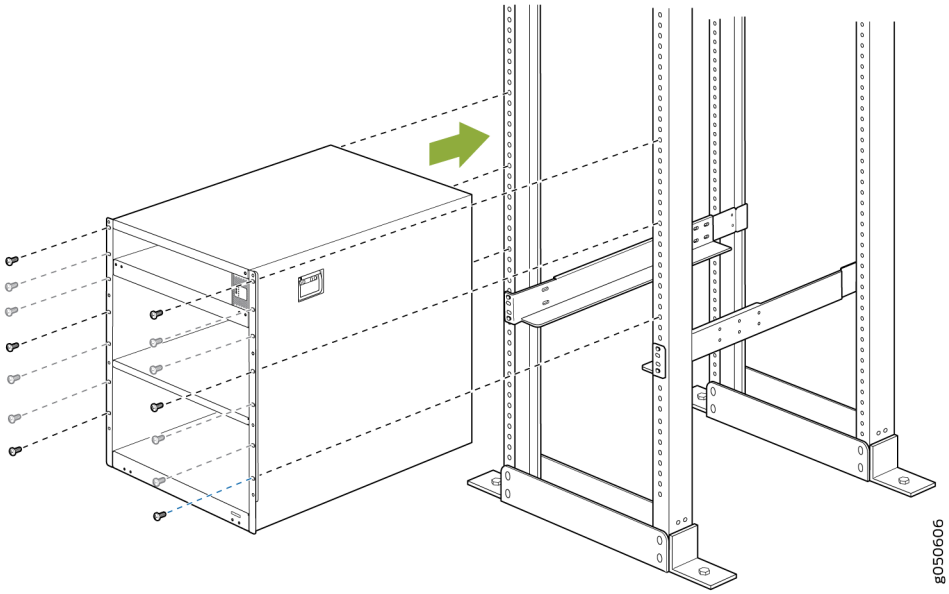
Figure 59: Lifting the MX10008 Without Using a Mechanical Lift



4. Carefully slide the router onto the base and rear mounting brackets until the chassis flanges contact the rack rails. The mounting brackets ensure that the holes in the flanges align with the holes in the rack rails. See Figure 60 on page 164.
5. Attach the chassis to the rack by installing a mounting screw through the open flange holes and rack, starting from the bottom.

6. Visually inspect the alignment of the chassis. If the chassis is installed properly in the rack, all the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side and the router is level.
7. After ensuring that the router is aligned properly, tighten the screws.

Figure 60: Installing an MX10008 in a 4-Post Rack



After you install the mounting screws and securely bolt the chassis to the rack, reinstall the components in the chassis. See:

- "Installing an MX10008 Switch Fabric Board" on page 263
- "Installing an MX10008 Fan Tray" on page 195
- "How to Install a JNP10K-PWR-AC Power Supply" on page 207 or "How to Install a JNP10K-PWR-DC Power Supply" on page 230

SEE ALSO

Connect the MX10008 to Earth Ground | **172**

Connect AC Power to an MX10008 | **174**

Connect DC Power to an MX10008 | **175**

Installing the Front Door on an MX10008

IN THIS SECTION

- Before You Begin | 165
- Install the Front Door | 166
- Install the Air Filter | 169

The front door is required on the MX10008 router to protect fiber optic cabling and to provide additional protection from electromagnetic interference (EMI). The front door can be installed with or without the optional cable management system.

The front door is available in two models:

- JNP10008-FRNT-PNL, without an air filter
- JNP10008-FRPNL1, with an air filter

Both models are covered in the following procedures.

Before You Begin

Ensure you have the following tools and parts before you begin:

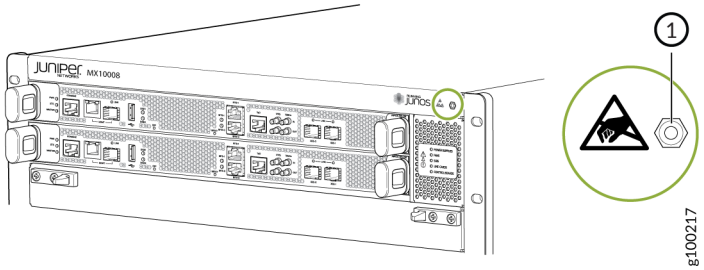
- A Phillips (+) screwdriver, number 2
- Front door (provided with the router chassis)
- Right base bracket (provided)
- Left base bracket (provided)
- 2 interchangeable latch brackets (provided)
- 8 Phillips flat-head mounting screws (provided)
- Three cable seals - Two seals for the right side and one for the left side (provided)

Install the Front Door

Install the front door on the front of the chassis after you mount the chassis in a 4-post rack. To install the front door:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to the ESD point on the front of the chassis. See Figure 61 on page 166.

Figure 61: ESD Point for MX10008 Chassis Front

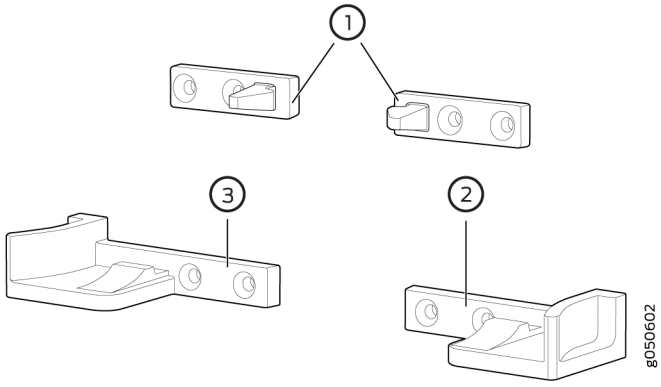


1– ESD point

2. Remove the plastic bag that is taped to the front door, which holds the brackets and screws.
3. Attach the right and left base brackets to the bottom front of the chassis. Use the Phillips screwdriver to attach the base brackets to the lower front of the chassis using four of the supplied flat-head screws.

> **NOTE**: The base brackets are larger than the latch brackets. The right and left base bracket cannot be interchanged (see Figure 62 on page 167).

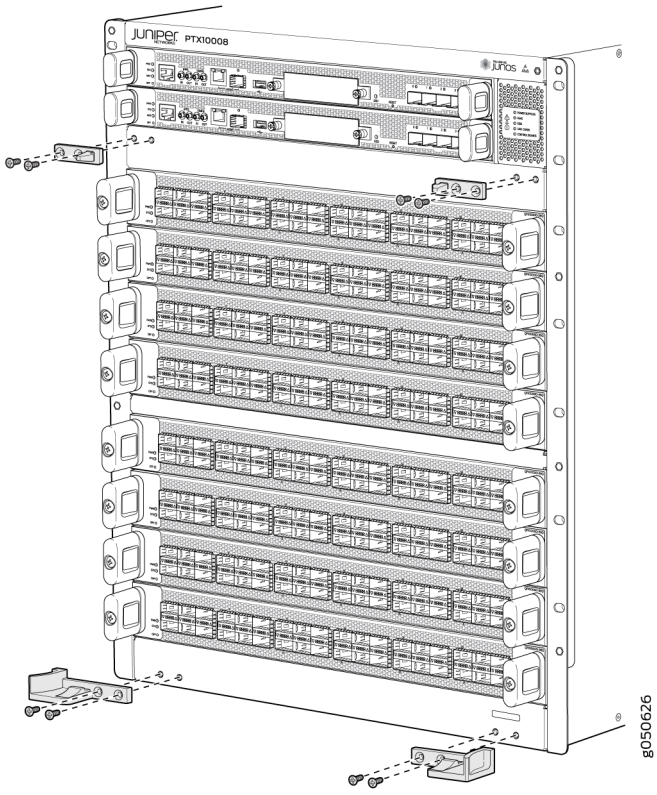
Figure 62: Front Door Mounting Hardware



1– Latch brackets	3– Left base bracket
2– Right base bracket	

4. Attach the two latch brackets to the chassis. Screw holes are located for each latch bracket between the top line card slot and the Routing and Control Boards (RCBs). Use the Phillips screwdriver to attach two supplied screws for each bracket. See Figure 63 on page 167.

Figure 63: Attach Base and Latch Brackets on an MX10008



5. Install the cable seals.

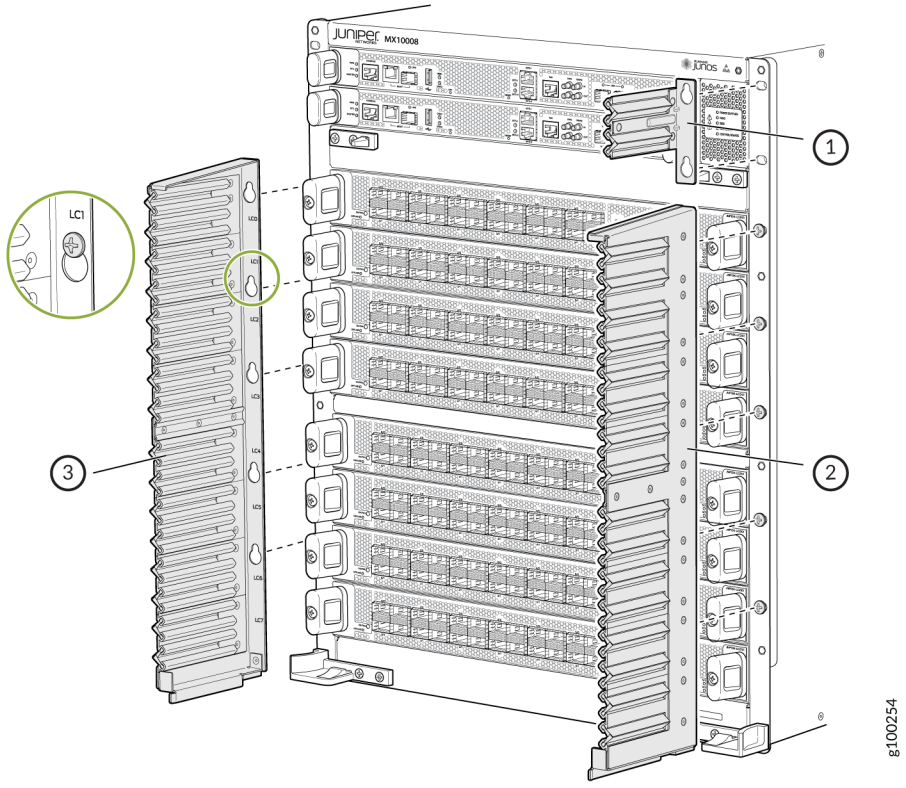
   a. Remove the top right mounting screw next to the RCB with the Phillips screwdriver. The mounting screws attach the chassis flanges to the 4-post rack.

   b. Align the hole of the RCB cable seal over the mounting hole in the flange. Fasten the seal and flange to the rack using the Phillips to tighten the mounting screw.

   c. Loosen the five mounting screws next to the line card slots along one side of the chassis.

   d. Position the keyhole slots of one of the long cable seal over the mounting screws. The long cable seals are not interchangeable; there is a right and left seal. Install the seals so that the keyhole slots are on the inside, next to the line card. See Figure 64 on page 168.

Figure 64: Install the Cable Seals



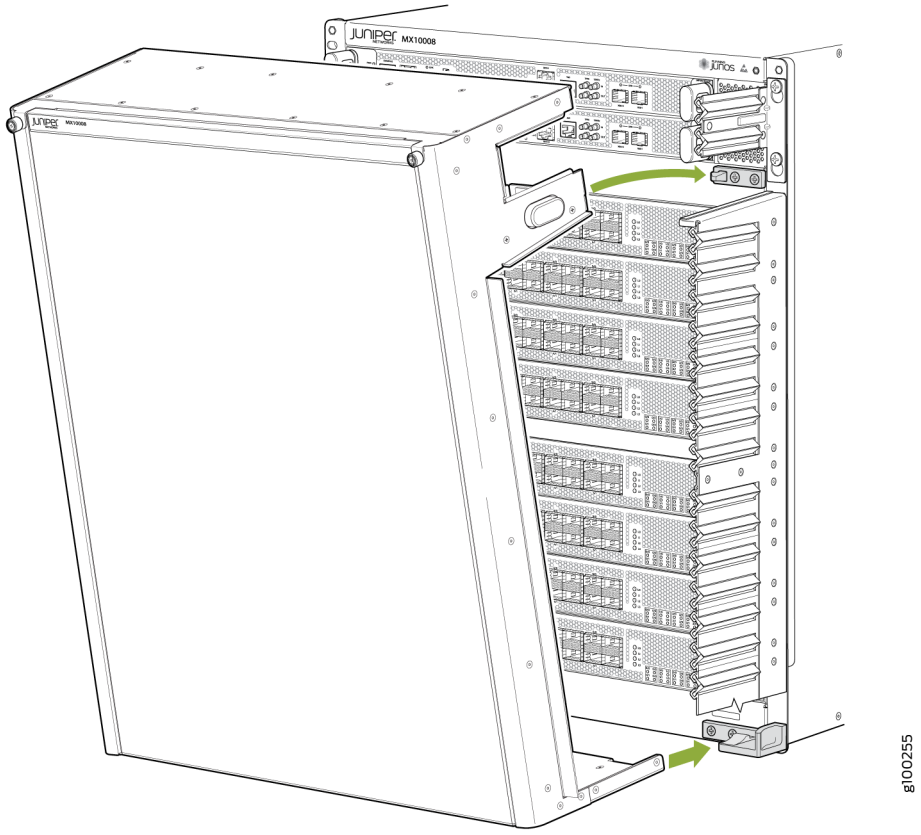
1– RCB cable seal, install on the right of RCB	3– Left cable seal
2– Right cable seal	

   e. Slide the keyhole slot down behind the mounting screws and align the cable seals with the chassis. Tighten the mounting screw with a Phillips screwdriver.

   f. Repeat Step 5.c through Step 5.e for the remaining cable seal.

6. If you have not yet installed the line cards, or the optional cable management system, do that now before attaching the door. See "Install an MPC in an MX10008" on page 275 and "Install the Cable Management System" on page 283.
7. Set the front door into place.
   a. Lift the front door and rest it on the two base brackets.
8. Slide the door back on the bracket glides until it engages on the two ramps.
9. Tilt the door towards the chassis until it is vertical with the chassis. The blue release buttons on the side of the door click into place (see Figure 65 on page 169).

Figure 65: Install the Front Door on an MX10008



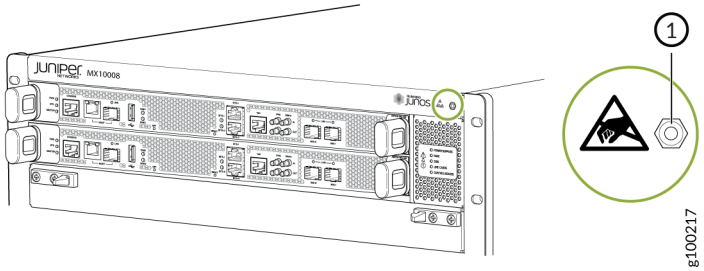
Install the Air Filter

If you have the JNP10008-FRPNL1 model of the front door, there is also an air filter to install. Read and follow the following procedure to add the air filter.

To install the air filter in the front door:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to the ESD point on the front of the chassis. See Figure 66 on page 170.

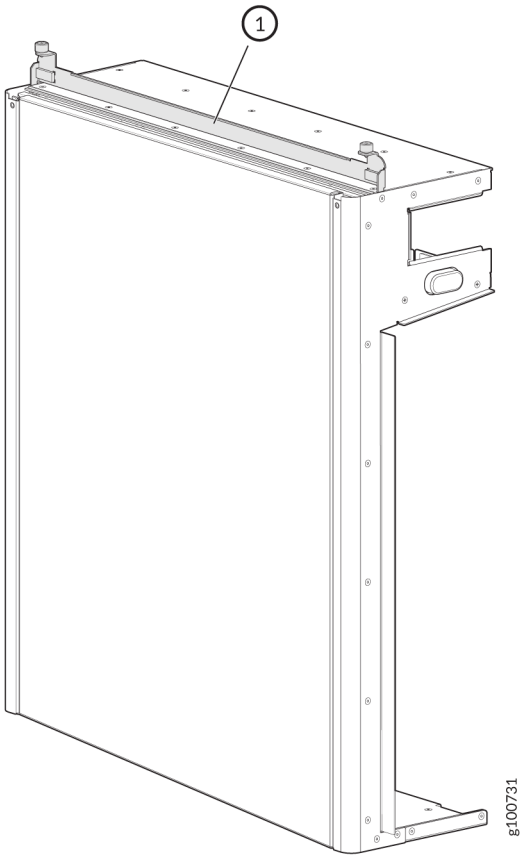
Figure 66: ESD Point for MX10008 Chassis Front



1– ESD point

2. Turn the knob of the air filter frame anti-clockwise and move it over the top of the front door. See Figure 67 on page 170.

Figure 67: Air Filter Frame in an MX10008 Front Door

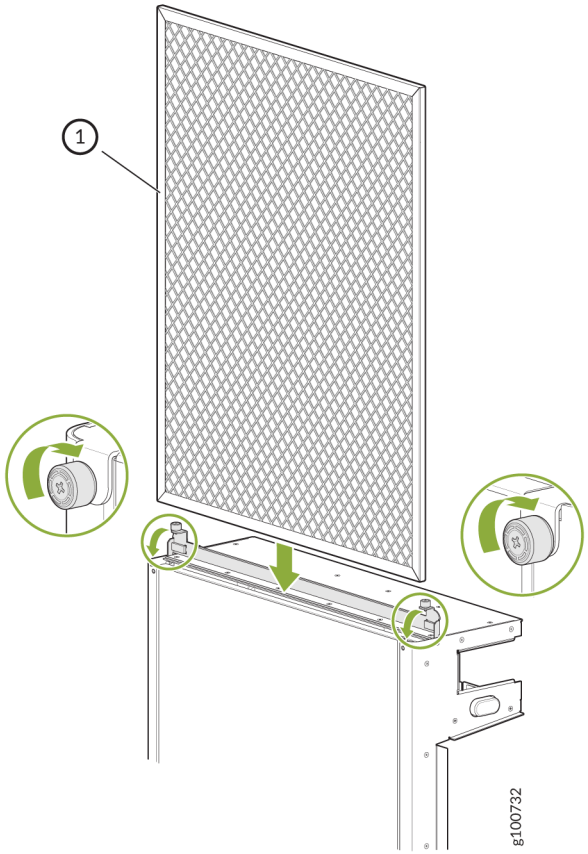


1– Air filter frame	

CAUTION: Juniper recommends installing the air filter to prevent harmful debris from entering the chassis.

3. Hold the air filter with both hands and insert it into the front door until it stops, see (Figure 68 on page 171).

Figure 68: Insert the Air Filter into an MX10008 Front Door



4. Move the air filter frame over the front door and turn the knob on the air filter frame clockwise back in place.

NOTE: You must replace the filter every 6 months.

Connecting the MX10008 to Power

IN THIS SECTION

- Connect the MX10008 to Earth Ground | **172**
- Connect AC Power to an MX10008 | **174**
- Connect DC Power to an MX10008 | **175**

The MX10008 router support both AC and DC power supplies. Additionally, MX10008 routers also support high-voltage alternating current (HVAC) and high-voltage direct current (HVDC) power supplies. To connect power to a MX10008 router, refer to the following procedures:

NOTE: Do not mix power supply models in the same chassis in a running environment. DC and HVDC can coexist in the same chassis during the hot swap of DC for HVDC.

Connect the MX10008 to Earth Ground

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

You must install the MX10008 in a restricted-access location and ensure that the chassis is always properly grounded. The MX10008 has a two-hole protective grounding terminal provided on the chassis. See Figure 70 on page 174. Under all circumstances, use this grounding connection to ground the chassis. For AC-powered systems, you must also use the grounding wire in the AC power cord along with the two-hole grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

Before you connect earth ground to the protective earthing terminal of an MX10008, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable. Using a grounding cable with an incorrectly attached lug can damage the router.

NOTE: Mount your router in the rack before attaching the grounding lug to the router. See "Installing the MX10008 into a Rack" on page 158.

Ensure that you have the following parts and tools available:

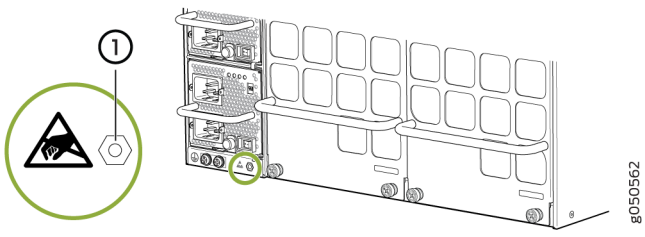
- An electrostatic discharge (ESD) grounding strap (provided).
- Protective earthing terminal lug (provided).
- Grounding cable for your MX10008 (not provided)—The grounding cable must be 6 AWG (13.3 mm^2), minimum 90° C wire, or as permitted by the local code.
- Grounding lug for your grounding cable (provided)—This bracket attaches to the lower left corner of the MX10008 router chassis next to PSU 5, providing a protective earthing terminal for the router. The grounding lug required is a Panduit LCD6-10A-L or equivalent.
- A Phillips screwdriver to tighten the two screws that are mounted on the chassis.

An AC-powered MX10008 gains additional grounding when you plug the power supply in the router into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "MX10008 Power Cables Specifications" on page 120.

To connect earth ground to an MX10008 chassis:

1. Verify that a licensed electrician has attached the cable lug (provided in the accessory kit) to the grounding cable.
2. Connect the other end of the grounding cable to a proper earth ground, such as the rack in which the router is mounted.
3. Attach an ESD grounding strap to your bare wrist, and connect the strap to the ESD grounding point next to the earthing posts (see Figure 69 on page 173).

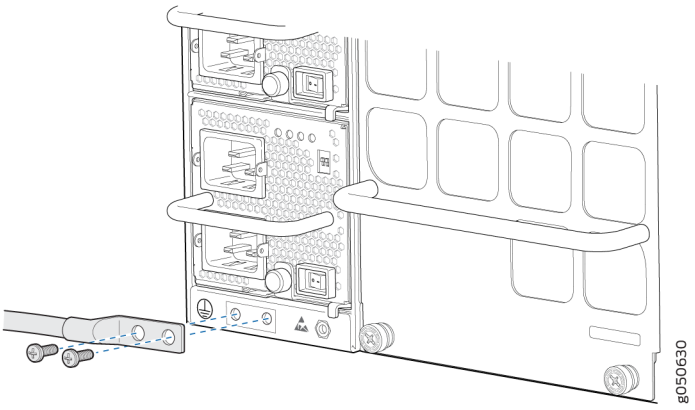
Figure 69: ESD Point for the MX10008



1– Grounding point

4. Remove the two screws on the chassis using a Phillips screwdriver.
5. Place the chassis grounding lug and cable over the PEM nuts with the cable connection pointing to the left. See Figure 70 on page 174.

Figure 70: Connecting a Grounding Cable to the MX10008



6. Place the two screws over the grounding lug and grounding cable.
7. Tighten the two 10-32 screws using a Phillips screwdriver applying torque between of 30.1 in.-lb (3.4 N-m) and 42.04 in.-lb (4.75 N-m).
8. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

SEE ALSO

General Safety Guidelines and Warnings | **334**

Grounded Equipment Warning | **347**

Removing and Installing MX10000 Power System Components | **201**

Connect AC Power to an MX10008

Before you begin to connect power to the router, be sure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

After you ground the chassis, connect the power supplies, and supply power to the chassis, the system initiates the power-on sequence. This sequence can start incrementally with a single power supply, but it is not recommended that you bring up an MX10008 system with at less than three power supplies.

To connect AC power to an MX10008 chassis:

1. Connect the chassis to earth ground (see "Connect the MX10008 to Earth Ground" on page 172).

   CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, an MX10008 must be adequately grounded before it is connected to power.

   For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the rear panel of the MX10008 to connect to the earth ground.

   An MX10008 gets additional grounding when you plug the power supply in the router into a grounded AC power outlet by using the AC power cord appropriate for your geographical location. See "MX10008 Power Cables Specifications" on page 120.

2. Install power supplies in the router and apply power. See "How to Install a JNP10K-PWR-AC Power Supply" on page 207 or "How to Install a JNP10K-PWR-AC2 Power Supply" on page 218.

SEE ALSO

JNP10K-PWR-AC Power Supply | 58

How to Install a JNP10K-PWR-AC Power Supply | 207

Connect DC Power to an MX10008

Before you begin connecting power to the router, be sure you understand how to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

The overall process of bringing up a DC-powered chassis involves the proper cabling of the individual power supplies, adding the power supplies to the chassis, and supplying power. The power-on sequence can start incrementally with a single power supply, we recommended that you bring up an MX10008 system with at least three power supplies.

Each power supply input feed must be connected to a dedicated DC power source outlet.

To connect DC power to a JNP10K-PWR-DC power supply, see "How to Install a JNP10K-PWR-DC Power Supply" on page 230. To connect DC power to a JNP10K-PWR-DC2 power supply, see "How to Install a JNP10K-PWR-DC2 Power Supply" on page 246.

SEE ALSO

JNP10K-PWR-DC Power Supply | 62

JNP10K-PWR-DC2 Power Supply | 66

Prevention of Electrostatic Discharge Damage | 359

RELATED DOCUMENTATION

General Safety Guidelines and Warnings | 334

Grounded Equipment Warning | 347

Connecting the MX10008 to External Devices

IN THIS SECTION

- Connecting an MX10008 to a Network for Out-of-Band Management | 176
- Connecting an MX10008 Router to a Management Console | 177

Connecting an MX10008 to a Network for Out-of-Band Management

Ensure that you have an appropriate cable available. See "MX10008 Cable Specifications for Console and Management Connections" on page 133.

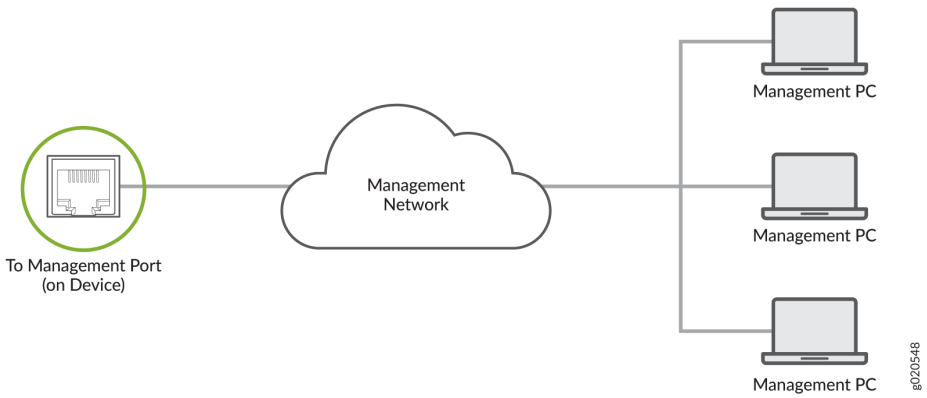
You can monitor and manage an MX10008 router using a dedicated management channel. Each MX10008 Routing and Control Board (RCB) has two management ports: a 10/100/1000BASE-T RJ-45 port for copper connections and a 1-Gigabit SFP port for fiber connections. Use the management ports to connect the RCB to a network for out-of-band management.

NOTE: You cannot use the management ports to perform the initial configuration of the MX10008. You must configure the management ports before you can successfully connect to the MX10008 using these ports. See "Configuring an MX10008 Router" on page 178.

To connect an MX10008 to a network for out-of-band management (see Figure 71 on page 177):

1. Connect one end of the cable to one of the two management ports (labeled **MGNT**) on one of the RCBs.
2. Connect the other end of the cable to the management device.

Figure 71: Connecting an MX10008 to a Network for Out-of-Band Management



SEE ALSO

MX10008 Routing and Control Board Description | **78**

Management Port Connector Pinouts for the MX10008 Router | **141**

Connecting an MX10008 Router to a Management Console

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

NOTE: If your laptop or PC does not have a DB-9 plug connector pin and you want to connect your laptop or PC directly to the MX10008 router, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

The MX10008 router has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

To connect the MX10008 router to a management console (see Figure 72 on page 178 and Figure 73 on page 178):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable into the console server (see Figure 72 on page 178) or management console (see Figure 73 on page 178).

Figure 72: Connecting the MX10008 Router to a Management Console Through a Console Server



Figure 73: Connecting the MX10008 Router Directly to a Management Console



SEE ALSO

Console Port Connector Pinouts for an MX10008 Router | **139**

Configuring an MX10008 Router

Before you begin connecting and configuring the router, set the following parameter values on the console server or PC:

- Baud Rate—9600
- Flow Control—None

- Data—8
- Parity—None
- Stop Bits—1
- DCD State—Disregard

You must perform the initial configuration of an MX10008 router through the console port using the command-line interface (CLI).

To connect and configure the router from the console:

1. Connect the console port to a laptop or PC using the supplied RJ-45 cable and RJ-45 to DB-9 adapter. The console (**CON**) port is located on the Routing and Control Board of the router.
2. Log in as **root**. A password is not required to log in as root. If the software boots before you connected to the console port, you might need to press the Enter key for the prompt to appear.

```
login: root
```

3. Start the CLI.

```
root@% cli
```

4. Enter configuration mode.

```
root> configure
```

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

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

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

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

7. Configure the default gateway.

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

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

```
[edit]
root@# set interfaces em0 unit 0 family inet address address/prefix-length
```

> **CAUTION**: Although the CLI permits you to configure two management Ethernet interfaces within the same subnet, only one interface is usable and supported.

> **NOTE**: The management ports, `em0` (**MGMT** for RJ-45 connections) and `em1` (also labeled **MGMT** for fiber connections), are found on the port panel of the RCBs of the MX10008 router.

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

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

10. Enable Telnet service.

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

> **NOTE**: When Telnet is enabled, you cannot log in to an MX10008 through Telnet using root credentials. Root login is allowed only for SSH access.

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

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

RELATED DOCUMENTATION

MX10008 Installation Overview | 145

MX10008 Hardware Overview

CHAPTER 4

Maintaining Components

Field-Replaceable Units in an MX10008 | 183

Removing and Installing Routing and Control Boards | 185

Removing and Installing MX10008 Cooling System Components | 191

Removing and Installing MX10000 Power System Components | 201

Removing and Installing MX10008 Switch Fabric Boards | 257

Removing and Installing MX10008 MPC Components | 273

Removing and Installing Transceivers and Fiber-Optic Cables | 286

Removing the MX10008 Router | 294

Field-Replaceable Units in an MX10008

Field-replaceable units (FRUs) are router components that you can replace at your site. Routers use these types of FRUs:

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

Table 60 on page 183 lists the FRUs and their types for the MX10008 routers.

Table 60: FRUs in an MX10008 Router

FRU	Type
Power supplies	Hot-insertable and hot-removable.
Fan trays	Hot-insertable and hot-removable.
Fan tray controllers	Hot-insertable and hot-removable.
Routing and Control Board (RCB)	Redundant configuration: • Primary RCB is hot-pluggable. • Backup RCB is hot-insertable and hot-removable. Base configuration: • Removal of the RCB causes the router to shut down. You can install a replacement RCB in the second slot. The system restarts to select a primary and backup. If necessary, you can switch the primary and backup using the `request chassis routing-engine master switch` command. See "MX10008 Components and Configurations" on page 22.

Table 60: FRUs in an MX10008 Router *(Continued)*

FRU	Type
Switch Fabric Boards (SFBs)	Hot-insertable and hot-removable. We recommend that you take the SFBs offline before removing them to avoid traffic loss while the router fabric is being reconfigured. You can take SFBs offline by using the **request chassis sib (offline | online) slot *slot-number*** command.
Line cards	Hot-insertable and hot-removable. We recommend that you take line cards offline before removing them. You can take line cards offline by using the **request chassis fpc slot *slot-number* offline** command. **NOTE**: Line cards are not part of the base configuration or redundant configuration. You must order them separately.
Optical transceivers	Hot-insertable and hot-removable. See "MX10008 Optical Transceiver and Cable Support" on page 132 for the Junos OS release in which the transceivers were introduced.

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

RELATED DOCUMENTATION

MX10008 Components and Configurations | 22

MX10008 Optical Transceiver and Cable Support | 132

Removing and Installing Routing and Control Boards

IN THIS SECTION

- Handling and Storing Routing and Control Boards | 185
- Removing a Routing and Control Board | 186
- Installing a Routing and Control Board | 188

Handling and Storing Routing and Control Boards

IN THIS SECTION

- Holding Routing and Control Boards | 185
- Storing Routing and Control Boards | 186

Holding Routing and Control Boards

Pay proper attention to the way you are holding Routing and Control Boards (RCBs). RCBs are installed horizontally and it is best to hold them by the sides of the units when they are not in the chassis.

To handle and store an RCB properly:

1. Orient the RCB so that the faceplate is toward you.
2. Grasp each side of the unit firmly as you slide the unit out of the chassis.
3. Take care not to strike the unit against any object as you carry it.

> ⚠ **CAUTION**: Never hold the RCB by the connector edge. The connectors are fragile and the RCB will not seat properly if the connector is damaged.

4. If you must rest an RCB on an edge, place a cushion between the edge and the surface.

> ⚠ **CAUTION**: Do not stack RCBs on top of one another or on top of any other component.

5. Place each RCB in an individual antistatic bag or separately on an antistatic mat that is placed on a flat, stable surface.

Storing Routing and Control Boards

You must store RCBs either in the chassis or in a spare shipping container, horizontally and sheet-metal side down. Do not stack these units on top of one another or on top of any other component. Place each unit separately in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

> **NOTE**: Because these units are heavy, and because antistatic bags are fragile, inserting the line card into the bag is best done by two people.

To insert an RCB into an electrostatic bag:

1. Hold the unit horizontally with the faceplate toward you.
2. Have the second person slide the opening of the antistatic bag over the connector edge and then pull the bag to cover the unit.

If you must insert an RCB into a bag by yourself:

1. Lay the unit horizontally on an antistatic mat that is on a flat, stable surface with the sheet metal side down.
2. Orient the unit with the faceplate toward you.
3. Carefully insert the connector edge into the opening of the bag and pull the bag toward you to cover the unit.

Removing a Routing and Control Board

An MX10008 can have one or two Routing and Control Boards (RCBs), depending on the configuration. RCBs can be installed in either of the two top slots on the front of the chassis.

In redundant configurations, an RCB is a hot-removable and hot-insertable field-replaceable unit (FRU). In base configurations, you need to install a second RCB before removing a failing RCB in order to prevent the router from shutting down. We recommend that you take base systems offline before replacing the RCB.

Before you remove an RCB, ensure that you have the following items:

- An electrostatic discharge (ESD) grounding strap
- An antistatic mat
- Cover panel for the empty slot if you are not replacing the RCB.

> ⚠ **CAUTION**: In base configurations, removal of the RCB causes the system to shut down. In redundant configurations, removal of the RCB causes the system to reboot and start the election process for a new primary.

To remove an RCB:

1. Place an antistatic bag or antistatic mat on a flat, stable surface.
2. Use the following CLI commands to take the RCB offline.

```
user@host>request vmhost power-off other-routing engine
Power-off the vmhost ? (yes,no?
yes
Initiating vmhost shutdown...
warning: Initiating Junos shutdown...
shutdown: [pid 42862]
Shutdown NOW!

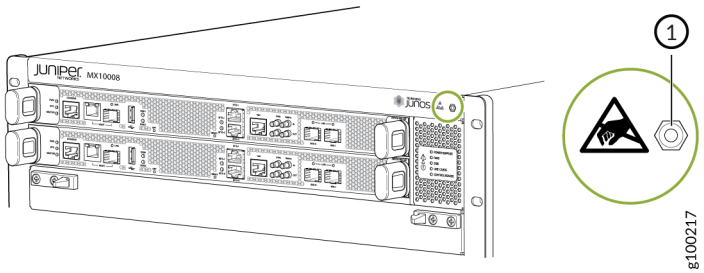
user@host>request chassis cb slot slot-number offline
```

   You can use the `show chassis environment cb | match State` CLI command to verify that the RCB is offline.

```
user@host>show chassis environment cb | match State
State                     Online Master
  State                     Offline
```

3. Wrap and fasten one end of an ESD strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis (see Figure 74 on page 188).

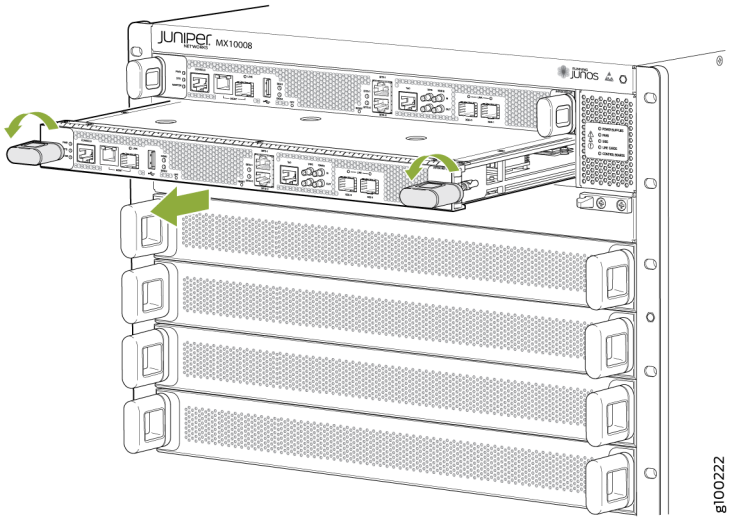
Figure 74: ESD Point on the Front of an MX10008



1– ESD point

4. Simultaneously rotate the RCB handles counterclockwise to unseat the RCB.
5. Grasp the handles, and slide the RCB about halfway out of the chassis (see Figure 75 on page 188).

Figure 75: Removing a Routing and Control Board



6. Grasp each side of the RCB and slide it completely out of the chassis.
7. Place the RCB on the antistatic mat.
8. If you are not replacing the RCB now, install a cover panel in the empty slot.

Installing a Routing and Control Board

An MX10008 can have one or two Routing and Control Boards (RCBs), depending on the configuration. RCBs can be installed in either of the two top slots on the front of the chassis.

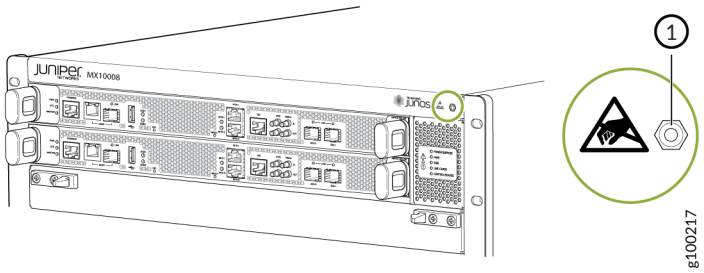
In redundant configurations, an RCB is a hot-removable and hot-insertable field-replaceable unit (FRU). In base configurations, you need to install a second RCB before removing a failing RCB in order to prevent the router from shutting down.

Before you install a RCB, ensure that you have an electrostatic discharge (ESD) grounding strap.

To install an RCB:

1. Wrap and fasten one end of an ESD strap around your bare wrist, and connect the other end of the strap to the ESD point on the front of an MX10008 (see Figure 76 on page 189).

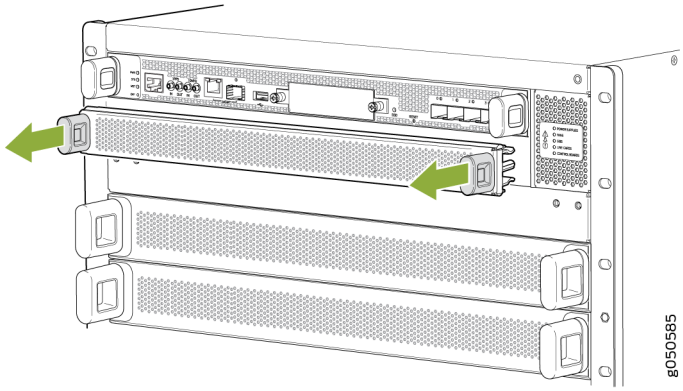
Figure 76: ESD Point for MX10008 Chassis Front



1– ESD point

2. Either remove the cover panel from the available RCB slot (see Figure 77 on page 189) or remove the failing RCB (see "Removing a Routing and Control Board" on page 186).

Figure 77: Removing a Routing and Control Board Cover Panel

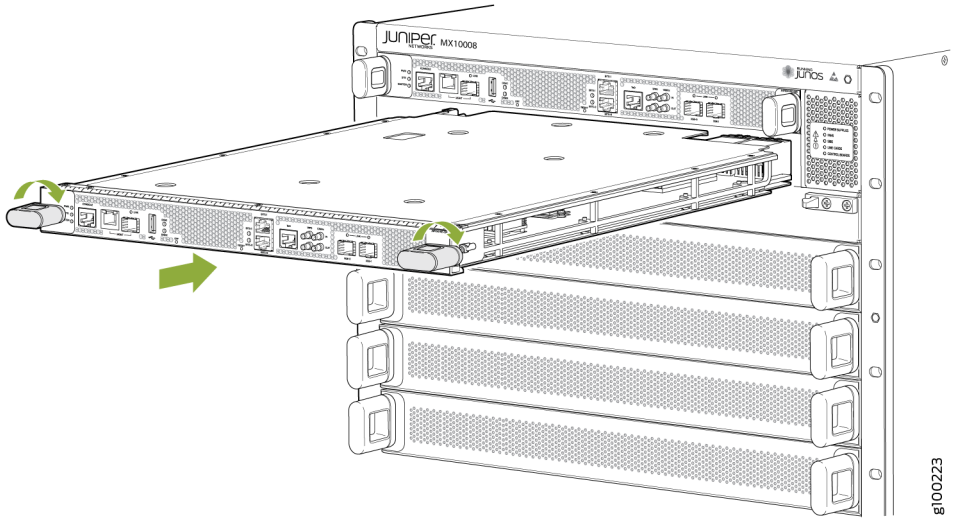


3. Remove the new RCB from the electrostatic bag and inspect it for any damage before installing it into the chassis.
4. Lift the RCB by its sides, being careful not to strike the connectors against any object.
5. Carefully align the sides of the RCB with the guides inside the chassis.

6. Slide the RCB into the chassis, carefully ensuring that it is correctly aligned.
7. Grasp both handles and simultaneously rotate them clockwise until the RCB is fully seated and the handles are vertical (see Figure 78 on page 190).

   The RCB begins the power-on sequence after it is fully seated.

Figure 78: Routing and Control Board Installation



8. To verify that the RCB is functioning normally, check the **PWR** LED on its faceplate and the **CONTROL BOARDS** LED on the status panel. Both LEDs should light steadily shortly after the RCB is installed. If the **PWR** LED is blinking yellow, there might be insufficient power available. Ensure that you have adequate power for the additional unit.

   You can also use the the **show chassis environment cb** command to verify that the RCB is online.

SEE ALSO

Power Requirements for an MX10008 Router | **112**

MX10008 Routing and Control Board LEDs | **81**

Removing and Installing MX10008 Cooling System Components

IN THIS SECTION

- Removing an MX10008 Fan Tray | **192**
- Installing an MX10008 Fan Tray | **195**
- Removing an MX10008 Fan Tray Controller | **197**
- Installing an MX10008 Fan Tray Controller | **199**

An MX10008 router has two independent, field-replaceable fan trays. Fan trays must be replaced within the duration mentioned in Table 61 on page 191.

Table 61: Replacement Duration for the Fan Tray

Chassis Ambient Temperature	Duration
27°C	5 minutes
35°C	3 minutes
40°C	2 minutes

NOTE: When replacing the fans or SFBs at 40°C chassis ambient temperature, ensure that the fans run at 100% fan speed for at least 10 minutes before replacing the fans or SFBs.

Use the `test chassis fan tray 0 speed` *`full-speed`* and `test chassis fan tray 1 speed` *`full-speed`* commands to set the chassis fans to 100% speed.

To install or remove the fan trays and fan tray controller, see the following sections:

Removing an MX10008 Fan Tray

Before you remove a fan tray:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- Ensure that you have the following parts and tools available to remove a fan tray:
  - Electrostatic discharge (ESD) grounding strap
  - Replacement fan tray
  - A Phillips (+) screwdriver, number 1 or 2 (optional), for the captive screws

An MX10008 has two independent, field-replaceable fan trays. Each fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace the fan tray while the router is running without turning off power to the router or disrupting routing functions. There are two models of the fan tray, JNP10008-FAN and JNP10008-FAN2.

CAUTION: Do not remove the fan tray unless you have a replacement fan tray available.

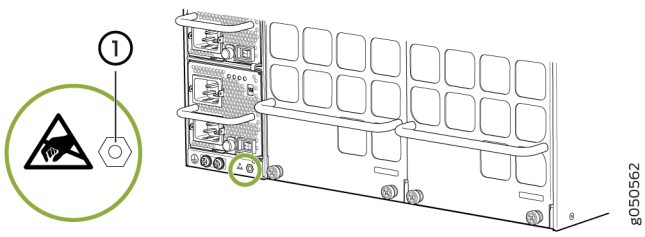
Each fan tray is installed vertically on the rear, or FRU-side, of the chassis.

CAUTION: A fan tray can be removed and replaced while the router is operating. Fan trays must be replaced within the duration mentioned in Table 61 on page 191.

To remove either the JNP10008-FAN or the JNP10008-FAN2 fan tray:

1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the rear left side of the chassis. See Figure 79 on page 192.

Figure 79: ESD Point on the Rear of an MX10008



1–	ESD point

2. Loosen the four captive screws either by unscrewing with your thumb and forefinger or by using a Phillips screwdriver.
3. Grasp the top and bottom handles and pull the fan tray out about 3 in. (7.6 cm). See Figure 80 on page 193 and Figure 81 on page 194.

Figure 80: Removing Fan Tray JNP10008-FAN from an MX10008

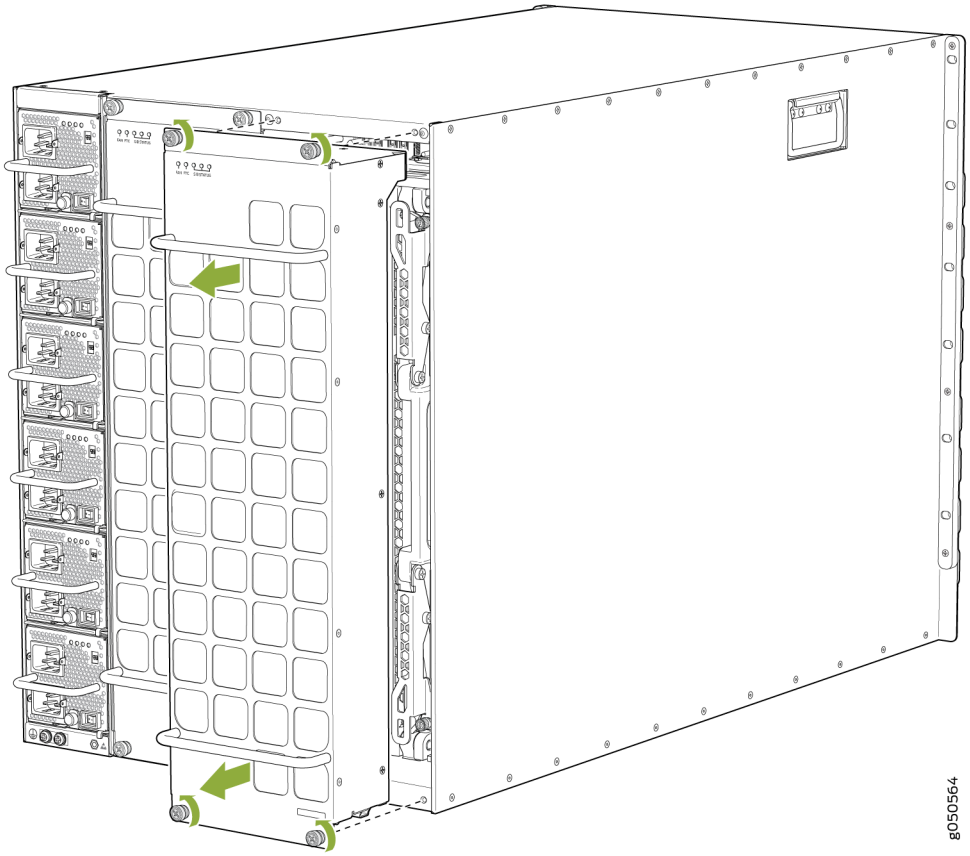
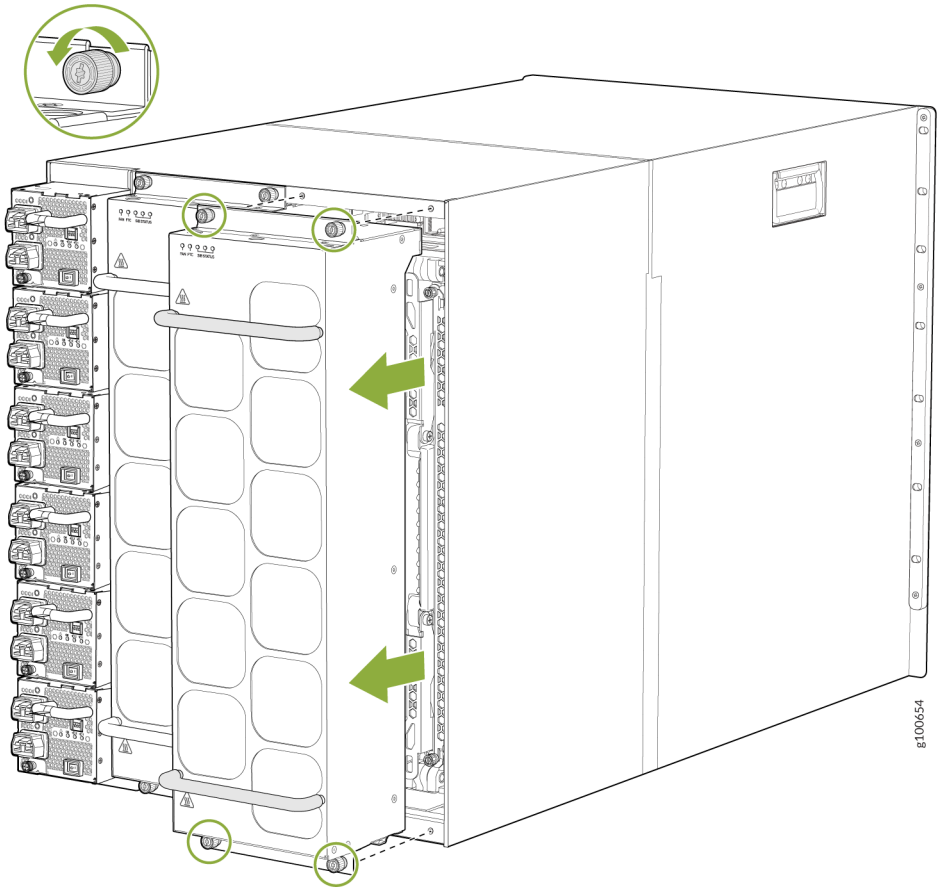


Figure 81: Removing Fan Tray JNP10008-FAN2 from an MX10008



4. Tilt the top of the fan tray forward.

> **CAUTION**: See the heat symbol
>
> 
>
>
> on the fan tray. The fan handle and its surfaces including the power supply handles may be hot. Wear proper protective, heat-resistant gloves while removing the fan tray.

5. Using both hands, lift the fan tray out of the slot and rest it on a flat surface with the handles to the side.

CAUTION: Fan trays must be replaced within the duration mentioned in Table 61 on page 191.

SEE ALSO

MX10008 Cooling System and Airflow | 41

Field-Replaceable Units in an MX10008 | 33

Installing an MX10008 Fan Tray

Before you begin to install a fan tray:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

Ensure that you have the following parts and tools available to install a fan tray:

- Electrostatic discharge (ESD) grounding strap
- A Phillips (+) screwdriver, number 1 or 2 (optional), for the captive screws
- A replacement fan tray

CAUTION: The fan tray can be removed and replaced while the router is operating. Fan trays must be replaced within the duration mentioned in Table 61 on page 191.

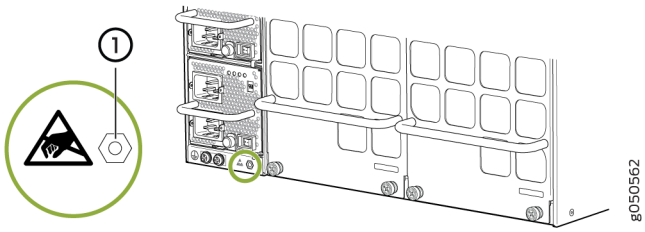
An MX10008 chassis has two independent, field-replaceable fan trays. Each fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace the fan tray while the router is running without turning off power to the router or disrupting routing functions. There are two models of the fan tray, JNP10008-FAN and JNP10008-FAN2.

Each fan tray is installed vertically on the rear, or FRU-side, of the chassis.

To install either the JNP10008-FAN or the JNP10008-FAN2 fan tray:

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the rear left side of the chassis (see Figure 82 on page 196).

Figure 82: ESD Point on the Rear of an MX10008



1– ESD point

2. Grasp the top and bottom fan tray handles and align the bottom of the fan tray with the bottom of the fan tray slot.
3. Rest the bottom edge of the fan tray in the slot and slide the fan tray into place so it is fully seated.
4. Tighten the captive screws until finger tight. See Figure 83 on page 196 or Figure 84 on page 197.

Figure 83: Installing Fan Tray JNP10008-FAN in an MX10008

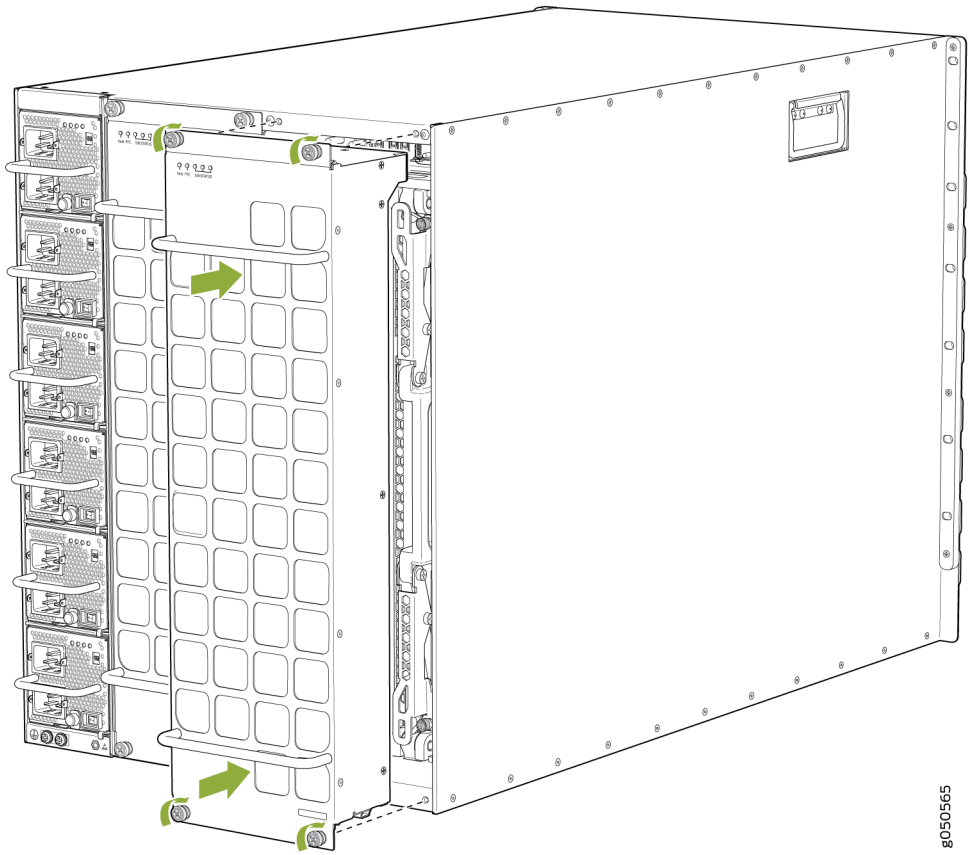
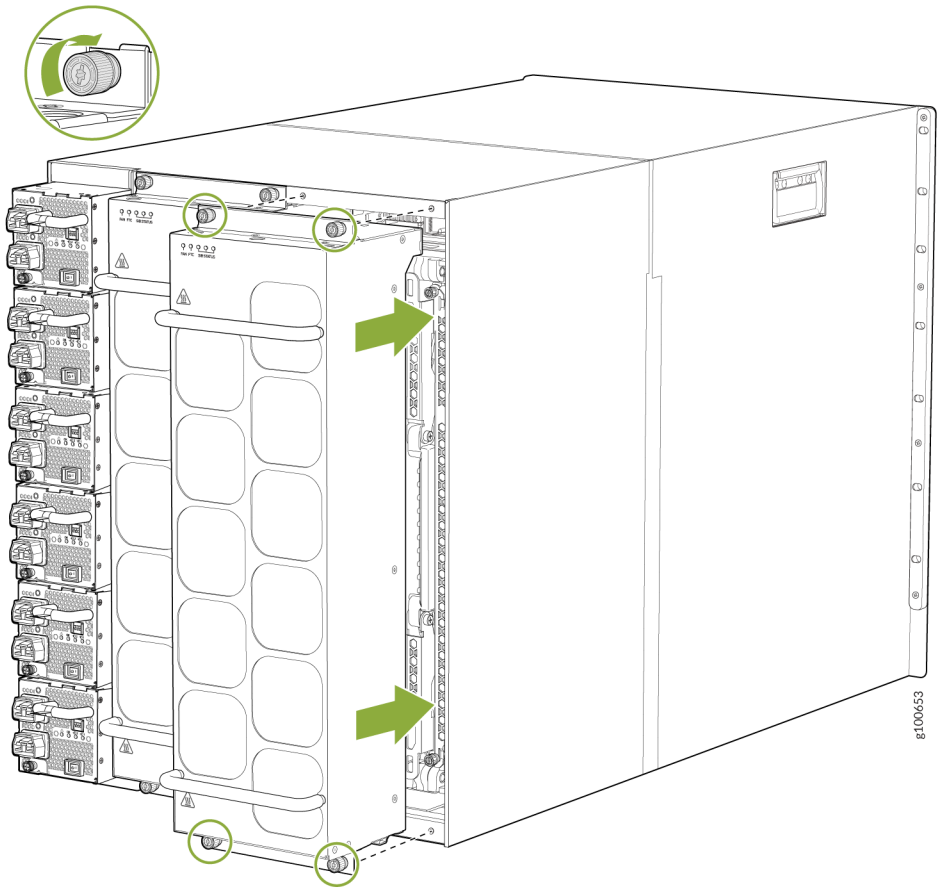


Figure 84: Installing Fan Tray JNP10008-FAN2 in an MX10008



SEE ALSO

MX10008 Cooling System and Airflow | 41

Field-Replaceable Units in an MX10008 | 33

Removing an MX10008 Fan Tray Controller

For each of the two fan trays, there is a fan tray controller. Each controller is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace one fan tray controller while the router is running without turning off power to the router or disrupting routing functions. There are two models of fan tray controller for the MX10008:

- JNP10008-FAN-CTRL, which supports fan tray JNP10008-FAN

- JNP10008-FTC2, which supports fan tray JNP10008-FAN2

See Figure 85 on page 198 for JNP10008-FAN-CTRL and Figure 86 on page 198.

Figure 85: JNP10008-FAN-CTRL

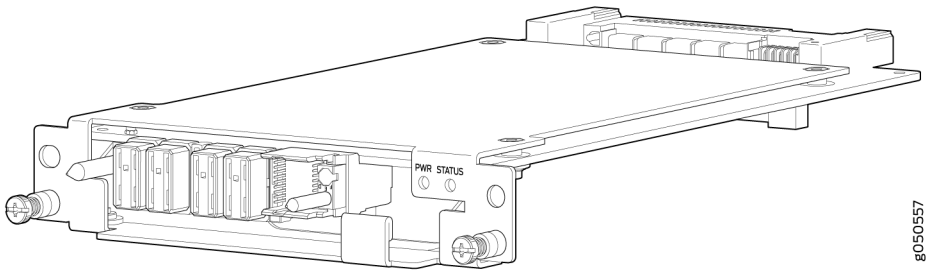
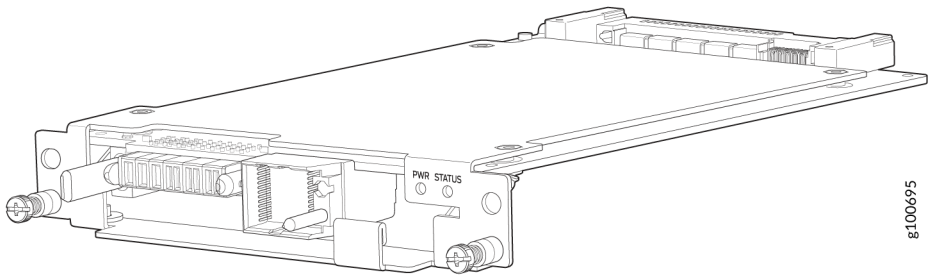


Figure 86: JNP10008-FTC2



CAUTION: Do not remove the fan tray controller unless you have a replacement controller available.

To access a fan tray controller, you must first remove the fan tray. With the fan tray removed, the fan tray controller is installed horizontally above the Switch Fabric Boards (SFBs) at the top of the chassis.

Before you remove a fan tray controller:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

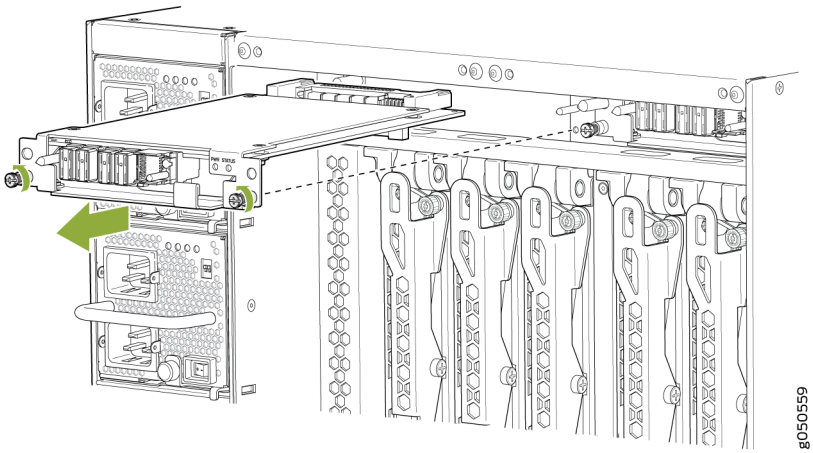
Ensure that you have the following parts and tools available to remove a fan tray controller:

- Electrostatic discharge (ESD) grounding strap
- An electrostatic bag or an antistatic mat
- Replacement fan tray controller
- A Phillips (+) screwdriver, number 1, for the captive screws

All models of fan controller are removed using the same procedure.

1. Remove the fan tray. See "Removing an MX10008 Fan Tray" on page 192.
2. Loosen the two captive screws on each side of the fan tray controller.
3. Grasp the fan tray controller and pull it straight out of the slot. See "Removing an MX10008 Fan Tray Controller" on page 197 for the MX10008.

Figure 87: Removing an MX10008 Fan Tray Controller



4. Place the fan tray controller in an electrostatic bag or on an antistatic mat.

Installing an MX10008 Fan Tray Controller

Each fan tray of an MX10008, has a fan tray controller. Each controller is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace one fan tray controller while the router is running without turning off power to the router or disrupting routing functions. There are two models of fan tray controller for the MX10008, JNP10008-FAN-CTRL and JNP10008-FTC2, see Figure 88 on page 200 and Figure 89 on page 200.

Figure 88: JNP10008-FAN-CTRL

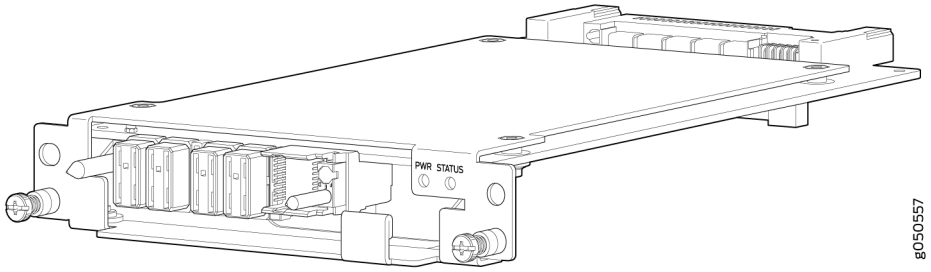
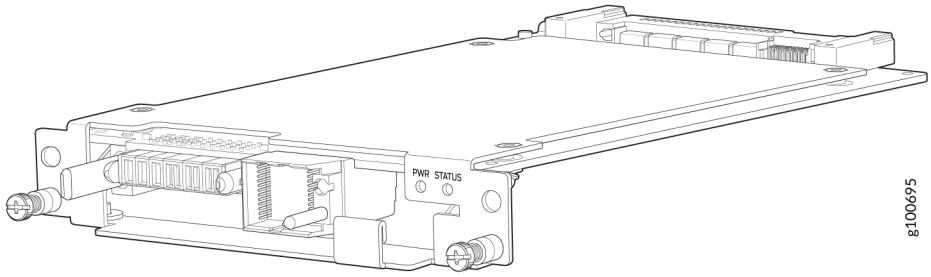


Figure 89: JNP10008-FTC2



CAUTION: Do not remove the fan tray controller unless you have a replacement controller available.

To access a fan tray controller, you must first remove the associated fan tray. With the fan tray removed, the fan tray controller is installed horizontally above the Switch Fabric Boards (SFBs) at the top of the chassis.

Before you replace a fan tray controller:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- You have removed the associated fan tray and fan tray controller. See "Removing an MX10008 Fan Tray" on page 192 and "Removing an MX10008 Fan Tray Controller" on page 197.

Ensure that you have the following parts and tools available to install a fan tray controller:

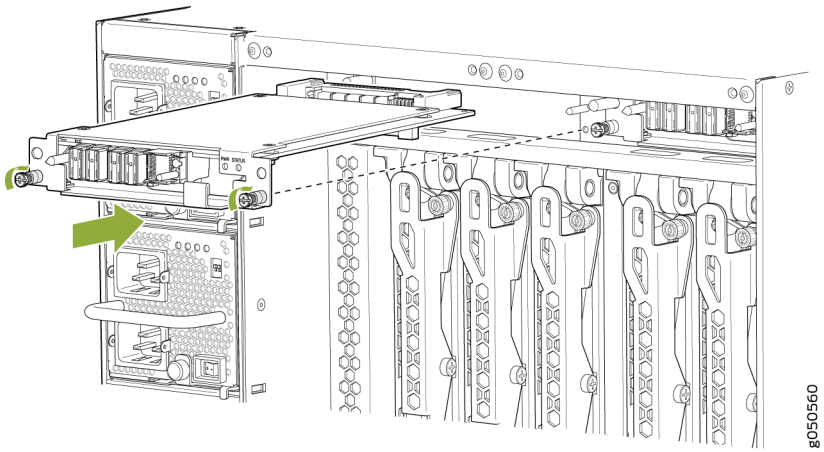
- Electrostatic discharge (ESD) grounding strap

- Replacement fan tray controller
- A Phillips (+) screwdriver, number 1 for the captive screws

To install a fan tray controller:

1. Remove the replacement fan tray controller from the electrostatic bag.
2. Carefully slide the fan tray controller into the fan tray controller slot until it is flush with the mounting holes. See Figure 90 on page 201.

Figure 90: Replacing an MX10008 Fan Tray Controller



3. Using a Phillips screwdriver, tighten the captive screws for the fan tray controller.
4. Replace the fan tray. See "Installing an MX10008 Fan Tray" on page 195.

Removing and Installing MX10000 Power System Components

IN THIS SECTION

- How to Remove a JNP10K-PWR-AC Power Supply | **202**
- How to Install a JNP10K-PWR-AC Power Supply | **207**
- How to Remove a JNP10K-PWR-AC2 Power Supply | **214**

- How to Install a JNP10K-PWR-AC2 Power Supply | **218**
- How to Remove a JNP10K-PWR-DC Power Supply | **225**
- How to Install a JNP10K-PWR-DC Power Supply | **230**
- How to Remove a JNP10K-PWR-DC2 Power Supply | **242**
- How to Install a JNP10K-PWR-DC2 Power Supply | **246**

MX10008 and MX10016 routers support both AC and DC power supplies. Additionally, MX10000 routers support high-voltage alternating current (HVAC) or high-voltage direct current (HVDC) power supplies. To install and remove the power supplies in a MX10008 router or a MX10016 router, refer to the following sections.

How to Remove a JNP10K-PWR-AC Power Supply

Before you remove an JNP10K-PWR-AC power supply from the chassis:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

Ensure that you have the following parts and tools available to remove a JNP10K-PWR-AC power supply from an MX10008 router:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 1
- Replacement power supply or a cover panel for the power supply slot

The JNP10K-PWR-AC power supply in an MX10008 router is a hot-removable and hot-insertable field-replaceable unit (FRU). You remove all power supplies from the rear of the chassis.



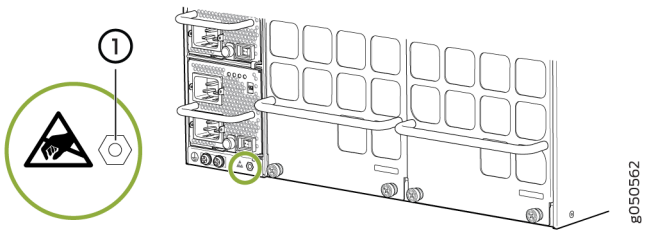
CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "Power Requirements for an MX10008 Router" on page 112.

CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

To remove a JNP10K-PWR-AC power supply from an MX10008 router:

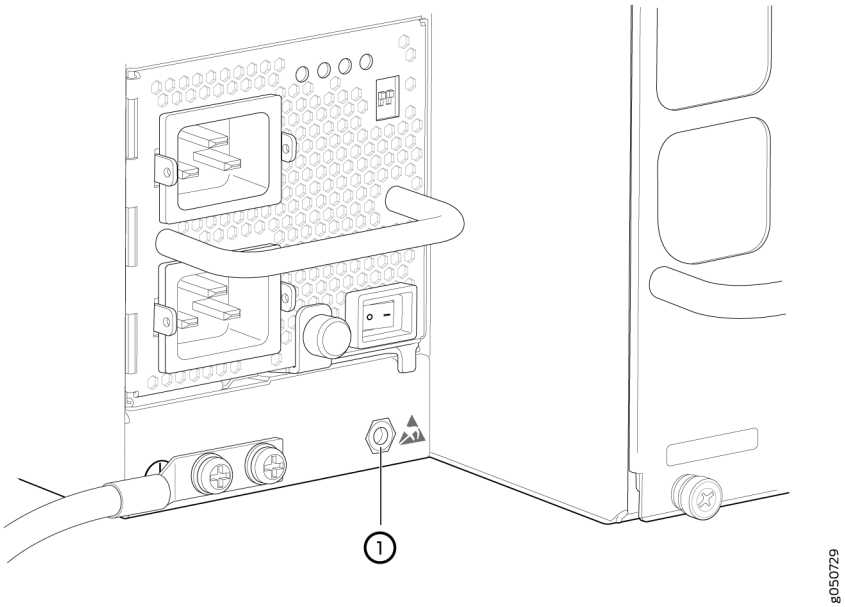
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 91 on page 203) and below **PSU_9** on the MX10016 (see Figure 92 on page 204).

Figure 91: ESD Point on the Rear of an MX10008



1– ESD point

Figure 92: ESD Point on MX10016 Chassis Rear



1– ESD point

2. Set the **Enable** switch next to the appliance inlet on the power supply to the standby position.
3. Disconnect power from the router by performing one of the two following tasks:
   - If the AC power source outlets have a power switch, set them to the off (O) position.
   - If the AC power source outlets do not have a power switch, gently pull the plug end of the power cords connected to the power source outlets out of the outlets.
4. Remove the power cords from the AC inlet on the AC power supply faceplate.
5. Turn the adjustment nut of the power cord retainers counterclockwise until you can see the power cord. Pull the power cord from the slot in the adjustment nuts.
6. Unscrew the captive screw counterclockwise by using the Phillips (+) screwdriver, number 1. See Figure 93 on page 205 and Figure 94 on page 206.
7. Rotate the captive screw away from the faceplate of the power supply to release the latch.
8. Taking care not to touch the power supply output connections, pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.

CAUTION: Do not bump the output connections. If the connection hits a solid object, it could damage the power supply.

CAUTION: See the heat symbol



. The power supply surfaces are hot. Allow a few minutes for the power supply to cool by pulling the power supply halfway out of the chassis, or wear protective, heat-resistant gloves while removing the power supply.

9. If you are not replacing the power supply, install the cover panel over the slot by inserting your thumb and forefinger into the finger holes, squeezing and pulling the cover out of the slot.

Figure 93: Removing a JNP10K-PWR-AC Power Supply from an MX10008

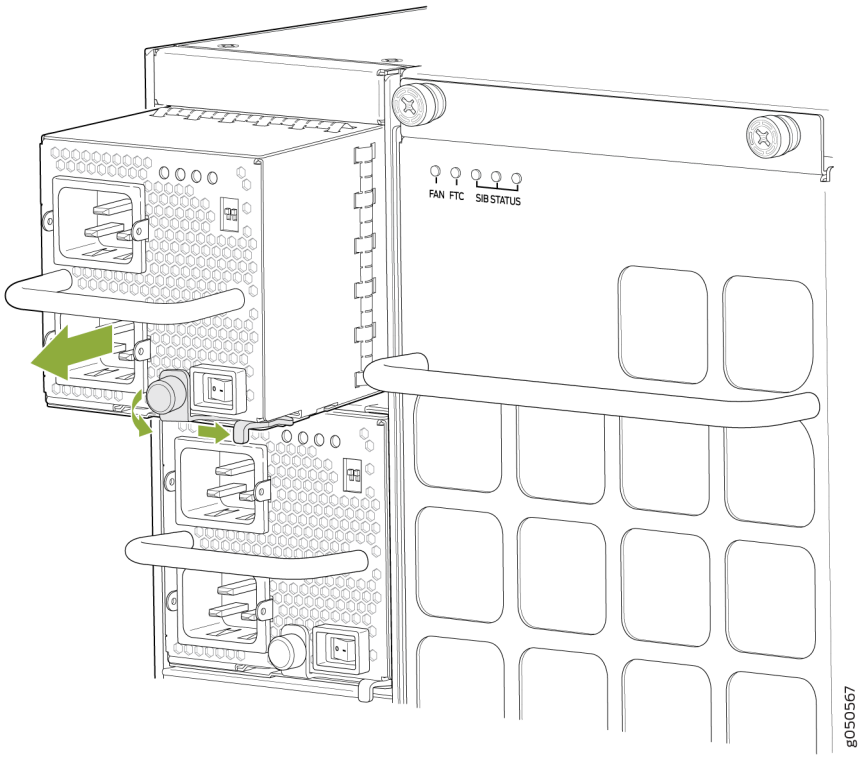
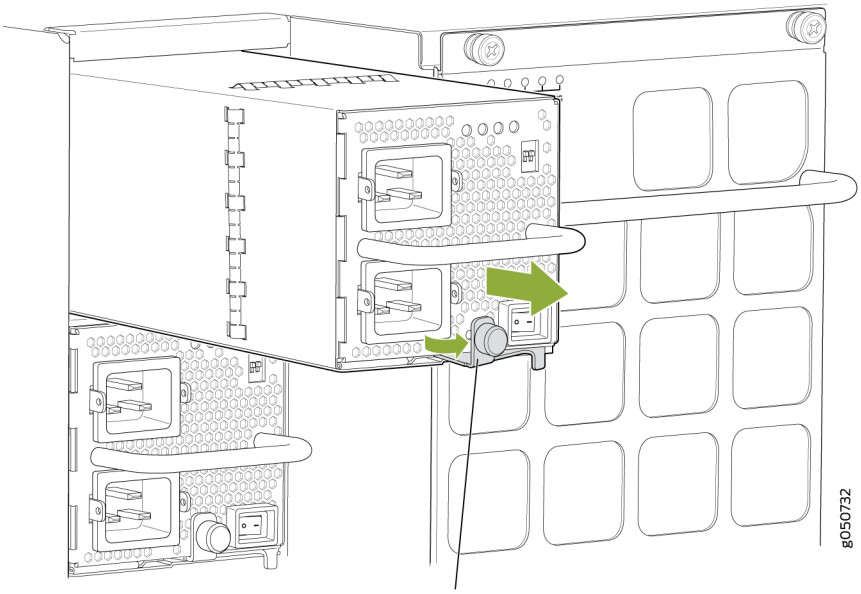
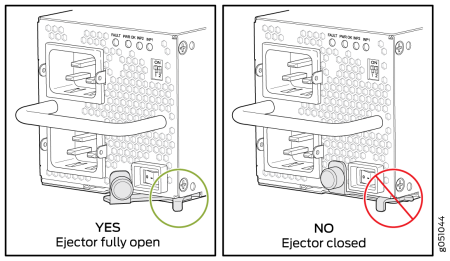
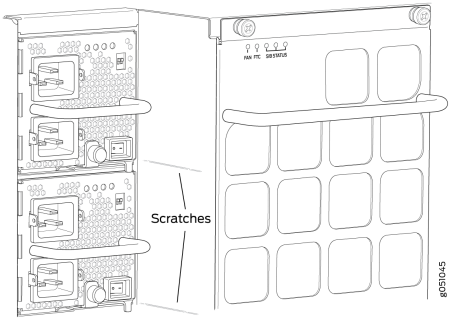


Figure 94: Removing a JNP10K-PWR-AC Power Supply from an MX10016



NOTE: Ensure that the ejector is fully open to avoid scratching the chassis.





SEE ALSO

JNP10K-PWR-AC Power Supply | 58

How to Install a JNP10K-PWR-AC Power Supply

Before you install a JNP10K-PWR-AC power supply in the router:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- If the AC power source outlets have a power switch, set them to the off (**O**) position.

Ensure that you have the following parts and tools available to install an AC power supply:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 1
- Power cords appropriate for your geographical location. See "MX10008 Power Cables Specifications" on page 120.
- Power cord retainer clips

The JNP10K-PWR-AC power supply in an MX10008 chassis or a MX10016 chassis is a hot-insertable and hot-removable field-replaceanble unit (FRU). You can install up to 6 power supplies in an MX10008 and 10 in a MX10016 router chassis. All power supplies install in the rear of the chassis in the slots provided along the left side.

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

NOTE: See the heat symbol

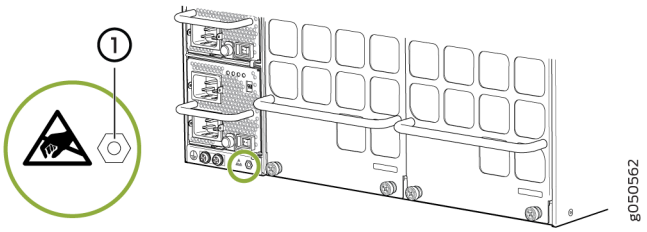


. Wear heat-resistant hand gloves while accessing the fan tray and power supply.

To install a JNP10K-PWR-AC power supply in an MX10008 or an MX10016:

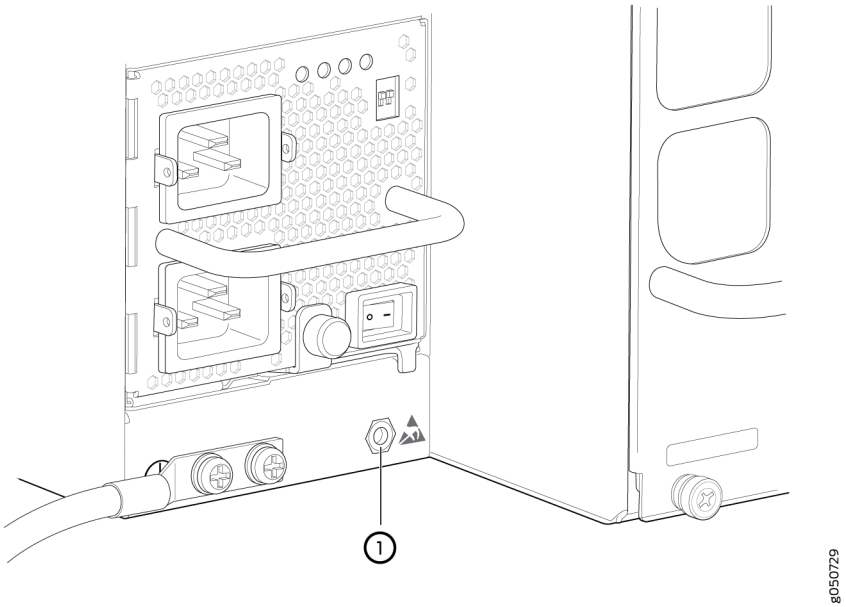
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 95 on page 208) or below **PSU_9** on the MX10016 (see Figure 96 on page 208).

Figure 95: ESD Point on the Rear of an MX10008



1– ESD point

Figure 96: ESD Point on MX10016 Chassis Rear



1– ESD point

2. If the power supply slot has a cover on it, insert your thumb and forefinger into the finger holes, squeeze and pull the cover out of the slot. Save the cover for later use. See Figure 97 on page 209 for removal on an MX10008 and Figure 98 on page 209 for the MX10016.

Figure 97: Removing the Power Supply Cover on an MX10008

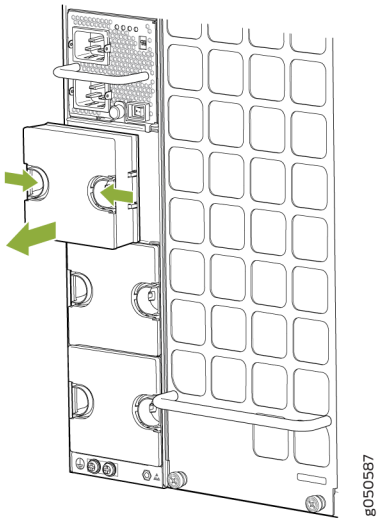
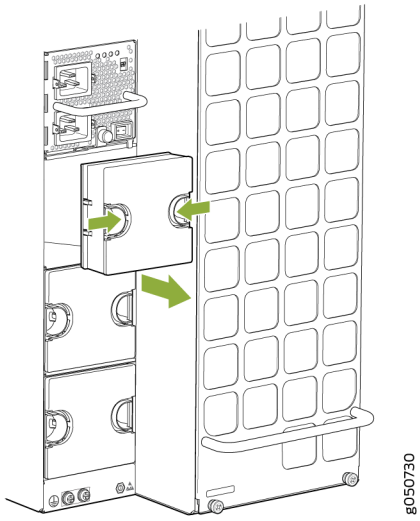


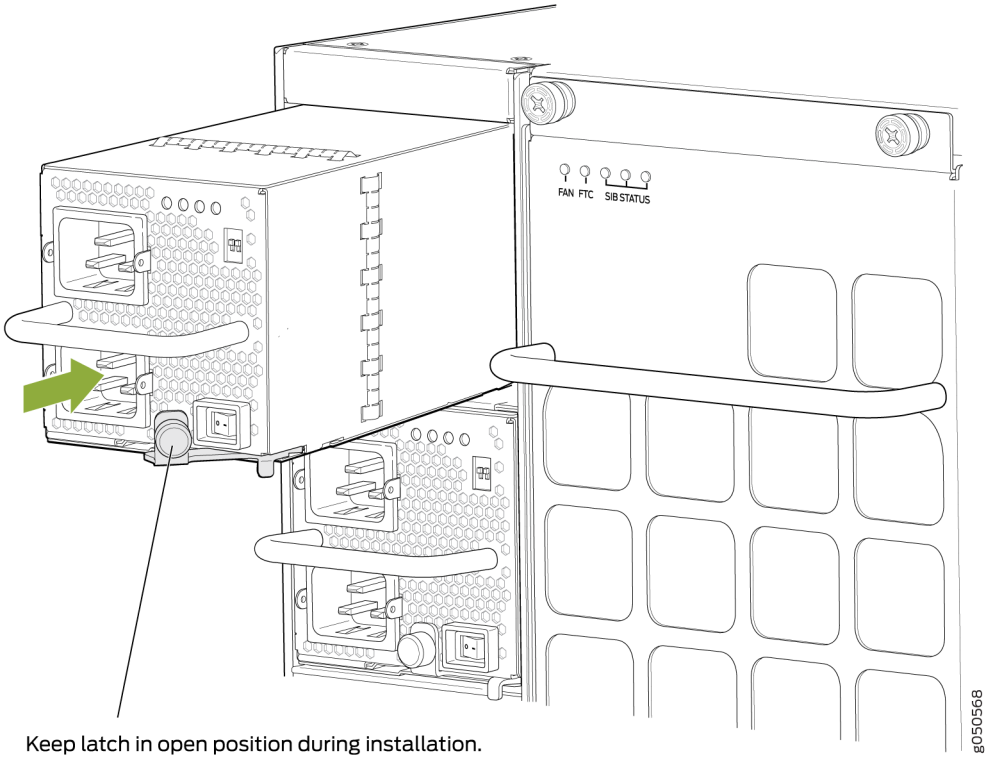
Figure 98: Removing the Power Supply Cover on a MX10016



3. Taking care not to touch power supply connections, remove the power supply from its bag.
4. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
5. Ensure the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt AC supply.
6. Unscrew the captive screw in the counterclockwise direction by using the Phillips (+) screwdriver, number 1.

7. Rotate the captive screw away from the faceplate of the power supply to release the latch. You can install the power supplies in any slot labeled **PSU 0** through **PSU 5** (top to bottom) on an MX10008 and **PSU 0** through **PSU 9** on a MX10016.
8. Using both hands, place the power supply in the power supply slot on the rear of the system.
9. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure the power supply faceplate is flush with any adjacent power supply faceplates or power supply covers (see Figure 99 on page 210 and Figure 100 on page 211).
10. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
11. Tighten the captive screw by turning it clockwise by using the Phillips (+) screwdriver, number 1. When the screw is completely tight, the latch locks into the router chassis.

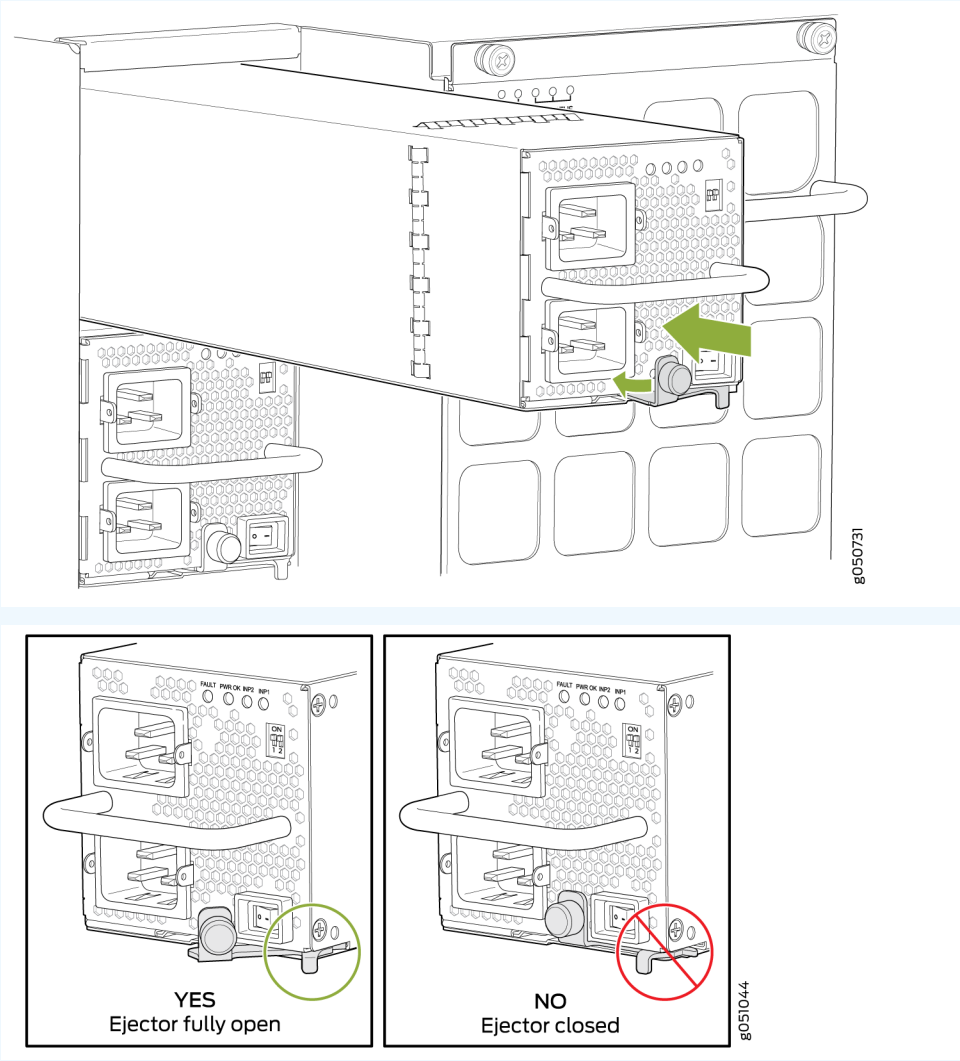
Figure 99: Installing a JNP10K-PWR-AC Power Supply in an MX10008



Keep latch in open position during installation.

NOTE: Ensure that the ejector is fully open to avoid scratching the chassis.

Figure 100: Installing a JNP10K-PWR-AC Power Supply in an MX10016



12. Manually load balance the power supplies as you attach each power cable to a dedicated AC power source outlet. To load balance, route the power cables to alternate between power sources. The JNP10K-PWR-AC does not share power; all power comes into INP1 (lower receptacle) and only uses INP2 (top receptacle) at fail over. See Figure 101 on page 212 for MX10008 and Figure 102 on page 212

Figure 101: Proper Load Balancing for JNP10K-PWR-AC Power Cables on MX10008

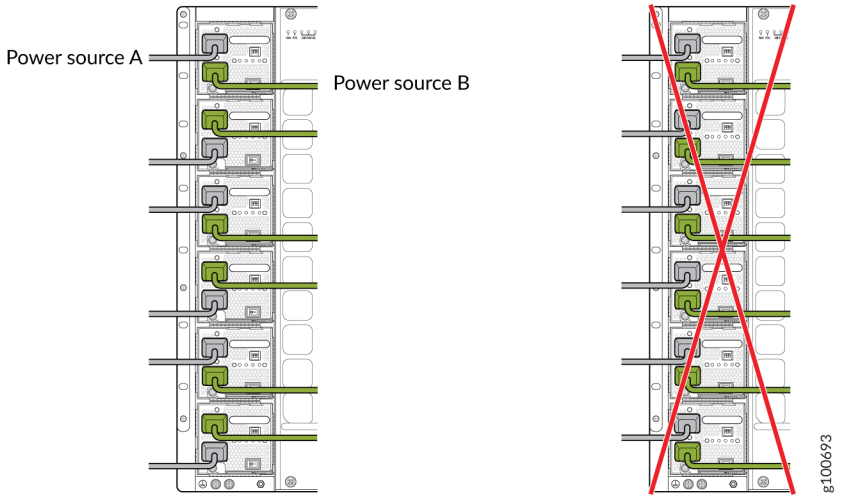
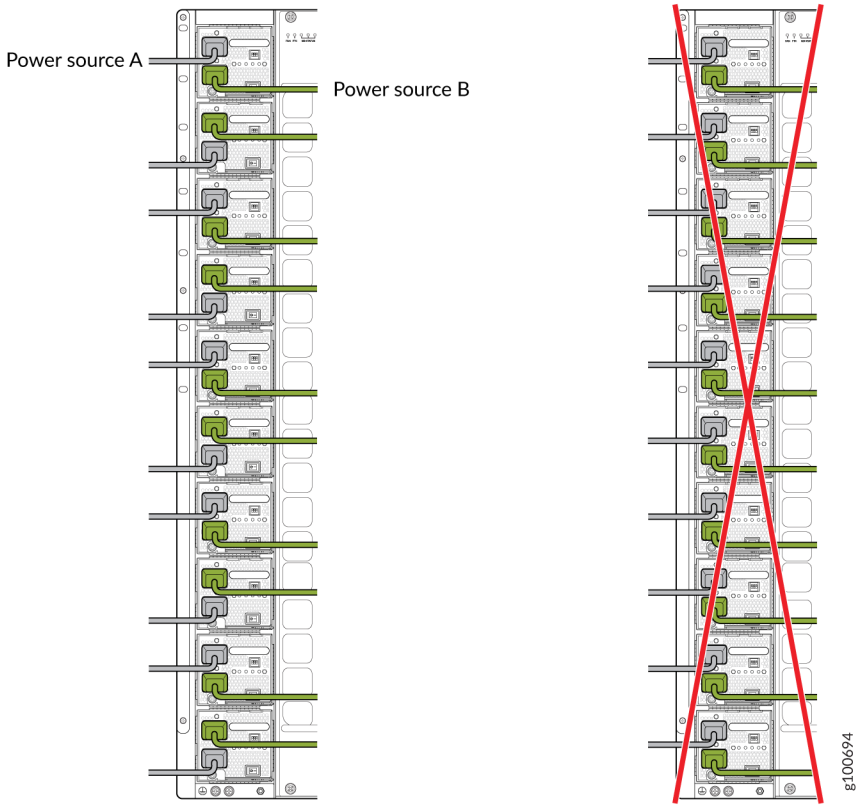


Figure 102: Proper Load Balancing for JNP10K-PWR-AC Power Cables on MX10016

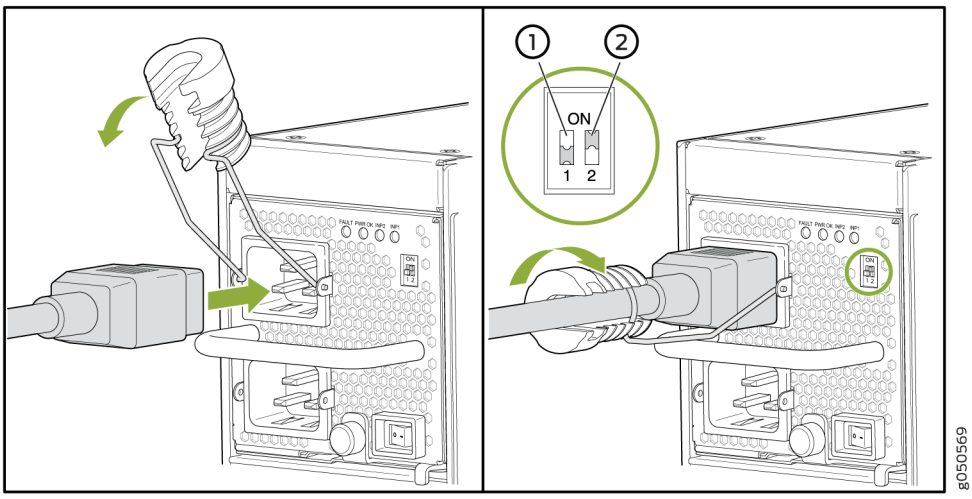


WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

13. Squeeze the two sides of the power cord retainer clip and insert the ends of the clip into the holes in the bracket on each side of the AC appliance inlets on the AC power supply faceplate. See Figure 103 on page 213.
14. Locate two power cords shipped with the router; the cords have plugs appropriate for your geographical location.
15. Insert the power cord coupler into the power supply.

    Each AC power supply has two independent 16 A rated AC inlets on the faceplate. Each inlet must be connected to a dedicated AC power feed to achieve 2*n* source redundancy. If redundancy is not a requirement, use the default input **INP1** for a single connection.
16. Fasten the cord retainer by lowering the clip over the cord and pushing the cord into the adjustment nut of the cord retainer. Rotate the nut until it is tight against the base of the cord. See Figure 103 on page 213.

Figure 103: Power Cord and Retainer Clip



1– Enable switch for **INP1** appears as INP0 in output.	2– Enable switch for **INP2** appears as INP1 in output.

WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

17. If the AC power source outlets have a power switch, set them to the on (|) position.

18. Move the enable switches for input 1 and input 2 to the **ON** position.
19. Verify that the **INP1** and **INP2** LEDs on the power supply faceplate are lit and are on steadily.
20. Press the power switch to the on (|) position.

SEE ALSO

Connect AC Power to an MX10008 | **174**

Power Requirements for an MX10008 Router | **112**

Field-Replaceable Units in an MX10008 | **33**

JNP10K-PWR-AC Power Supply | **58**

How to Remove a JNP10K-PWR-AC2 Power Supply

Before you remove an JNP10K-PWR-AC2 power supply from the chassis:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

Ensure that you have the following parts and tools available to remove a JNP10K-PWR-AC2 power supply from an MX10000 router:

- Heat protective gloves able to withstand temperatures of 158°F (70°C)
- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 1
- Replacement power supply or a cover panel for the power supply slot

The JNP10K-PWR-AC2 power supply in an MX10008 or an MX10016 chassis is a hot-removable and hot-insertable field-replaceable unit (FRU). You remove all power supplies from the rear of the chassis.



WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a working JNP10K-PWR-AC2 power supply from the chassis. These power supplies can reach 158°F (70°C).

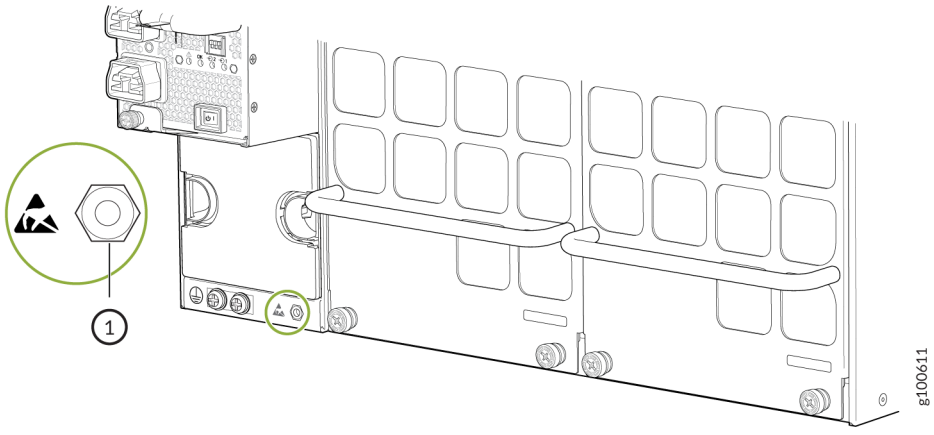
CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "Power Requirements for an MX10008 Router" on page 112.

CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

To remove a JNP10K-PWR-AC2 power supply from an MX10000 router:

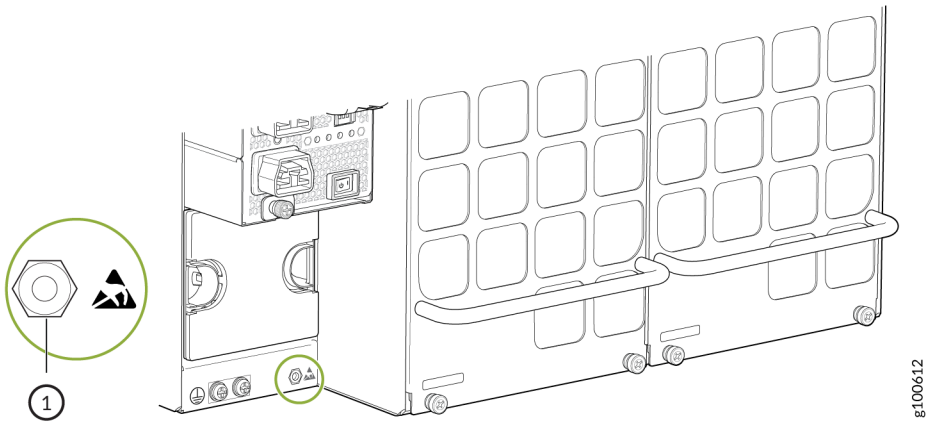
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10000 rear panel (see Figure 104 on page 215) and below **PSU_9** on the MX10016 (see Figure 105 on page 216).

Figure 104: ESD Point on the MX10008 Chassis Rear



1– ESD point

Figure 105: ESD Point on the MX10016 Chassis Rear



1– ESD point

2. Flip the power | switch next to the appliance inlet on the power supply to the standby position.
3. If the AC or DC power source outlets have a power switch, set them to the OFF position.
4. Disconnect the Anderson connectors from each input on the JNP10K-PWR-AC2 power supply faceplate.
5. Unscrew the captive screw counterclockwise by using the Phillips (+) screwdriver, number 1. See Figure 106 on page 217 and Figure 107 on page 217.

Figure 106: Removing a JNP10K-PWR-AC2 from an MX10008 Chassis

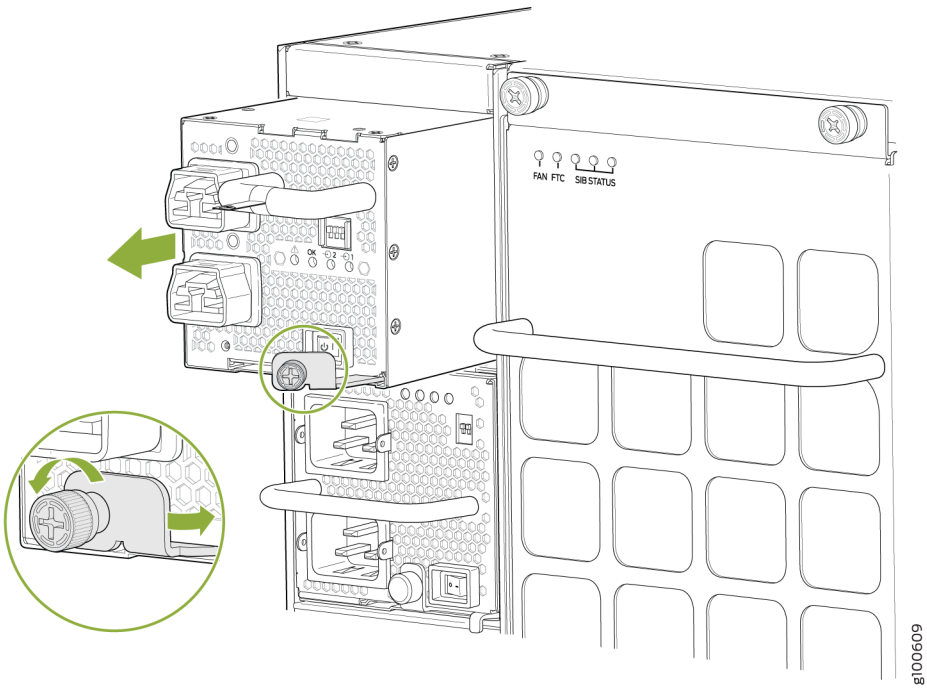
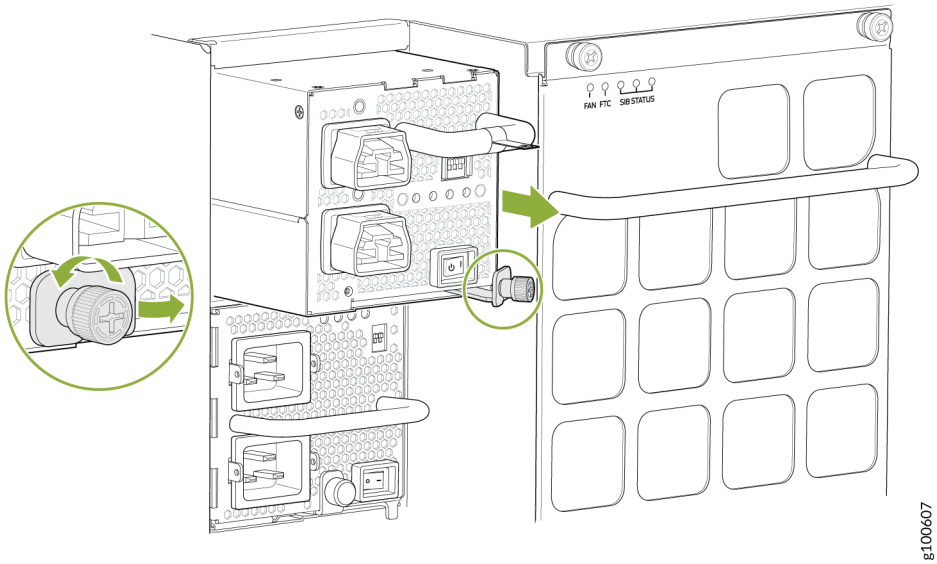


Figure 107: Removing a JNP10K-PWR-AC2 from an MX10016 Chassis



6. Rotate the captive screw away from the faceplate of the power supply to release the latch.
7. Put on your heat protective gloves before removing the power supply from the chassis.

8. Taking care not to touch the power supply output connections, pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.

   CAUTION: Do not bump the output connections. If the connection hits a solid object, it could damage the power supply.

9. Place the JNP10K-PWR-AC2 on an antistatic surface to completely cool before placing the power supply in an antistatic bag for storage.
10. If you are not replacing the power supply, install the cover over the slot by inserting your thumb and forefinger into the finger holes, squeezing and pulling the cover out of the slot. Do not run the chassis without a power supply or cover in place.

How to Install a JNP10K-PWR-AC2 Power Supply

The JNP10K-PWR-AC2 power supply in an MX10008 or an MX10016 chassis is a hot-insertable and hot-removable field-replaceable unit (FRU). You can install up to 6 AC power supplies in a MX10008 and 10 in a MX10016 router chassis. All power supplies install in the rear of the chassis in the slots provided along the left side.

CAUTION: Do not mix AC and DC power supplies in the same running chassis. You may have both JNP10K-PWR-AC and JNP10K-PWR-AC2 in the same chassis while swapping out one type of power supply for the other.

WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a running JNP10K-PWR-AC2 power supply from the chassis. The power supply can reach 158°F (70°C).

Before you install a JNP10K-PWR-AC2 power supply in the chassis:

Ensure that you have followed all safety warnings and cautions:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- If the AC or DC power source outlets have a power switch, set them to the off (**O**) position.

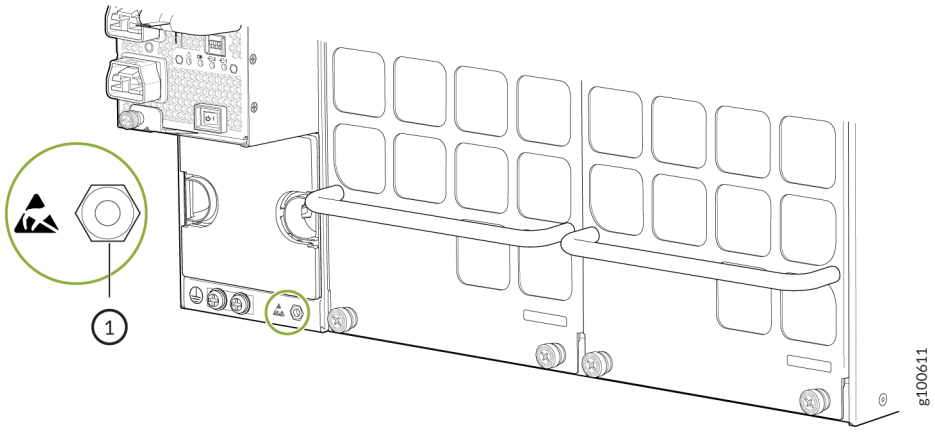
Ensure that you have the following parts and tools available to install an JNP10K-PWR-AC2 power supply:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 1
- Power cables appropriate for your geographical location (for low-voltage installations) or input amperage (for high-voltage installations). See "MX10008 Power Cables Specifications" on page 120. HVAC and HVDC connectors and lugs must be installed by a qualified electrician before installation.

To install a JNP10K-PWR-AC2 power supply in an MX10008 or an MX10016:

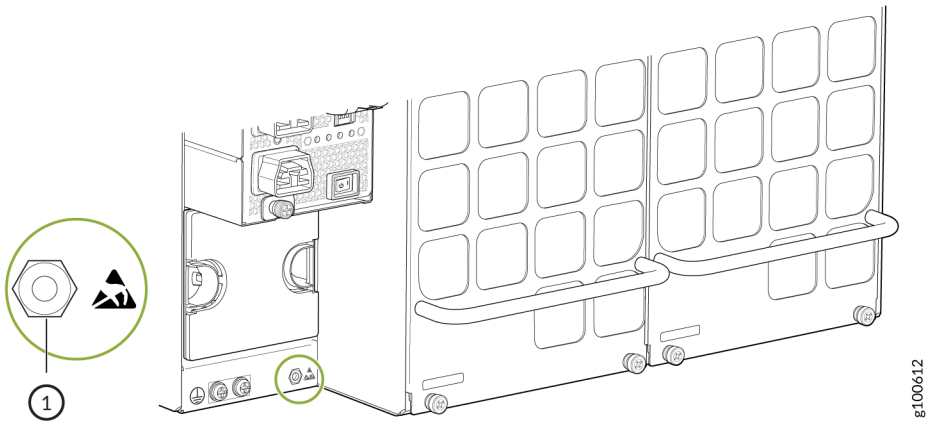
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU5** on the MX10008 rear panel (see Figure 108 on page 219) or below **PSU9** on the MX10016 (see Figure 109 on page 220).

Figure 108: ESD Point on the MX10008 Chassis Rear



1– ESD point	

Figure 109: ESD Point on MX10016 Chassis Rear



1– ESD point

2. If the power supply slot has a cover on it, insert your thumb and forefinger into the finger holes, squeeze, and pull the cover out of the slot. Save the cover for later use. See Figure 110 on page 220 for removal on a MX10008 and Figure 111 on page 221 for the MX10016.

Figure 110: Removing the Power Supply Cover on an MX10008

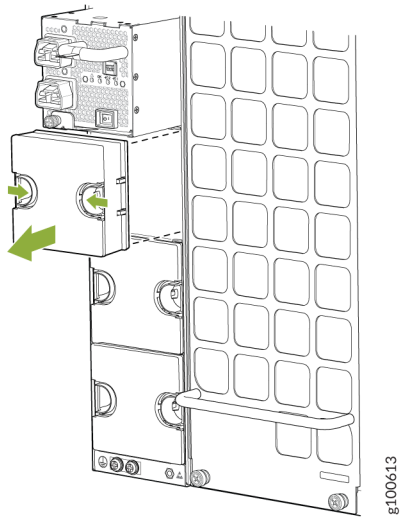
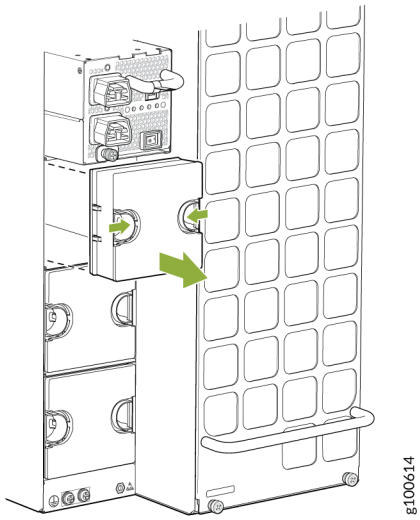


Figure 111: Removing the Power Supply Cover on an MX10016



3. Taking care not to touch power supply connections, remove the power supply from its bag.
4. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
5. Ensure the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt input power.
6. Unscrew the captive screw in the counterclockwise direction by using the Phillips (+) screwdriver, number 1.
7. Rotate the captive screw away from the faceplate of the power supply to release the latch.

> **NOTE**: You can install the power supplies in any slot labeled **PSU 0** through **PSU 5** (top to bottom) on an MX10008, and **PSU 0** through **PSU 9** on a MX10016.

8. Using both hands, place the power supply in the power supply slot on the rear of the system. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure the power supply faceplate is flush with any adjacent power supply faceplates or power supply covers (see Figure 112 on page 222 and Figure 113 on page 222).
9. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
10. Tighten the captive screw by turning it clockwise by using the Phillips (+) screwdriver, number 1. When the screw is completely tight, the latch locks into the router chassis.

Figure 112: Installing JNP10K-PWR-AC2 in an MX10008

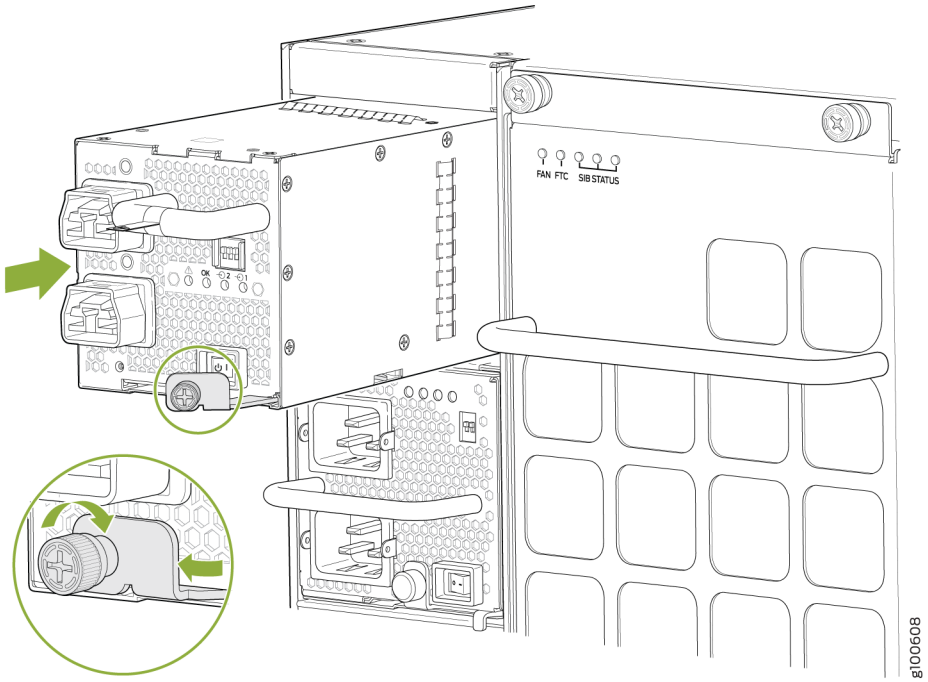
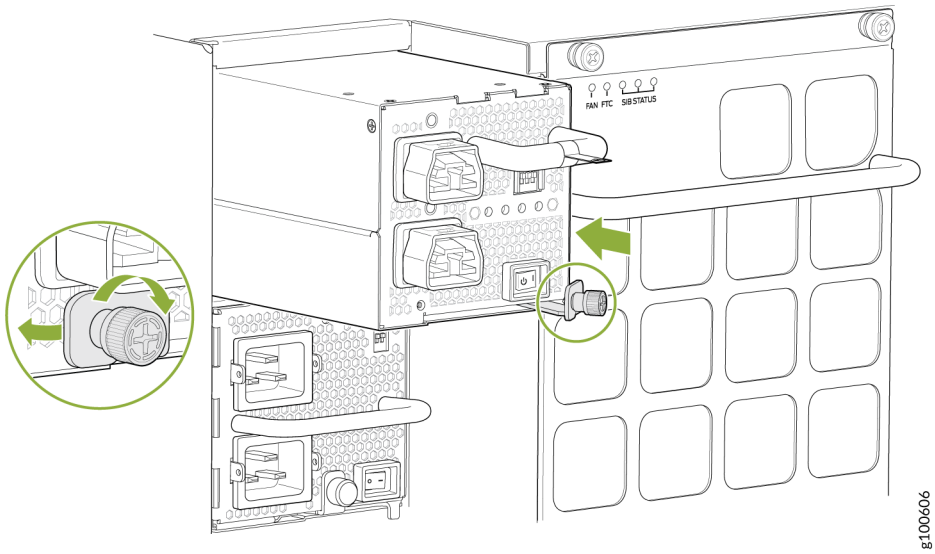


Figure 113: Installing a JNP10K-PWR-AC2 in an MX10016



11. Attach each power cable to a dedicated power (A and B). The JNP10K-PWR-AC2 only requires that each power supply be connected to a separate source. See Figure 114 on page 223 for some possible cabling combinations for MX10008 and Figure 115 on page 224 for MX10016.

Figure 114: Proper Load Balancing for JNP10K-PWR-AC2 Power Cables on MX10008

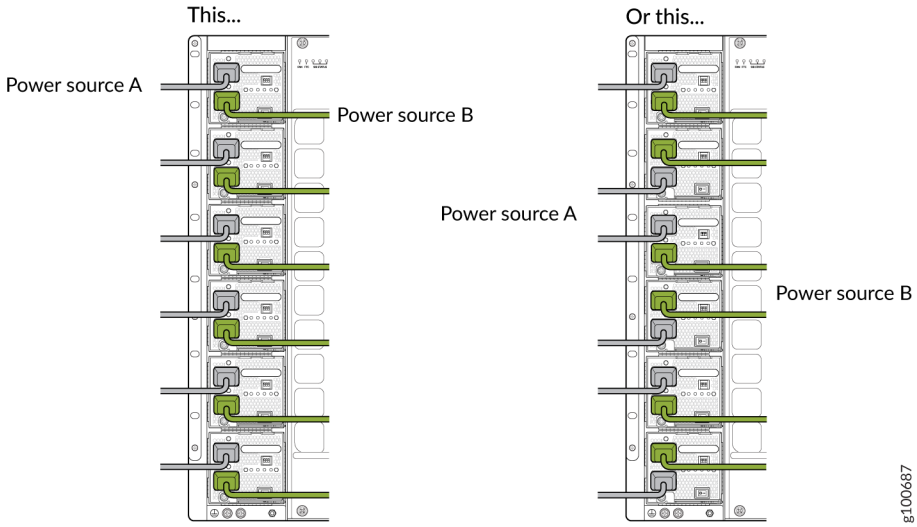
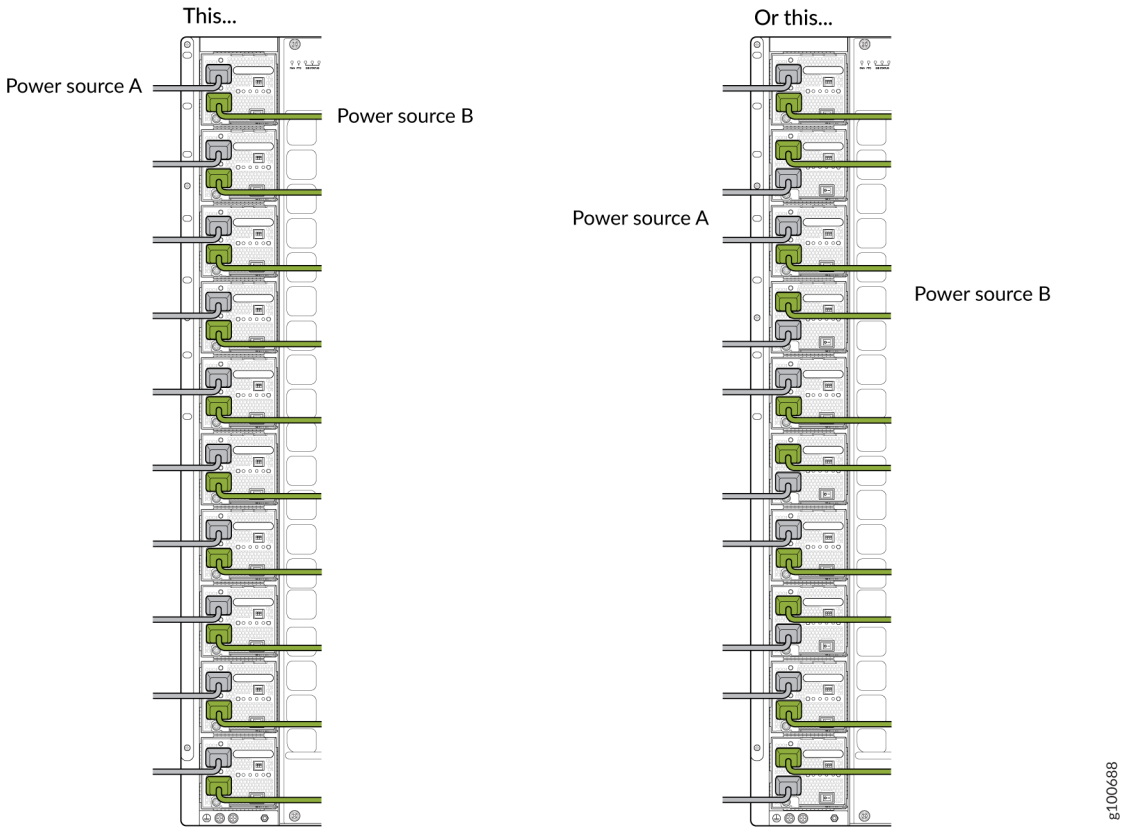


Figure 115: Proper Load Balancing for JNP10K-PWR-AC2 Power Cables on MX100016



12. For each power cable, insert the end of the cable with the Anderson connector into the JNP10K-PWR-AC2 power supply module. The connector snaps and locks the cable into position.

> **WARNING**: Ensure that the power cords do not block access to router components or drape where people can trip on them.

13. If the AC or DC power source outlets have a power switch, set them to the on (|) position.
14. Set the three DIP switches to set the inputs and whether the power supply is running at 3000 W, 5000 W, or 5500 W. See Table 62 on page 225.

    Set both enable switches to the **on** position when using both source inputs; power is shared equally. When not using source redundancy, set the unused source to the **O** (off) position. The LED turns red and indicates an error if a source input is not in use and the enable switch is **|** (on).

Table 62: Setting the JNP10K-PWR-AC2 DIP Switches

Switch	State	Field
1	On	INP1 (INP0 in CLI output) is present
	Off	INP1 is not present
2	On	INP2 (INP1 in CLI output) is present
	Off	INP2 is not present
3	On	Enabled for 30 A feed; 5500-W for a single feed, 5000-W for dual feeds
	Off	Enabled for 20 A feed; power supply capacity is 3000-W

15. Verify that the **INP1** and **INP2** LEDs on the power supply faceplate are lit and are on steadily.
16. Press the power switch to the on (|) position.

How to Remove a JNP10K-PWR-DC Power Supply

Before you remove a DC power supply from the router:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

Ensure that you have the following parts and tools available to remove a JNP10K-PWR-DC power supply:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, numbers 1 and 2
- 13/32 in. (10 mm) nut driver or socket wrench
- Replacement power supply or a cover for the power supply slot

The JNP10K-PWR-DC power supply in an MX10008 and in an MX10016 chassis is a hot-removable and hot-insertable field-replaceable unit (FRU). You remove DC power supplies from the rear of the chassis.

CAUTION: Before you remove a power supply, ensure that sufficient power supplies are left in the chassis to power the router (see "Power Requirements for an MX10008 Router" on page 112).

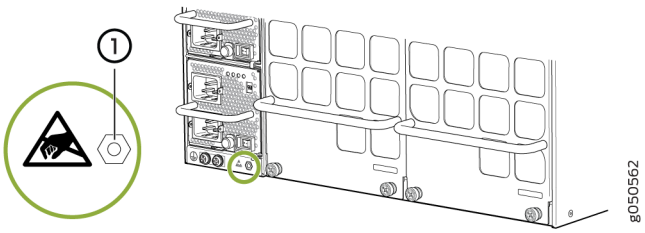
WARNING: Before performing DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, router the circuit breaker to the OFF position, and tape the router handle of the circuit breaker in the OFF position.

CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

To remove a JNP10K-PWR-DC power supply from an MX10000 router:

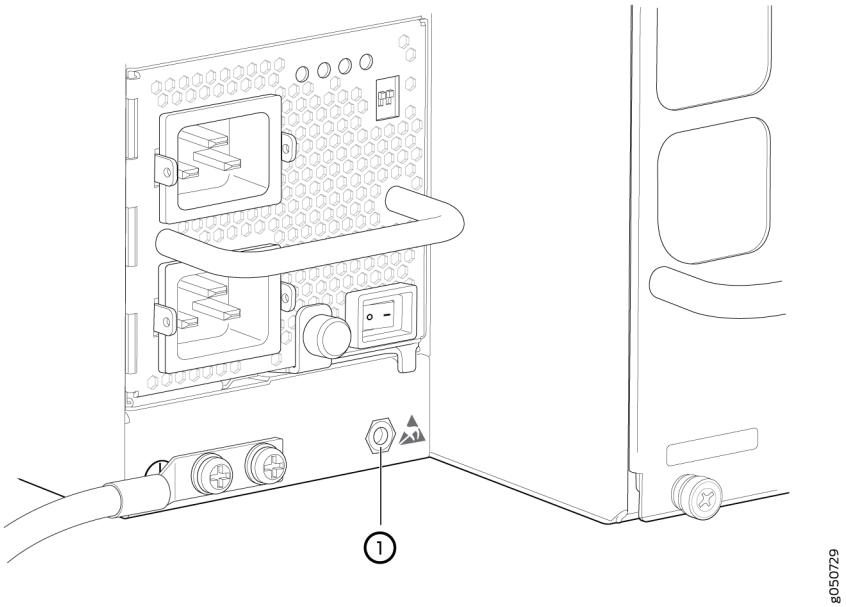
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 116 on page 226) and below **PSU_9** on the MX10016 (see Figure 117 on page 227).

Figure 116: ESD Point on an MX10008 Chassis Rear



1– ESD point

Figure 117: ESD Point on an MX10016 Chassis Rear



1–	ESD point

2. Make sure that the voltage across the DC power source cables leads is 0 V and that there is no chance that the cable leads might become active during the removal process.
3. Ensure the black power supply output switch, to the right of the captive screw, is set to the standby position.
4. Unscrew the captive screw counterclockwise by using the Phillips (+) screwdriver, number 1.
5. Rotate the captive screw away from the faceplate of the power supply to release the latch. See Figure 118 on page 228 and Figure 119 on page 228.

Figure 118: Removing a JNP10K-PWR-DC Power Supply from an MX10008

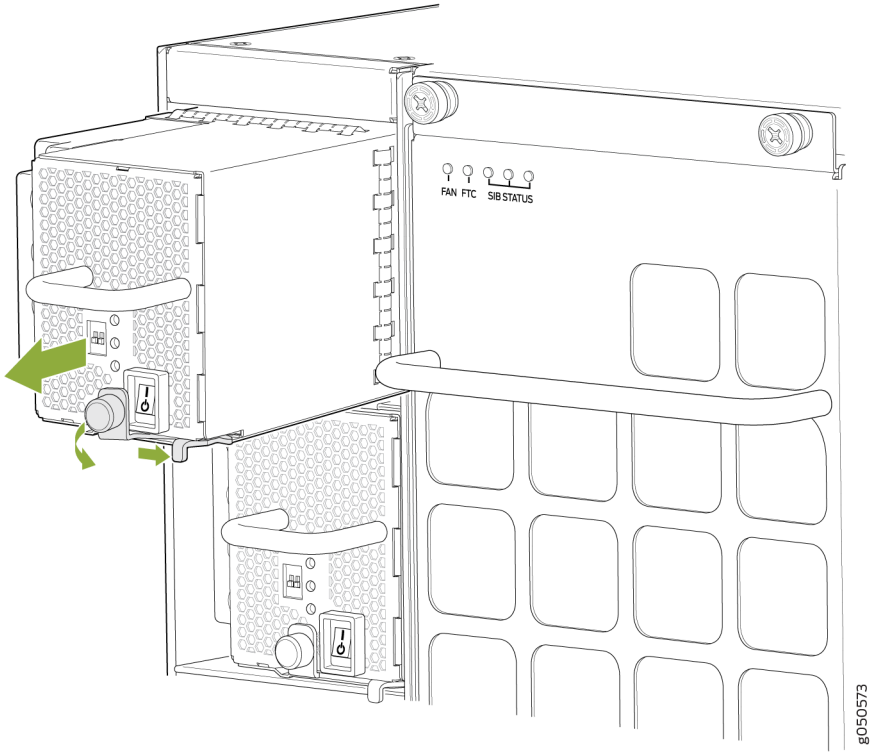
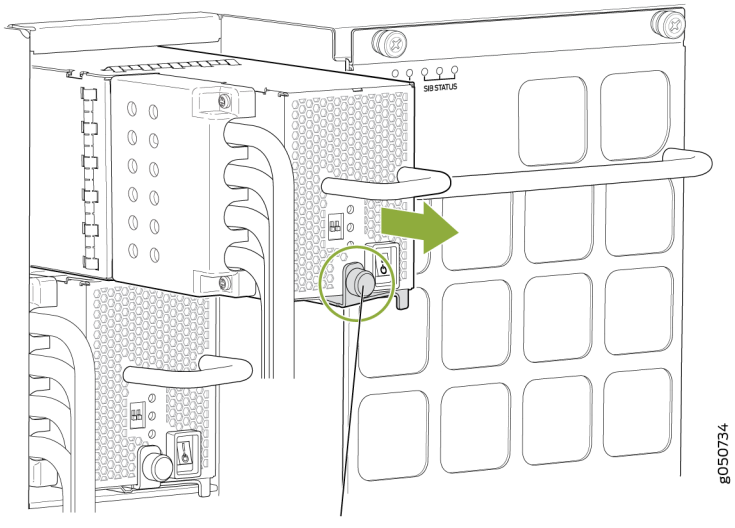
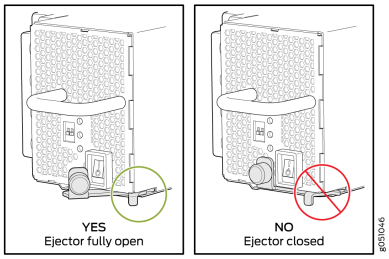


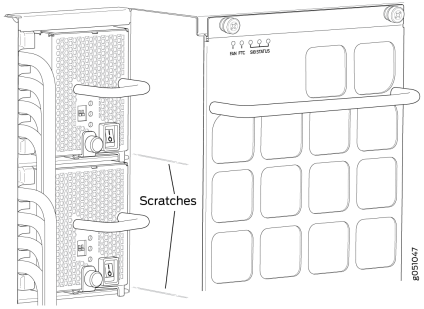
Figure 119: Removing a JNP10K-PWR-DC Supply from an MX10016



Keep latch in open position during removal.

NOTE: Ensure that the ejector is fully open to avoid scratching the chassis.





6. Taking care not to touch power supply components, pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.

CAUTION: See the heat symbol



. The power supply surfaces are hot. Allow a few minutes for the power supply to cool by pulling the power supply halfway out of the chassis, or wear heat-resistant gloves while removing the power supply.

7. If you are not replacing the power supply, install the cover panel over the slot.
   a. Insert your thumb and forefinger into the finger holes of the cover panel.
   b. Squeeze and place the cover in the slot.
   c. Release your fingers and the cover remains in the slot.
8. Remove the plastic cable cover that shields the DC power input terminal studs counterclockwise by using the number 2 Phillips (+) screwdriver.
9. Unscrew the nuts counterclockwise using the 13/32 in. (10 mm) nut driver or socket wrench from the input terminal studs.
10. Remove the cable lugs from the input terminal studs.

SEE ALSO

JNP10K-PWR-DC Power Supply | 62

How to Install a JNP10K-PWR-DC Power Supply

Before you install a JNP10K-PWR-DC power supply in the chassis, ensure that you have followed all safety warnings and cautions:

WARNING: Before performing DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, router the circuit breaker to the OFF position, and tape the router handle of the circuit breaker in the OFF position.

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

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

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect MX10000 routers to earth ground before you connect them to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the router chassis to connect to earth ground. For instructions on connecting an MX10000 router to ground using a separate grounding conductor, see "Connect the MX10008 to Earth Ground" on page 172.

NOTE: Each battery return of the DC power supply must be connected as an isolated DC return (DC-I).

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

- Ensure that you have the following parts and tools available to install a JNP10K-PWR-DC power supply:
  - Electrostatic discharge (ESD) grounding strap
  - DC power source cables (not provided) with the cable lugs (provided) attached

    The provided terminal lugs in an MX10000 are sized for either4 AWG (21.1 mm^2) or 6 AWG (13.3 mm^2) power source cables. When running all JNP10K-PWR-DC power supply modules in the chassis, the DC power source cables that you provide must be 6 AWG (13.3 ^{2}) mm^2) stranded wire We recommend that you install heat-shrink tubing insulation around the crimped section of the power cables and lugs.

    NOTE: If you upgrade the JNP10K-PWR-DC to a JNP10K-PWR-DC2 and set the input mode to high (80-A), you must use 4 AWG (21.1 mm^2) stranded wire.

    NOTE: See the heat symbol

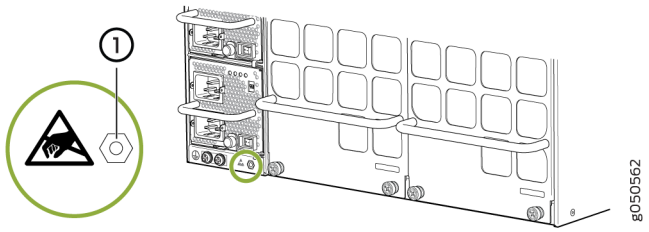
    . Wear heat-resistant gloves while accessing the fan tray and power supply.
  - 13/32 in. (10 mm) nut driver or socket wrench
  - Phillips (+) screwdrivers, numbers 1 and 2
  - Multimeter

The JNP10K-PWR-DC power supply in an MX10008 and MX10016 chassis is a hot-removable and hot-insertable field-replaceable unit (FRU). You can install up to 6 JNP10K-PWR-DC power supplies in an MX10008 router chassis and 10 in an MX10016 router chassis. All power supplies install in the rear of the chassis in the slots along the left side of the chassis.

To install a JNP10K-PWR-DC power supply in an MX10000:

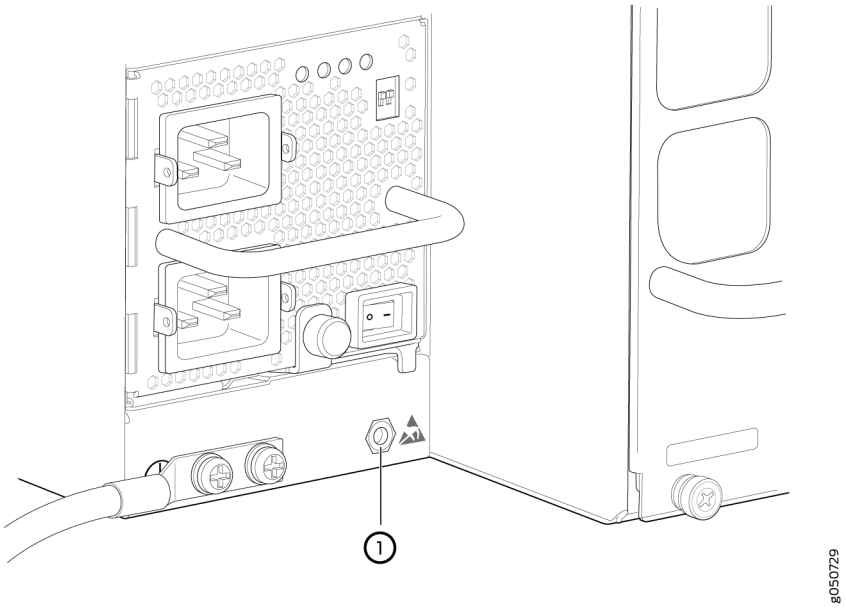
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 120 on page 232) and below **PSU_9** on the MX10016 rear panel (see Figure 121 on page 232).

Figure 120: ESD Point on MX10008 Chassis Rear



1– ESD point

Figure 121: ESD Point on an MX10016 Chassis Rear



1– ESD point

2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.

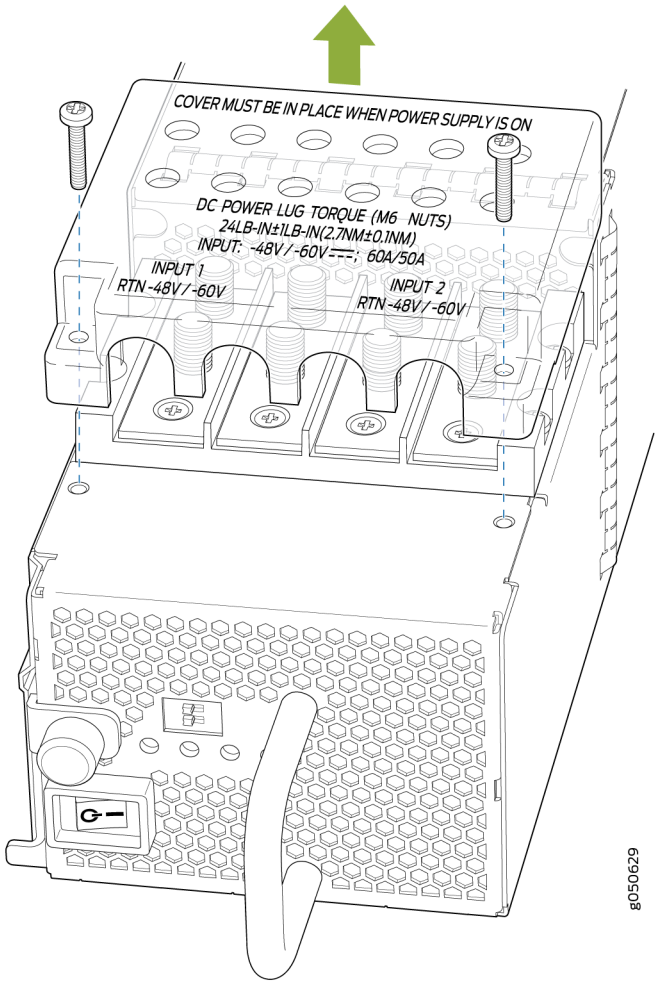
CAUTION: See the heat symbol



. The power supply surfaces are hot. Allow a few minutes for the power supply to cool by pulling the power supply halfway out of the chassis, or wear heat-resistant gloves while removing the power supply.

3. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
4. Ensure the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt DC.
5. Remove the plastic cable cover from the DC power input terminals by using the Phillips (+) screwdriver, number 2, to loosen the screws (see Figure 122 on page 234).

Figure 122: Removing the Plastic Cable Cover on an MX10008 DC Power Supply



6. Remove the nuts from each DC power input terminal, using the 13/32 in. (10 mm) nut driver or socket wrench to loosen the nuts.
7. Ensure that the power source circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.
8. Install a power lug on each DC power cable. Ensure the lug meets the double hole standard lug terminal for 4 AWG wire. The lugs should be dual, 1/4 in. spaced 5/8 in. apart. The terminal must accommodate double hole standard lug terminal for 4 AWG or larger wire.
9. Verify that the DC power cables are correctly labeled before making connections to the power supply.

   In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the **–48V** and **RTN** DC cables to chassis ground:

- The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the **–48V** (input) DC power input terminal.
- The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the **RTN** (return) DC power input terminal.

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

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

    To install heat-shrink tubing:

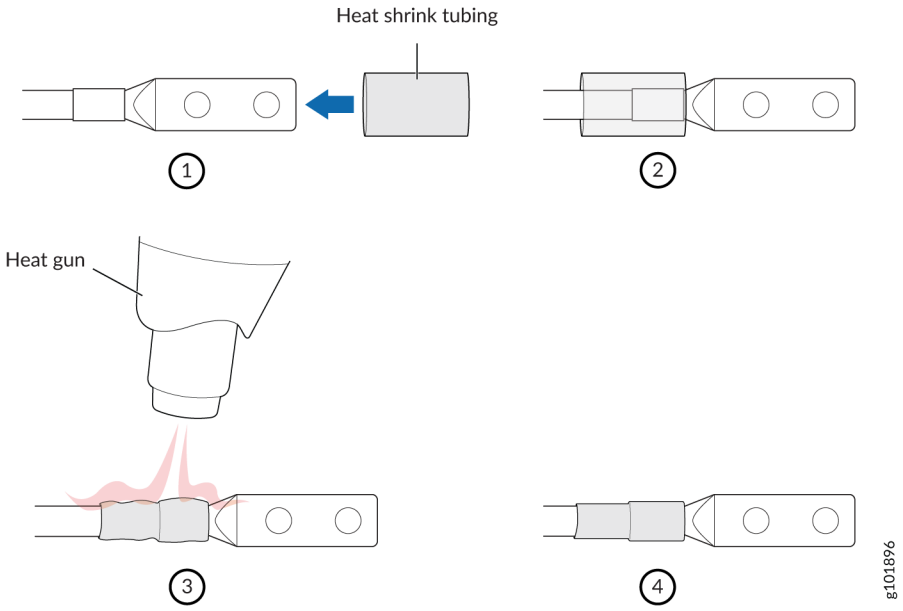
    a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

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

    Figure 123 on page 236 shows the steps to install heat-shrink tubing.

> **NOTE**: Do not overheat the tubing.

Figure 123: How to Install Heat-Shrink Tubing

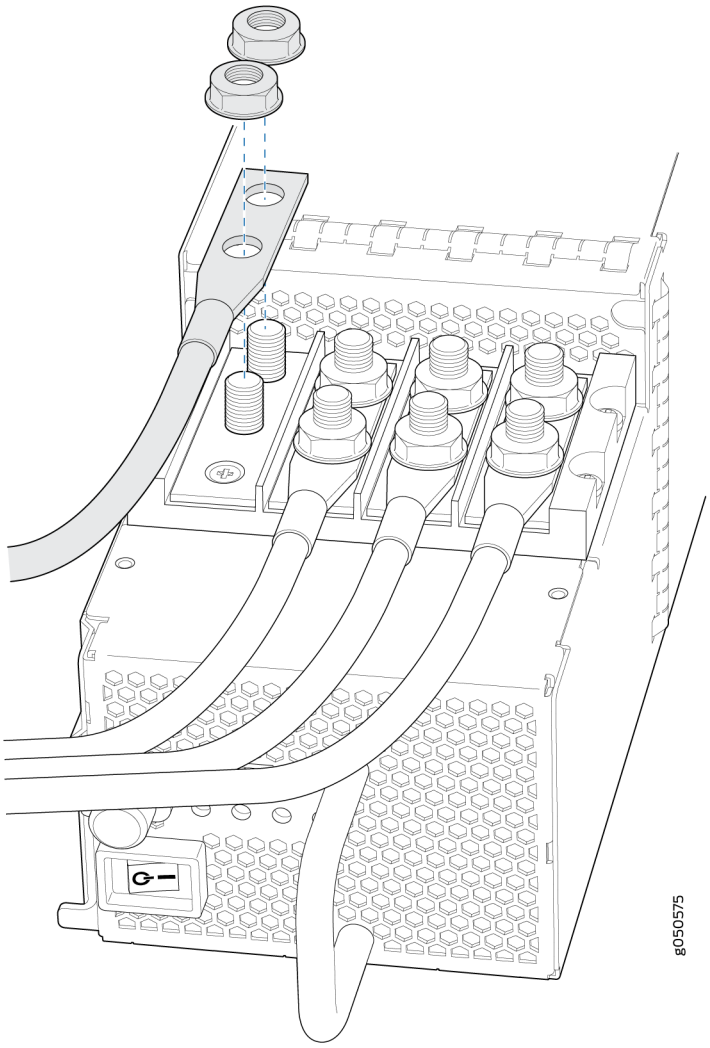


11. Install each power cable lug on the DC power input terminal, securing it with the nut (see Figure 124 on page 237). Apply between 24 in.-lb (2.7 Nm) and 25 in.-lb (2.8 Nm) of torque to each nut. (Use the 13/32 in. [10 mm] nut driver or socket wrench.)

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

    b. Secure each negative **(–)** DC source power cable lug to the **–48V** (input) DC power input terminal.

Figure 124: Connecting the DC Power Supply Cables to an JNP10K-PWR-DC



Each power supply has two independent sets of DC power input terminals (**INPUT 1: RTN –48V/–60V**: and **INPUT 2: : RTN –48V/–60V**). For feed redundancy, each power supply must be powered by dedicated power feeds derived from feed **INPUT 1** and feed **INPUT 2**. This configuration provides the commonly deployed INPUT 1 / INPUT 2 feed redundancy for the router. There is basic insulation between the inputs and the chassis ground. Also, there is basic insulation between RTN input feeds.

12. Install the plastic cable cover over each set of power cables by using the Phillips (+) screwdriver, number 2, to tighten the screw.
13. If the power supply slot on the chassis has a cover panel on it, insert your thumb and forefinger into the finger holes, squeeze, and pull the cover out of the slot. Save the cover panel for later use (see Figure 125 on page 238 for MX10008 installations and Figure 126 on page 238 for MX10016 installations).

Figure 125: Removing the PSU Cover Panel on an MX10008

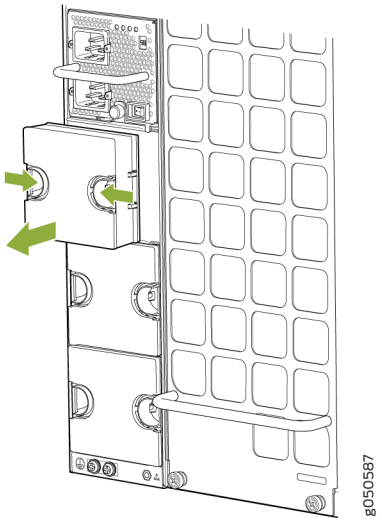
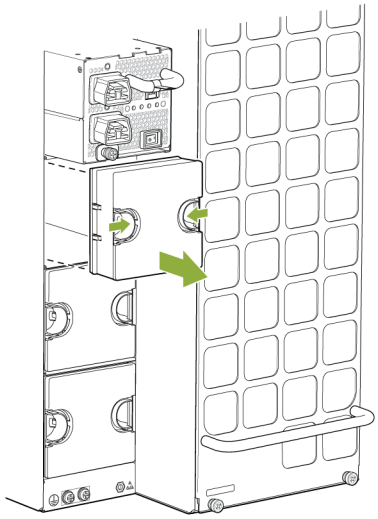


Figure 126: Removing the Power Supply Cover Panel on an MX10016



14. Unscrew the captive screw in the counterclockwise direction by using the Phillips (+) screwdriver, number 1.
15. Pull the captive screw away from the faceplate of the power supply to release the latch. You can install the power supplies in any slot labeled **PSU 0** through **PSU 5** (top to bottom) on an MX10008 and **PSU 0** through **PSU 9** on an MX10016.
16. Using both hands, place the power supply in the power supply slot on the rear of the router.

17. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure the power supply faceplate is flush with any adjacent power supply faceplates or power supply cover panels (see Figure 127 on page 239 and Figure 128 on page 240).
18. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
19. Tighten the captive screw by turning it clockwise by using the Phillips (+) screwdriver, number 1. When the screw is completely tight, the latch locks into the router chassis.

Figure 127: Installing a JNP10K-PWR-DC Power Supply in an MX10008

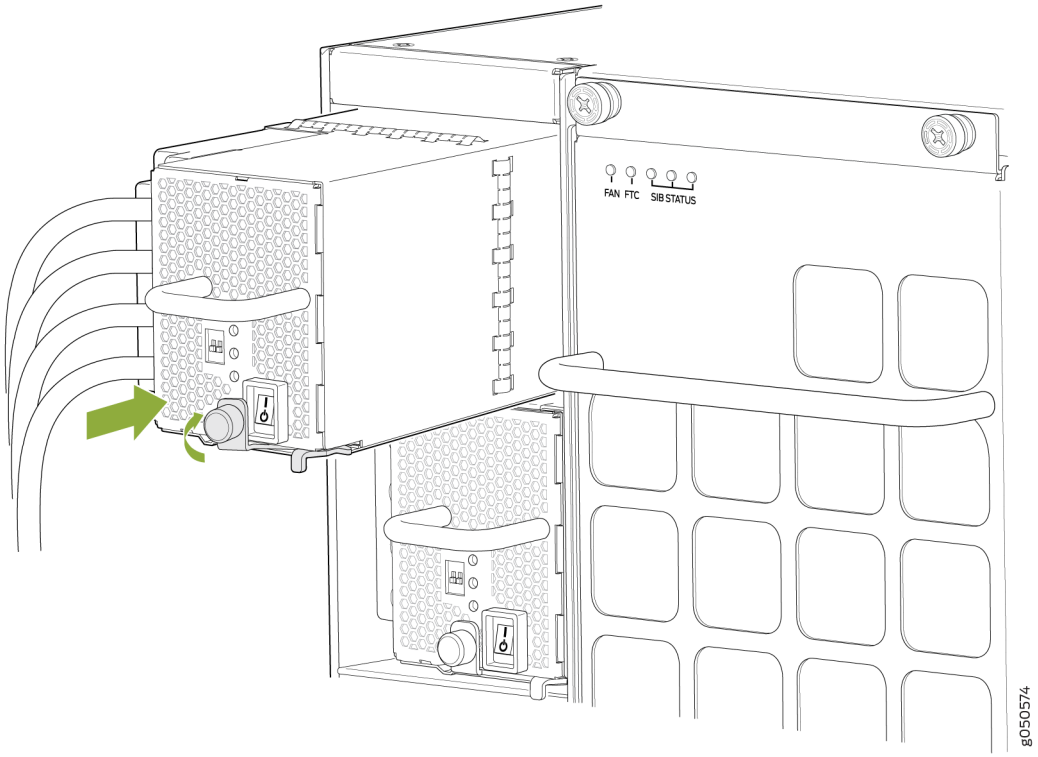
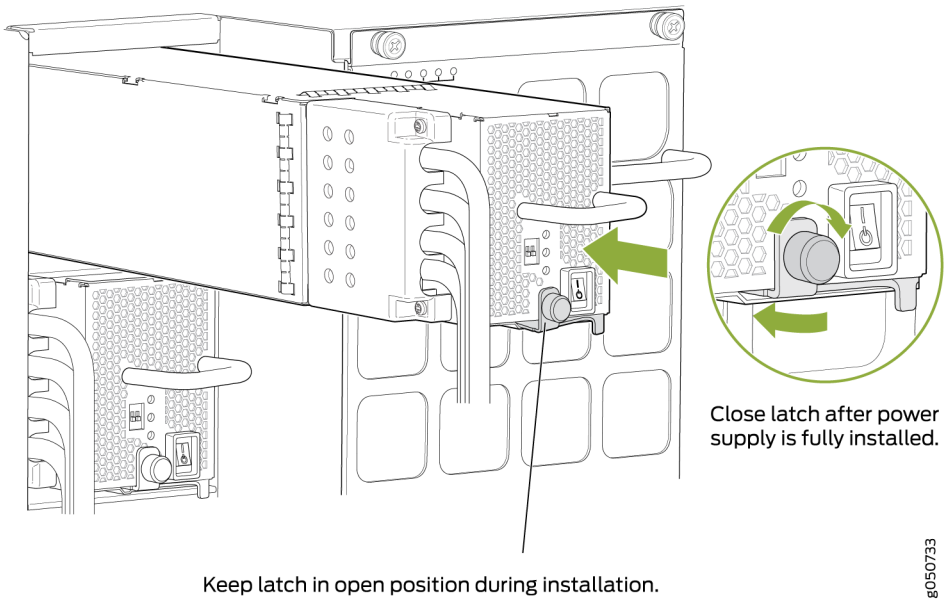
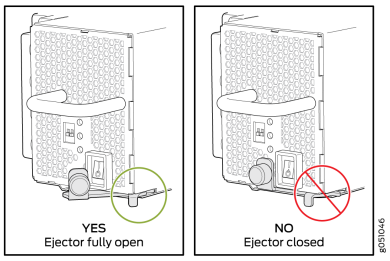
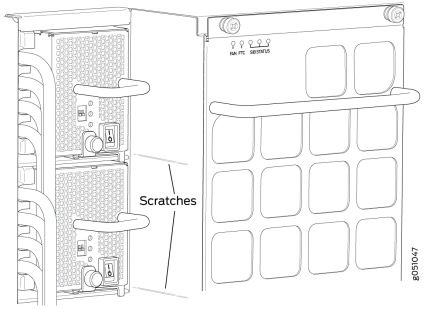


Figure 128: Installing a JNP10K-PWR-DC Power Supply in an MX10016



NOTE: Ensure that the ejector is fully open to avoid scratching the chassis.





20. Route INP1 cables to a power source and INP2 to another power source. The JNP10K-PWR-DC shares power, so if power dips on one input, the power supply is able to load balance internally. See Figure 129 on page 241 and Figure 130 on page 241.

Figure 129: Proper Load Balancing for JNP10K-PWR-DC Power Cables on MX10008

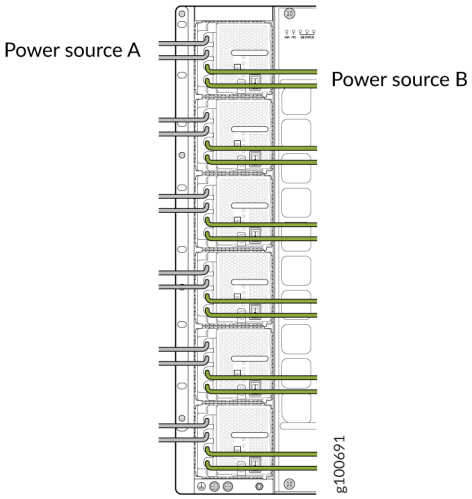
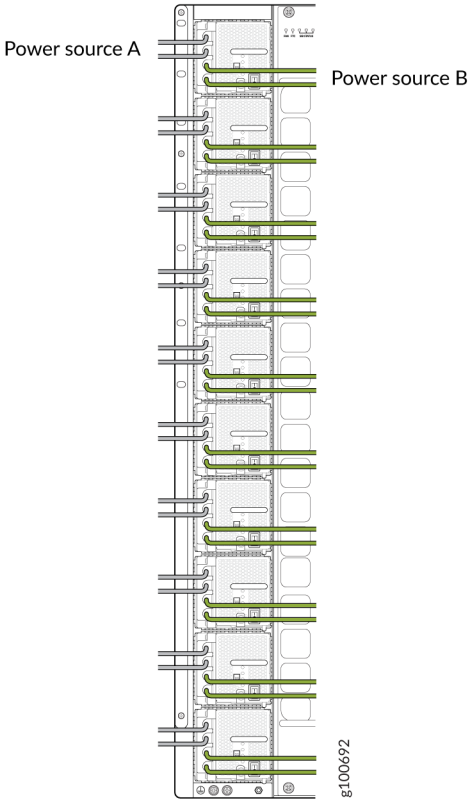


Figure 130: Proper Load Balancing for JNP10K-PWR-DC Power Cables on MX100016

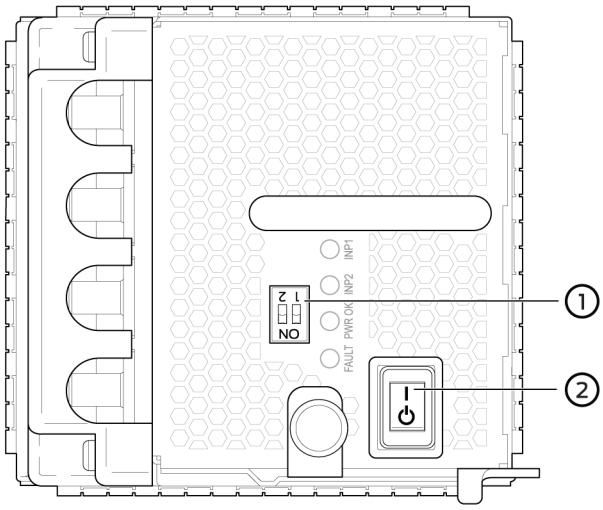


WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

21. Set the enable switches for input 1 and input 2 (see Figure 131 on page 242).

    Set both enable switches to the **|** (on) position when using both source inputs. When not using source redundancy, set the unused source to the **O** (off) position. The LED turns red and indicates an error if a source input is not in use and the enable switch is **|** (on).

Figure 131: Setting the Enable Switches for the Power Source



1– Dip switches for enabling input sources

2– Power switch, on (|) and standby (o)

22. Verify that the input 1 and 2 LEDs on the power supply faceplate are lit and are on steadily.
23. Press the power switch to the on (|) position.

SEE ALSO

JNP10K-PWR-DC Power Supply | 62

Connect DC Power to an MX10008 | 175

How to Remove a JNP10K-PWR-DC2 Power Supply

Before you remove a DC power supply from the router:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.

Ensure that you have the following parts and tools available to remove a JNP10K-PWR-DC2 power supply:

- Heat protective gloves able to withstand temperatures of 158°F (70°C)
- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, numbers 1 and 2
- 13/32 in. (10 mm) nut driver or socket wrench
- Replacement power supply or a cover panel for the power supply slot

The JNP10K-PWR-DC2 power supply in an MX10000 chassis is a hot-removable and hot-insertable field-replaceable unit (FRU). You remove power supplies from the rear of the chassis.

CAUTION: A working JNP10K-PWR-DC2 power supply can reach temperatures of 158°F (70°C); In order to avoid injury, do not touch a running power supply with your bare hands.

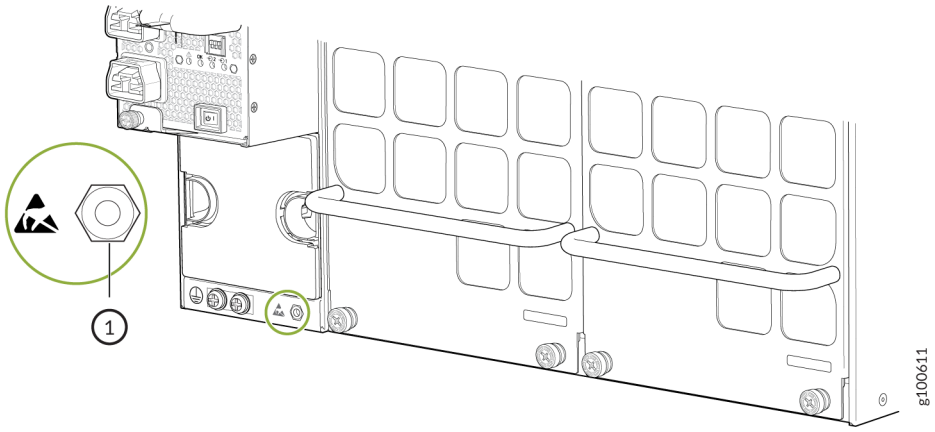
CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "Power Requirements for an MX10008 Router" on page 112, *Calculating Power Requirements for an MX10016* , and "Power Requirements for an MX10008 Router" on page 112.

CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

To remove a JNP10K-PWR-DC2 power supply from an MX10000 router:

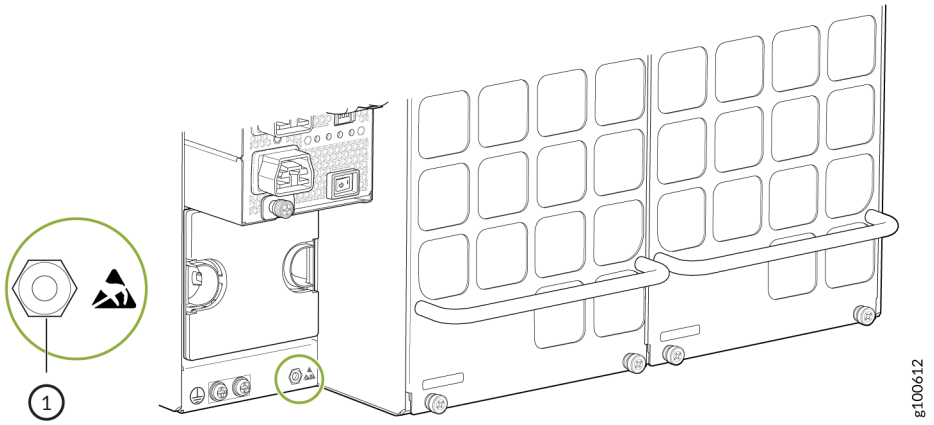
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 132 on page 244 and below **PSU_9** on the MX10016 (see Figure 133 on page 244).

Figure 132: ESD Point on an MX10008 Chassis Rear



1– ESD point

Figure 133: ESD Point on MX10016 Chassis Rear



1– ESD point

2. Make sure that the voltage across the DC power source cables leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Ensure the black power supply output router, to the right of the captive screw, is set to the standby position.
4. Unscrew the captive screw counterclockwise by using the Phillips (+) screwdriver, number 1.
5. Rotate the captive screw away from the faceplate of the power supply to release the latch. (See Figure 134 on page 245 and Figure 135 on page 245.)

Figure 134: Removing a JNP10K-PWR-DC2 Power Supply on an MX10008

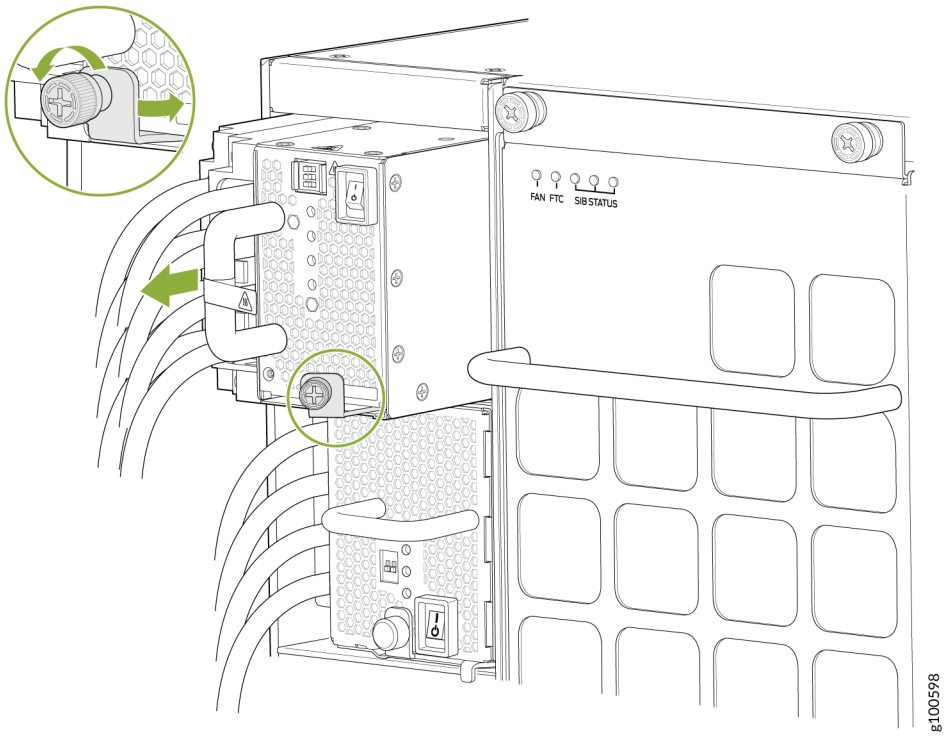
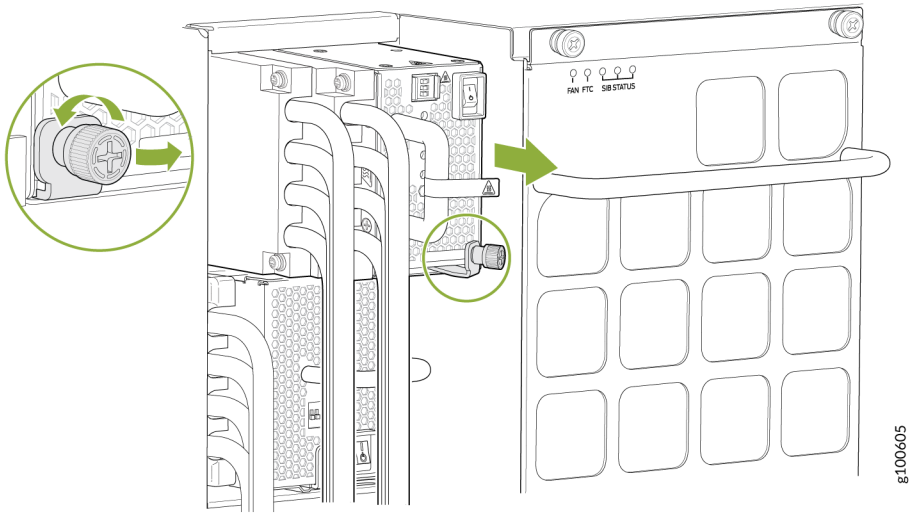


Figure 135: Removing a JNP10K-PWR-DC2 Power Supply on an MX10016



6. Put on the heat resistant gloves to protect your hands from the hot power supply.

7. Taking care not to touch power supply components, pins, leads, or solder connections, place one gloved hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.
8. If you are not replacing the power supply, install the cover panel over the slot.
   a. Insert your thumb and forefinger into the finger holes of the cover panel.
   b. Squeeze and place the cover in the slot.
   c. Release your fingers and the cover remains in the slot.
9. Unscrew the screw on the plastic cable cover that shield the input terminal studs counterclockwise by using the Phillips (+) screwdriver, number 2.
10. Unscrew the nuts counterclockwise using the 13/32 in. (10 mm) nut driver or socket wrench from the input terminal studs.
11. Remove the cable lugs from the input terminal studs.

How to Install a JNP10K-PWR-DC2 Power Supply

Before you install an HVDC power supply in the chassis, ensure that you have followed all safety warnings and cautions:



WARNING: Before performing DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, router the circuit breaker to the OFF position, and tape the router handle of the circuit breaker in the OFF position.



WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a working HVDC power supply from the chassis. HVDC power supplies can reach 158°F(70°C).



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

CAUTION: Do not mix AC, DC, or HVDC power supplies in the same running chassis. You can mix DC and HVDC power supplies while swapping out one type for another during installation.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect MX10008 routers to earth ground before you connect them to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the router chassis to connect to earth ground. For instructions on connecting an MX10000 router to ground using a separate grounding conductor, see "Connect the MX10008 to Earth Ground" on page 172.

NOTE: The battery returns of the JNP10K-PWR-DC2 power supply must be connected as an isolated DC return (DC-I).

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- Ensure that you have the following parts and tools available to install a DC power supply:
  - Electrostatic discharge (ESD) grounding strap
  - Use high current cable assembly, CBL-PWR2-BARE (not provided) with the cable lugs (provided) attached

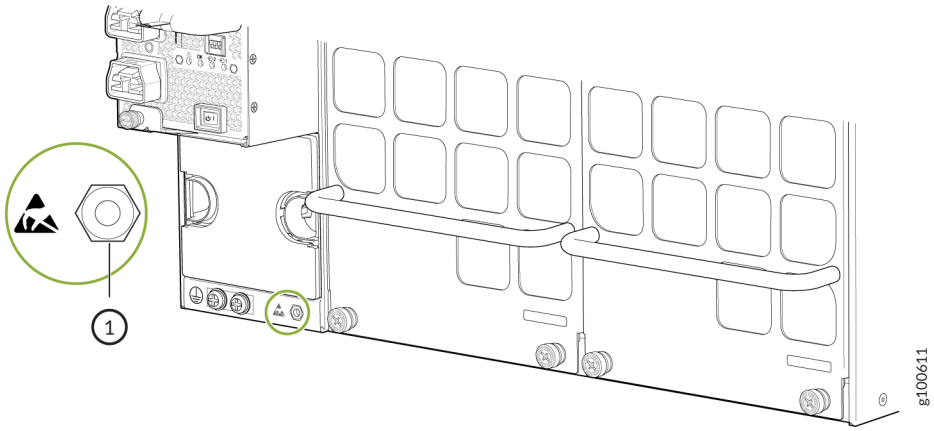
    The provided terminal lugs for the JNP10K-PWR-DC2 are Panduit LCD4-14A-L, or equivalent, and sized for 4 AWG (21.1 mm^2) power source cables. We recommend that you install heat-shrink tubing insulation around the crimped section of the power cables and lugs.
  - 13/32 in. (10 mm) nut driver or socket wrench
  - Phillips (+) screwdrivers, numbers 1 and 2
  - Multimeter

The JNP10K-PWR-DC2 power supply in an MX10000 chassis is a hot-removable and hot-insertable field-replaceable unit (FRU). You can install up to 6 power supplies in an MX10008 router chassis. All HVDC power supplies install in the rear of the chassis in the slots along the left side of the chassis.

To install a JNP10K-PWR-DC2 power supply in an MX10008 or PMTX10016 :

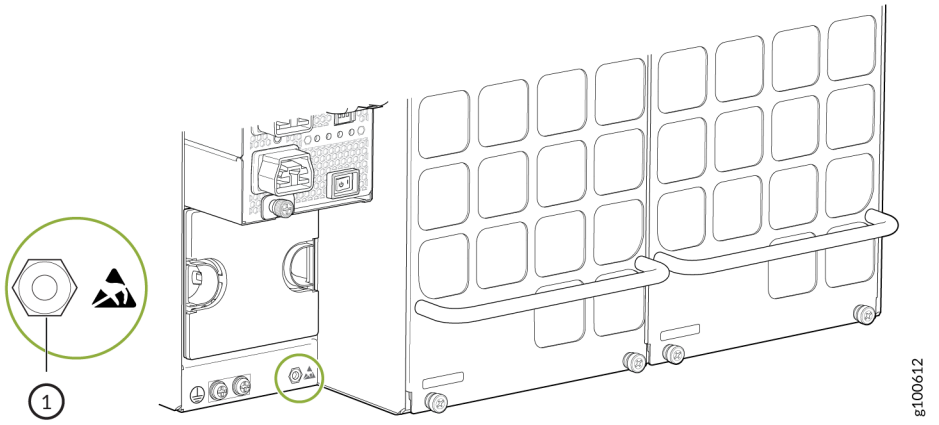
1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 136 on page 248) and below **PSU_9** on the MX10016 (see Figure 137 on page 248).

Figure 136: ESD Point on the MX10008 Chassis Rear



1– ESD point

Figure 137: ESD Point on the MX10016 Chassis Rear

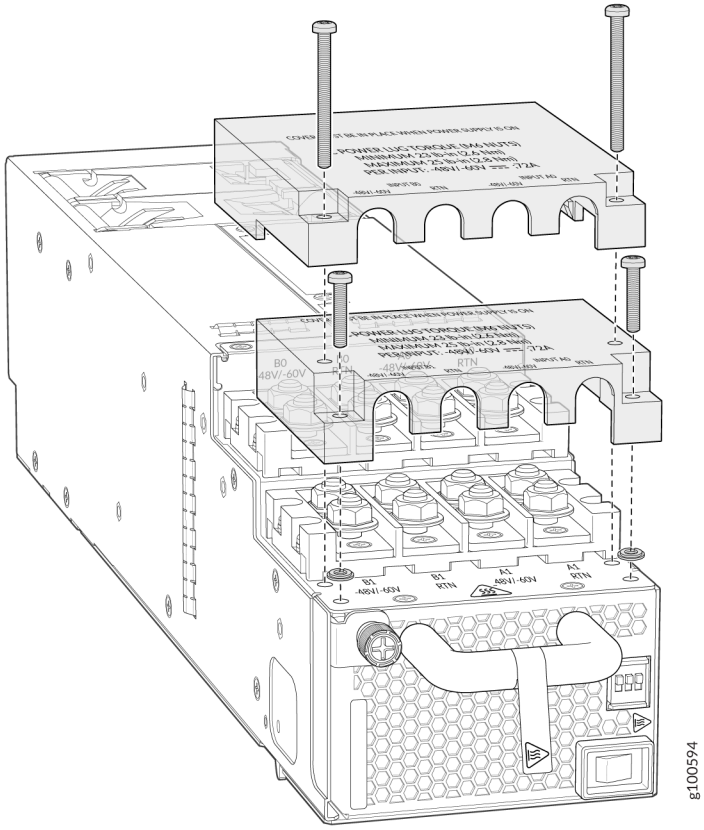


1– ESD point

2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
3. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.

4. Ensure the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt DC.
5. Remove the plastic cable cover from the power input terminals by using the Phillips (+) screwdriver, number 2, to loosen the screws (see Figure 138 on page 249).

Figure 138: Removing the Plastic Cable Cover on a JNP10K-PWR-DC2 Power Supply



6. Remove the nuts from each DC power input terminal, using the 13/32 in. (10 mm) nut driver or socket wrench to loosen the nuts.
7. Ensure that the power source circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.
8. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the **–48V** and **RTN** DC cables to chassis ground:
   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the **–48V** (input) DC power input terminal.

- The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the **RTN** (return) DC power input terminal.

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

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

   To install heat-shrink tubing:

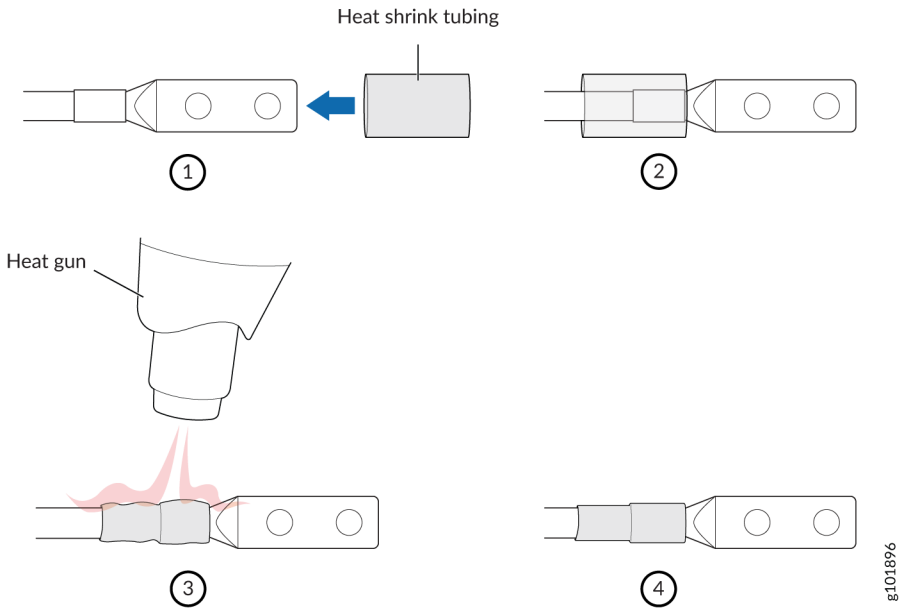
   a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

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

Figure 139 on page 250 shows the steps to install heat-shrink tubing.

> **NOTE**: Do not overheat the tubing.

Figure 139: How to Install Heat-Shrink Tubing



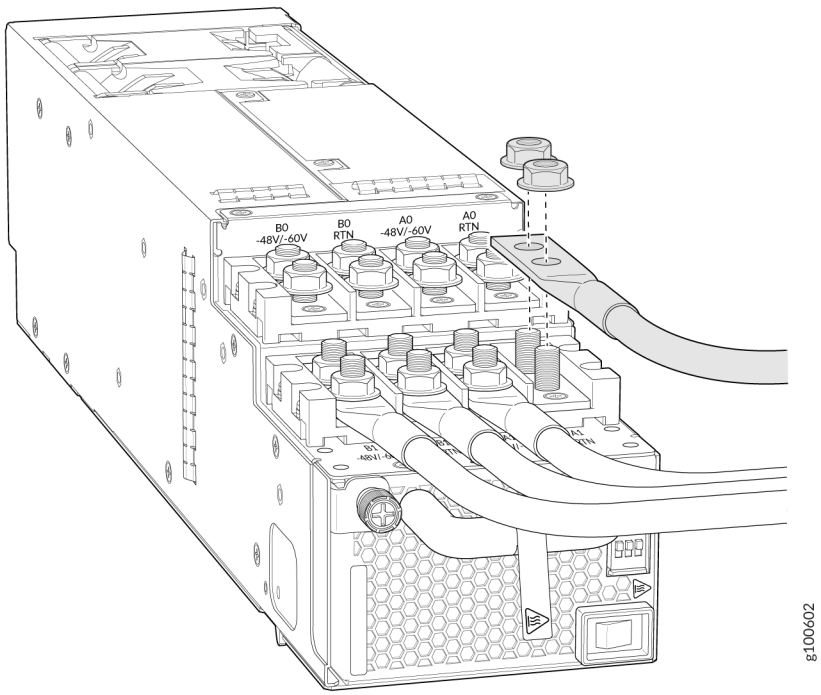
10. Install each power cable lug on the DC power input terminal, securing it with the nut (see Figure 140 on page 251). Apply between 24 in.-lb (2.7 N-m) and 25 in.-lb (2.8 N-m) of torque to each nut. (Use the 13/32 in. [10 mm] nut driver or socket wrench.)

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

    b. Secure each negative **(–)** DC source power cable lug to the **–48V** (input) DC power input terminal.

    Each power supply has two independent sets of DC power input terminals (**INPUT 1: RTN –48V/–60V**: and **INPUT 2: : RTN –48V/–60V**). For feed redundancy, each power supply must be powered by dedicated power feeds derived from feed **INPUT 1** and feed **INPUT 2**. This configuration provides the commonly deployed INPUT 1 / INPUT 2 feed redundancy for the router. There is basic insulation between the inputs and the chassis ground. Also, there is basic insulation between RTN input feeds.

Figure 140: Connecting the DC Power Supply Cables to a JNP10K-PWR-DC2



11. Install the plastic cable cover over each set of power cables by using the Phillips (+) screwdriver, number 2, to tighten the screw.

12. If the power supply slot on the chassis has a cover panel on it, insert your thumb and forefinger into the finger holes, squeeze, and pull the cover out of the slot. Save the cover panel for later use (see Figure 141 on page 252 and Figure 142 on page 252).

Figure 141: Removing the Power Supply Cover Panel on an MX10008

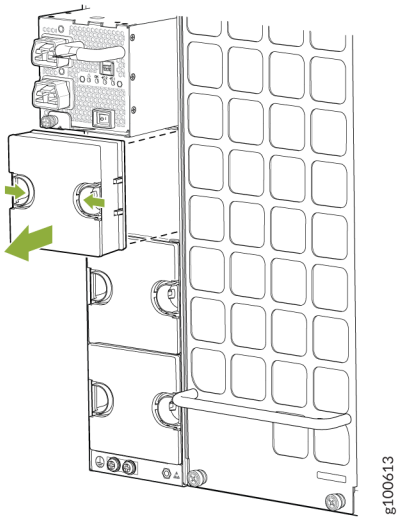
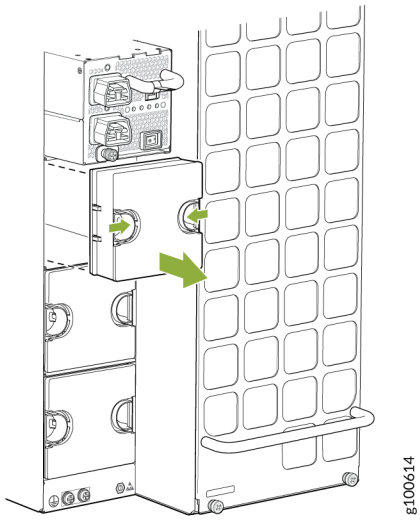


Figure 142: Removing the Power Supply Cover Panel on an MX10016



13. Unscrew the captive screw in the counterclockwise direction by using the Phillips (+) screwdriver, number 1.
14. Rotate the captive screw away from the faceplate of the power supply to release the latch.

15. Using both hands, place the power supply in the power supply slot on the rear of the router. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. The power supply will protrude from the chassis about 2 in. (5 cm) (see Figure 143 on page 253 and Figure 144 on page 254).
16. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
17. Tighten the captive screw by turning it clockwise by using the Phillips (+) screwdriver, number 1. When the screw is completely tight, the latch locks into the router chassis.

Figure 143: Installing a JNP10K-PWR-DC2 in an MX10008

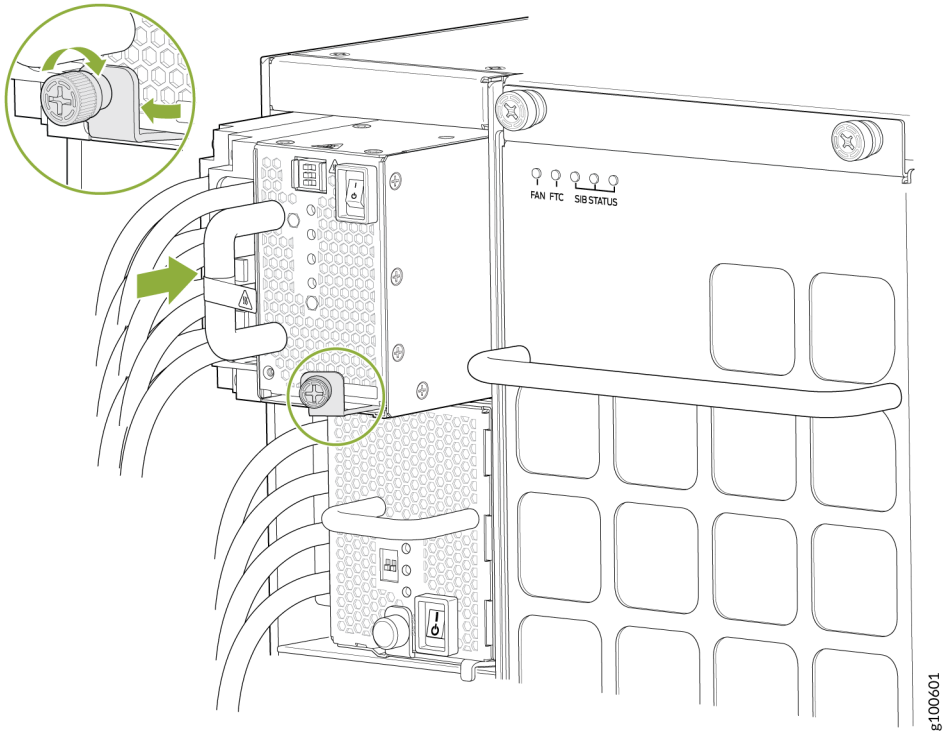
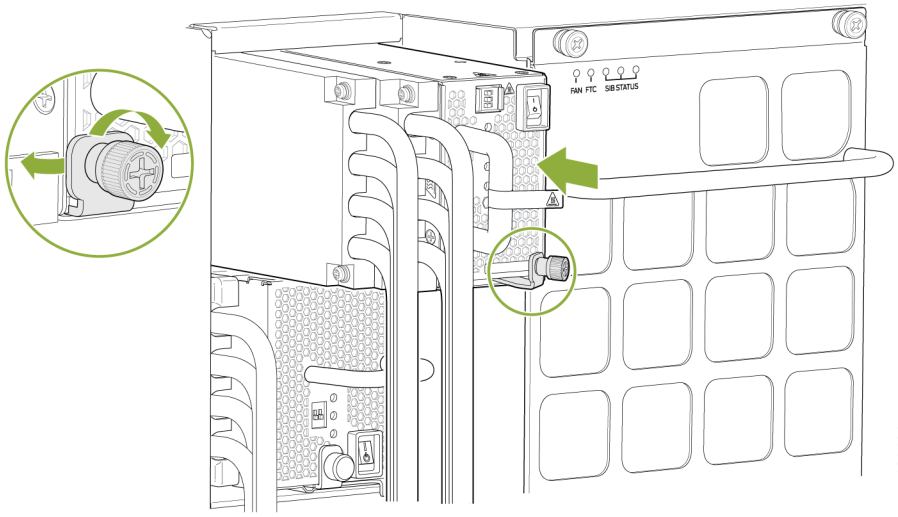


Figure 144: Installing a JNP10K-PWR-DC2 in an MX10016



18. Route INP1 cables to a power source and INP2 to another power source. The JNP10K-PWR-DC shares power, so if power dips on one input, the power supply is able to load balance internally. See Figure 145 on page 254 and Figure 146 on page 255.

Figure 145: Proper Load Balancing for JNP10k-PWR-DC2 Power Cables on MX10008

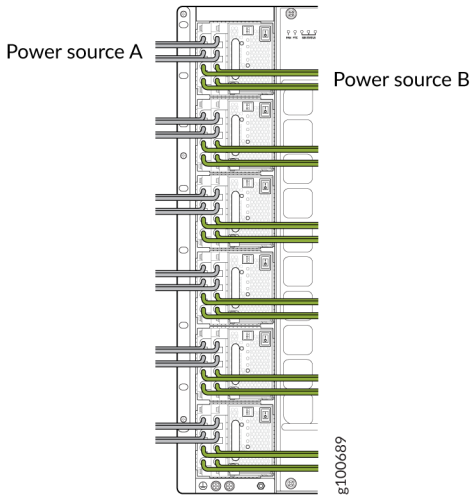
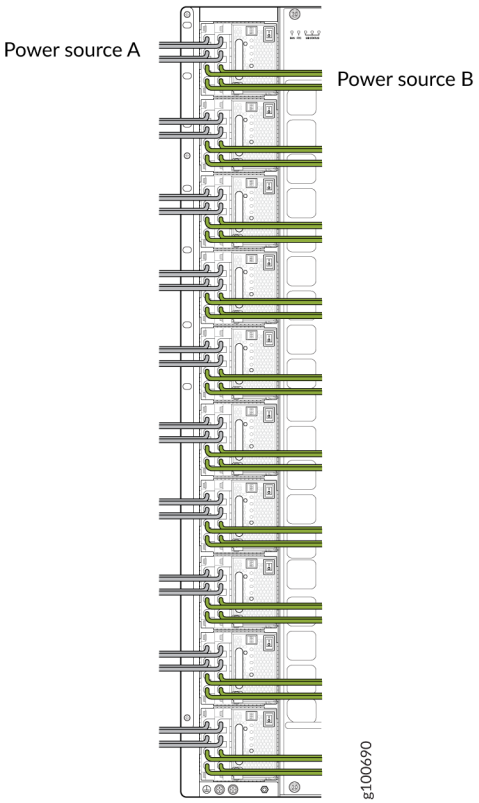


Figure 146: Proper Load Balancing for JNP10K-PWR-DC2 Power Cables on MX100016



WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

19. Set the three dip switches to select the inputs and confirm whether the power supply is running at 2200 W, 2750 W, 4400 W, or 5500 W. See Table 63 on page 255 and Figure 147 on page 256.

    Set both enable routers to the **on** position when using both source inputs. When not using source redundancy, set the unused source to the **O** (off) position. The LED turns red and indicates an error if a source input is not in use and the enable router is **|** (on).

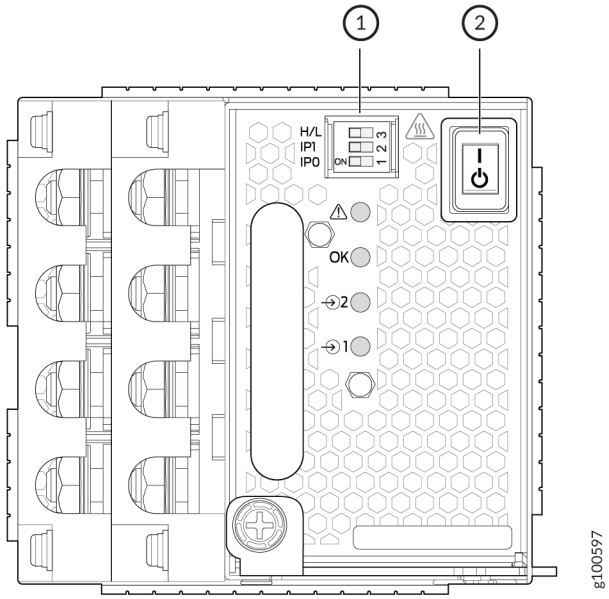
Table 63: Setting the JNP10K-PWR-DC2 Dip Switches

Switch	State	Field
1	On	IP0 is present

Table 63: Setting the JNP10K-PWR-DC2 Dip Switches *(Continued)*

Switch	State	Field
	Off	IP0 is not present
2	On	IP1 is present
	Off	IP1 is not present
3	On	Enabled for 80 A feed; 2750-W for a single feed, 5500-W for dual feeds
	Off	Enabled for 60 A feed; 2200-W for a single feed, 4400-W for dual feeds

Figure 147: Setting the Enable Routers for the Power Source



1– Dip switches	2– Power switch, on (|) and standby (**O**)

20. Verify that the input 1 and 2 LEDs on the power supply faceplate are lit and are on steadily.
21. Press the power switch to the on (|) position.

Removing and Installing MX10008 Switch Fabric Boards

IN THIS SECTION

- Handling and Storing MX10008 Switch Fabric Boards | 257
- Removing an MX10008 Switch Fabric Board | 259
- Installing an MX10008 Switch Fabric Board | 263
- Upgrade from JNP10008-SF to JNP10008-SF2 | 268

Handling and Storing MX10008 Switch Fabric Boards

IN THIS SECTION

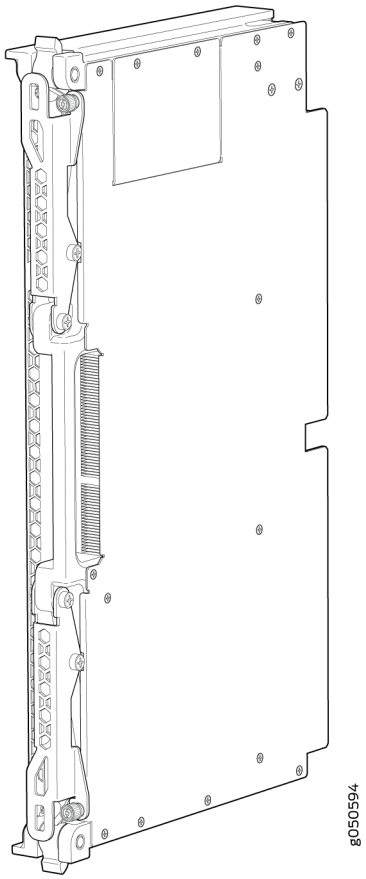
- Holding Switch Fabric Boards | 257
- Storing Switch Fabric Boards | 259

The MX10008 Switch Fabric Boards (SFBs have fragile components. To avoid damaging the SFBs, you must follow safe handling practices.

Holding Switch Fabric Boards

While removing an SFB from the router chassis, you should hold the SFB vertically until it is clear of the router chassis. Then you should rotate the SFB 90 degrees and place it on an antistatic mat or in an electrostatic bag for storage (see Figure 1).

Figure 148: SFB



The proper method of holding an SFB is to:

1. Hold the SFB by the ejectors while you keep the SFB vertical, and slide the SFB about three-quarters of the way out of the chassis.
2. Place one hand underneath the SFB to support it, and slide it completely out of the chassis.

CAUTION: Never hold an SFB by the connector edge. The connectors are fragile. You cannot align and seat an SFB properly if the connectors are damaged.

CAUTION: Do not stack SFBs on top of one another or on top of any other component.

Storing Switch Fabric Boards

You must store SFBs either in the chassis or in a spare shipping container, horizontally and sheet-metal side down. Do not stack these units on top of one another or on top of any other component. Place each unit separately in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

NOTE: Because these units are heavy, and because antistatic bags are fragile, inserting the line card into the bag is best done by two people.

NOTE: The JNP10008-SF2 SFBs are shipped with protective plastic covers on the fabric interface connectors. The plastic covers keep the connectors clean and free of dust and other particles. When you remove JNP10008-SF2 SFB from the router, re-insert the protective plastic covers on the fabric interface connectors and then place the SFB in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

To insert an SFB into an electrostatic bag:

1. Hold the unit horizontally with the faceplate toward you.
2. Have the second person slide the opening of the antistatic bag over the connector edge and then pull the bag to cover the unit.

If you must insert an SFB into a bag by yourself:

1. Lay the unit horizontally on an antistatic mat that is on a flat, stable surface with the sheet metal side down.
2. Orient the unit with the faceplate toward you.
3. Carefully insert the connector edge into the opening of the bag and pull the bag toward you to cover the unit.

Removing an MX10008 Switch Fabric Board

An MX10008 router has six Switch Fabric Boards (SFBs) that are located in the middle of the chassis behind the fan trays. **SIB 0** through **SIB 2** are located behind the left fan tray and **SIB 3** through **SIB 5** are located behind the right fan tray. You must remove the appropriate fan tray to access the failing SFB. See "Removing an MX10008 Fan Tray" on page 192.

Ensure you have the following equipment on hand before replacing an SFB:

- Electrostatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap
- Replacement SFB
- SFB blank (JNP10008-SF-BLNK)

CAUTION: Do not remove the SFB unless you have a replacement SFB or a SFB blank (JNP10008-SF-BLNK) available.

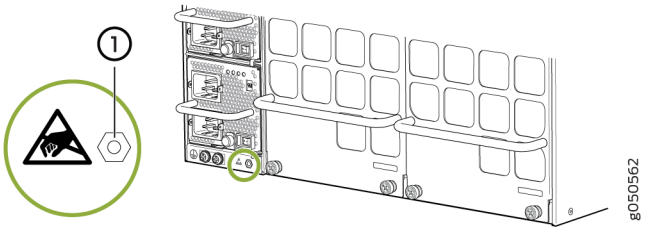
NOTE: If you are not installing another SFB into the empty card slot within a short time, install the SFB blank into the slot to maintain proper airflow in the card cage.

To remove an SFB (see Figure 151 on page 262):

1. Set the fans to full speed by using the `test chassis fan tray speed 0 full` and `test chassis fan tray speed 1 full` commands and **wait** for **ten** minutes.
2. Take the SFB offline using the `request chassis sfb offline slot` *`slot number`* command.

   NOTE:
3. Place an electrostatic bag or an antistatic mat on a flat, stable surface.
4. Remove the appropriate fan tray (see "Removing an MX10008 Fan Tray" on page 192).
5. Wrap and fasten one end of an ESD strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 149 on page 260).

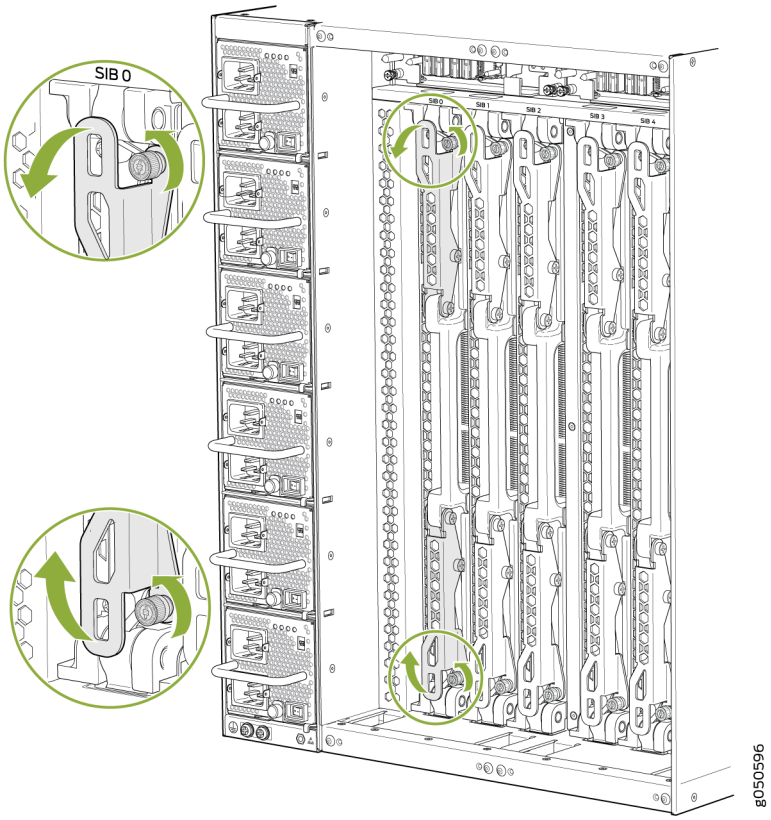
Figure 149: ESD Point on MX10008 Chassis Rear



1– ESD point

6. Loosen the captive screws at the top and bottom of the card.
7. Grasp both handles and spread them apart, and then slide the SFB about a quarter of the way out of the slot. See Figure 150 on page 261.

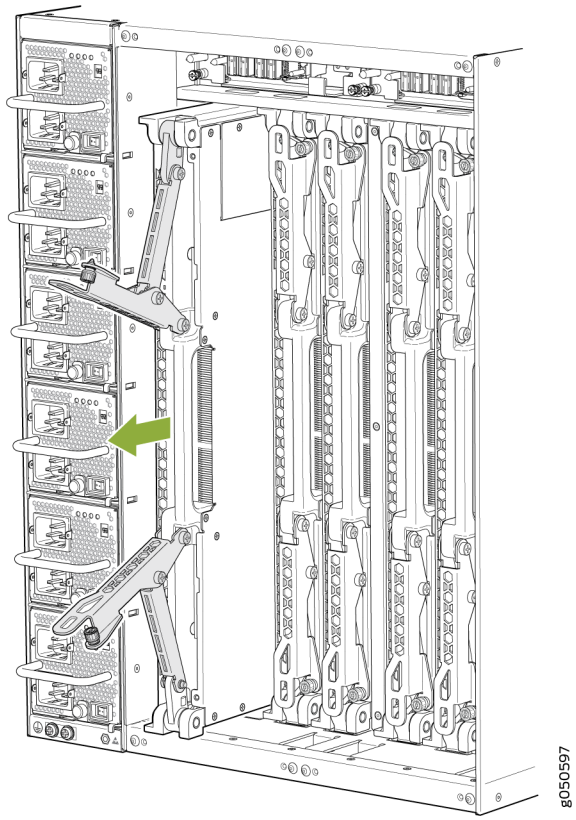
Figure 150: Loosening Captive Screws and Spread Ejector Handles



8. Grasp the ejector handle with one hand and place your other hand under the SFB for support as you slide the SFB out of the slot (see Figure 151 on page 262).

> ⚠ **CAUTION**: The SFB surface and handles may be hot. Allow a few minutes for the surface and handles to cool by pulling out the SFB halfway out of the chassis. Wear proper protective, heat-resistant gloves while removing an SFB.

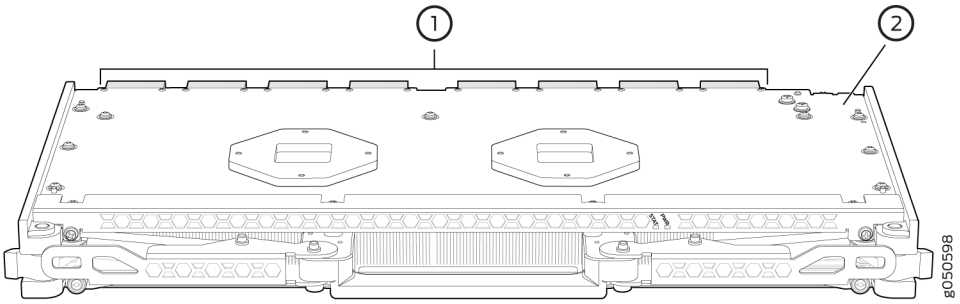
Figure 151: Removing the SFB from an MX10008 Chassis



9. Support the SFB as you rotate the SFB 90 degrees and place it on the antistatic mat with the printed circuit board facing upward. Be careful not to bump or handle the SFB by the connectors. If you do not have an antistatic mat, have another person help you slide the electrostatic bag over the SFB before placing it on the stable surface. See Figure 152 on page 263.

> ⚠ **CAUTION**: Do not stack hardware components on top of one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

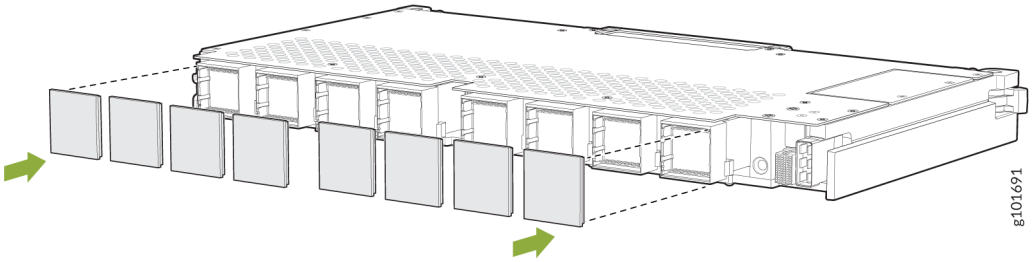
Figure 152: Extracted SFB



1– Connectors	2– Printed circuit board

10. If you removed an JNP10008-SF2 SFB from the router, re-insert the protective plastic covers on the fabric interface connectors of the SFB to keep the connectors clean and free of dust and other particles (see Figure 153 on page 263).

Figure 153: Inserting Protective Plastic Covers on JNP10008-SF2 SFB Interface Connectors



Installing an MX10008 Switch Fabric Board

An MX10008 router has six Switch Fabric Boards (SFBs) that are located in the middle of the chassis behind the fan trays. **SFB 0** through **SFB 2** are located behind the left fan tray, and **SFB 3** through **SFB 5** are located behind the right fan tray. You must remove the appropriate fan tray to install an SFB. See "Removing an MX10008 Fan Tray" on page 192. Fan trays must be replaced within the duration mentioned in Table 64 on page 264.

Table 64: Replacement Duration for the Fan Tray

Chassis Ambient Temperature	Duration
27°C	5 minutes
35°C	3 minutes
40°C	2 minutes

NOTE: When replacing the fans or SIBs at 40°C chassis ambient temperature, ensure that the fans run at 100% fan speed for at least 10 minutes before replacing the fans or SIBs.

Use the `test chassis fan tray 0 speed` *`full-speed`* and `test chassis fan tray 1 speed` *`full-speed`* commands to set the chassis fans to 100% speed.

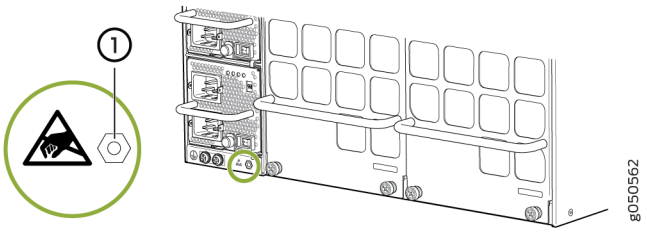
Ensure you have the following equipment on hand before installing an SFB:

- Electrostatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap
- Replacement SFB

To install an SFB:

1. Place an electrostatic bag or an antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of an ESD strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the MX10008 rear panel (see Figure 154 on page 265).

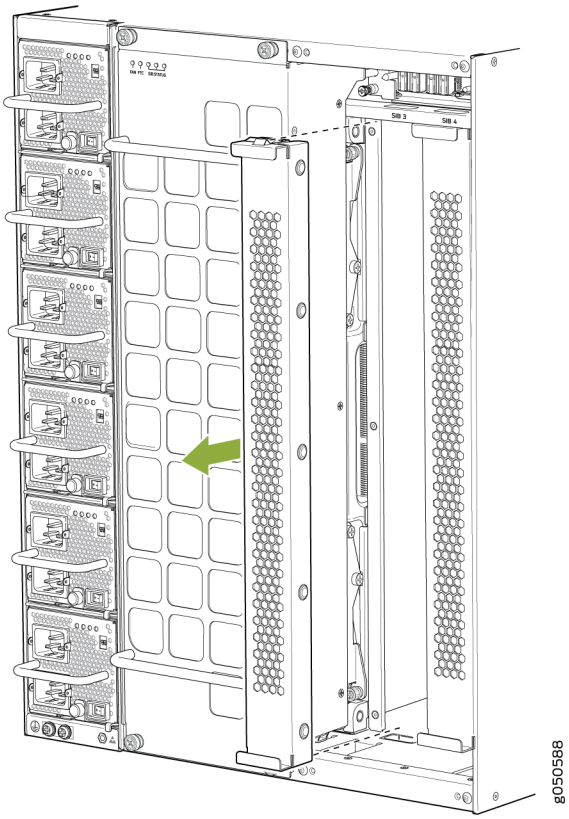
Figure 154: ESD Point on MX10008 Chassis Rear



1– ESD point

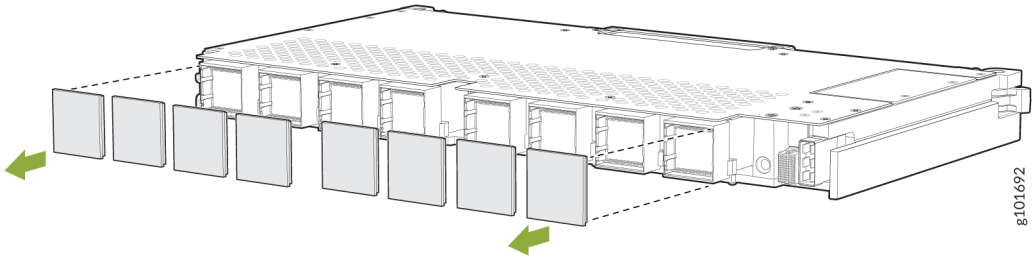
3. Either remove the failing SFB and store it in an electrostatic bag or on an antistatic mat (see "Removing an MX10008 Switch Fabric Board" on page 259) or remove the cover panel by grasping each side of the plate and pulling the panel straight out (see Figure 155 on page 265 for an example using the MX10008).

Figure 155: Removing an SFB Cover Plate on an MX10008



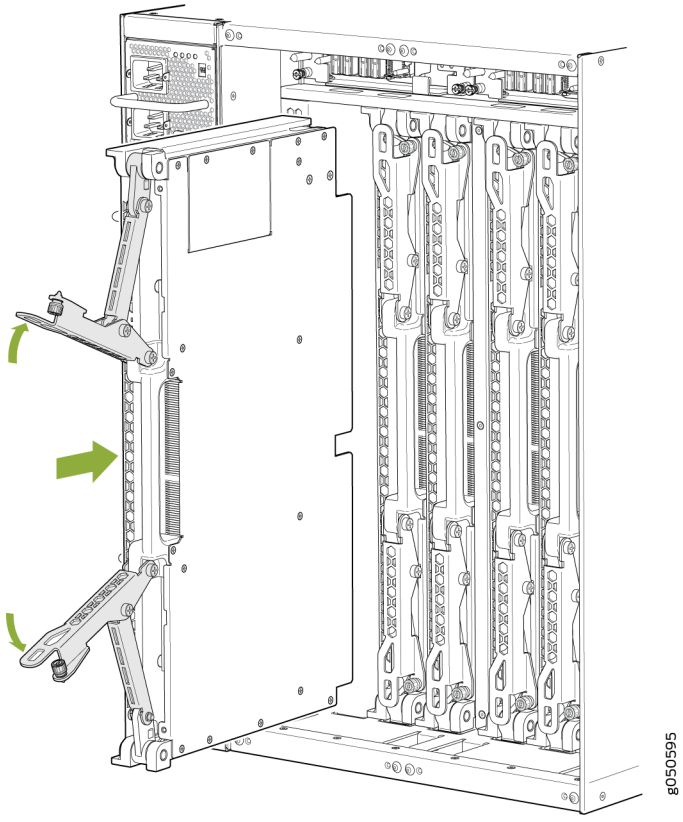
4. If you are installing JNP10008-SF2 SFBs, remove the protective plastic covers on the fabric interface connectors and save the plastic covers for future use (see Figure 156 on page 266).

Figure 156: Removing Protective Plastic Covers from JNP10008-SF2 SFB Interface Connectors



5. Lift the SFB by the handle with one hand and support the lower edge with the other hand.
6. Holding the SFB vertically, slide the SFB into the open slot until the ejector handles engage and start to close.
7. Grasp the two ejector handles and fold them inward until they latch to so that the SFB is fully seated (see Figure 157 on page 266 for the MX10008.

Figure 157: Installing an MX10008 SFB



8. Tighten the captive screws by using your thumb and forefinger.
9. Install the appropriate fan tray (see "Installing an MX10008 Fan Tray" on page 195).

10. Set the fans to normal speed by using the `test chassis fan tray speed 0 normal` and `test chassis fan tray speed 1 normal` command.
11. Bring the SFB online by using the `request chassis sfb online slot` *`slot number`* command. You can check the status of the SFB by using the `show chassis sfb` and the `show chassis fabric plane-location` commands.

```
root> show chassis sfb
Slot  State              Uptime
 0    Online              1 day, 17 hours, 7 minutes, 53 seconds
 1    Online              1 day, 17 hours, 7 minutes, 35 seconds
 2    Online              1 day, 17 hours, 7 minutes, 18 seconds
 3    Online              1 day, 17 hours, 7 minutes
 4    Empty
 5    Empty

root> show chassis fabric plane-location
------------Fabric Plane Locations-------------
Plane 0              Switch Fabric Board 0
Plane 1              Switch Fabric Board 0
Plane 2              Switch Fabric Board 0
Plane 3              Switch Fabric Board 0
Plane 4              Switch Fabric Board 1
Plane 5              Switch Fabric Board 1
Plane 6              Switch Fabric Board 1
Plane 7              Switch Fabric Board 1
Plane 8              Switch Fabric Board 2
Plane 9              Switch Fabric Board 2
Plane 10             Switch Fabric Board 2
Plane 11             Switch Fabric Board 2
Plane 12             Switch Fabric Board 3
Plane 13             Switch Fabric Board 3
Plane 14             Switch Fabric Board 3
Plane 15             Switch Fabric Board 3
Plane 16             Switch Fabric Board 4
Plane 17             Switch Fabric Board 4
Plane 18             Switch Fabric Board 4
Plane 19             Switch Fabric Board 4
Plane 20             Switch Fabric Board 5
Plane 21             Switch Fabric Board 5
Plane 22             Switch Fabric Board 5
Plane 23             Switch Fabric Board 5
```

NOTE: If you completely powered off the SFB using the `set chassis sib power-off slot slot` command, you must delete the existing configuration in order to bring the SFB online. To delete the existing configuration and bring a replacement SFB online, use the `delete chassis sib power-off slot slot number` command.

SEE ALSO

Removing an MX10008 Fan Tray | 192

Upgrade from JNP10008-SF to JNP10008-SF2

The MX10008 routers support Switch Fabric Board (SFB; model number: JNP10008-SF) and the enhanced Switch Fabric Board (SFB2; model number: JNP10008-SF2). SFB2 is designed to support higher bandwidth than that provided by SFB on the MX10008 routers.

This topic explains how to upgrade from JNP10008-SF Switch Fabric Board (SFB) to enhanced Switch Fabric Board JNP10008-SF2 on MX10008 routers.

NOTE: Smooth upgrade from JNP10008-SF to JNP10008-SF2 is not supported in MX10008 routers.

NOTE: The MX10008 routers support either JNP10008-SF or JNP10008-SF2 only. The routers do not support JNP10008-SF and JNP10008-SF2 at the same time.

NOTE: The JNP10008-SF2 operates only with the following power supplies and fan tray:

- JNP10K-PWR-AC2 power supply
- JNP10K-PWR-DC2 power supply
- JNP10008-FAN2 fan tray
- JNP10008-FTC2 fan tray controller

Ensure that you have the following tools and parts before upgrading from SFB to SFB2:

- Electrostatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver, number 2
- JNP10008-SF2s
- JNP10008-FAN2 fan trays and JNP10008-FTC2 fan tray controllers if your MX10008 router has JNP10008-FAN trays and JNP10008-FAN-CTLR installed
- JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies if your MX10008 router has JNP10K-PWR-AC or JNP10K-PWR-DC power supplies installed

Ensure that you complete the following tasks before upgrading from JNP10008-SF to JNP10008-SF2:

1. Prepare the router and install the version of Junos OS Release (21.4R1 or later) that supports SFB2.
2. Use the following CLI command to power off both the Routing and Control Boards (RCBs).

```
user@host>request vmhost power-off
```

3. Wait for the RCBs to gracefully shut down. Once the RCBs are powered off the router will automatically shut down.

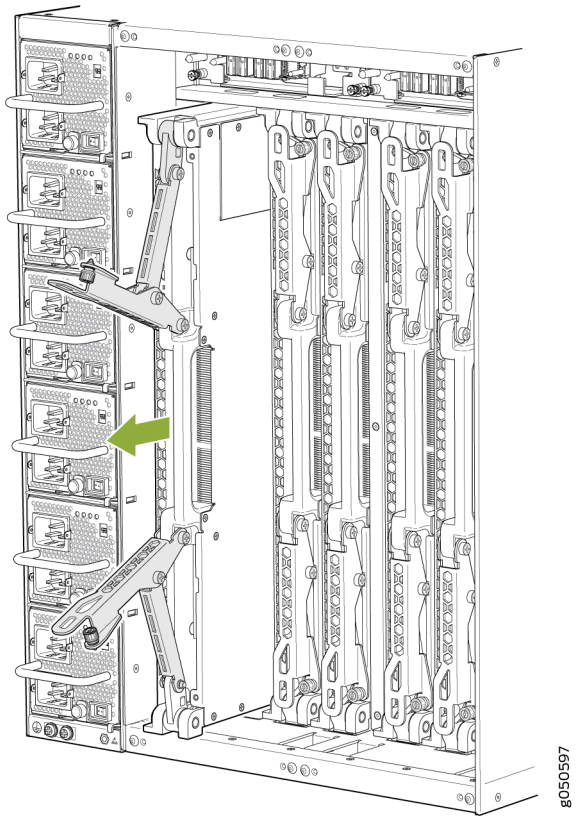
Remove JNP10008-SFs

1. Wrap and fasten one end of an ESD strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
2. Remove both the fan trays. See "Removing and Installing MX10008 Cooling System Components" on page 191.
3. Using your fingers, loosen the captive screws at the top and bottom of the SFB.
4. Grasp both handles and spread them apart, and then slide the SFB about a quarter of the way out of the slot.
5. Grasp the ejector handle with one hand and place your other hand under the SFB for support as you slide the SFB out of the slot see (Figure 158 on page 270).



CAUTION: The SFB surface and handles may be hot. Allow a few minutes for the surface and handles to cool by pulling out the SFB halfway out of the chassis. Wear proper protective, heat-resistant gloves while removing an SFB.

Figure 158: Removing the SFB from an MX10008



6. Support the SFB as you rotate the SFB 90 degrees and place it on the antistatic mat with the printed circuit board facing upward. Be careful not to bump or handle the SFB by the connectors. If you do not have an antistatic mat, have another person help you slide the electrostatic bag over the SFB before placing it on the stable surface.

   CAUTION: Do not stack hardware components on top of one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

7. Repeat step 3 to step 6 to remove the remaining SFBs.

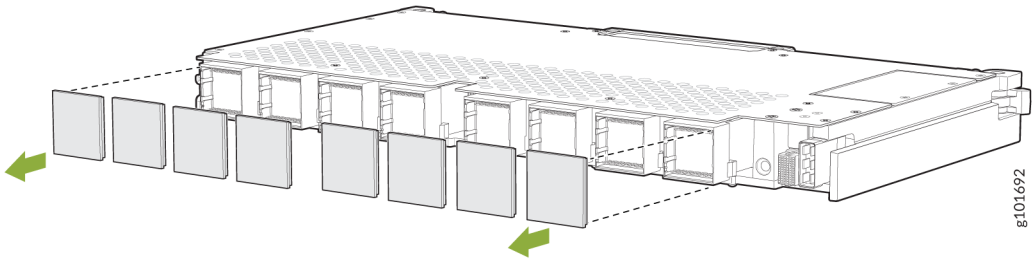
8. Remove the power supplies if you have JNP10K-PWR-AC or JNP10K-PWR-DC power supplies installed on your router. See "Removing and Installing MX10000 Power System Components" on page 201

9. Place all the removed SFBs, power supplies, and fan trays in Electrostatic bags or on antistatic mat.

Install JNP10008-SF2s

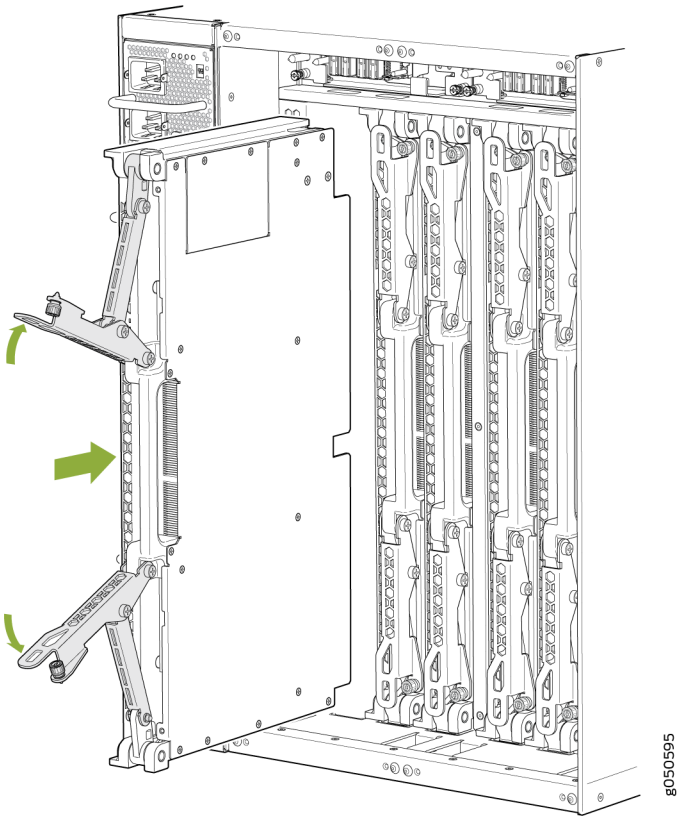
1. Wrap and fasten one end of an ESD strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
2. Remove the protective plastic covers that are on the fabric interface connectors of the JNP10008-SF2 SFB and save them for future use (see Figure 159 on page 271).

Figure 159: Removing Protective Plastic Covers from JNP10008-SF2 SFB Interface Connectors



3. Lift the JNP10008-SF2 by the handle with one hand and support the lower edge with the other hand.
4. Holding the JNP10008-SF2 vertically, slide the JNP10008-SF2 into the open slot until the ejector handles engage and start to close.
5. Grasp the two ejector handles and fold them inward until they latch to seat the JNP10008-SF2 (see Figure 160 on page 272).

Figure 160: Installing an JNP10008-SF2



6. Hand-tighten the captive screws.
7. Repeat step 2 to step 5 to install the remaining JNP10008-SF2s.
8. Install the JNP10008-FAN2 fan trays and JNP10008-FTC2 fan tray controllers. See "Removing and Installing MX10008 Cooling System Components" on page 191.
9. Install the JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies if you removed the JNP10K-PWR-AC or JNP10K-PWR-DC power supplies from the router.
10. Power on the router.

Removing and Installing MX10008 MPC Components

IN THIS SECTION

- How to Handle and Store an MX10008 MPC | 273
- Install an MPC in an MX10008 | 275
- Remove an MPC | 279
- Install the Cable Management System | 283

An MX10008 Modular Port Concentrator (MPC) is a field-replaceable unit (FRU) that you can install in any of the line card slots on the front of the chassis. An MPC is hot-insertable and hot-removable; you can remove and replace them without powering off the router or disrupting router functions.

NOTE: When upgrading the firmware for any line card, be sure the power supply is stable. Prevent any power outages, and do not remove the line card from the router. Losing power to the line card during a firmware upgrade can cause serious damage.

How to Handle and Store an MX10008 MPC

IN THIS SECTION

- Handling MPCs | 273
- Storing MPCs | 274

Handling MPCs

Pay proper attention to how you are handling MPCs. Because MPCs are installed horizontally, we recommend that you hold them by the sides of the units when they are not in the chassis. A running

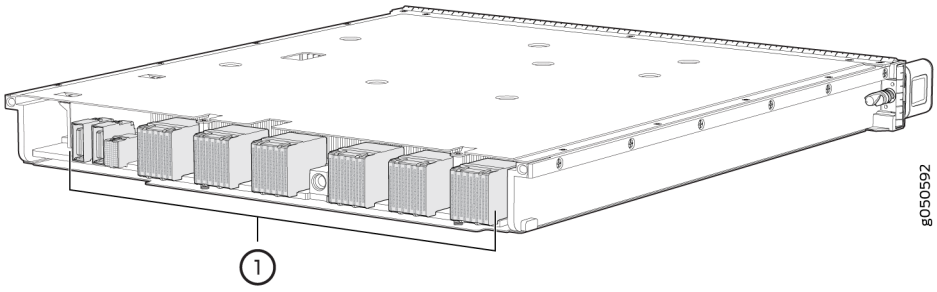
MPC can be hot, use heat protective gloves, and allow the unit to cool half way out of the chassis before removing.

To handle e an MPC properly:

1. Orient the MPC so that the faceplate of the unit is toward you.
2. Grasp each side of the unit firmly as you slide the unit out of the chassis.
3. Take care not to strike the unit against any object as you carry it.

CAUTION: Never hold an MPC by the connector edge. The connectors are fragile. You cannot seat an MPC properly if the connectors are damaged (see Figure 161 on page 274).

Figure 161: Connector Edge of an MPC



1– Connectors

4. If you must rest an MPC on an edge, place a cushion between the connector edge and the surface.

CAUTION: Do not stack MPCs on top of one another or on top of any other component.

5. Place each MPC in an individual antistatic bag or separately on an antistatic mat that is placed on a flat, stable surface.

Storing MPCs

You must store MPCs either in the chassis or in a spare shipping container, horizontally and sheet-metal side down. Do not stack these units on top of one another or on top of any other component. Place each unit in an individual antistatic bag or separately on an antistatic mat placed on a flat, stable surface.

NOTE: Because these MPCs are heavy, and because electrotatic bags are fragile, inserting an MPC into the bag is best done by two people.

NOTE: The MX10K-LC9600 line cards are shipped with a protective plastic cover on the fabric interface connectors. The plastic cover keeps the connectors clean and free of dust and other particles. When you remove MX10K-LC9600 line card from the router, re-insert the protective plastic cover on the fabric interface connectors and then place the line card in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

To insert an MPC into an antistatic bag with the help of another person:

1. Hold the unit horizontally with the faceplate toward you.
2. Have the second person slide the opening of the antistatic bag over the connector edge and then pull the bag to cover the unit.

To insert an into a bag by yourself:

1. Lay the unit horizontally on an antistatic mat that is on a flat, stable surface, with the sheet-metal side of the unit facing down.
2. Orient the unit with the faceplate toward you.
3. Carefully insert the connector edge into the opening of the bag, and then pull the bag toward you to cover the unit.

Install an MPC in an MX10008

Before you install a line card in the router chassis:

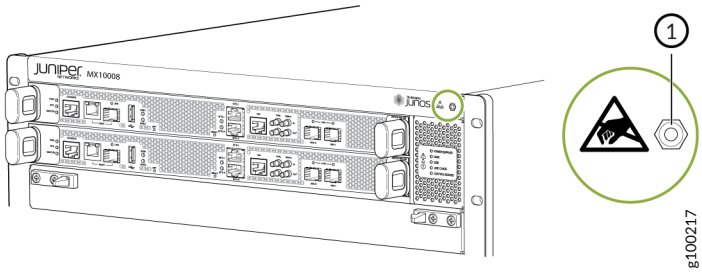
- Ensure that you have taken the necessary precautions to prevent antistatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Inspect the connector edge of the MPC for physical damage. Installing a damaged MPC might damage the router.
- Ensure that you know how to handle and store the line card (see

- Ensure that the router has sufficient power to power the line card while maintaining its *n*+1 power redundancy. To determine whether the router has enough power available for the line card, use the `show chassis power-budget-statistics` command.
- In addition to the MPC, ensure that you have the following parts and tools available to install an MPC in the router:
  - ESD grounding strap
  - An antistatic bag or an antistatic mat

To install an MPC in the router chassis:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis. An ESD point is located above the status LED panel on the front of the router chassis. See Figure 162 on page 276.

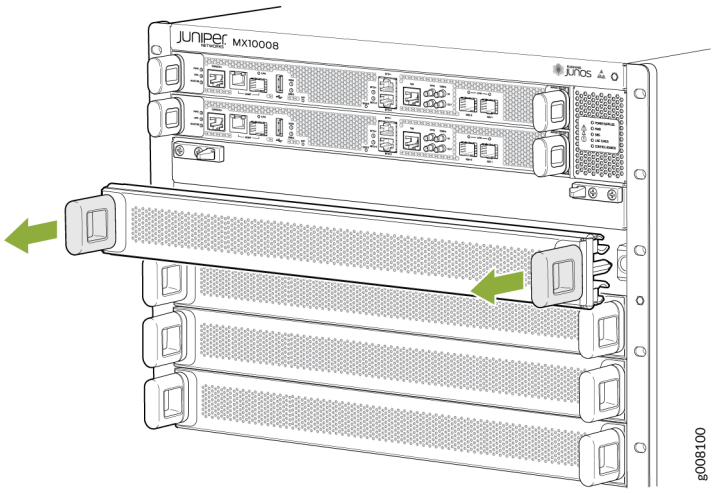
Figure 162: ESD Point for MX10008 Chassis Front



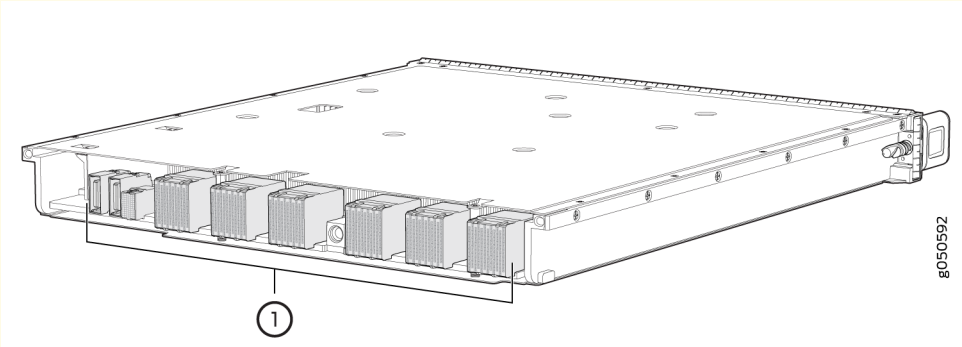
1– ESD point

2. Remove the MPC cover by grasping the handles and pulling straight out to expose the slot for the MPC. See Figure 163 on page 277.

Figure 163: Remove the MPC Cover

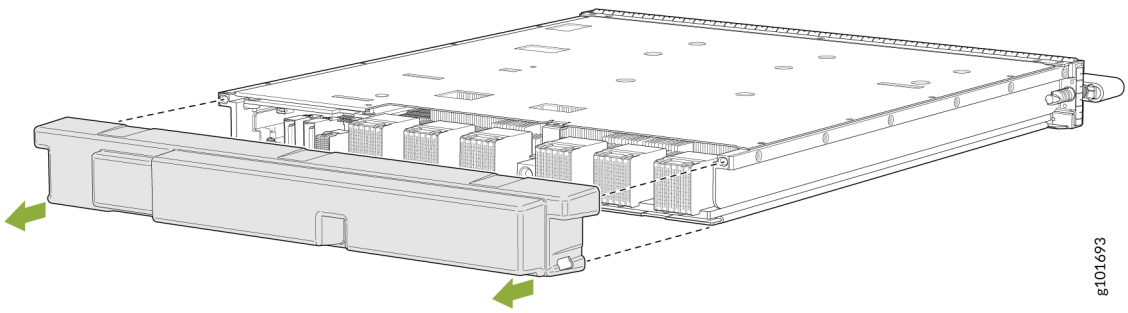


3. Remove the MPC from the antistatic bag and place on the antistatic mat. Inspect it for any damage before installing it into the chassis.

> ⚠ **CAUTION**: Do not lift the MPC by holding the edge connectors or the handles on the faceplate. Neither the handles nor the edge connectors can support the weight of the line card. Lifting the line card by the handles or edge connectors might bend them, which would prevent the line cards from being properly seated in the chassis. See Figure 164 on page 277.
>
> **Figure 164: MPC Connectors**
>
> 
>
>
> 1– Connectors

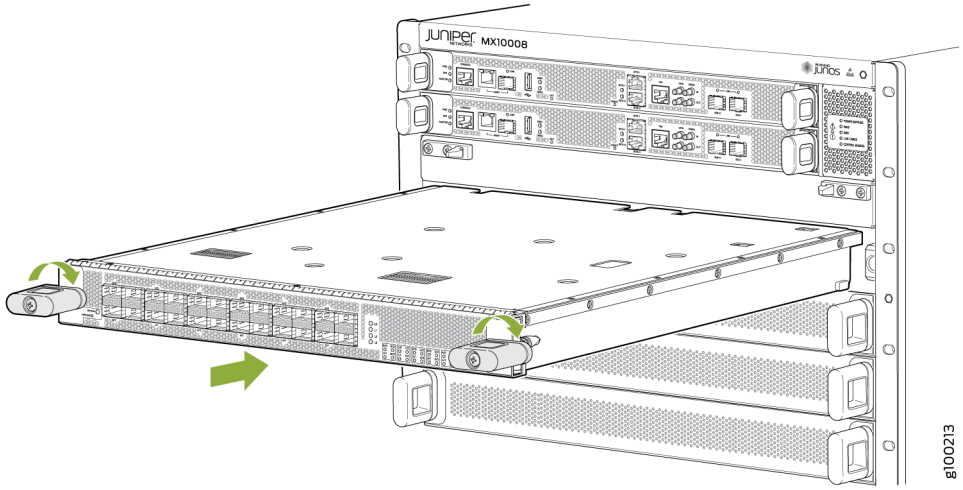
4. If you are installing MX10K-LC9600, remove the protective plastic cover on the fabric interface connectors and save the plastic cover for future use (see Figure 165 on page 278).

Figure 165: Removing Protective Plastic Cover from the MX10K-LC9600 Interface Connectors



5. With the faceplate towards you, grasp and lift the MPC by the sides. An MPC can weigh up to 31.57 lb (14.32 kg). Be prepared to accept the full weight of the MPC as you lift the MPC.
6. Align the sides of the MPC with the guides inside the chassis slot. Slide the MPC all the way into the slot until the handle holes align and you feel resistance. See Figure 166 on page 278.

Figure 166: Installing an MPC



7. Grasp both ejector handles, and simultaneously rotate them clockwise until the MPC is fully seated and the handles are vertical.
8. Insert the appropriate cable into the cable connector ports on the MPC. Secure the cables so that they do not support their own weight.

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

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

CAUTION: Avoid bending a 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.

Verify that the MPC is functioning correctly by using the **show chassis fpc** and `show chassis fpc pic-status` commands.

You can install the optional cable management kit after the card is installed.

Remove an MPC

If you have the optional cable management system, it is not necessary to remove the cable management system before removing the MPC. However, we recommend that you take the MPCs offline before removing them.

Before you remove an MPC from the router chassis:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you know how to handle and store the MPC (see "How to Handle and Store an MX10008 MPC" on page 273).
- Ensure you have the following parts and tools available to remove an MPC from an MX10008 chassis:
  - ESD grounding strap
  - An antistatic bag or an antistatic mat

    NOTE: Placing an MPC in an antistatic bag might require a second person to assist with sliding the MPC into the bag.

  - Replacement MPC or line card blank (JNP10K-LC-BLNK) for the empty slot

- Heat resistant gloves

CAUTION: Do not remove the MPC unless you have a replacement MPC or a line card blank (JNP10K-LC-BLNK) available.

NOTE: If you are not installing another MPC into the empty card slot within a short time, install the line card blank into the slot to maintain proper airflow in the card cage.

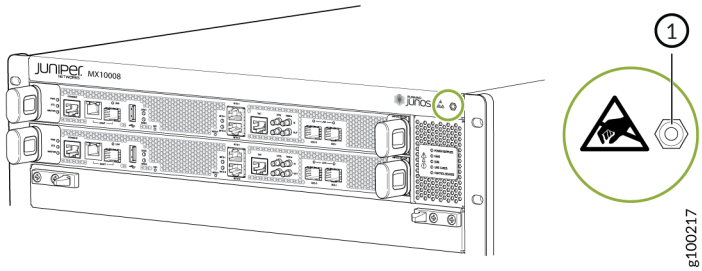
The air filters in the line card blanks will prevent dust and other particles entering the chassis. If an empty MPC slot is not covered, dust and other particles may accumulate on the connector pins of the installed MPCs and SFBs and affect the performance of the router.

When you remove an MPC, the router continues to function, although the interfaces that are installed on the MPC that is being removed no longer function.

To remove an MPC from an MX10008 router chassis:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis. An ESD point is located above the status LED panel on the front of the router chassis. See Figure 167 on page 280.

Figure 167: ESD Point for MX10008 Chassis Front



1– ESD point

3. Label the cables connected to each port on the MPC so that you can reconnect the cables to the correct ports later.
4. Use one of the following methods to take the MPC offline:
   - Press and hold the offline button on the MPC. The green **OK/FAIL** LED next to the button begins to blink. Hold the button down until the LED goes off.

- Issue the following CLI command:

```
user@host>request chassis fpc slot slot-number offline
```

For more information about the CLI command, see the CLI Explorer.

5. Disconnect the cables from the ports that are installed in the MPC.



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



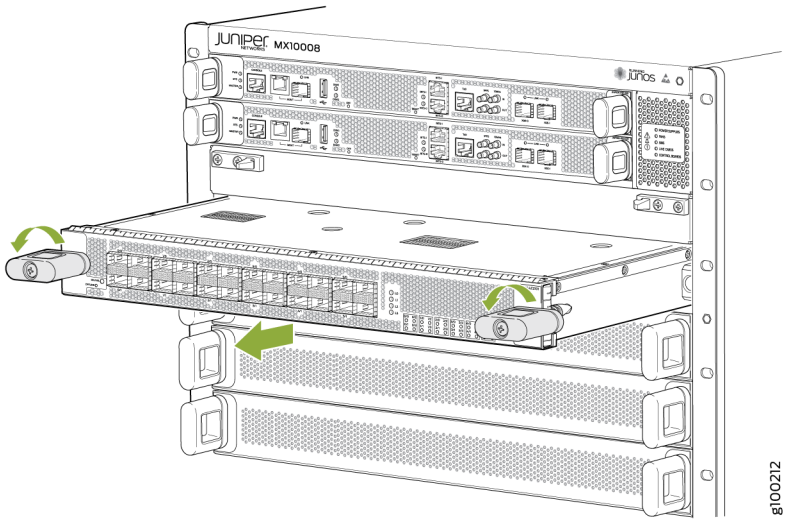
CAUTION: Do not leave a fiber-optic transceiver uncovered, except when inserting or removing a cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.



CAUTION: Avoid bending a 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. Arrange the disconnected cables in the cable manager to prevent the cables from developing stress points.
7. Simultaneously turn both the ejector handles of the MPC counterclockwise to unseat the MPC.

Figure 168: Removing an MPC



8. Put on the heat resistant gloves.
9. Grasp the handles, and holding the MPC straight, slide it halfway out of the card cage.

> **CAUTION**: The MPC and the handles may be hot. Allow a few minutes for the MPC and handles to cool by pulling out the MPC halfway out of the chassis.
>
> 
>

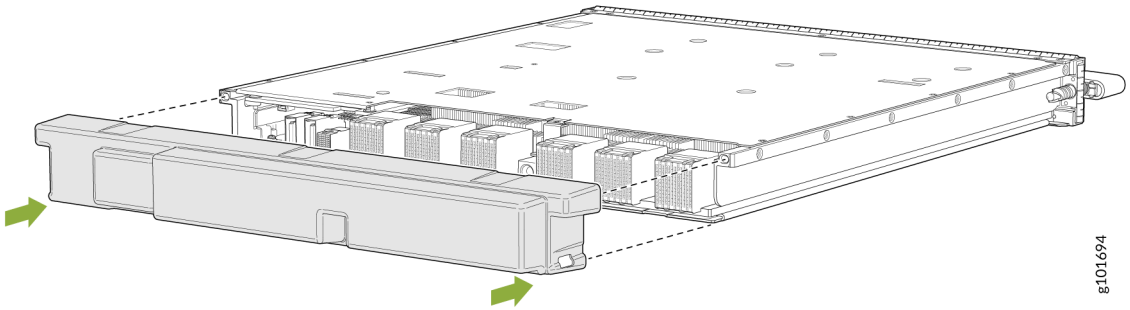
10. Grasp both sides of the MPC at the midpoint, and remove the MPC from the chassis. Slide the MPC completely out of the chassis, and place the MPC on the antistatic mat or in the antistatic bag.

> **CAUTION**: The weight of the MPC is concentrated in the back end. Be prepared to accept the full weight of the MPC—up to 31.57 lb. (14.32 kg)—as you slide the MPC out of the chassis.
>
> When the MPC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support the weight of the MPC.
>
> Do not stack MPCs on top of one another after removal. Place each MPC individually in an antistatic bag or on its own antistatic mat on a flat, stable surface.

CAUTION: After removing an MPC from the chassis, wait at least 30 seconds before replacing it with another MPC, or inserting an MPC into a different slot.

11. If you removed an MX10K-LC9600 from the router, re-insert the protective plastic cover on the fabric interface connectors of the line card to keep the connectors clean and free of dust and other particles (see Figure 169 on page 283).

Figure 169: Inserting Protective Plastic Cover on MX10K-LC9600 Interface Connectors



Install the Cable Management System

The cable management system is an optional kit that can be ordered to organize and protect optical cabling attached to the line cards. After a card is installed, you can still remove the line card without needing to remove the cable management system.

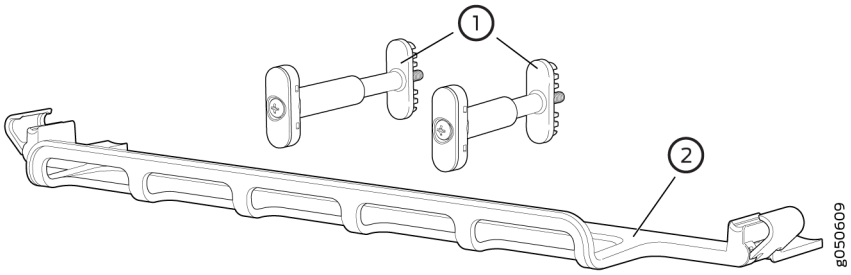
Ensure that you have the following parts and tools available to install the cable management system on a line card:

- Phillips (+) screwdriver, number 2
- The cable management system

To install the cable management system (see Figure 170 on page 284):

1. Open the shipping carton of the cable management system and check that you have:
   - Two handle extensions
   - One cable tray

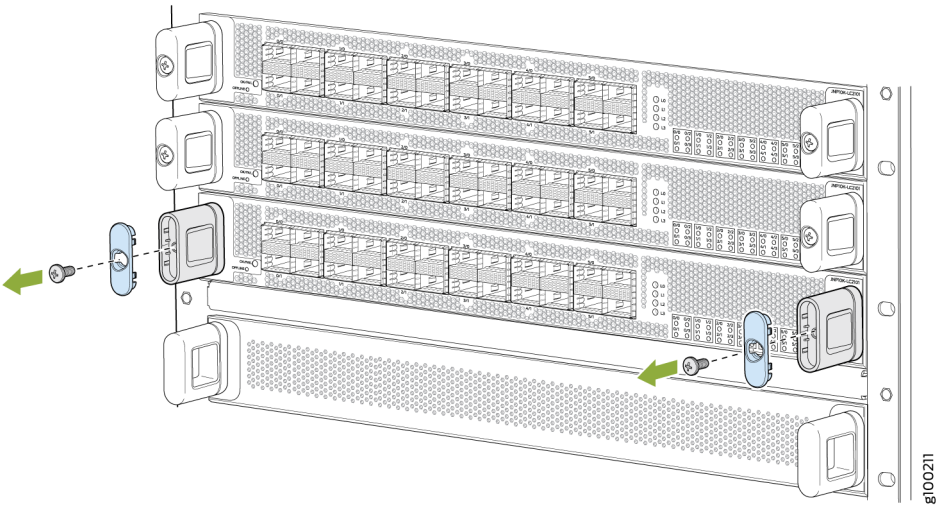
Figure 170: Cable Management System Components



1– Handle extensions	2– Cable tray

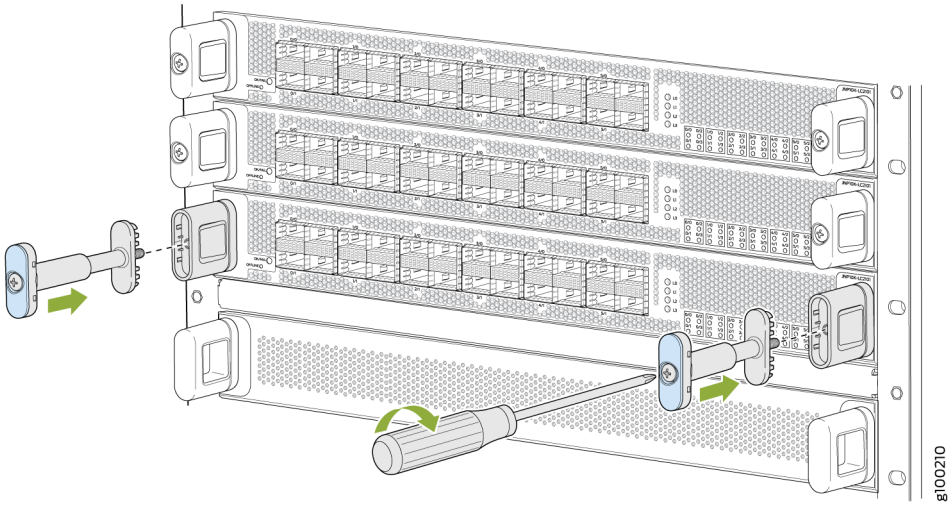
2. Use the Phillips screwdriver to loosen and remove the screws on the two line card handles (see Figure 171 on page 284).

Figure 171: Removing the Screws on the Line Card Handles



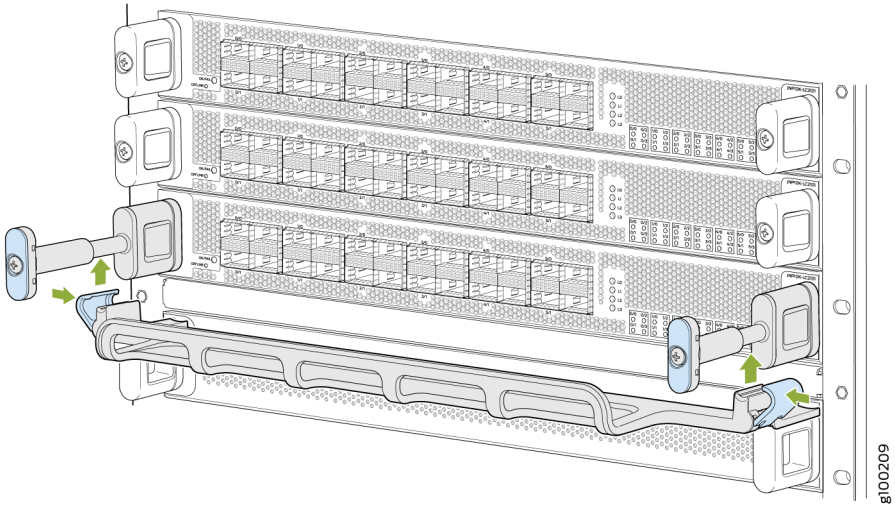
3. Replace the blue cap on each line card handle with the two handle extensions (see Figure 172 on page 285).

Figure 172: Adding Handle Extensions



4. Tighten the screws into the handle extensions.
5. Snap open the blue clips on the ends of the cable tray with your hands.
6. Place the cable tray across the front of the line card so that the two ends of the cable tray are under the handle extensions.
7. Snap close the blue clips of the cable tray around the handle extensions (see Figure 173 on page 285).

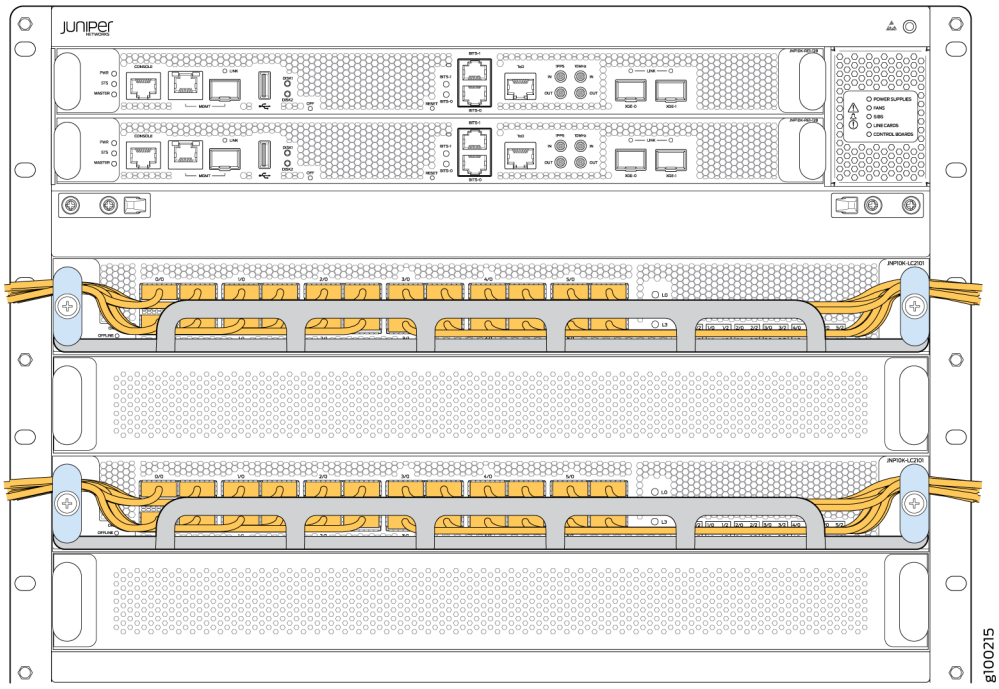
Figure 173: Adding the Cable Tray



8. Drape the optical cables using one of the following methods:
   - Drape and tie the optical cables to the side (see Figure 174 on page 286).

- Drape some of the cables under the handle extension and some cables over the handle extension.

Figure 174: Completed Cable Management System



Removing and Installing Transceivers and Fiber-Optic Cables

IN THIS SECTION

- Remove a Transceiver | **287**
- Install a Transceiver | **289**
- Disconnect a Fiber-Optic Cable from a Router | **291**
- Connect a Fiber-Optic Cable to a Router | **292**
- Maintain the Fiber-Optic Cables in a Router | **293**

Remove a Transceiver

Before you begin removing a transceiver from the router, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

Ensure that you have the following parts and tools available:

- Electrostatic bag or antistatic mat
- Rubber safety caps to cover the transceiver and fiber-optic cable connector
- Dust cover to cover the port or a replacement transceiver

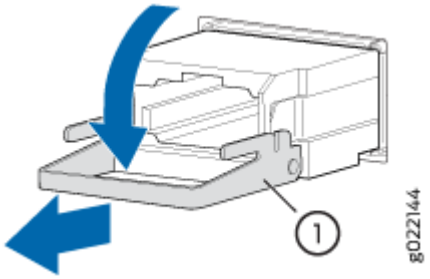
The transceivers for the router are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting device functions.

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

Figure 175 on page 287 shows how to remove a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To remove a transceiver from the router:

Figure 175: Removing an SFP, SFP+, XFP, or a QSFP+ Transceiver



1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the router.
3. Label the cable connected to the transceiver so that you can reconnect the cable correctly later.

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

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

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

4. Remove the cable connected to the transceiver (see "Disconnect a Fiber-Optic Cable from a Router" on page 291).
5. Cover the transceiver and the end of each fiber-optic cable connector with a rubber safety cap immediately after disconnecting the fiber-optic cables.
6. By using your fingers, pull the ejector lever away from the transceiver to unlock the transceiver.

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

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

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

8. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
9. Place the transceiver in the electrostatic bag or on the antistatic mat placed on a flat, stable surface.
10. Cover the empty port with the dust cover or install the replacement transceiver into the port.

Install a Transceiver

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

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

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

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

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

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

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

Figure 176 on page 291 shows how to install a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To install a transceiver in the router:

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

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the router.
2. Remove the transceiver from its bag.
3. Check whether the transceiver is covered with a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.

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

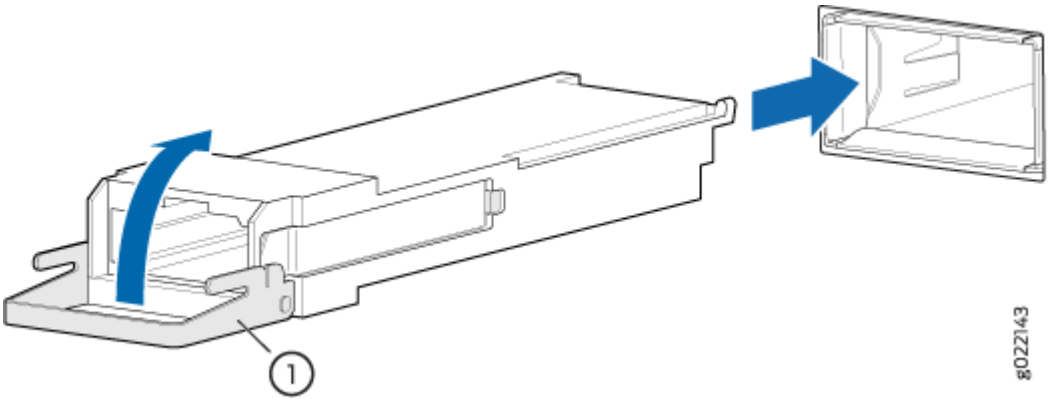
4. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover, and save the cover in case you need to cover the port later. If you are hot-swapping a transceiver, wait for at least 10 seconds after removing the transceiver from the port before installing a new transceiver.
5. Using both hands, carefully place the transceiver in the empty port. The connectors must face the device chassis.

CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment of the transceiver might cause the pins to bend, making the transceiver unusable.

6. Slide the transceiver in gently until it is fully seated. See Figure 176 on page 291 for an example of inserting a QSFP transceiver.
7. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.

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

Figure 176: Installing a Transceiver



1– Ejector lever	

Disconnect a Fiber-Optic Cable from a Router

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

Ensure that you have the following parts and tools available:

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

The router has field-replaceable optical transceivers to which you can connect fiber-optic cables.

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

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

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



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

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



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

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

Connect a Fiber-Optic Cable to a Router

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

The router has field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables. You can remove and replace the cables without powering off the device or disrupting the routing functions.

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



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



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

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. If the optical transceiver is covered by a rubber safety cap, remove the cap. Save the cap.
3. Insert the cable connector into the optical transceiver.
4. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

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

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

Maintain the Fiber-Optic Cables in a Router

To maintain fiber-optic cables:

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

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

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

Removing the MX10008 Router

IN THIS SECTION

- Powering Off an MX10008 Router | 294
- Removing an MX10008 Router From a Four-Post Rack Using a Mechanical Lift | 297
- Manually Removing an MX10008 Router from a 4-Post Rack | 298

Powering Off an MX10008 Router

Before you power off an MX10008:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- Ensure that you do not need to forward traffic through the router.

NOTE: Use the following procedure to power off an MX10008.

Ensure that you have the following parts and tools available to power off the router:

- An ESD grounding strap
- An external management device such as a PC
- An RJ-45 to DB-9 rollover cable to connect the external management device to the console port on one of the RCBs

To power off an MX10008:

1. Connect to the router using one of the following methods:
   - Connect a management device to the console (**CON**) port on an RCB by following the instructions in "Connecting an MX10008 to a Network for Out-of-Band Management" on page 176"Connecting an MX10008 Router to a Management Console" on page 177.

- Connect a management device to one of the two management (**MGMT**) ports on the RCB by following the instructions in "Connecting an MX10008 to a Network for Out-of-Band Management" on page 176.

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

   You see the following output (or something similar, depending on the hardware being shut down) after entering the command:

```
Shutdown NOW!
System going down IMMEDIATELY


Terminated
Poweroff for hypervisor to respawn
Oct 25 10:35:05 init: event-processing (PID 1114) exited with status=1
Oct 25 10:35:05 init: packet-forwarding-engine (PID 1424) exited with status=8
.
Waiting (max 60 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 60 seconds) for system process `vnlru' to stop...done
Waiting (max 60 seconds) for system process `bufdaemon' to stop...done
Waiting (max 60 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...0 0 0 0 done

syncing disks... All buffers synced.
Uptime: 11h0m30s
Normal shutdown (no dump device defined)
unloading fpga driver
unloading fx-scpld
Powering system off using ACPI
kvm: 28646: cpu0 disabled perfctr wrmsr: 0xc1 data 0xabcd
pci-stub 0000:01:00.2: transaction is not cleared; proceeding with reset anyway
pci-stub 0000:01:00.1: transaction is not cleared; proceeding with reset anyway
hub 1-1:1.0: over-current change on port 1
Stopping crond: [  OK  ]
Stopping libvirtd daemon: [  OK  ]
Shutting down ntpd: [  OK  ]
Shutting down system logger: [  OK  ]
Shutting down sntpc: [  OK  ]
Stopping sshd: [  OK  ]
Stopping vehostd: [  OK  ]
```

```
Stopping watchdog: [  OK  ]
Stopping xinetd: [  OK  ]
Sending all processes the TERM signal... [  OK  ]
Sending all processes the KILL signal... [  OK  ]
Saving random seed:  [  OK  ]
Syncing hardware clock to system time [  OK  ]
Turning off swap:  [  OK  ]
Unmounting file systems:  [  OK  ]
init: Re-executing /sbin/init
Halting system...
System halted.
```

CAUTION: The final output of any version of the `request vmhost halt` command is the "The operating system has halted." Wait at least 60 seconds after first seeing this message before following the instructions in Step 4 and Step 5 to power off the router.

3. Attach the grounding strap to your bare wrist and to one of the two site ESD points on the chassis.
4. Disconnect power to the router by performing one of the following tasks:
   - AC power supply—Set the enable switch to the OFF (O) position and gently pull out the coupler for the power cord from the faceplate.
   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.
5. Remove the power source cable from the power supply faceplate:
   - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the plug end of the power cord connected to the power supply faceplate.
   - DC power supply—Loosen the thumbscrews securing the DC power connector on the power source cables. Remove the power source cables from the power supply.
6. Remove any remaining cables and optics before removing it from the rack.

SEE ALSO

Connect AC Power to an MX10008 | **174**

Connect DC Power to an MX10008 | **175**

Removing an MX10008 Router From a Four-Post Rack Using a Mechanical Lift

Before you remove the router using a lift:

- Ensure that the rack is stable and secured to the building.
- Ensure there is enough space to place the removed router in its new location and along the path to the new location. See "MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110.
- Review "General Safety Guidelines and Warnings" on page 334.
- Review the chassis lifting guidelines described in "MX10008 Chassis Lifting Guidelines" on page 340.
- Ensure that the router has been safely powered off (see "Powering Off an MX10008 Router" on page 294).

> ⚠ **CAUTION**: When removing more than one router chassis from a rack, remove the routers in order from top to bottom.

Ensure that you have the following parts and tools available to remove the router:

- A mechanical lift rated for 500 lb (226.8 kg)
- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your mounting screws

Because of the router's size and weight, we strongly recommend using a mechanical lift to install the MX10008.

> **NOTE**: For instructions on installing a router without using a mechanical lift, see "Manually Mounting an MX10008 in a 4-Post Rack" on page 161.

To remove the router using a mechanical lift (see Figure 177 on page 298):

1. Use the appropriate Phillips (+) screwdriver to remove the 14 mounting screws that attach the chassis flange to the rack.
2. Move the lift to the rack and position it so that its platform is centers about 0.5 in. (1.27 cm) below the bottom of the router chassis and as close to it as possible.
3. Carefully slide the router from the adjustable base bracket attached to the rack onto the lift.
4. Move the lift away from the rack and lower the lift.
5. Use the lift to transport the router to its new location.

Figure 177: Moving the MX10008 Using a Mechanical Lift



Manually Removing an MX10008 Router from a 4-Post Rack

Before you manually remove the router from a rack:

- Ensure that the rack is stable and secured to the building.
- Ensure there is enough space to place the removed router in its new location and along the path to the new location. See "MX10008 Depth Clearance Requirements for Airflow and Hardware Maintenance" on page 110.
- Review "General Safety Guidelines and Warnings" on page 334.
- Review the chassis lifting guidelines described in "MX10008 Chassis Lifting Guidelines" on page 340.

- Ensure that the router has been safely powered off (see "Powering Off an MX10008 Router" on page 294).

Ensure you have a Phillips (+) screwdriver, number 2 or number 3, depending on the size of your mounting screws.

If you cannot use a mechanical lift to remove the router (the preferred method), you can install it manually.

CAUTION: The chassis weighs approximately 145 lb (66 kg) with only the fan tray controllers installed. Lifting the chassis and mounting it in a rack or cabinet requires at least three people.

Make sure the chassis is empty (contains only the backplane) before you lift it.

CAUTION: When removing more than one router chassis from a rack, remove the routers in order from top to bottom.

To manually remove an MX10008 from a rack:

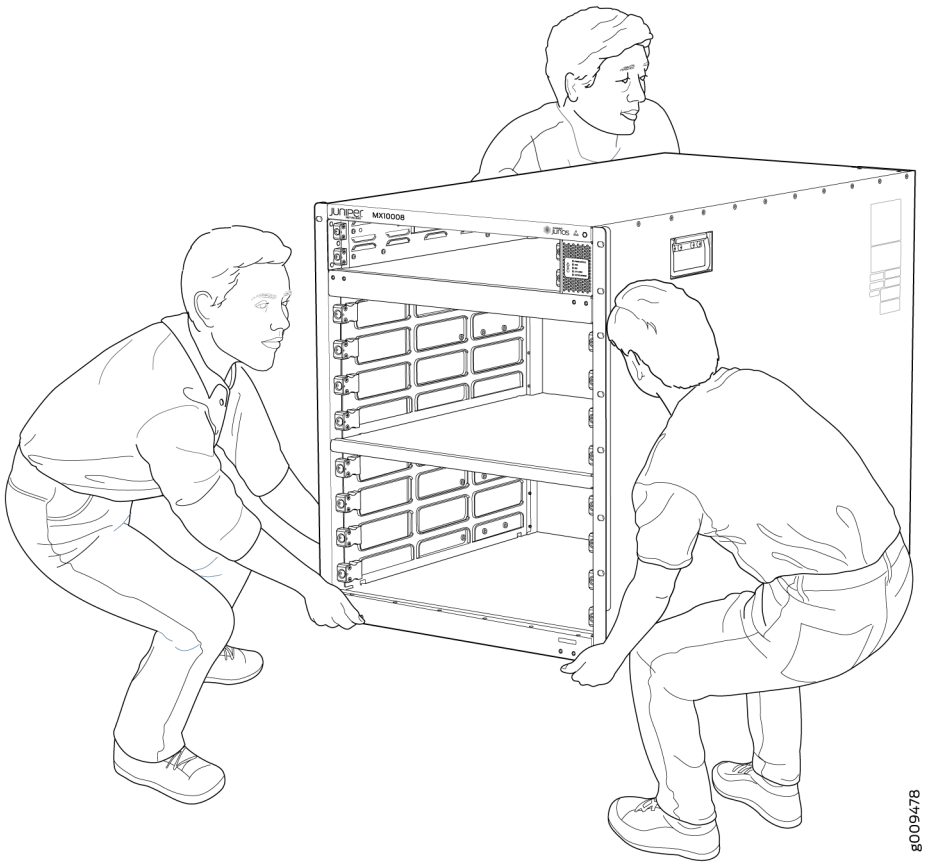
1. Remove all line cards, RCBs, power supplies, fan trays, SFBs, and optics before attempting to move the router chassis.
   - "Removing a Routing and Control Board" on page 186
   - "How to Remove a JNP10K-PWR-AC Power Supply" on page 202
   - "How to Remove a JNP10K-PWR-DC Power Supply" on page 225
   - "Removing an MX10008 Fan Tray" on page 192
   - "Removing an MX10008 Switch Fabric Board" on page 259

   Ensure that all of the removed components are stored in electrostatic bags.
2. Use the appropriate Phillips (+) screwdriver to remove the 14 mounting screws that attach the chassis flange to the rack.

   WARNING: To prevent injury, keep your back straight and lift with your legs, not your back. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
3. Position one person on each side and another in the rear of the chassis. There are two handles on the side, but these handles are only meant to help guide the empty chassis out of the base and rear brackets.

4. On each side, hold the bottom of the chassis and carefully lift it up from the base and rear brackets on the four-post rack.
5. Carefully lift it out of the rack. If you have a pallet jack, move the router onto the pallet jack. See Figure 178 on page 300.

Figure 178: Lifting the MX10008 Without Using a Mechanical Lift



6. Carefully move the chassis to its new location.

   After moving the router to its new location, reinstall the components in the chassis or store the components in electrostatic bags.

SEE ALSO

Connect the MX10008 to Earth Ground | **172**

Connect AC Power to an MX10008 | **174**

Connect DC Power to an MX10008 | **175**

5

CHAPTER

Troubleshooting Hardware

Restoring Junos OS | 302

Alarm Messages | 306

Restoring Junos OS

IN THIS SECTION

- Creating an Emergency Boot Device | 302
- Performing a Recovery Installation Using an Emergency Boot Device | 304

Creating an Emergency Boot Device

Before you begin, you need to download the installation media image for your device and Junos OS release from https://www.juniper.net/customers/support/ .

If Junos OS on the device is damaged in some way that prevents the software from loading properly, you can use an emergency boot device to repartition the primary disk and load a fresh installation of Junos OS. Use the following procedure to create an emergency boot device.

NOTE: You can create the emergency boot device on another Juniper Networks router or router, or any PC or laptop that supports Linux. The steps you take to create the emergency boot device vary, depending on the device.

To create an emergency boot device:

1. Use FTP to copy the installation media image into the **/var/tmp** directory on the device.
2. Insert a USB device into the USB port.
3. From the Junos OS command-line interface (CLI), start the shell:

```
user@device> start shell
%
```

4. Switch to the root account using the su command:

```
% su
Password: password
```

NOTE: The password is the root password for the device. If you logged in to the device as root, you do not need to perform this step.

5. Enter the following command on the device:

```
root@device% dd if=/var/tmp/filename of=/dev/da1 bs=16k
```

The device writes the installation media image to the USB device:

```
root@device% dd if=install-media-qfx-5e-15.1X53-D30.5-domestic.img of=/dev/da0 bs=1m
1399+0 records in
1399+0 records out
1466957824 bytes transferred in 394.081902 secs (3722469 bytes/sec)
```

6. Enter the following command:

```
root@device% dd if=/var/tmp/filename of=/dev/da0 bs=1048576
```

The device writes the installation media image to the USB device:

```
root@device% dd if=/var/tmp/jinstall-vjunos-usb-13.2.img of=/dev/da0 bs=1048576
11006+1 records in
11006+1 records out
180332544 bytes transferred in 71.764266 secs (2512846 bytes/sec)
```

NOTE: The device automatically create a recovery Junos OS image.

The “Select a recovery image” menu appears on the console when one of these routers is booted and unable to load a version of Junos OS. You can follow the instructions in the “Select a recovery image” menu to load the Junos OS image for one of these routers.

7. Log out of the shell:

```
root@device% exit
% exit
user@device>
```

Performing a Recovery Installation Using an Emergency Boot Device

If Junos OS on your device is damaged in some way that prevents the software from loading correctly, you might need to perform a recovery installation using an emergency boot device (for example, a USB flash drive) to restore the default factory installation. After you have recovered the software, you need to restore the device configuration. You can either create a new configuration as you did when the device was shipped from the factory, or if you saved the previous configuration, you can simply restore that file to the device.

We recommend that you perform the following steps before you perform the recovery installation:

1. Ensure that you have an emergency boot device to use during the installation. See "Creating an Emergency Boot Device" on page 302 for information about how to create an emergency boot device.

2. Copy the existing configuration in the file **/config/juniper.conf.gz** from the device to a remote system, such as a server, or to an emergency boot device. For extra safety, you can also copy the backup configurations (the files named **/config/juniper.conf.*n***, where *n* is a number from 0 through 9) to a remote system or to an emergency boot device.

   You can use the system snapshot feature to complete this step. The system snapshot feature takes a “snapshot” of the files currently used to run the MX10008 router—the complete contents of the **/config** and **/var** directories, which include the running Juniper Networks Junos OS, the active configuration, and the rescue configuration—and copies all of these files into a memory source.

   WARNING: The recovery installation process completely overwrites the entire contents of the internal flash storage.

3. Copy any other stored files to a remote system as desired.

To reinstall Junos OS:

1. Insert the emergency boot device into the router.

2. Power cycle the router.

   The emergency boot device is detected. At this time, you can load Junos OS from the emergency boot device onto the internal flash storage.

3. Install Junos OS by choosing one of the following options:

- If you have a snapshot saved on the emergency boot device, the system prompts you with the following option.

```
Junos Snapshot Installer - (c) Juniper Networks 2013
          Reboot
          Install Junos Snapshot [14.1X53-D11_vjunos.61]
          Boot to host shell
[debug]
```

Select **Install Junos Snapshot** to install the snapshot.

- If Junos OS is installed at the factory on the emergency boot device, the system prompts you with the following option.

```
Juniper Linux Installer - (c) Juniper Networks 2014
            Reboot
            Install Juniper Linux Platform
            Boot to host shell [debug]
```

Select **Install Juniper Linux Platform** to install the Junos OS software from the emergency boot device.

The device copies the software from the emergency boot device, occasionally displaying status messages. Copying the software can take up to 12 minutes.

4. After the software is copied from the emergency device to the device, the device reboots from the internal flash storage on which the software was just installed. When the reboot is complete, the device displays the Junos OS login prompt:

```
root@router#
```

5. Create a new configuration as you did when the device was shipped from the factory, or restore the previously saved configuration file to the device.

6. Remove the emergency boot device.

Alarm Messages

IN THIS SECTION

- Understanding Alarms | 306
- Interface Alarm Messages | 308

Understanding Alarms

The MX10008 router supports different alarm types and severity levels. Table 65 on page 306 provides a list of alarm terms and definitions that can help you in monitoring the device.

Table 65: Alarm Terms and Definitions

Term	Definition
Alarm	Signal alerting you to conditions that might prevent normal operation. On the device, alarm indicators might include the LCD panel and LEDs on the device. The LCD panel (if present on the device) displays the chassis alarm message count. Blinking yellow LEDs indicate minor alarm conditions for chassis components.
Alarm condition	Failure event that triggers an alarm.

Table 65: Alarm Terms and Definitions *(Continued)*

Term	Definition

Alarm severity levels	Seriousness of the alarm. The level of severity can be either major (red) or minor (yellow).
	• Major (red)—Indicates a critical situation on the device that has resulted from one of the following conditions.
	A red alarm condition requires immediate action.
	  • One or more hardware components have failed.
	  • One or more hardware components have exceeded temperature thresholds.
	  • An alarm condition configured on an interface has triggered a critical warning.
	• Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left ignored or unaddressed, might cause an interruption in service or degradation in performance.
	A yellow alarm condition requires monitoring or maintenance. For example, a missing rescue configuration generates a yellow system alarm.

Alarm types	Alarms include the following types: • Chassis alarm—Predefined alarm triggered by a physical condition on the device such as a power supply failure or excessive component temperature. • Interface alarm—Alarm you configure to alert you when an interface link is down. Applies to `ethernet`, `fibre-channel`, and `management-ethernet` interfaces. You can configure a red (major) or yellow (minor) alarm for the link-down condition, or have the condition ignored. • System alarm—Predefined alarm that might be triggered by a missing rescue configuration, failure to install a license for a licensed software feature, or high disk usage.

SEE ALSO

show chassis alarms

show system alarms

Interface Alarm Messages

You configure interface alarms to alert you when an interface is down.

To configure an interface link-down condition to trigger a red or yellow alarm, or to configure the link-down condition to be ignored, use the `alarm` statement at the [`edit chassis`] hierarchy level. You can specify the `ethernet`, `fibre-channel`, or `management-ethernet` interface type.

By default, major alarms are configured for interface link-down conditions on the control plane and management network interfaces in an MX10008 router. The link-down alarms indicate that connectivity to the control plane network is down. You can configure these alarms to be ignored using the `alarm` statement at the [`edit chassis`] hierarchy level.

CHAPTER 6

Contacting Customer Support and Returning the Chassis or Components

Contact Customer Support | 310

Returning the MX10008 Chassis or Components | 311

Contact Customer Support

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

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

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

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

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

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

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

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

Returning the MX10008 Chassis or Components

IN THIS SECTION

- Returning a Router or Component for Repair or Replacement | 311
- Locating the Serial Number on an MX10008 Router or Component | 312
- Contacting Customer Support to Obtain a Return Materials Authorization for a Router or Component | 325
- Packing an MX10008 Router or Component for Shipping | 326

Returning a Router or Component for Repair or Replacement

If you need to return an MX10008 router, or an MX10016 router, or a component to Juniper Networks for repair or replacement, follow this procedure:

1. Determine the serial number of the component. For instructions, see "Locating the Serial Number on an MX10008 Router or Component" on page 312.
2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC), as described in "Contacting Customer Support to Obtain a Return Materials Authorization for a Router or Component" on page 325.

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

3. Pack the router or component for shipping, as described in "Packing an MX10008 Router or Component for Shipping" on page 326.

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

Locating the Serial Number on an MX10008 Router or Component

IN THIS SECTION

- Listing the Chassis and Component Details Using the CLI | 312
- Locating the Chassis Serial Number ID Label on an MX10008 | 319
- Locating the Serial Number ID Labels on MX10008 Power Supplies | 320
- Locating the Serial Number ID Labels on MX10008 Fan Trays and Fan Tray Controllers | 323
- Locating the Serial Number ID Labels on MX10008 Routing and Control Boards | 324
- Locating the Serial Number ID Labels on an MX10008 Line Card | 324
- Locating the Serial Number ID Labels on an MX10008 Switch Fabric Board (SFB) | 325

If you are returning a router or component to Juniper Networks for repair or replacement, you must locate the serial number of the router or component. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain a Return Materials Authorization (RMA). See "Contacting Customer Support to Obtain a Return Materials Authorization for a Router or Component" on page 325.

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

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

Listing the Chassis and Component Details Using the CLI

To list the MX10008 chassis and the components and their serial numbers, use the `show chassis hardware` CLI operational mode command.

```
user@device> show chassis hardware

Hardware inventory:
```

```
Item             Version  Part number  Serial number     Description
Chassis                                AF218             JNP10008 [MX10008]
Midplane         REV 05   750-071974   CAGY2639          Midplane 8
Routing Engine 0          BUILTIN      BUILTIN           RE X10
Routing Engine 1          BUILTIN      BUILTIN           RE X10
CB 0             REV 05   750-079562   CAJX5293          Control Board
CB 1             REV 03   750-079562   CAJS5123          Control Board
FPC 0            REV 04   750-084779   CAKR7006          JNP10K-LC2101
  CPU            REV 05   750-073391   CAKG1690          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   8543              QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   8500              QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   8493              QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   8506              QSFP28-LPBK
  PIC 1                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   8490              QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   8494              QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   8497              QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   8488              QSFP28-LPBK
  PIC 2                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   8496              QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   8499              QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   8547              QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   8491              QSFP28-LPBK
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   8489              QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   8498              QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   8522              QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   8542              QSFP28-LPBK
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   8519              QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   8541              QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   8495              QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   8518              QSFP28-LPBK
  PIC 5                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   8492              QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   8544              QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   8546              QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   8545              QSFP28-LPBK
FPC 1            REV 04   750-084779   CAKR7008          JNP10K-LC2101
 CPU            REV 05   750-073391   CAKR1015          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   54582             QSFP28-LPBK
```

```
    Xcvr 1       REV 01   740-064669   54655            QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   54589            QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   54611            QSFP28-LPBK
  PIC 1                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   54661            QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   54604            QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   54618            QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   54662            QSFP28-LPBK
  PIC 2                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   54654            QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   54602            QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   54594            QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   54645            QSFP28-LPBK
  PIC 3                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   54607            QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   54634            QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   54576            QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   54657            QSFP28-LPBK
  PIC 4                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   54580            QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   54665            QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   54651            QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   54658            QSFP28-LPBK
  PIC 5                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-064669   54660            QSFP28-LPBK
    Xcvr 1       REV 01   740-064669   54616            QSFP28-LPBK
    Xcvr 2       REV 01   740-064669   54666            QSFP28-LPBK
    Xcvr 3       REV 01   740-064669   54656            QSFP28-LPBK
FPC 2            REV 04   750-084779   CAKN5712         JNP10K-LC2101
  CPU            REV 05   750-073391   CAKN1558         LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120306G      QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120401P      QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ1210021      QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120801J      QSFP-100GBASE-SR4
  PIC 1                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120307V      QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120400V      QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120304X      QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120301B      QSFP-100GBASE-SR4
  PIC 2                   BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120800B      QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203011      QSFP-100GBASE-SR4
```

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    Xcvr 2       REV 01   740-058734   1ECQ120308B       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120307F       QSFP-100GBASE-SR4
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ112108Y       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120304V       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ1204019       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1209028       QSFP-100GBASE-SR4
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120307X       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203090       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120800G       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ11180EV       QSFP-100GBASE-SR4
  PIC 5                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ1121090       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203091       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120303F       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120400W       QSFP-100GBASE-SR4
FPC 3            REV 04   750-084779   CAKR7020          JNP10K-LC2101
  CPU            REV 05   750-073391   CAKJ2876          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120900E       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120306T       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120306A       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120800R       QSFP-100GBASE-SR4
  PIC 1                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ11180DG       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120306Z       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120905A       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120303Z       QSFP-100GBASE-SR4
  PIC 2                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120902C       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120309X       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ1209045       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120308G       QSFP-100GBASE-SR4
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120901Y       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120307T       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ11210AL       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ11180DF       QSFP-100GBASE-SR4
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120308H       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120303B       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120309H       QSFP-100GBASE-SR4
```

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    Xcvr 3       REV 01   740-058734   1ECQ1203085       QSFP-100GBASE-SR4
  PIC 5                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120307J       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120800J       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ11180E8       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ11180ED       QSFP-100GBASE-SR4
FPC 4            REV 04   750-084779   CAKN5702          JNP10K-LC2101
  CPU            REV 05   750-073391   CAKJ2856          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120902P       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120900M       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ11200ZL       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1209014       QSFP-100GBASE-SR4
  PIC 1                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120901K       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ12030C2       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120902T       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120305P       QSFP-100GBASE-SR4
  PIC 2                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ1209051       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120900X       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120306Y       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1209010       QSFP-100GBASE-SR4
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120307P       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1209011       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120901G       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1203079       QSFP-100GBASE-SR4
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120901D       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1209017       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ1209021       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120902R       QSFP-100GBASE-SR4
  PIC 5                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ11200XW       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203066       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120307E       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120900K       QSFP-100GBASE-SR4
FPC 5            REV 04   750-084779   CAKR7031          JNP10K-LC2101
  CPU            REV 05   750-073391   CAKJ2861          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120309D       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120308J       QSFP-100GBASE-SR4
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    Xcvr 2       REV 01   740-058734   1ECQ1203057       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120309K       QSFP-100GBASE-SR4
  PIC 1                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ11180EG       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ11210AA       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120401L       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1203093       QSFP-100GBASE-SR4
  PIC 2                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ1208019       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1209038       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ1203069       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120308D       QSFP-100GBASE-SR4
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120900H       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1204016       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ12030AA       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120903T       QSFP-100GBASE-SR4
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120309B       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ11180F1       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ11180EJ       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1209013       QSFP-100GBASE-SR4
  PIC 5                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120308N       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ120309G       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ121001W       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120308W       QSFP-100GBASE-SR4
FPC 6            REV 04   750-084779   CAKN5708          JNP10K-LC2101
  CPU            REV 05   750-073391   CAKN1560          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ121002B       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203099       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ120307Z       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ1210034       QSFP-100GBASE-SR4
  PIC 1                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ1203064       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ11180HC       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-061409   1GCQA231090       QSFP-100GBASE-LR4-T2
    Xcvr 3       REV 01   740-061409   1GCQA2380AW       QSFP-100GBASE-LR4-T2
  PIC 2                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-061409   1GCQA23200V       QSFP-100GBASE-LR4-T2
    Xcvr 1       REV 01   740-061409   1GCQA2280GV       QSFP-100GBASE-LR4-T2
    Xcvr 2       REV 01   740-061409   1GCQA22804D       QSFP-100GBASE-LR4-T2
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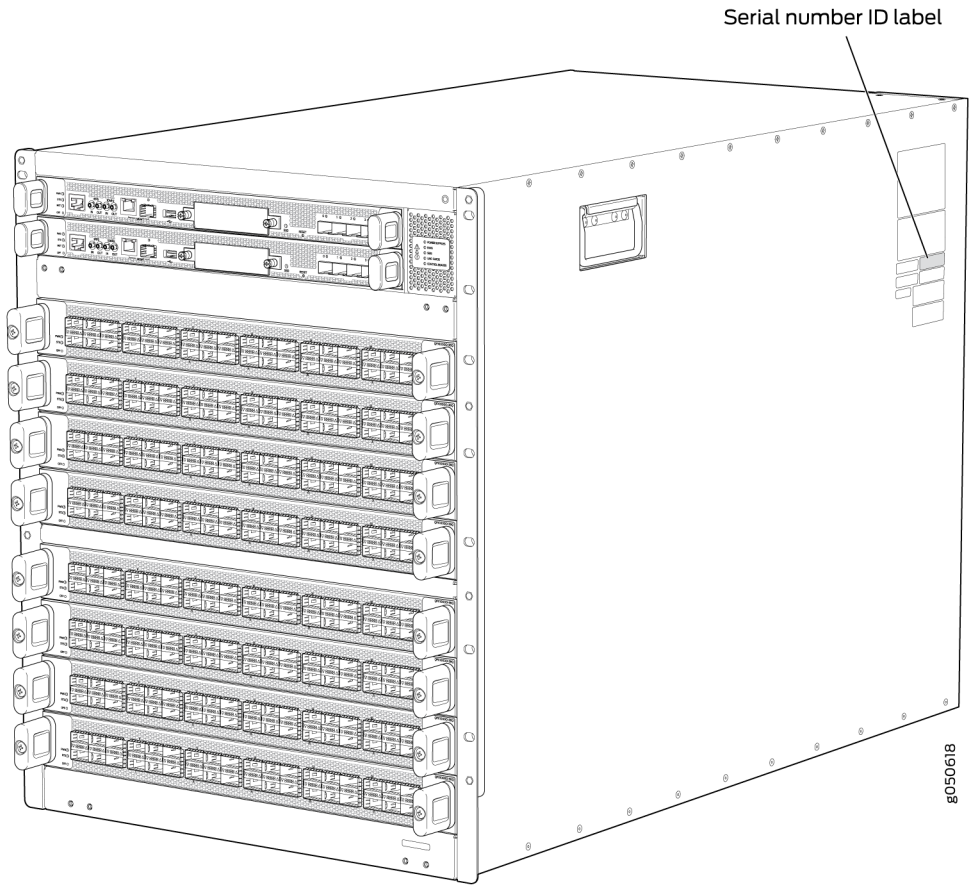
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    Xcvr 3       REV 01   740-061409   1GCQA22813P       QSFP-100GBASE-LR4-T2
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-061409   1GCQA23204M       QSFP-100GBASE-LR4-T2
    Xcvr 1       REV 01   740-061409   1GCQA2280LW       QSFP-100GBASE-LR4-T2
    Xcvr 2       REV 01   740-061409   1GCQA2310CM       QSFP-100GBASE-LR4-T2
    Xcvr 3       REV 01   740-061409   1GCQA23801F       QSFP-100GBASE-LR4-T2
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-061409   1GCQA2380PB       QSFP-100GBASE-LR4-T2
    Xcvr 1       REV 01   740-061409   1GCQA229044       QSFP-100GBASE-LR4-T2
    Xcvr 2       REV 01   740-058734   1ECQ120309F       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ120801D       QSFP-100GBASE-SR4
  PIC 5                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120305G       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203084       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058734   1ECQ1204017       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-058734   1ECQ11210NP       QSFP-100GBASE-SR4
FPC 7            REV 04   750-084779   CAKR7009          JNP10K-LC2101
  CPU            REV 05   750-073391   CAKR1004          LC 2101 PMB
  PIC 0                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058734   1ECQ120309E       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-058734   1ECQ1203092       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-058732   1BTQA21807H       QSFP-100GBASE-LR4
    Xcvr 3       REV 01   740-058732   1BTQA2180H4       QSFP-100GBASE-LR4
  PIC 1                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058732   1BTQA21807B       QSFP-100GBASE-LR4
    Xcvr 1       REV 01   740-058732   1BTQA21808P       QSFP-100GBASE-LR4
    Xcvr 2       REV 01   740-058732   1BTQA21807F       QSFP-100GBASE-LR4
    Xcvr 3       REV 01   740-058732   1BTQA2180GH       QSFP-100GBASE-LR4
  PIC 2                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058732   1BTQA21807J       QSFP-100GBASE-LR4
    Xcvr 1       REV 01   740-058732   1BTQA2180GK       QSFP-100GBASE-LR4
    Xcvr 2       REV 01   740-058732   1BTQA21807S       QSFP-100GBASE-LR4
    Xcvr 3       REV 01   740-058732   1BTQA218079       QSFP-100GBASE-LR4
  PIC 3                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058732   1BTQA2180H9       QSFP-100GBASE-LR4
    Xcvr 1       REV 01   740-058732   1BTQA2180GS       QSFP-100GBASE-LR4
    Xcvr 2       REV 01   740-058732   1BTQA2180GM       QSFP-100GBASE-LR4
    Xcvr 3       REV 01   740-058732   1BTQA21807A       QSFP-100GBASE-LR4
  PIC 4                   BUILTIN      BUILTIN           4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058732   1BTQA21807E       QSFP-100GBASE-LR4
    Xcvr 1       REV 01   740-058732   1BTQA218088       QSFP-100GBASE-LR4
    Xcvr 2       REV 01   740-058732   1BTQA2180H3       QSFP-100GBASE-LR4
    Xcvr 3       REV 01   740-058732   1BTQA21807R       QSFP-100GBASE-LR4
```

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  PIC 5                 BUILTIN      BUILTIN          4xQSFP28 SYNCE
    Xcvr 0       REV 01   740-058732   1BTQA2180KN      QSFP-100GBASE-LR4
    Xcvr 1       REV 01   740-058732   1BTQA21807G      QSFP-100GBASE-LR4
    Xcvr 2       REV 01   740-061412   1HTQ521000N      QSFP-100G-CWDM4
    Xcvr 3       REV 01   740-061412   1HTQ5209020      QSFP-100G-CWDM4
FPD Board        REV 07   711-054687   CAGY2459         Front Panel Display
PEM 0            REV 02   740-073146   1EDL62503RK      Power Supply AC
PEM 1            REV 02   740-073146   1EDL631051X      Power Supply AC
PEM 2            REV 02   740-073146   1EDL73104YE      Power Supply AC
PEM 3            REV 02   740-073146   1EDL62503AL      Power Supply AC
PEM 4            REV 02   740-073146   1EDL62102EE      Power Supply AC
PEM 5            REV 02   740-073146   1EDL625036K      Power Supply AC
FTC 0            REV 03   750-072657   CAGY3565         Fan Controller 8
FTC 1            REV 03   750-072657   CAGY3562         Fan Controller 8
Fan Tray 0       REV 04   760-072656   CAHC8375         Fan Tray 8
Fan Tray 1       REV 04   760-072656   CAHC8372         Fan Tray 8
SFB 0            REV 28   750-072655   ACPR2589         Switch Fabric 8
SFB 1            REV 03   750-072655   CAGY3066         Switch Fabric 8
SFB 2            REV 28   750-072655   ACPP8485         Switch Fabric 8
SFB 3            REV 07   750-072655   ACNL2260         Switch Fabric 8
SFB 4            REV 01   750-072655   ACPN5048         Switch Fabric 8
SFB 5            REV 03   750-072655   CAGY3050         Switch Fabric 8
```

Locating the Chassis Serial Number ID Label on an MX10008

The serial number ID label is located on a label on the right side of the chassis. See Figure 179 on page 320 for the location on an MX10008 .

Figure 179: MX10008 Serial Number Label

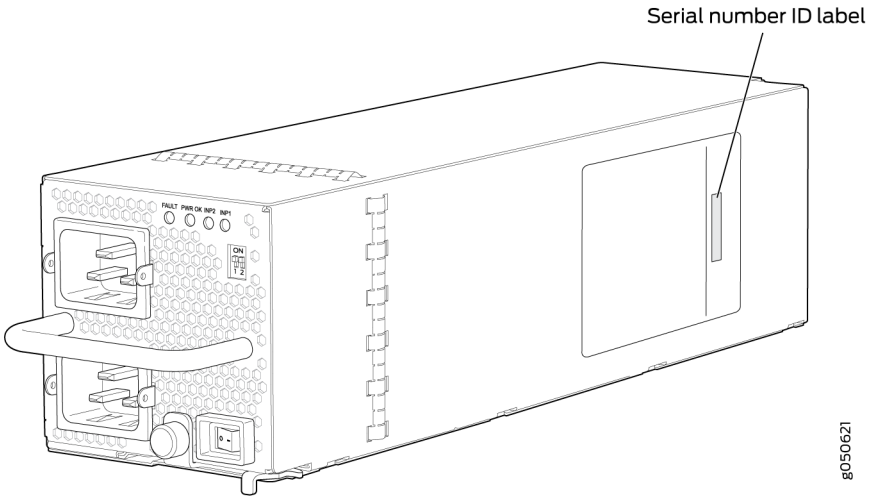


Locating the Serial Number ID Labels on MX10008 Power Supplies

The power supplies installed in an MX10008 are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the router chassis to see the FRU serial number ID label.

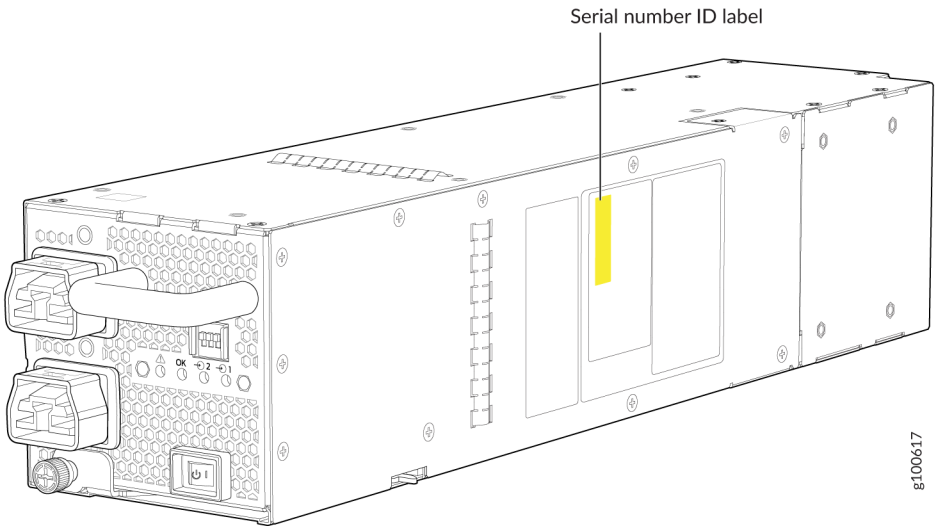
- JNP10K-PWR-AC power supply—The serial number ID label is on the right side of the power supply. See Figure 180 on page 321.

Figure 180: JNP10K-PWR-AC Power Supply Serial Number Location



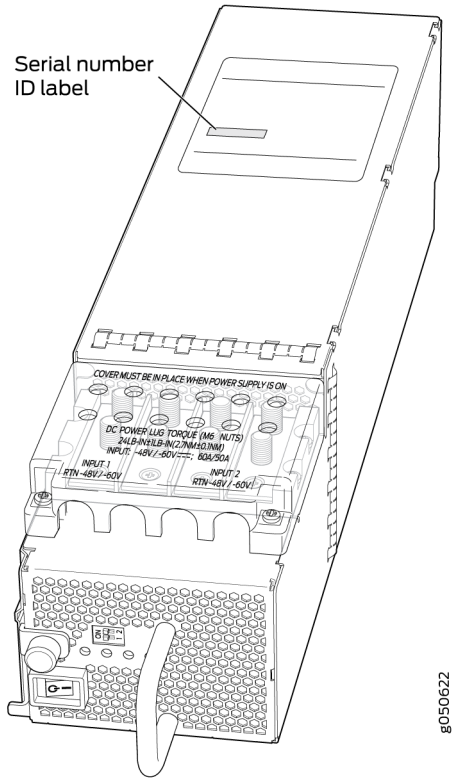
- JNP10K-PWR-AC2 power supply—The serial ID label is on the right side of the power supply. See Figure 181 on page 321.

Figure 181: JNP10K-PWR-AC2 Power Supply Serial Number Location



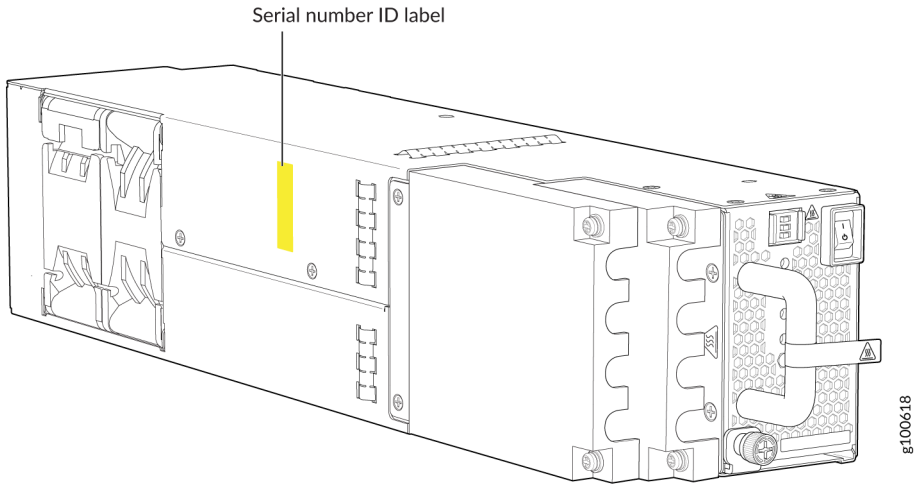
- JNP10K-PWR-DC power supply—The serial number ID label is on the left side of the power supply. See Figure 182 on page 322.

Figure 182: JNP10K-PWR-DC Power Supply Serial Number Location



- JNP10K-PWR-DC2 power supply—The serial number ID label is on the left side of the power supply. See Figure 183 on page 322.

Figure 183: JNP10K-PWR-DC2 Power Supply Serial Number Location

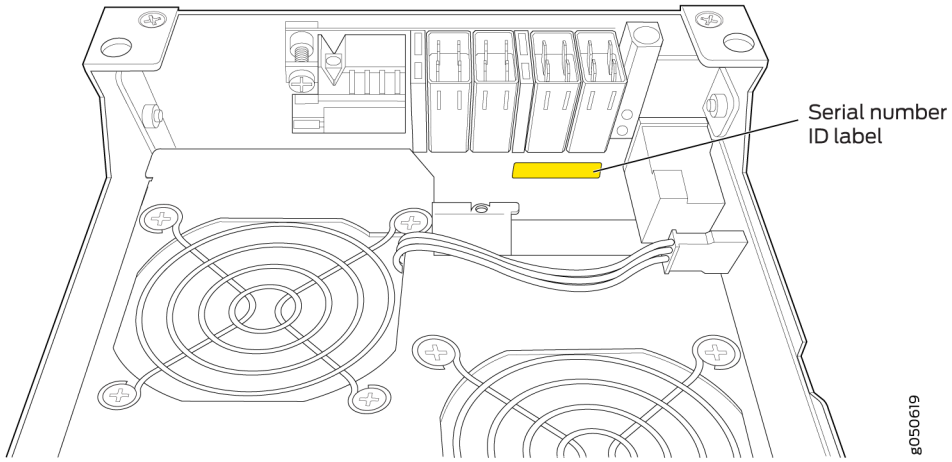


Locating the Serial Number ID Labels on MX10008 Fan Trays and Fan Tray Controllers

The two fan trays and their associated fan tray controllers installed in an MX10008 are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the router chassis to see the FRU serial number ID label.

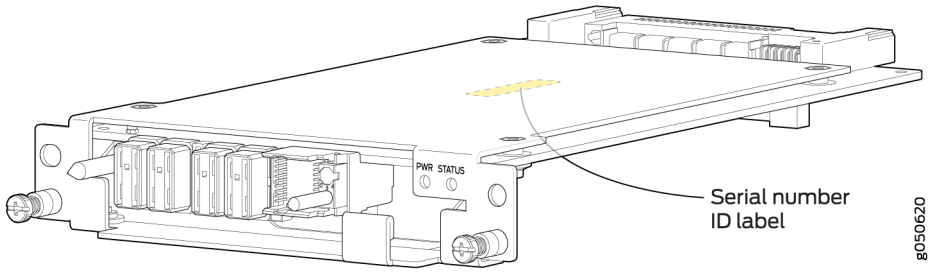
- Fan tray–The serial number ID label for both fan tray models (JNP10008-FAN and JNP10008-FAN2) is located on the inside of the fan tray at the base of the fan tray control board. See Figure 184 on page 323.

Figure 184: MX10008 Fan Tray Serial Number Location



- Fan tray controller–The serial number ID label for both fan tray controller models (JNP10008-FAN-CTRL and JNP10008-FTC2) is located on the top of the fan tray controller. See Figure 185 on page 323.

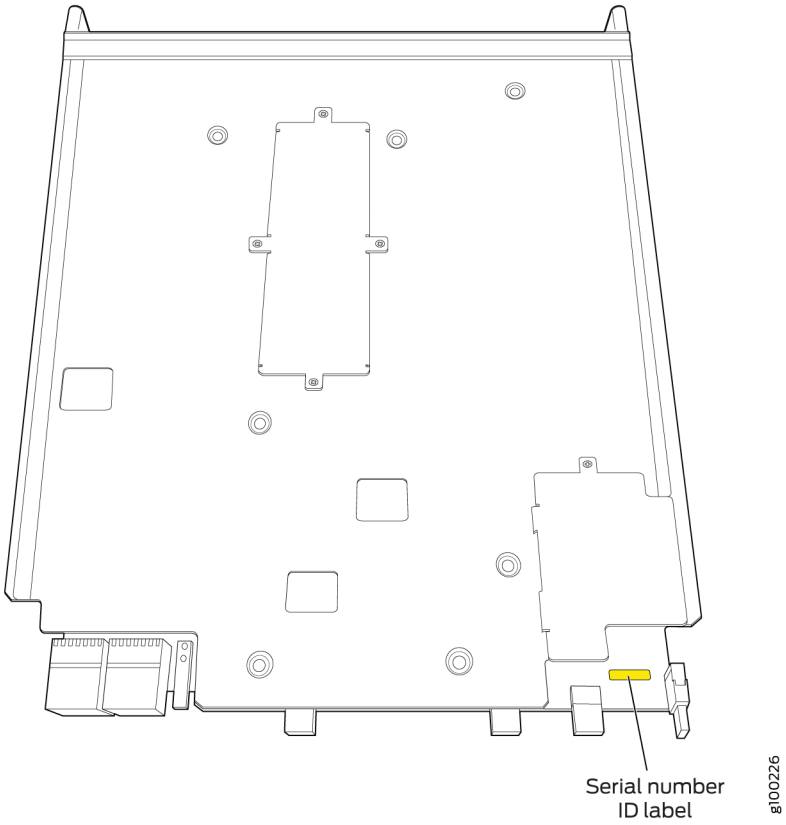
Figure 185: MX10008 Fan Tray Controller Serial Number Location



Locating the Serial Number ID Labels on MX10008 Routing and Control Boards

The serial number ID label for an RCB is located on the connector end of the unit. See Figure 186 on page 324.

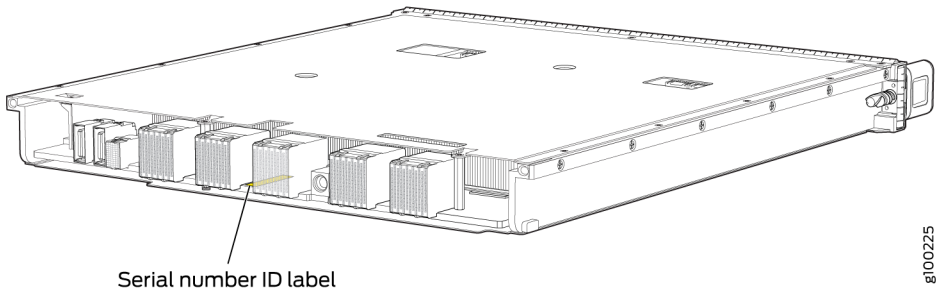
Figure 186: MX10008 RCB Serial Number Location



Locating the Serial Number ID Labels on an MX10008 Line Card

The serial number ID label for a line card is located on the connector end of the card. See Figure 187 on page 325.

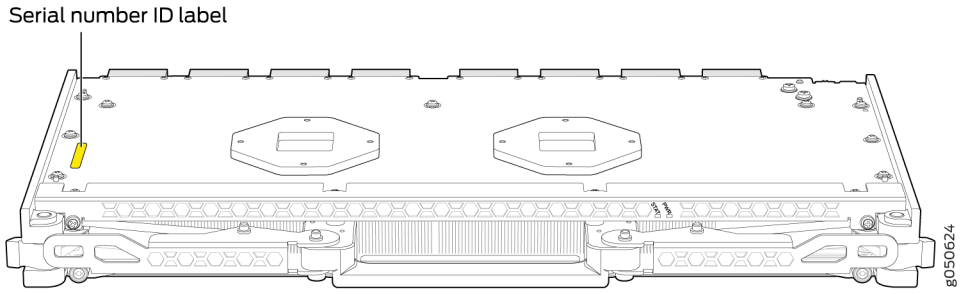
Figure 187: MX10008 Line Card Serial Number Location



Locating the Serial Number ID Labels on an MX10008 Switch Fabric Board (SFB)

The serial number ID label for an SFB is located on the PC board. See Figure 188 on page 325.

Figure 188: MX10008 SFB Serial Number Location



Contacting Customer Support to Obtain a Return Materials Authorization for a Router or Component

If you are returning a MX10008 router or component to Juniper Networks for repair or replacement, you must first obtain a Return Materials Authorization (RMA) from the Juniper Networks Technical Assistance Center (JTAC).

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

For instructions on locating the serial number of the device or component you want to return, see the following device instructions:

- "Locating the Serial Number on an MX10008 Router or Component" on page 312

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

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

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

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

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

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

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

Packing an MX10008 Router or Component for Shipping

IN THIS SECTION

- Packing an MX10008 Chassis for Shipping | **327**
- Packing MX10008 Components for Shipping | **330**

Follow this procedure if you are returning an MX10008 chassis or component to Juniper Networks for repair or replacement.

Before you pack an MX10008 or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 359.
- Pack your chassis or component using one of these materials:
  - Use the packing material from the replacement chassis or component
  - Retrieve the original shipping carton and packing materials

Contact your JTAC representative if you do not have these materials, to learn about approved packing materials. See "Contact Customer Support" on page 310.

Ensure that you have the following parts and tools available:

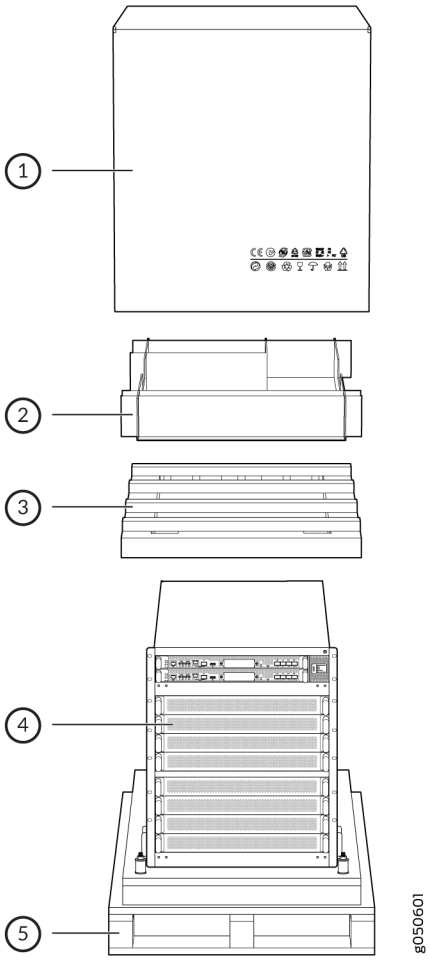
- ESD grounding strap.
- Electrostatic bag, one for each component.
- If you are returning the chassis:
  - A 13/32-in. or 10-mm open-end or socket wrench to install the bracket bolts on the chassis and shipping pallet
  - An appropriate screwdriver for the mounting screws used on your rack.

This topic covers:

Packing an MX10008 Chassis for Shipping

The MX10008 is shipped in a cardboard box that has a two-layer wooden pallet base with foam cushioning between the layers. The router chassis is bolted to the pallet base with four pallet fasteners, two on each side of the chassis. See Figure 11 for the stacking configuration of the MX10008 .

Figure 189: Stacking Configuration for Packing the MX10008 Chassis



To pack an MX10008 for shipping:

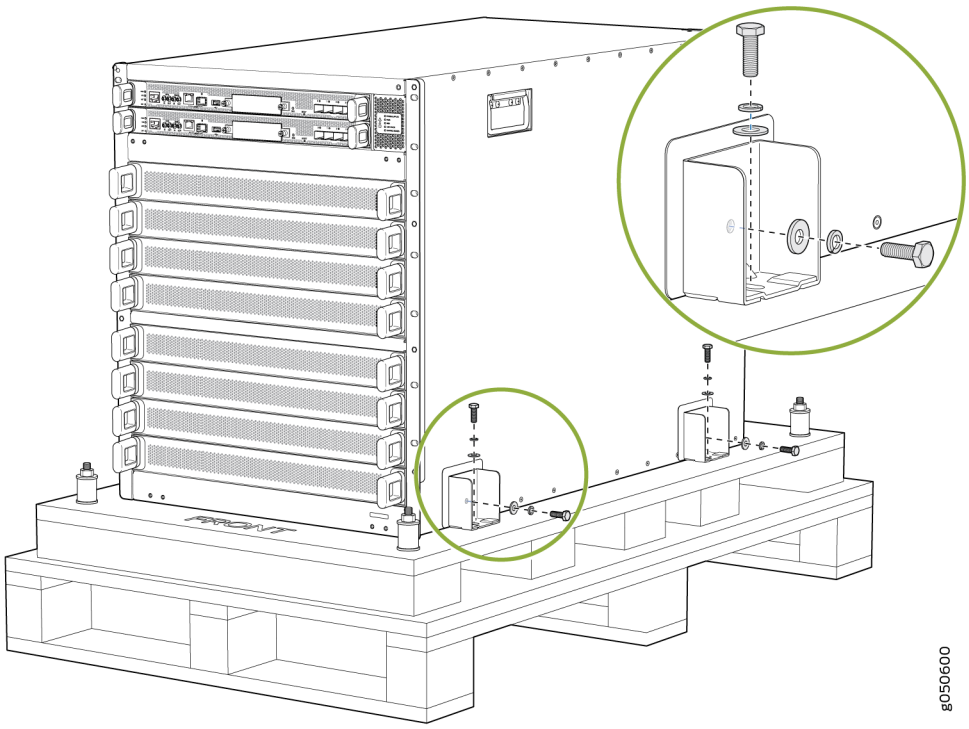
1. Power down the chassis and remove the power cables. See "Powering Off an MX10008 Router" on page 294.
2. Remove the cables that connect the MX10008 to all external devices.
3. Remove all line cards and pack them in their original shipping containers. See "Packing an MX10008 Router or Component for Shipping" on page 326.
4. Install covers over empty slots.

   Leave components that came installed in the chassis in the chassis, such as the Control Boards or power supplies.
5. Move the wooden pallet and packing material to a staging area as close to the router as possible. Make sure there is enough space to move the chassis from the rack to the wooden pallet.
6. Position a mechanical lift under the device. If a mechanical lift is not available, have three people support the weight of the router while another person uses the screwdriver to remove the front mounting screws that attach the chassis mounting brackets to the rack. For MX10008 removal, see

"Removing an MX10008 Router From a Four-Post Rack Using a Mechanical Lift" on page 297 or "Manually Removing an MX10008 Router from a 4-Post Rack" on page 298. .

7. Remove the router from the rack (see "MX10008 Chassis Lifting Guidelines" on page 340) and place the router on the shipping pallet. Position the router on the pallet so that the front of the router is facing the silkscreened “front” mark on the pallet. The pallet also has crop marks to guide you in positioning the chassis
8. Use the 13/32-in. or 10-mm open-end or socket wrench to install the four sets of brackets and bolts that secure the chassis to the wooden pallet.
9. Slide the plastic cover over the router chassis. The plastic cover is part of the router’s original packing materials.
10. Place the packing foam on top of and around the router.
11. Place the power cords in the box.
12. Remove the adjustable mounting brackets from the rack and place them and their connecting screws in the accessory box.
13. If you are returning accessories or FRUs with the router, pack them as instructed in "Packing MX10008 Components for Shipping" on page 330.
14. Verify that all accessories are present. See "Unpacking Line Cards, RCBs, and Switch Fabric Boards" on page 148.
15. Slide the cardboard box over the chassis, making sure that the arrows on the box point up and the pallet fasteners to secure the cardboard box to the wooden pallet are near the bottom.
16. Attach the cardboard box to the wooden pallet by screwing two screws into each of the four pallet fasteners. See Figure 12.

Figure 190: Attaching the MX10008 to the Pallet



17. Write the RMA number on the exterior of the box to ensure proper tracking.

Packing MX10008 Components for Shipping

Before you begin packing a router component, ensure that you have the following parts and tools available:

- Antistatic bag, one for each component
- Electrostatic discharge (ESD) grounding strap

> ⚠ **CAUTION**: Do not stack router components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.

To pack and ship MX10008 components:

1. Place individual FRUs in antistatic bags.
2. Use the original packing materials if they are available. If the original packing materials are not available, ensure the component is adequately packed to prevent damage during transit. The packing material you use must be able to support the weight of the component.
3. Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

4. Close the top of the cardboard shipping box and seal it with packing tape.
5. Write the RMA number on the exterior of the box to ensure proper tracking.

RELATED DOCUMENTATION

MX10008 Hardware Overview | 2

Prevention of Electrostatic Discharge Damage | 359

CHAPTER 7

Safety and Compliance Information

General Safety Guidelines and Warnings | 334

Definitions of Safety Warning Levels | 335

Qualified Personnel Warning | 337

Warning Statement for Norway and Sweden | 337

Fire Safety Requirements | 338

Installation Instructions Warning | 339

MX10008 Chassis Lifting Guidelines | 340

Restricted Access Warning | 340

Ramp Warning | 342

Rack-Mounting and Cabinet-Mounting Warnings | 342

Grounded Equipment Warning | 347

Radiation from Open Port Apertures Warning | 347

Laser and LED Safety Guidelines and Warnings | 348

Maintenance and Operational Safety Guidelines and Warnings | 351

General Electrical Safety Guidelines and Warnings | 357

Action to Take After an Electrical Accident | 359

Prevention of Electrostatic Discharge Damage | 359

AC Power Electrical Safety Guidelines | 361

AC Power Disconnection Warning | 362

DC Power Electrical Safety Guidelines for MX10008 Router | 363

DC Power Disconnection Warning | 364

DC Power Grounding Requirements and Warning | 365

DC Power Wiring Sequence Warning | 366

DC Power Wiring Terminations Warning | 368

Multiple Power Supplies Disconnection Warning | 369

TN Power Warning | 370

Agency Approvals and Compliance Statements | 371

General Safety Guidelines and Warnings

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

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

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



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

Definitions of Safety Warning Levels

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Qualified Personnel Warning



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

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

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

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

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

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

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

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

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

Warning Statement for Norway and Sweden



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

Varning! Apparaten skall anslutas till jordat nätuttag.

Fire Safety Requirements

IN THIS SECTION

- Fire Suppression | 338
- Fire Suppression Equipment | 338

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.

MX10008 Chassis Lifting Guidelines

The weight of a fully loaded base AC configuration is approximately 285 lb (129.27 kg) and 332 lb (150.59 kg) for the redundant AC configuration. Similarly, the weight of a redundant DC configuration is 319 lb (144.69 kg). Observe the following guidelines for lifting and moving an MX10008:

CAUTION: If you are installing the MX10008 without a mechanical lift, remove all power supplies, RCBs, SFBs, cover panels, and fan trays before attempting to install the router. Unless you are using a mechanical lift, at least three people are required to perform the rack installation.

- Before installing an MX10008, read the guidelines in "MX10008 Site Preparation Checklist" on page 102 to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the MX10008, disconnect all external cables.
- When raising the MX10008 into the rack, have two people lift and align the router with the rack while another person secures the router to the rack. As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings | 334
Installation Instructions Warning | 339
Mounting an MX10008 in a 4-Post Rack Using a Mechanical Lift | 158
Manually Mounting an MX10008 in a 4-Post Rack | 161

Restricted Access Warning

WARNING: This unit is intended for installation in restricted access areas. A restricted access area is an area to which access can be gained only by service personnel through

the use of a special tool, lock and key, or other means of security, and which is controlled by the authority responsible for the location.

Waarschuwing Dit toestel is bedoeld voor installatie op plaatsen met beperkte toegang. Een plaats met beperkte toegang is een plaats waar toegang slechts door servicepersoneel verkregen kan worden door middel van een speciaal instrument, een slot en sleutel, of een ander veiligheidsmiddel, en welke beheerd wordt door de overheidsinstantie die verantwoordelijk is voor de locatie.

Varoitus Tämä laite on tarkoitettu asennettavaksi paikkaan, johon pääsy on rajoitettua. Paikka, johon pääsy on rajoitettua, tarkoittaa paikkaa, johon vain huoltohenkilöstö pääsee jonkin erikoistyökalun, lukkoon sopivan avaimen tai jonkin muun turvalaitteen avulla ja joka on paikasta vastuussa olevien toimivaltaisten henkilöiden valvoma.

Avertissement Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité. L'accès aux zones de sécurité est sous le contrôle de l'autorité responsable de l'emplacement.

Warnung Diese Einheit ist zur Installation in Bereichen mit beschränktem Zutritt vorgesehen. Ein Bereich mit beschränktem Zutritt ist ein Bereich, zu dem nur Wartungspersonal mit einem Spezialwerkzeugs, Schloß und Schlüssel oder anderer Sicherheitsvorkehrungen Zugang hat, und der von dem für die Anlage zuständigen Gremium kontrolliert wird.

Avvertenza Questa unità deve essere installata in un'area ad accesso limitato. Un'area ad accesso limitato è un'area accessibile solo a personale di assistenza tramite un'attrezzo speciale, lucchetto, o altri dispositivi di sicurezza, ed è controllata dall'autorità responsabile della zona.

Advarsel Denne enheten er laget for installasjon i områder med begrenset adgang. Et område med begrenset adgang gir kun adgang til servicepersonale som bruker et spesielt verktøy, lås og nøkkel, eller en annen sikkerhetsanordning, og det kontrolleres av den autoriteten som er ansvarlig for området.

Aviso Esta unidade foi concebida para instalação em áreas de acesso restrito. Uma área de acesso restrito é uma área à qual apenas tem acesso o pessoal de serviço autorizado, que possua uma ferramenta, chave e fechadura especial, ou qualquer outra forma de segurança. Esta área é controlada pela autoridade responsável pelo local.

¡Atención! Esta unidad ha sido diseñada para instalarse en áreas de acceso restringido. Área de acceso restringido significa un área a la que solamente tiene acceso el personal de servicio mediante la utilización de una herramienta especial, cerradura con llave, o

algún otro medio de seguridad, y que está bajo el control de la autoridad responsable del local.

Varning! Denna enhet är avsedd för installation i områden med begränsat tillträde. Ett område med begränsat tillträde får endast tillträdas av servicepersonal med ett speciellt verktyg, lås och nyckel, eller annan säkerhetsanordning, och kontrolleras av den auktoritet som ansvarar för området.

Ramp Warning



WARNING: When installing the device, do not use a ramp inclined at more than 10 degrees.

Waarschuwing Gebruik een oprijplaat niet onder een hoek van meer dan 10 graden.

Varoitus Älä käytä sellaista kaltevaa pintaa, jonka kaltevuus ylittää 10 astetta.

Avertissement Ne pas utiliser une rampe dont l'inclinaison est supérieure à 10 degrés.

Warnung Keine Rampen mit einer Neigung von mehr als 10 Grad verwenden.

Avvertenza Non usare una rampa con pendenza superiore a 10 gradi.

Advarsel Bruk aldri en rampe som heller mer enn 10 grader.

Aviso Não utilize uma rampa com uma inclinação superior a 10 graus.

¡Atención! No usar una rampa inclinada más de 10 grados.

Varning! Använd inte ramp med en lutning på mer än 10 grader.

Rack-Mounting and Cabinet-Mounting Warnings

Ensure that the rack or cabinet in which the device is installed is evenly and securely supported. Uneven mechanical loading could lead to a hazardous condition.

WARNING: To prevent bodily injury when mounting or servicing the device in a rack, take the following precautions to ensure that the system remains stable. The following directives help maintain your safety:

- Install the device in a rack that is secured to the building structure.
- Mount the device at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

Waarschuwing Om lichamelijk letsel te voorkomen wanneer u dit toestel in een rek monteert of het daar een servicebeurt geeft, moet u speciale voorzorgsmaatregelen nemen om ervoor te zorgen dat het toestel stabiel blijft. De onderstaande richtlijnen worden verstrekt om uw veiligheid te verzekeren:

- De Juniper Networks switch moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.
- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

Varoitus Kun laite asetetaan telineeseen tai huolletaan sen ollessa telineessä, on noudatettava erityisiä varotoimia järjestelmän vakavuuden säilyttämiseksi, jotta vältytään loukkaantumiselta. Noudata seuraavia turvallisuusohjeita:

- Juniper Networks switch on asennettava telineeseen, joka on kiinnitetty rakennukseen.
- Jos telineessä ei ole muita laitteita, aseta laite telineen alaosaan.
- Jos laite asetetaan osaksi täytettyyn telineeseen, aloita kuormittaminen sen alaosasta kaikkein raskaimmalla esineellä ja siirry sitten sen yläosaan.

- Jos telinettä varten on vakaimet, asenna ne ennen laitteen asettamista telineeseen tai sen huoltamista siinä.

Avertissement Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel:

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

Warnung Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt. Die folgenden Richtlinien sollen zur Gewährleistung Ihrer Sicherheit dienen:

- Der Juniper Networks switch muß in einem Gestell installiert werden, das in der Gebäudestruktur verankert ist.
- Wenn diese Einheit die einzige im Gestell ist, sollte sie unten im Gestell angebracht werden.
- Bei Anbringung dieser Einheit in einem zum Teil gefüllten Gestell ist das Gestell von unten nach oben zu laden, wobei das schwerste Bauteil unten im Gestell anzubringen ist.
- Wird das Gestell mit Stabilisierungszubehör geliefert, sind zuerst die Stabilisatoren zu installieren, bevor Sie die Einheit im Gestell anbringen oder sie warten.

Avvertenza Per evitare infortuni fisici durante il montaggio o la manutenzione di questa unità in un supporto, occorre osservare speciali precauzioni per garantire che il sistema rimanga stabile. Le seguenti direttive vengono fornite per garantire la sicurezza personale:

- Il Juniper Networks switch deve essere installato in un telaio, il quale deve essere fissato alla struttura dell'edificio.
- Questa unità deve venire montata sul fondo del supporto, se si tratta dell'unica unità da montare nel supporto.
- Quando questa unità viene montata in un supporto parzialmente pieno, caricare il supporto dal basso all'alto, con il componente più pesante sistemato sul fondo del supporto.
- Se il supporto è dotato di dispositivi stabilizzanti, installare tali dispositivi prima di montare o di procedere alla manutenzione dell'unità nel supporto.

Advarsel Unngå fysiske skader under montering eller reparasjonsarbeid på denne enheten når den befinner seg i et kabinett. Vær nøye med at systemet er stabilt. Følgende retningslinjer er gitt for å verne om sikkerheten:

- Juniper Networks switch må installeres i et stativ som er forankret til bygningsstrukturen.
- Denne enheten bør monteres nederst i kabinettet hvis dette er den eneste enheten i kabinettet.
- Ved montering av denne enheten i et kabinett som er delvis fylt, skal kabinettet lastes fra bunnen og opp med den tyngste komponenten nederst i kabinettet.
- Hvis kabinettet er utstyrt med stabiliseringsutstyr, skal stabilisatorene installeres før montering eller utføring av reparasjonsarbeid på enheten i kabinettet.

Aviso Para se prevenir contra danos corporais ao montar ou reparar esta unidade numa estante, deverá tomar precauções especiais para se certificar de que o sistema possui um suporte estável. As seguintes directrizes ajudá-lo-ão a efectuar o seu trabalho com segurança:

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do edificio.
- Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
- Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.

- Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.

¡Atención! Para evitar lesiones durante el montaje de este equipo sobre un bastidor, oeriormente durante su mantenimiento, se debe poner mucho cuidado en que el sistema quede bien estable. Para garantizar su seguridad, proceda según las siguientes instrucciones:

- El Juniper Networks switch debe instalarse en un bastidor fijado a la estructura del edificio.
- Colocar el equipo en la parte inferior del bastidor, cuando sea la única unidad en el mismo.
- Cuando este equipo se vaya a instalar en un bastidor parcialmente ocupado, comenzar la instalación desde la parte inferior hacia la superior colocando el equipo más pesado en la parte inferior.
- Si el bastidor dispone de dispositivos estabilizadores, instalar éstos antes de montar o proceder al mantenimiento del equipo instalado en el bastidor.

Varning! För att undvika kroppsskada när du installerar eller utför underhållsarbete på denna enhet på en ställning måste du vidta särskilda försiktighetsåtgärder för att försäkra dig om att systemet står stadigt. Följande riktlinjer ges för att trygga din säkerhet:

- Juniper Networks switch måste installeras i en ställning som är förankrad i byggnadens struktur.
- Om denna enhet är den enda enheten på ställningen skall den installeras längst ned på ställningen.
- Om denna enhet installeras på en delvis fylld ställning skall ställningen fyllas nedifrån och upp, med de tyngsta enheterna längst ned på ställningen.
- Om ställningen är försedd med stabiliseringsdon skall dessa monteras fast innan enheten installeras eller underhålls på ställningen.

Grounded Equipment Warning



WARNING: This device must be properly grounded at all times. Follow the instructions in this guide to properly ground the device to earth.

Waarschuwing Dit apparaat moet altijd goed geaard zijn. Volg de instructies in deze gids om het apparaat goed te aarden.

Varoitus Laitteen on oltava pysyvästi maadoitettu. Maadoita laite asianmukaisesti noudattamalla tämän oppaan ohjeita.

Avertissement L'appareil doit être correctement mis à la terre à tout moment. Suivez les instructions de ce guide pour correctement mettre l'appareil à la terre.

Warnung Das Gerät muss immer ordnungsgemäß geerdet sein. Befolgen Sie die Anweisungen in dieser Anleitung, um das Gerät ordnungsgemäß zu erden.

Avvertenza Questo dispositivo deve sempre disporre di una connessione a massa. Seguire le istruzioni indicate in questa guida per connettere correttamente il dispositivo a massa.

Advarsel Denne enheten på jordes skikkelig hele tiden. Følg instruksjonene i denne veiledningen for å jorde enheten.

Aviso Este equipamento deverá estar ligado à terra. Siga las instrucciones en esta guía para conectar correctamente este dispositivo a tierra.

¡Atención! Este dispositivo debe estar correctamente conectado a tierra en todo momento. Siga las instrucciones en esta guía para conectar correctamente este dispositivo a tierra.

Varning! Den här enheten måste vara ordentligt jordad. Följ instruktionerna i den här guiden för att jorda enheten ordentligt.

Radiation from Open Port Apertures Warning



LASER WARNING: Because invisible radiation might be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.

Waarschuwing Aangezien onzichtbare straling vanuit de opening van de poort kan komen als er geen fiberkabel aangesloten is, dient blootstelling aan straling en het kijken in open openingen vermeden te worden.

Varoitus Koska portin aukosta voi emittoitua näkymätöntä säteilyä, kun kuitukaapelia ei ole kytkettynä, vältä säteilylle altistumista äläkä katso avoimiin aukkoihin.

Avertissement Des radiations invisibles à l'il nu pouvant traverser l'ouverture du port lorsqu'aucun câble en fibre optique n'y est connecté, il est recommandé de ne pas regarder fixement l'intérieur de ces ouvertures.

Warnung Aus der Port-Öffnung können unsichtbare Strahlen emittieren, wenn kein Glasfaserkabel angeschlossen ist. Vermeiden Sie es, sich den Strahlungen auszusetzen, und starren Sie nicht in die Öffnungen!

Avvertenza Quando i cavi in fibra non sono inseriti, radiazioni invisibili possono essere emesse attraverso l'apertura della porta. Evitate di esporvi alle radiazioni e non guardate direttamente nelle aperture.

Advarsel Unngå utsettelse for stråling, og stirr ikke inn i åpninger som er åpne, fordi usynlig stråling kan emiteres fra portens åpning når det ikke er tilkoblet en fiberkabel.

Aviso Dada a possibilidade de emissão de radiação invisível através do orifício da via de acesso, quando esta não tiver nenhum cabo de fibra conectado, deverá evitar an EXposição à radiação e não deverá olhar fixamente para orifícios que se encontrarem a descoberto.

¡Atención! Debido a que la apertura del puerto puede emitir radiación invisible cuando no existe un cable de fibra conectado, evite mirar directamente a las aperturas para no exponerse a la radiación.

Varning! Osynlig strålning kan avges från en portöppning utan ansluten fiberkabel och du bör därför undvika att bli utsatt för strålning genom att inte stirra in i oskyddade öppningar.

Laser and LED Safety Guidelines and Warnings

IN THIS SECTION

General Laser Safety Guidelines | 349

- Class 1 Laser Product Warning | **350**
- Class 1 LED Product Warning | **350**
- Laser Beam Warning | **351**

Juniper Networks devices are equipped with laser transmitters, which are considered a Class 1 Laser Product by the U.S. Food and Drug Administration and are evaluated as a Class 1 Laser Product per IEC/EN 60825-1 requirements.

Observe the following guidelines and warnings:

General Laser Safety Guidelines

When working around ports that support optical transceivers, observe the following safety guidelines to prevent eye injury:

- Do not look into unterminated ports or at fibers that connect to unknown sources.
- Do not examine unterminated optical ports with optical instruments.
- Avoid direct exposure to the beam.



LASER WARNING: Unterminated optical connectors can emit invisible laser radiation. The lens in the human eye focuses all the laser power on the retina, so focusing the eye directly on a laser source—even a low-power laser—could permanently damage the eye.

Avertissement Les connecteurs à fibre optique sans terminaison peuvent émettre un rayonnement laser invisible. Le cristallin de l'œil humain faisant converger toute la puissance du laser sur la rétine, toute focalisation directe de l'œil sur une source laser, —même de faible puissance—, peut entraîner des lésions oculaires irréversibles.

Class 1 Laser Product Warning



LASER WARNING: Class 1 laser product.
Waarschuwing Klasse-1 laser produkt.

Varoitus Luokan 1 lasertuote.

Avertissement Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning



LASER WARNING: Class 1 LED product.
Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Avertissement Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning



LASER WARNING: Do not stare into the laser beam or view it directly with optical instruments.

Waarschuwing Niet in de straal staren of hem rechtstreeks bekijken met optische instrumenten.

Varoitus Älä katso säteeseen äläkä tarkastele sitä suoraan optisen laitteen avulla.

Avertissement Ne pas fixer le faisceau des yeux, ni l'observer directement à l'aide d'instruments optiques.

Warnung Nicht direkt in den Strahl blicken und ihn nicht direkt mit optischen Geräten prüfen.

Avvertenza Non fissare il raggio con gli occhi né usare strumenti ottici per osservarlo direttamente.

Advarsel Stirr eller se ikke direkte p strlen med optiske instrumenter.

Aviso Não olhe fixamente para o raio, nem olhe para ele directamente com instrumentos ópticos.

¡Atención! No mirar fijamente el haz ni observarlo directamente con instrumentos ópticos.

Varning! Rikta inte blicken in mot strålen och titta inte direkt på den genom optiska instrument.

Maintenance and Operational Safety Guidelines and Warnings

IN THIS SECTION

- Battery Handling Warning | 352
- Jewelry Removal Warning | 353
- Lightning Activity Warning | 354

Operating Temperature Warning | 355
Product Disposal Warning | 356

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 191 on page 360) 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).

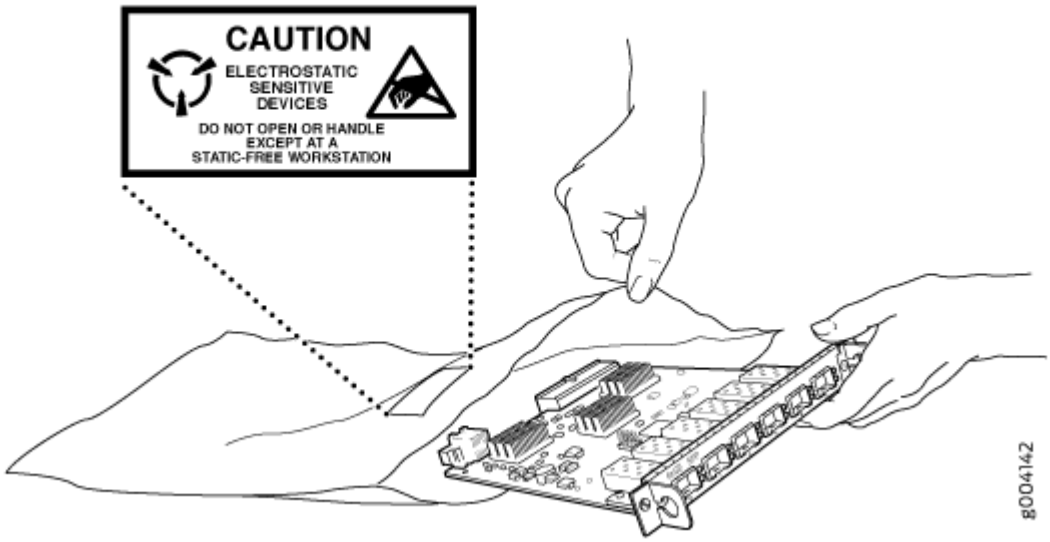
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  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 191 on page 360). If you are returning a component, place it in an antistatic bag before packing it.

Figure 191: Placing a Component into an Antistatic Bag





CAUTION: ANSI/TIA/EIA-568 cables such as Category 5e and Category 6 can get electrostatically charged. To dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.

Attention Les câbles ANSI/TIA/EIA-568, par exemple Cat 5e et Cat 6, peuvent emmagasiner des charges électrostatiques. Pour évacuer ces charges, reliez toujours les câbles à une prise de terre adaptée avant de les raccorder au système.

AC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to AC-powered devices:

- Note the following warnings printed on the device:

  "**CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK."

  "**ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE."

- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.

- You must provide an external certified circuit breaker (2-pole circuit breaker or 4-pole circuit breaker based on your device) rated minimum 20 A in the building installation.

- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.

- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

Power Cable Warning (Japanese)

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

注意

附属の電源コードセットはこの製品専用です。
他の電気機器には使用しないでください。

AC Power Disconnection Warning

WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

Waarschuwing Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

Avertissement Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut på vekselstrømsenheter.

Aviso Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada.

¡Atención! Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA).

Varning! Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden.

DC Power Electrical Safety Guidelines for MX10008 Router

This topic applies to hardware devices in the MX10008 router.

- A DC-powered device is equipped with a DC terminal block that is rated for the power requirements of a maximally configured device.

  NOTE: To supply sufficient power, terminate the DC input wiring on a facility DC source that is capable of supplying:

  - Minimum of 60 A at –48 VDC for MX10008 routers

  Incorporate an easily accessible disconnect device into the facility wiring. Be sure to connect the ground wire or conduit to a solid office earth ground. A closed loop ring is recommended for terminating the ground conductor at the ground stud.

- Run two wires from the circuit breaker box to a source of 48 VDC.

- A DC-powered device that is equipped with a DC terminal block is intended only for installation in a restricted-access location. In the United States, a restricted-access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

  NOTE: Primary overcurrent protection is provided by the building circuit breaker. This breaker must protect against excess currents, short circuits, and earth grounding faults in accordance with NEC ANSI/NFPA 70.

- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.

- For personal safety, connect the green and yellow wire to safety (earth) ground at both the device and the supply side of the DC wiring.
- The marked input voltage of –48 VDC for a DC-powered device is the nominal voltage associated with the battery circuit, and any higher voltages are only to be associated with float voltages for the charging function.
- Because the device is a positive ground system, you must connect the positive lead to the terminal labeled **RTN**, the negative lead to the terminal labeled –48 VDC, and the earth ground to the device grounding points.

DC Power Disconnection Warning



WARNING: Before performing any of the DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the device handle of the circuit breaker in the OFF position.

Waarschuwing Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

Varoitus Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

Avertissement Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

Warnung Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die

Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

Avvertenza Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

Advarsel Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

Aviso Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

¡Atención! Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF), y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

Varning! Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

DC Power Grounding Requirements and Warning

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors but is identifiable by green and yellow stripes is installed as part of the branch circuit that supplies the device. The grounding conductor is a separately derived system at the supply transformer or motor generator set.

WARNING: When you install the device, the ground connection must always be made first and disconnected last.

Waarschuwing Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

Varoitus Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

Avertissement Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

Warnung Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

Avvertenza In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

Advarsel Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

Aviso Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

¡Atención! Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

Varning! Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

DC Power Wiring Sequence Warning

WARNING: Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, +RTN to +RTN, then –48 V to –48 V. When disconnecting power, the proper wiring sequence is –48 V to –48 V, +RTN to +RTN, then ground to ground. Note that the ground wire must always be connected first and disconnected last.

Waarschuwing De juiste bedradingsvolgorde verbonden is aarde naar aarde, +RTN naar +RTN, en –48 V naar – 48 V. De juiste bedradingsvolgorde losgemaakt is en –48 naar – 48 V, +RTN naar +RTN, aarde naar aarde.

Varoitus Oikea yhdistettava kytkentajarjestys on maajohto maajohtoon, +RTN varten +RTN, −48 V varten − 48 V. Oikea irrotettava kytkentajarjestys on −48 V varten − 48 V, +RTN varten +RTN, maajohto maajohtoon.

Avertissement Câblez l'approvisionnement d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, +RTN à +RTN, puis −48 V à −48 V. En débranchant la puissance, l'ordre approprié de câblage est −48 V à −48 V, +RTN à +RTN, a alors rectifié pour rectifier. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

Warnung Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

Avvertenza Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

Advarsel Riktig tilkoples tilkoplingssekvens er jord til jord, +RTN til +RTN, −48 V til − 48 V. Riktig frakoples tilkoplingssekvens er −48 V til − 48 V, +RTN til +RTN, jord til jord.

Aviso Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, +RTN a +RTN, entonces −48 V a −48 V. Al desconectar potencia, la secuencia apropiada del cableado es −48 V a −48 V, +RTN a +RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

¡Atención! Wire a fonte de alimentação de DC Usando os talões apropriados nan EXtremidade da fiação. Ao conectar a potência, a seqüência apropriada da fiação é moída para moer, +RTN a +RTN, então −48 V a −48 V. Ao desconectar a potência, a seqüência apropriada da fiação é −48 V a −48 V, +RTN a +RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

Varning! Korrekt kopplingssekvens ar jord till jord, +RTN till +RTN, –48 V till –48 V. Korrekt kopplas kopplingssekvens ar –48 V till –48 V, +RTN till +RTN, jord till jord.

DC Power Wiring Terminations Warning



WARNING: When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations must be the appropriate size for the wires and must clamp both the insulation and conductor.

Waarschuwing Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Avertissement Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

Avvertenza Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

Advarsel Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

Aviso Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

¡Atención! Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

Multiple Power Supplies Disconnection Warning



WARNING: The network device has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

Waarschuwing Deze eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

Varoitus Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

Avertissement Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

Warnung Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

Avvertenza Questa unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

Advarsel Denne enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

Aviso Este dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

¡Atención! Esta unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

Varning! Denna enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

TN Power Warning



WARNING: The device is designed to work with a TN power system.
Waarschuwing Het apparaat is ontworpen om te functioneren met TN energiesystemen.

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

Avertissement Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

Warnung Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

Avvertenza Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

Advarsel Utstyret er utfomet til bruk med TN-strømsystemer.

Aviso O dispositivo foi criado para operar com sistemas de corrente TN.

¡Atención! El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.

Varning! Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.

Agency Approvals and Compliance Statements

IN THIS SECTION

- Agency Approvals for the Router | 371
- Compliance Statements for EMC Requirements for the Router | 372
- Compliance Statements for Environmental Requirements | 375

Agency Approvals for the Router

IN THIS SECTION

- Compliance Statement for Argentina | 372

The JNP Series complies with the following standards:

- Safety
  - CAN/CSA-C22.2 No. 60950-1 Information Technology Equipment - Safety
  - EN 60950-1 Information Technology Equipment - Safety
  - IEC 60825-1
  - IEC 60950-1 Information Technology Equipment - Safety CB Scheme report
  - UL 60950-1 Information Technology Equipment - Safety
- EMC
  - EN 55022, Class A
  - CISPR 22, Class A
  - Australian Communications and Media Authority (ACMA) AS/NZS CISPR 22: Class A
  - FCC Part 15, Subpart B, for Class A digital devices

- Industry Canada ICES 003, Class A
- VCCI Regulations for Voluntary Control Measures of Radio Interference Generated by Information Technology Equipment, (Class A).
- EN 300 386, Class A
- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 55024
- CISPR 24

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements for the Router

IN THIS SECTION

- Canada | **372**
- European Community | **373**
- Israel | **373**
- Japan | **374**
- Korea | **374**
- United States | **374**
- Nonregulatory Environmental Standards | **375**
- Compliance Statement for Argentina | **375**

This topic describes the EMC requirements for the router:

Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.



CAUTION: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

European Community

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

Israel

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 may cause radio interference, and in such a situation, the user may 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. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

VCCI-A

Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Korean Class A Warning g040913

The preceding translates as follows:

This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

United States

The JNP router 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, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Nonregulatory Environmental Standards

These MX Series product SKUs are designed to be Network Equipment Building System (NEBS) compliant:

- MX10008
- MX10016

Those device product SKUs are designed to meet the following NEBS compliance standards:

- SR-3580 NEBS Criteria Levels (Level 3 Compliance)
- GR-1089-CORE, Issue 6: EMC and Electrical Safety—Generic Criteria for Network Telecommunications Equipment
  - The equipment is suitable for installation in locations where the National Electrical Code (NEC) applies.
  - The battery return connection is to be treated as an Isolated DC return (DC-I), as defined in GR-1089-CORE.
- GR-63-CORE: NEBS, Physical Protection
  - The equipment is suitable for installation as part of the Common Bonding Network (CBN).
  - The equipment is suitable for installation in a central office (CO).

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for Environmental Requirements

IN THIS SECTION

- MX10008 Compliance Statements for Acoustic Noise | **376**
- MX10016 Compliance Statements for Acoustic Noise | **376**

MX10008 Compliance Statements for Acoustic Noise

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 96.1 dB(A) oder weniger gemäss GR63 CORE

Translation:

The emitted sound pressure is below 96.1 dB(A) per GR63 CORE.

MX10016 Compliance Statements for Acoustic Noise

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 92. dB(A) oder weniger gemäss GR63 CORE

Translation:

The emitted sound pressure is below 92 dB(A) per GR63 CORE.