

MX10004 Universal Routing Platform Hardware Guide

Published
2023-01-17

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

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MX10004 Universal Routing Platform Hardware Guide
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About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the MX10004 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.

1

CHAPTER

Overview

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MX10004 System Overview

SUMMARY

This chapter describes the Juniper® Networks MX10004 Universal Router, its hardware components, the CLI terms that match terms in this user documentation, and the Junos OS software that runs the MX10004 router.

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- [MX10004 Hardware Overview | 2](#)
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MX10004 Hardware Overview

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The MX10004 router is the most compact, high-density, and power-efficient modular router in the MX10000 line of modular packet-routing transport routers. At only 7 U in height, the MX10004 is designed for today's space-constrained facilities. Like the larger MX10000 routers, the MX10004 supports Juniper Networks' 400-Gigabit Ethernet (GbE) architecture with inline Media Access Control Security (MACsec) on all ports for point-to-point security on Ethernet links.

The MX10004 provides 1-Gigabit Ethernet, 10-Gigabit Ethernet, 25-Gigabit Ethernet, 40-Gigabit Ethernet, 50-Gigabit Ethernet, 100-Gigabit Ethernet, or 400-Gigabit Ethernet modular solutions that support up to 38.4 terabits per second (Tbps) of throughput. The MX10004 power system and the Routing Control Board (RCB) provide redundancy and resiliency.

Benefits

The MX10004 is a small-footprint complement to the larger MX10000 modular chassis, with these benefits:

- **Ease of deployment**—The MX10004 features a compact 7-U modular chassis for sites with limited space or power.
- **Modular, flexible design**—The MX10004 router uses the custom silicon line cards (2.4 Tbps, 480 Gbps, and 9.6 Tbps throughput) and power supplies found in the larger MX10000 modular chassis.
- **Always-on infrastructure base**—The MX10004 is engineered with full hardware redundancy for power 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 OS operating system on MX10004 supports high availability (HA) features such as graceful Routing Engine switchover (GRES) and nonstop active routing (NSR).

Chassis Description

The MX10004 router is 7-U tall. You can install up to six MX10004 routers in a standard 42-U rack with adequate cooling and power. All key MX10004 router components are field-replaceable units (FRUs). [Figure 1 on page 4](#) illustrates the key components visible from the front of the chassis, [Figure 2 on page 4](#) illustrates the components that are visible from the rear of the chassis, and [Figure 3 on page 5](#) illustrates the components that are internal to the chassis and are accessible after removing the fan trays.

Figure 1: MX10004 Chassis Front

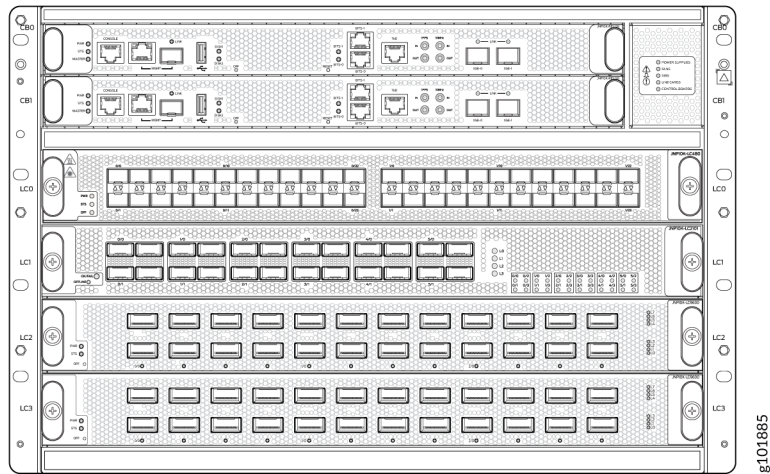
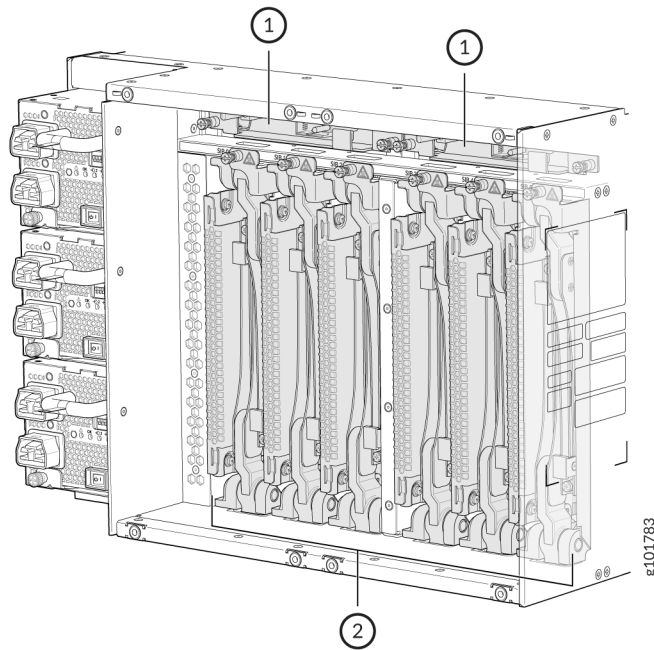


Figure 2: MX10004 Chassis Rear



Figure 3: MX10004 Chassis Internal Components



1– Fan tray controllers

2– Switch Fabric Boards (SFBs)

See ["MX10004 Chassis Physical Specifications"](#) on page 18.

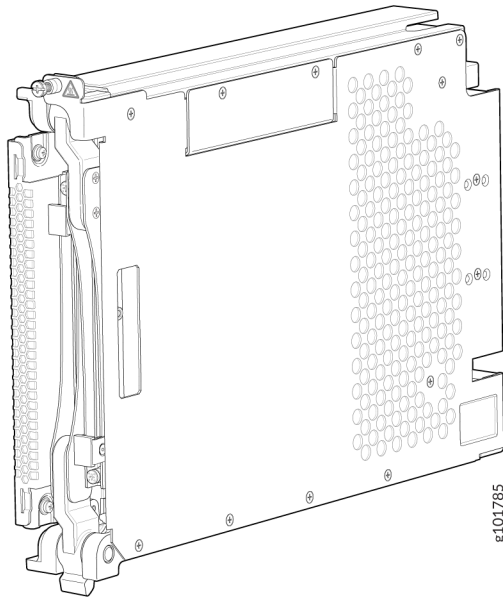
Switch Fabric Boards

Switch Fabric Boards (SFBs) create the switch fabric for the MX10004. Each SFB has a set of connectors to mate the line cards and the Routing and Control Board (RCB) to the switch fabric. See [Figure 4 on page 6](#) for an example of the JNP10004-SF2 Switch Fabric Board.

For the MX10004 switch fabric, three SFBs provide reduced switching functionality to an MX10004 router. Six SFBs provide full throughput. You install the SFBs between the line cards and the fan trays inside the chassis. Each MX10004 SFB has four connectors. Each connector matches up with a line card slot, eliminating the need for a backplane.

You can order the MX10004 with different SFB configurations that enable you to grow your system as needed. See ["MX10004 Components and Configurations"](#) on page 11.

Figure 4: JNP10004-SF2 Switch Fabric Board



Routing and Control Board

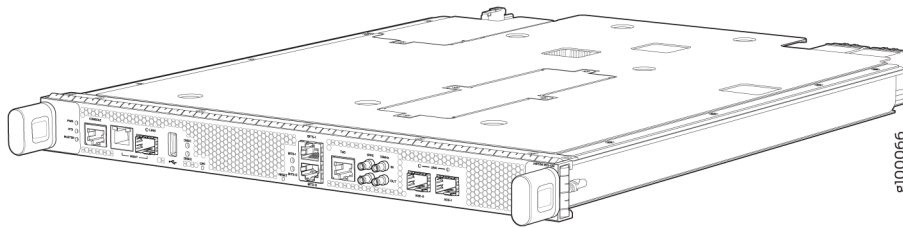
The Routing and Control Board (RCB) contains a Routing Engine and is responsible for system management and system control in the MX10004. See ["MX10004 Routing and Control Board Components and Descriptions" on page 57](#). RCBs are field-replaceable units (FRUs) that you install in the front of the chassis in the slots labeled **CB0** and **CB1**.

The supported models of RCB for JNP10004-SF2 fabric systems are as follows:

- JNP10K-RE1, 64 gigabytes of memory
- JNP10K-RE1-LT, 64 gigabytes of memory
- JNP10K-RE1-128, 128 gigabytes of memory

These RCBs run Junos OS 22.3R1. See [Figure 5 on page 7](#).

Figure 5: The JNP10K-RE1 and JNP10K-RE1-128 Routing and Control Boards



The MX10004-BASE configuration has a single RCB. The fully redundant configurations have two RCBs. The RCB also contains Precision Time Protocol (PTP) ports and four Media Access Control Security (MACsec) capable ports. See ["MX10004 Components and Configurations" on page 11](#).

Line Cards

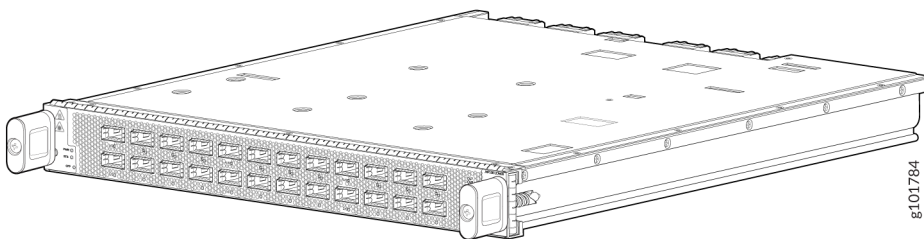
The MX10004 has four horizontal line card slots. The line cards combine a Packet Forwarding Engine and Ethernet interfaces enclosed in a single assembly. The MX10004 line card architecture is based on a number of identical, independent Packet Forwarding Engine slices. Line cards are FRUs that you can install in the line card slots labeled **0** through **3** (top to bottom) on the front of the chassis. All line cards are hot-removable and hot-insertable.

The MX10004 supports the following line cards:

- ["MX10K-LC2101" on page 69](#)
- ["MX10K-LC480" on page 71](#)
- ["MX10K-LC9600" on page 75](#)

See [Figure 6 on page 7](#) for an example of an MX10004 line card.

Figure 6: The MX10K-LC9600 Line Card

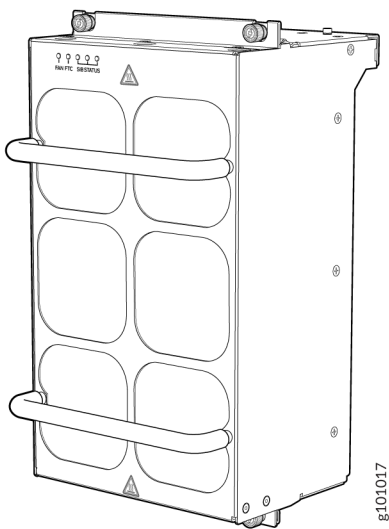


Cooling System

The cooling system in an MX10004 consists of two fan trays (see [Figure 7 on page 8](#)) and two fan tray controllers (see [Figure 8 on page 9](#)).

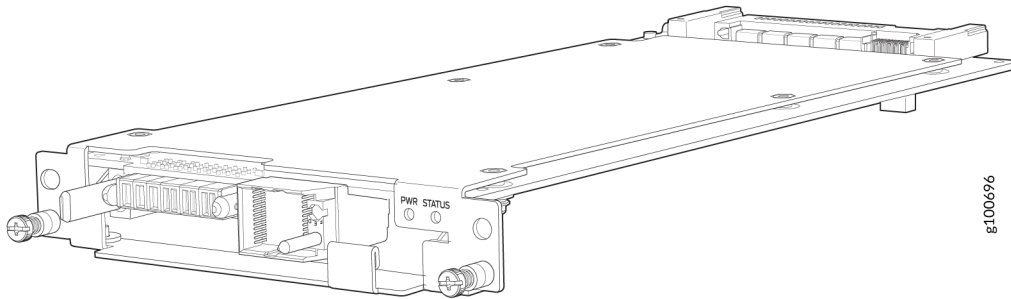
The JNP10004-FAN2 fan tray contains an array of six fans and operates as a single hot-removable and hot-insertable field-replaceable unit (FRU). You install the fan trays vertically on the rear of the chassis to provide front-to-back chassis cooling. See "[MX10004 Cooling System](#)" on page 25.

Figure 7: Fan Tray JNP10004-FAN2



Each JNP10004-FAN2 fan tray has a corresponding fan tray controller, JNP10004-FTC2. See [Figure 8 on page 9](#).

Figure 8: Fan Tray Controller JNP10004-FTC2



Power Supplies

The MX10004 routers support AC, DC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) through the following power supplies:

- JNP10K-PWR-AC2
- JNP10K-PWR-DC2

Power supplies for the MX10004 are load-sharing, hot-removable, hot-insertable FRUs. The router operates with three power supplies. Each power supply has an internal fan for cooling. You can install the power supplies in any slot. See [Figure 9 on page 10](#) and [Figure 10 on page 10](#).



CAUTION: Avoid mixing power supply models in the same chassis in a running environment.

Figure 9: JNP10K-PWR-AC2 Power Supply

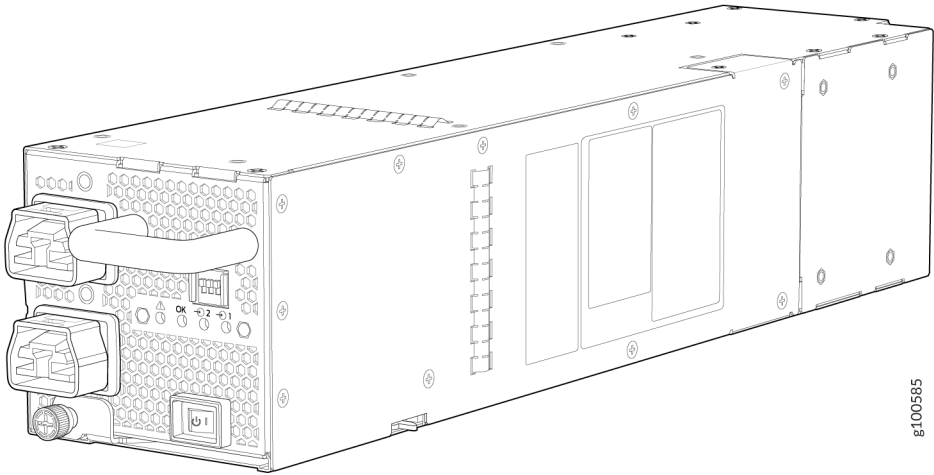


Figure 10: JNP10K-PWR-DC2 Power Supply

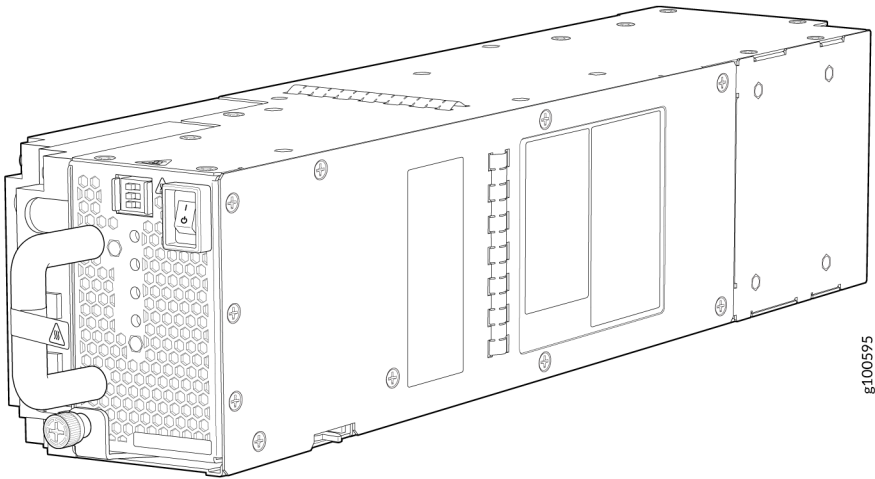


Table 1 on page 10 provides an overview of the differences between the power supplies.

Table 1: Power Supply Overview

Power Supply Model	Input Type	Wattage
JNP10K-PWR-AC2	AC, HVAC, or HVDC	5000 W, single feed; 5500 W, dual feed

Table 1: Power Supply Overview *(Continued)*

Power Supply Model	Input Type	Wattage
JNP10K-PWR-DC2	DC only	2750 W, single feed; 5500 W, dual feed

Software

The Juniper Networks MX10004 Universal Routing platform runs on the Junos OS 22.3R1 operating system.

MX10004 Components and Configurations

IN THIS SECTION

- [MX10004 Configurations | 11](#)

MX10004 Configurations

[Table 2 on page 12](#) lists the hardware configurations for an MX10004 modular chassis and the components included in each configuration.

Table 2: MX10004 Hardware Configurations

Router Configuration	Configuration Components
MX10004-BASE	• Chassis (JNP10004-CHAS) • One RCB (JNP10K-RE1, JNP10K-RE1-LT or JNP10K-RE1-128) • One RCB cover (JNP10K-RE-BLNK) • Two fan tray controllers (JNP10004-FTC2) • Two fan trays (JNP10004-FAN2) • Two AC power supplies (JNP10K-PWR-AC2) or two DC power supplies (JNP10K-PWR-DC2) • One power supply blank cover panel (JNP10K-PWR-BLNK) • Five SFBs (JNP10004-SF2) • One SFB cover (JNP10004-SF-BLNK) • Four line card covers (JNP10K-LC-BLNK) • Front door (JNP10004-FRNT-PNL or JNP10004-FRPNL1)
MX10004-PREMIUM	• Chassis (JNP10004-CHAS) • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT or JNP10K-RE1-128) • Two fan tray controllers (JNP10004-FTC2) • Two fan trays (JNP10004-FAN2) • Three AC power supplies (JNP10K-PWR-AC2) or three DC power supplies (JNP10K-PWR-DC2) • Six SFBs (JNP10004-SF2) • Four line card covers (JNP10K-LC-BLNK) • Front door (JNP10004-FRNT-PNL or JNP10004-FRPNL1)

Table 2: MX10004 Hardware Configurations (*Continued*)

Router Configuration	Configuration Components
MX10004-3F-BASE	• Chassis (JNP10004-CHAS) • One RCB (JNP10K-RE1, JNP10K-RE1-LT or JNP10K-RE1-128) • One RCB cover (JNP10K-RE-BLNK) • Two fan tray controllers (JNP10004-FTC2) • Two fan trays (JNP10004-FAN2) • Two AC power supplies (JNP10K-PWR-AC2) or two DC power supplies (JNP10K-PWR-DC2) • One power supply blank cover panel (JNP10K-PWR-BLNK) • Three SFBs (JNP10004-SF2) • Three SFB cover (JNP10004-SF-BLNK) • Four line card covers (JNP10K-LC-BLNK) • Front door (JNP10004-FRNT-PNL or JNP10004-FRPNL1)
MX10004-4F-PREM	• Chassis (JNP10004-CHAS) • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT or JNP10K-RE1-128) • Two fan tray controllers (JNP10004-FTC2) • Two fan trays (JNP10004-FAN2) • Three AC power supplies (JNP10K-PWR-AC2) or three DC power supplies (JNP10K-PWR-DC2) • Four SFBs (JNP10004-SF2) • Two SFB cover (JNP10004-SF-BLNK) • Four line card covers (JNP10K-LC-BLNK) • Front door (JNP10004-FRNT-PNL or JNP10004-FRPNL1)

NOTE: In MX10004-3F-BASE and MX10004-4F-PREM configurations with MX10K-LC9600 line cards installed the fabric capacity is only 52% and 69% respectively. When you try to use all the ports on the line cards, it leads to fabric over-subscription. To prevent fabric over-subscriptions, you must use only the odd-numbered ports or only the even-numbered ports.

NOTE: You must order line cards and the cable management system separately. They are not part of the base or redundant configuration.

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.

MX10004 Component Redundancy

The MX10004 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 MX10004 router can have one or two RCBs. When two RCBs are installed, one functions as the primary RCB, and the other functions as the backup RCB. If the primary RCB (or either of its components) fails, the backup RCB can take over as primary. See ["MX10004 Routing and Control Board Components and Descriptions" on page 57](#).
- **Switch Fabric Boards (SFBs)**—The MX10004 has six SFB slots for the JNP10004-SF2 SFBs. The switch fabric requires a minimum of three SFBs to provide the reduced switching functionality to an MX10004 router. You can achieve 5+1 SFB redundancy, only when the MX10004 router is populated with MX10K-LC2101 or MX10K-LC480 line cards or a mix of the two line cards. You must install all six SFBs for MX10K-LC9600 line card support.
- **Power supplies**—The system requires two power supplies for minimum operation. If you install three power supplies, the third power supply provides 2+1 redundancy. If one power supply fails in a fully redundant system, the other power supplies can provide full power to the MX10004 router indefinitely.

With the power supply redundancy, when one power supply fails, it does not cause line cards to go offline. Only the No Redundant Power minor alarm is raised. You can disable this alarm by using the `set chassis no-psu-redundancy` command.

Line cards can go offline depending on the total chassis power available at that time. When an line card goes offline due to insufficient power, Power Budget: Insufficient Power major alarm is raised.

The MX10004 router also supports power source redundancy. 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 MX10004 has two fan trays, both of which are controlled by the corresponding fan tray controllers. If one of the fans in a JNP10004-FAN2 fan tray fails, under most conditions the fan tray rebalances the remaining fans to continue. The fan tray continues to operate indefinitely and provide sufficient cooling even when a single rotor fails in a fan, provided that the room temperature is within the operating range. See ["MX10004 Cooling System" on page 25](#).

MX10004 Hardware and CLI Terminology Mapping

This topic describes the hardware terms used in MX10004 router documentation and the corresponding terms used in the Junos OS CLI. See [Table 3 on page 15](#).

Table 3: CLI Equivalents of Terms Used in Documentation for MX10004 Routers

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item in Documentati on	Additional Information
Chassis	MX10004	–	Router chassis	"MX10004 Chassis Physical Specifications" on page 18
Fan tray	JNP10004-FAN2	Fan Tray 0/1 Fan <i>n</i> The variable <i>n</i> is a value in the range of 0–11. The value corresponds to the individual fan number in the fan tray.	Fan tray	"MX10004 Cooling System" on page 25

Table 3: CLI Equivalents of Terms Used in Documentation for MX10004 Routers (Continued)

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item in Documentation	Additional Information
FPC (<i>n</i>)	Abbreviation for the Flexible PIC Concentrator (FPC) On MX10004, an FPC is equivalent to a line card.	The variable <i>n</i> is a value in the range of 0–3 for the MX10004. The value corresponds to the line card slot number in which the line card is installed.	Line card	Understanding Interface Naming Conventions
PIC (<i>n</i>)	Abbreviated name of the Physical Interface Card (PIC).	The variable <i>n</i> is a value in the range of 0–5.	–	Understanding Interface Naming Conventions
PEM (<i>n</i>)	Abbreviation for power supply module One of the following: • JNP10K-PWR-AC2 • JNP10K-PWR-DC2	The variable <i>n</i> is a value in the range of 0–2. The value corresponds to the power-supply slot number.	AC, DC, or HVDC power supply	One of the following: • "JNP10K-PWR-AC2 Power Supply" on page 38 • "JNP10K-PWR-DC2 Power Supply" on page 49
Routing Engine	RE (<i>n</i>)	The variable <i>n</i> is a value in the range of 0–1. Multiple line items appear in the CLI if more than one RCB is installed in the chassis.	RCB	"MX10004 Routing and Control Board Components and Descriptions" on page 57

Table 3: CLI Equivalents of Terms Used in Documentation for MX10004 Routers *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item in Documentation	Additional Information
SFB (<i>n</i>)	This field indicates: • State of the fabric plane: • Active • Spare • Check • Status of the Packet Forwarding Engine in each fabric plane: • Links OK • Error	The variable <i>n</i> is a value in the range of 0–5.	Fabric plane	show chassis sfb
Xcvr (<i>n</i>)	Abbreviation for the transceiver	The variable <i>n</i> is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	"MX10004 Optical Transceiver and Cable Support" on page 97

MX10004 Chassis

SUMMARY

Learn about the MX10004 router chassis, the field replaceable units (FRUs), and the physical specifications of each component.

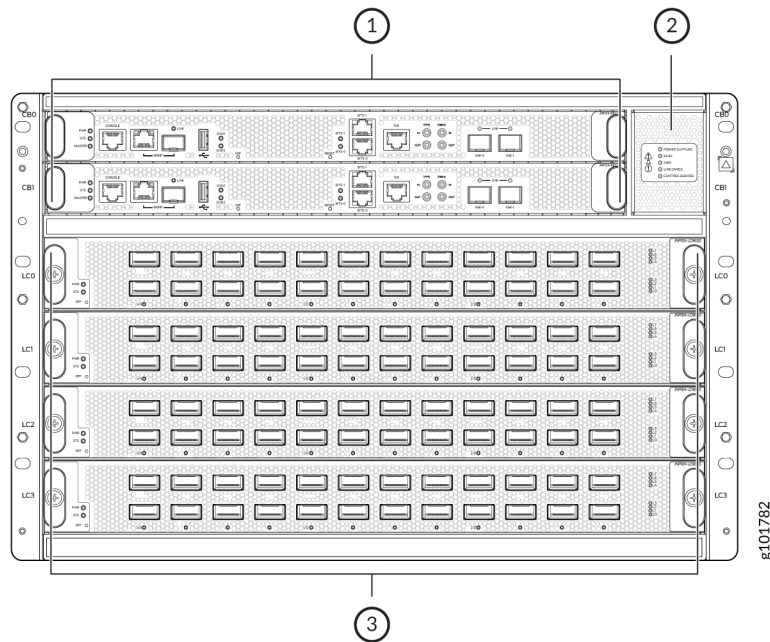
IN THIS SECTION

- [MX10004 Chassis Physical Specifications | 18](#)
- [MX10004 Field-Replaceable Units | 21](#)
- [MX10004 Status Panel | 22](#)
- [MX10004 Optional Equipment | 25](#)

MX10004 Chassis Physical Specifications

The MX10004 modular chassis is a rigid sheet-metal structure that houses the other router components. You can mount up to six MX10004 routers in a standard 19-in. 4-post rack (42 U), provided that the rack can bear the combined weight and that adequate power and cooling is available. See [Figure 11 on page 19](#) to help identify the major components. See [Table 4 on page 19](#) for the physical specifications of the chassis of these components.

Figure 11: Front View of the MX10004 Router



1– RCBs

3– Line cards

2– Status panel



WARNING: The handles on each side of the chassis are not for lifting the chassis. These handles facilitate the fine-tune positioning of the chassis on the base brackets. Do not use the handles to lift the chassis, even when the chassis is empty. See ["Mount the Juniper Networks MX10004 Router Using the JNP10004-RMK-4POST Rack-Mount Kit"](#) on page 122 for instructions about properly moving a loaded chassis.

Table 4: MX10004 Router Physical Specifications

Description	Weight	Height	Width	Depth
Chassis, MX10004-BASE AC or DC configuration	217 lbs (99 kg)	12.2 in. (31 cm)	17.4 in. (44.2 cm) NOTE: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.6 in. (92.96 cm) with JNP10004-FAN2 fan trays 42.7 in. (108.5 cm) with EMI door

Table 4: MX10004 Router Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
Chassis MX10004-3F-BASE AC or DC configuration	210 lbs (95 kg)	12.2 in. (31 cm)	17.4 in. (44.2 cm) NOTE: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.6 in. (92.96 cm) with JNP10004-FAN2 fan trays 42.7 in. (108.5 cm) with EMI door
Chassis MX10004-PREMIUM AC or DC configuration	248 lbs (113 kg)	12.2 in. (31 cm)	17.4 in. (44.2 cm) NOTE: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.6 in. (92.96 cm) with JNP10004-FAN2 fan trays 42.7 in. (108.5 cm) with EMI door
Chassis redundant MX10004-4F-PREM AC or DC configuration	239 lbs (108 kg)	12.2 in. (31 cm)	17.4 in. (44.2 cm) NOTE: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.6 in. (92.96 cm) with JNP10004-FAN2 fan trays 42.7 in. (108.5 cm) with EMI door
MX10K-LC2101 line card	31.57 lb (14.32 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	19.05 in. (48.3 cm) (excluding FRU ejector)
MX10K-LC480 Line Card	21.6 lb (9.8 kg)	1.89 in. (4.8 cm)	17.2 in. (43.68 cm)	19.05 in. (48.3 cm) (excluding FRU ejector)
MX10K-LC9600 Line Card	27 lb (12.24 kg)	1.89 in. (4.8 cm)	17.2 in. (43.68 cm)	19.05 in. (48.3 cm) (excluding FRU ejector)

MX10004 Field-Replaceable Units

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

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

[Table 5 on page 21](#) lists the FRUs and their types for the MX10004 routers.

Table 5: FRUs in a MX10004

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 Boards (RCBs)	Redundant configuration: • Primary RCB is hot-pluggable. • Backup RCB is hot-insertable and hot-removable. Base configuration: Removal of the RCB causes the router to shut down. To prevent traffic disruption, take the chassis offline. If a temporary disruption is acceptable, you can install a replacement RCB in the second slot. The system restarts to elect a primary RCB and a backup RCBs. If necessary, you can manually switch the primary and backup RCB using the <code>request chassis routing-engine master switch</code> command.

Table 5: FRUs in a MX10004 (Continued)

FRU	Type
Switch Fabric Boards (SFBs)	SFBs are hot-insertable and hot-removable. We recommend that you take SFBs offline before removing them to avoid traffic loss while the router fabric is being reconfigured. Use the following command: <pre>request chassis sfb slot <i>slot-number</i> offline</pre>
Line cards	Hot-insertable. We recommend that you take line cards offline before removing them. Use the following command: <pre>request chassis fpc slot <i>slot-number</i> offline</pre>
Optical transceivers	Hot-insertable and hot-removable.

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

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

MX10004 Status Panel

The MX10004 status panel shows the overall status of the chassis.

The MX10004 chassis ships with an enhanced power bus to future-proof the chassis for potential power growth.

The status panel indicates the chassis status through a set of five bicolor LEDs. It has an Azure blue stripe along the left side of the LEDs. See [Figure 12 on page 23](#) for a chassis status panel.

Figure 12: Status Panel on the Chassis

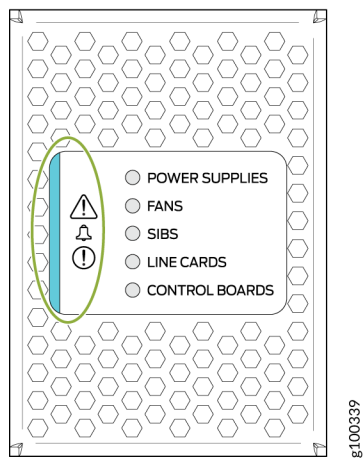


Table 6 on page 23 describes the status panel LEDs.

Table 6: Status Panel LEDs on an MX10004

Name	Color	State	Description
! Minor alarm (Triangle warning symbol)	Yellow	Off	No minor alarms are active.
		On steadily	A minor alarm is active.
Alarm (Bell symbol)	Yellow	Off	No minor alarms are active.
		On steadily	A minor alarm is active.
	Red	Off	No major alarms are active.
		On steadily	A major alarm is active.
! Major alarm (Circle warning symbol)	Red	Off	No major alarms are active.
		On steadily	A major alarm is active.

Table 6: Status Panel LEDs on an MX10004 (*Continued*)

Name	Color	State	Description
POWER SUPPLIES	Green	On steadily	All of the power supplies are online and operating normally.
	Yellow	Blinking	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	Blinking	An error occurred in a fan or in one of the fan tray controllers.
	None	Off	The fan tray controllers and fan trays are not receiving power.
SIBS	Green	On steadily	At least one installed Switch Fabric Board (SFB) is online.
	Yellow	Blinking	A hardware error occurred 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	One or more line cards have an error.
	None	Off	All the line cards are offline.

Table 6: Status Panel LEDs on an MX10004 (*Continued*)

Name	Color	State	Description
CONTROL BOARDS	Green	On steadily	All installed Routing and Control Boards (RCBs) are online.
	Yellow	Blinking	One or more RCBs have an error condition.
	None	Off	The installed RCBs are offline.

MX10004 Optional Equipment

The MX10004 routers offer the following optional equipment:

1. Line card cable management kit (JLC-CBL-MGMT-KIT)
2. JNP10004 replaceable air filter (JNP10004-FLTR)

MX10004 Cooling System

IN THIS SECTION

- [MX10004 Cooling System and Airflow | 26](#)
- [MX10004 Fan Tray LEDs and Fan Tray Controller LEDs | 31](#)

The MX10004 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 (RCB) shuts down some or all of the hardware components.

MX10004 Cooling System and Airflow

IN THIS SECTION

- Fan Tray | 26
- Fan Tray Controller | 29
- Airflow Direction in the MX10004 | 30

The cooling system in an MX10004 chassis consists of dual fan trays (JNP10004-FAN2) with matching dual fan tray controllers (JNP10004-FTC2). Each fan tray requires a companion fan tray controller to be installed and operational to be hot-insertable and hot-removable.

Fan Tray

The JNP10004-FAN2 fan tray contains an array of internal fans, a non-removable control board, and LEDs.

The two fan trays install vertically, side by side, next to the power supplies on the rear side of the chassis. Two handles on each front faceplate facilitate handling of the fan tray. See [Figure 13 on page 27](#) and [Figure 14 on page 27](#).

Figure 13: JNP10004-FAN2 Fan Tray

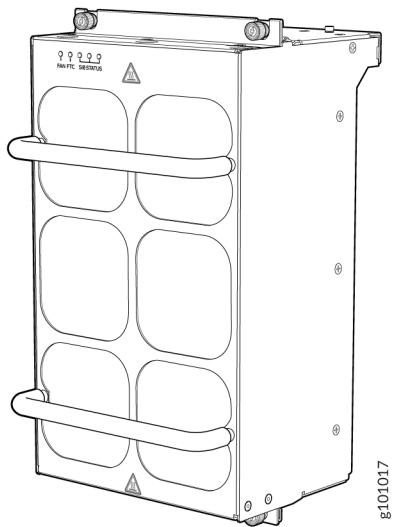
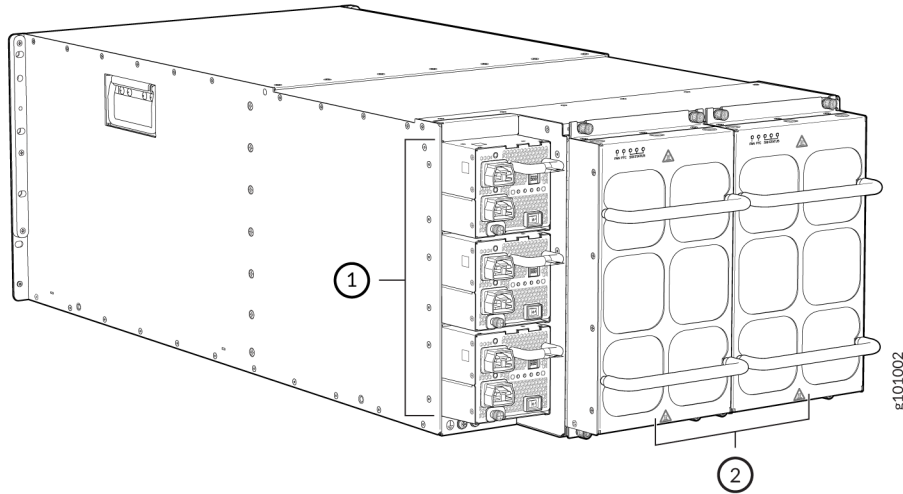


Figure 14: Installed Fan Trays on an MX10004



1– Power supplies

2– Fan trays

See [Table 7 on page 28](#) for the physical specifications of the fan trays.

Table 7: Fan Tray Specifications

Specification	JNP10004-FAN2
Corresponding fan tray controller model	JNP10004-FTC2
Number of fans per fan tray	6
Number of fans per chassis	12
Fan numbering	0 through 11
Volume flow at 100 percent	948 CFM for both fan trays
Height	12.08 in. (30.68 cm)
Width	6.6 in. (16.8 cm)
Depth	5.5 in. (13.97 cm) without handles, 6.85 in. (17.4 cm) with handles
Weight	9.8 lb (4.45 kg)

The fan tray operates as a single unit. If an individual fan in the tray fails, you must replace the entire fan tray. However, the fan tray continues to operate indefinitely and provides sufficient cooling even when a single fan rotor fails. The fan tray operates indefinitely provided that the room temperature is within the operating range.

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.



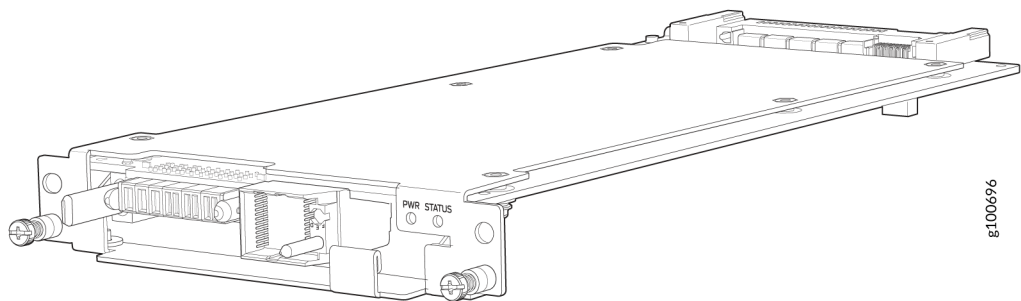
CAUTION: To avoid triggering a thermal alarm, remove only one fan tray while the router is operating.

Fan Tray Controller

The MX10004 supports two fan tray controllers to provide the control logic and power to hot-insert and hot-remove a fan tray

JNP10004-FTC2—Supports model JNP10004-FAN2; see [Figure 15 on page 29](#).

Figure 15: Fan Tray Controller JNP10004-FTC2



WARNING: Do not mix the fan tray controller models. Use only the supported fan tray model for each fan tray controller. See [Table 8 on page 29](#).

Table 8: Fan Tray Controller Specifications

Specification	JNP10004-FTC2
Corresponding fan tray model	JNP10004-FAN2
Height	1.5 in. (3.81 cm)
Width	6.5 in. (15.24 cm)
Depth	12.4 in. (31.5 cm)
Weight	1.1 lb (0.5 kg)

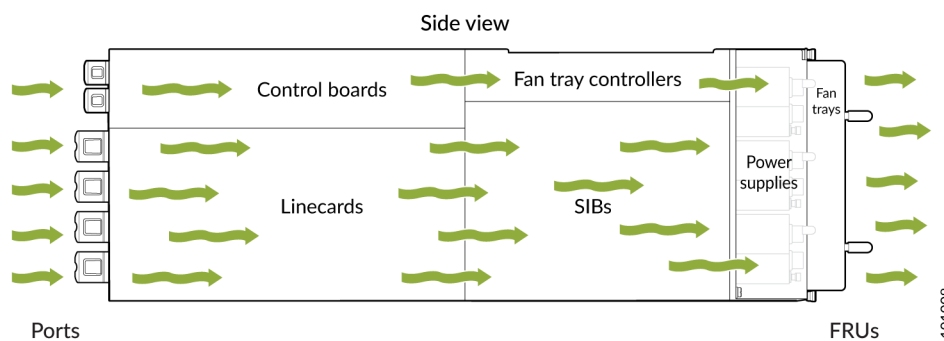
The system continually monitors the temperature of critical parts across the chassis and adjusts the chassis fan speed according to the temperature. Junos OS controls the fan speed. Under normal operating conditions, the fans in the fan tray run at less than full speed. If one fan tray controller fails or appears missing, the other fan tray controller sets the fans to full speed. (A fan tray can appear to be missing when you replace an SFB, for example.) The ability to modify fan speed enables 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.

To determine the cooling of all the components in the system, use the `show chassis environment` command.

Airflow Direction in the MX10004

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 Routing and Control Boards (RCBs) and line cards, through the Switch Fabric Boards (SFBs), and exits from the fan trays and the power supplies. See [Figure 16 on page 30](#).

Figure 16: Airflow Through an MX10004



The fan tray continues to operate indefinitely and provide sufficient cooling even when a single rotor 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.

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

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

MX10004 Fan Tray LEDs and Fan Tray Controller LEDs

IN THIS SECTION

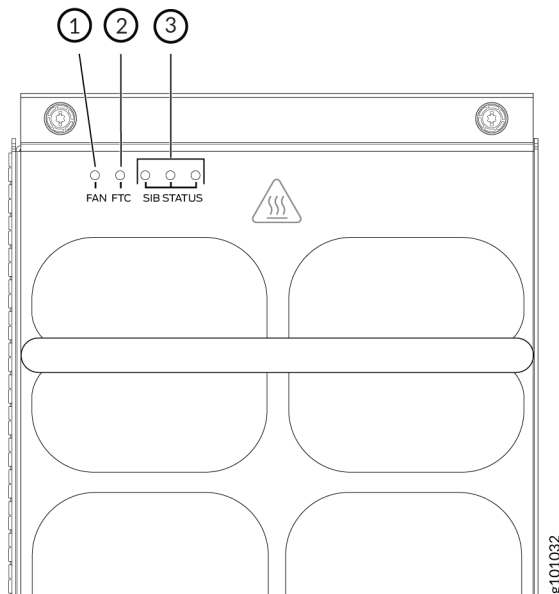
- Fan Tray LEDs | 31
- Fan Tray Controller LEDs | 36

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

Fan Tray LEDs

Each fan tray has a set of five LEDs that represent the status of the fans in the fan tray, the fan tray controller, and three of the Switch Fabric Boards (SFBs) that are installed behind the fan tray. The LEDs are located on the top left corner of each fan tray. [Figure 17 on page 31](#) shows the location of the LEDs on JNP10004-FAN2 fan trays.

Figure 17: Fan Tray JNP10004-FAN2 LEDs



1– Fan status LED

3– SFB status LEDs - The **SIB STATUS** LEDs on the left fan tray display the status of the three SFBs installed in SFB 0 through SFB 2

	and the SIB STATUS LEDs on the right fan tray display the status of the three SFBs installed in SFB 3 through SFB 5.
2– Fan tray controller status LED	

Table 9 on page 32 describes the functions of the fan tray LEDs.

Table 9: Fan Tray LEDs on an MX10004

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 fan tray is starting. The fan tray is not ready.
	Amber	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.
	Amber	Blinking	Beacon is enabled.
	None	Off	The fan is not receiving power from the fan tray controller. All fans are off.
FTC (fan tray controller status)	Green	On steadily	Power is on. The fan tray controller is online and is operating normally.

Table 9: Fan Tray LEDs on an MX10004 (Continued)

Name	Color	State	Description
	Amber	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.
	Amber	Blipping	Beacon is enabled.
	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.
	Amber	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.
	Amber	Blipping	Beacon is enabled.
	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 9: Fan Tray LEDs on an MX10004 (Continued)

Name	Color	State	Description
	Amber	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 group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the 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.
	Amber	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 group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SFB.
	Amber	Blipping	Beacon is enabled.
	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 9: Fan Tray LEDs on an MX10004 (Continued)

Name	Color	State	Description
	Amber	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 of the group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SFB.
	Amber	Blipping	Beacon is enabled.
	None	Off	The SFB is offline.
SIB Status (SFB 4 status)	Green	On steadily	The center SFB behind the right fan tray is online.
	Amber	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 group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SFB.
	Amber	Blipping	Beacon is enabled.
	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.

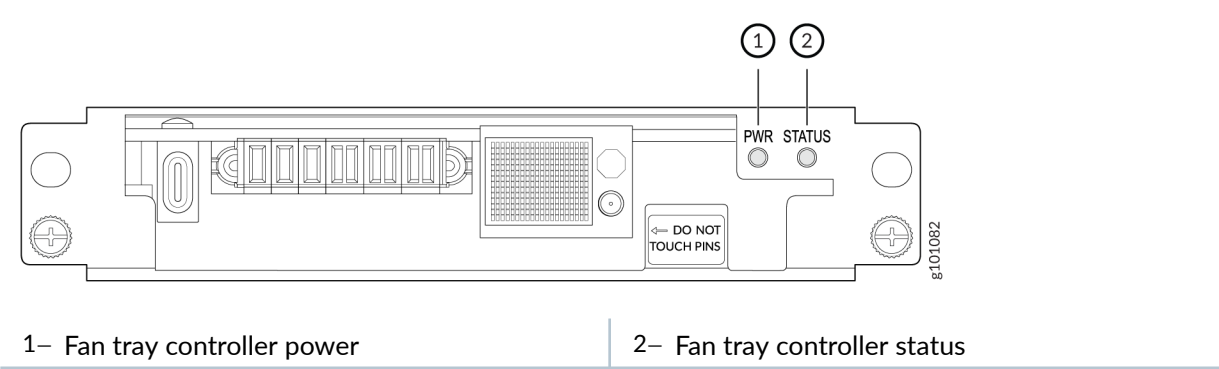
Table 9: Fan Tray LEDs on an MX10004 (Continued)

Name	Color	State	Description
	Amber	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 group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SFB.
	Amber	Blipping	Beacon is enabled.
	None	Off	The SFB is offline.

Fan Tray Controller LEDs

The fan tray controller LEDs are visible only when the associated fan tray is removed. The fan tray controller LEDs are located on the right of the controller panel. [Figure 18 on page 36](#) shows the location of the LEDs on the JNP10004-FTC2 fan tray controller faceplate.

Figure 18: Fan Tray Controller LEDs on an MX10004



[Table 10 on page 37](#) describes the functions of the fan tray controller LEDs.

Table 10: Fan Tray Controller LEDs on an MX10004

Name	Color	State	Description
PWR (fan tray controller power)	Green	On steadily	The fan tray controller has power and is operating normally.
	Amber	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.
	Amber	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.

MX10004 Power System

IN THIS SECTION

- [JNP10K-PWR-AC2 Power Supply | 38](#)
- [JNP10K-PWR-AC2 Power Specifications | 40](#)
- [JNP10K-PWR-AC2 Power Supply LEDs | 41](#)
- [MX10004 Power Cable Specifications | 43](#)
- [JNP10K-PWR-DC2 Power Supply | 49](#)
- [JNP10K-PWR-DC2 Power Specifications | 51](#)
- [JNP10K-PWR-DC2 Power Supply LEDs | 52](#)
- [MX10004 Grounding Cable and Lug Specifications | 56](#)

You can install up to three power supplies in an MX10004 router in the slots labeled **PSU0** through **PSU2** (top to bottom) located in the rear of the chassis. The JNP10K-PWR-AC2 is designed for AC, high-voltage alternating current (HVAC) and high-voltage direct current (HVDC) environments and can be set for single or dual feeds and high or low output settings. The JNP10K-PWR-DC2 power supply is two DC power supplies bundled in a single housing. Each model can provide up to 5500 W of output power.

The JNP10K-PWR-AC2 and JNP10K-PWR-DC2 power supplies share power.

JNP10K-PWR-AC2 Power Supply

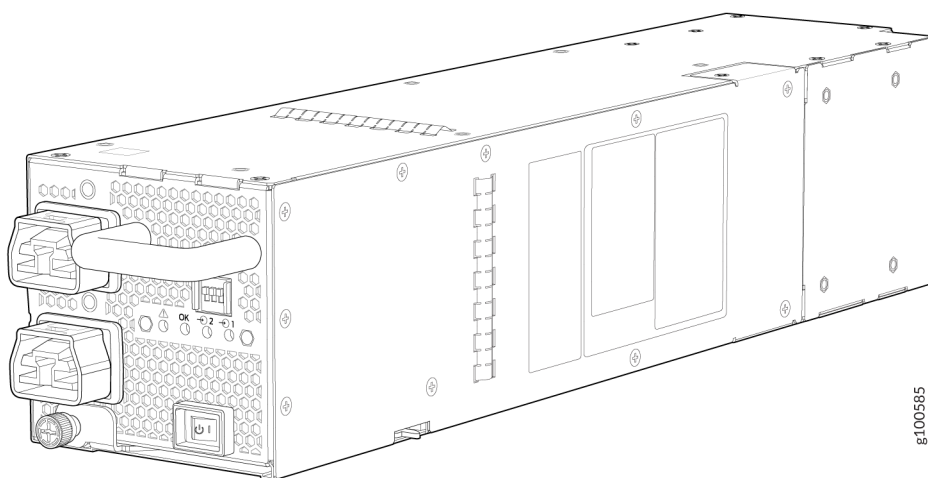
The JNP10K-PWR-AC2 power supply is a high-capacity model that is designed to support AC, high-voltage AC (HVAC), or high-voltage DC (HVDC) systems in either a 20-A or a 30-A mode; see [Figure 19 on page 39](#). The power supply feeds AC input and provides DC output of 5000 W with a single feed and 5500 W with a dual feed. The operating input voltage range is 180 to 305 VAC for AC systems and 190 to 410 VDC for DC systems.

You configure the number of power feeds and high or low output using a set of dual inline package (DIP) switches on the faceplate of the power supply. You use the switches to configure whether the power supplies provide high-output (30-A) or low-output (20-A) power. 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 the DIP switch settings or the output results in the CLI. This design safeguards against accidentally setting the power supply to 30 A in a facility that can provide only 20 A and tripping the facility circuit breaker. We

recommend that you not mix DIP switch settings in your system. See [Table 11 on page 40](#) for information about the input and output voltages when you use the DIP switches.

The JNP10K-PWR-AC2 power supply has internal fans that contribute to chassis cooling. Consequently, all three power supplies must be present in a running chassis to provide adequate airflow. While all power supplies are required to be present in the chassis, they do not all need to be connected to power. If a power supply is installed in a slot but not connected to a power source, it draws power from the chassis to power the internal fans in the power supplies.

Figure 19: JNP10K-PWR-AC2 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 in the range of 158° F to 176° F (70° C to 80° C) under running conditions.



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



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



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

Table 11: DIP Switch Settings for JNP10K-PWR-AC2 Power Supplies

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



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

JNP10K-PWR-AC2 Power Specifications

The JNP10K-PWR-AC2 power supply supports AC, high-voltage alternating current (HVAC) and high-voltage direct current (HVDC).

[Table 12 on page 41](#) lists the power specifications for the AC power supply (JNP10K-PWR-AC2) used in an MX10004 chassis.

Table 12: Power Specifications for a JNP10K-PWR-AC2 Power Supply

Specification	Value
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 13 on page 41](#) shows the physical specifications for a JNP10K-PWR-AC2 power supply.

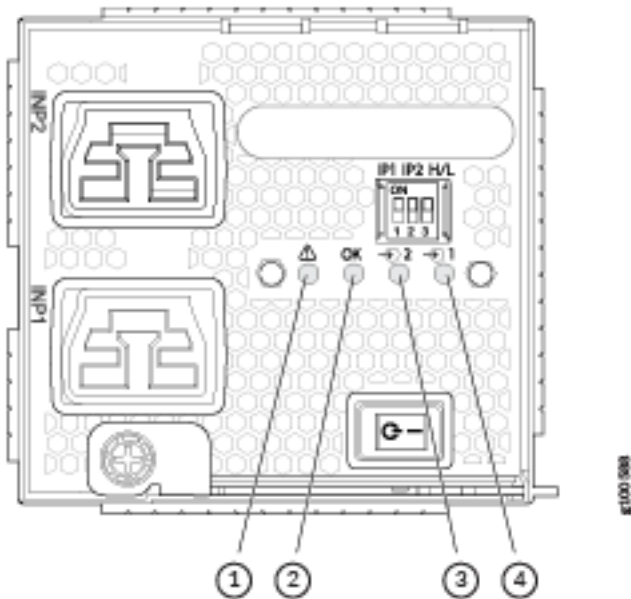
Table 13: Physical Specifications for a JNP10K-PWR-AC2 Power Supply

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)

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 20 on page 42](#).

Figure 20: LEDs on a JNP10K-PWR-AC2 Power Supply



1- ! Fault	3- 2 INP2-Source input 2
2- OK Power OK	4- 1 INP1-Source input 1

NOTE: Physical markings on the power supply are 1 and 2. These markings correspond to INP1 and INP2 in the show chassis power output (see [Table 14 on page 42](#)).

You can display the DIP switch settings for input and output power using the show chassis power command.

Table 14: Physical Markings on Chassis Versus show chassis power Command

Physical Marking on JNP10K-PWR-AC2	show chassis power Command
INP1	INP1
INP2	INP2

[Table 15 on page 43](#) describes the LEDs on a JNP10K-PWR-AC2 power supply.

Table 15: JNP10K-PWR-AC2 LEDs on an MX10004

LED	Color	State	Description
1 or (INP1 in CLI output)	Yellow	Blinking	The input voltage is present, but a fault is detected.
	Green	Solid	The power supply is functioning properly.
	Unlit	Off	The power supply is switched off; voltage is zero.
2 or (INP2 in CLI output)	Yellow	Blinking	The input voltage is present, but a fault is detected.
	Green	Solid	The power supply is functioning properly.
	Unlit	Off	The power supply is switched off; voltage is zero.
OK (Power OK)	Green	Solid	The power supply is functioning properly.
	Yellow	Blinking	The power supply output has detected a fault.
! (Fault)	Red	Solid	The power supply has failed and must be replaced.
	Unlit	Off	The power supply is functioning normally.

MX10004 Power Cable Specifications

IN THIS SECTION

- [JNP10K-PWR-AC2 Power Cable Specifications | 44](#)
- [JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input | 47](#)

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

NOTE: In North America, AC power cords must not exceed 15 feet (approximately 4.5 meters) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and with Canadian Electrical Code (CEC) Section 4-010(3). The cords shipped with the router to North America and Canada are in compliance.

The MX10004 AC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) power supplies have specific cord requirements. Use the following sections to determine the cable requirements based on the model of your power supply and any mode settings:

- For JNP10K-PWR-AC2 with 20-A input, see ["JNP10K-PWR-AC2 Power Cable Specifications" on page 44](#).
- For JNP10K-PWR-AC2 with 30-A input, see ["JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 47](#).

JNP10K-PWR-AC2 Power Cable Specifications

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

- 20-A input with 3000-W output; see [Table 16 on page 45](#) for a list of appropriate cables.
- 30-A input with 5500-W output; see ["JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 47](#) for a list of appropriate cables and connectors for 30-A input.



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



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

Table 16: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input

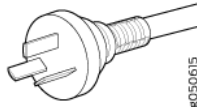
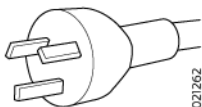
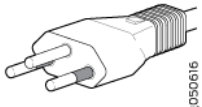
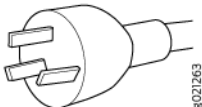
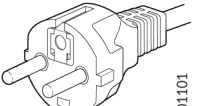
Locale	Cord Set Rating	Plug Standard	Spare Juniper Model Number	Graphic
Argentina	16 A, 250 VAC	IRAM 2073 Type RA/3	CBL-JNP-SG4-AR	
Australia and New Zealand	15 A, 250 VAC	AS/NZS 3112	CBL-JNP-SG4-AU	
Brazil	16 A, 250 VAC	NBR 14136 Type BR/3	CBL-JNP-SG4-BR	
China	16 A, 250 VAC	GB2099	CBL-JNP-SG4-CH	
Europe (except Italy, Switzerland, and the 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	

Table 16: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input (Continued)

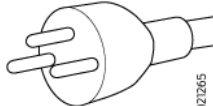
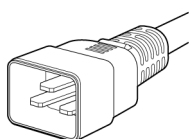
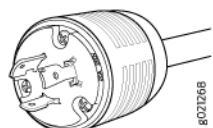
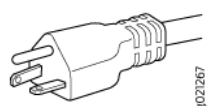
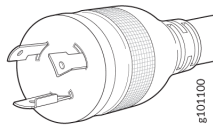
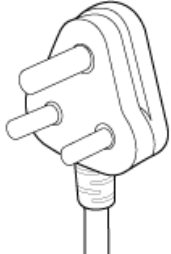
Locale	Cord Set Rating	Plug Standard	Spare Juniper Model Number	Graphic
Israel	16 A, RA, 250 VAC	SI 32/1971 Type IL/3C	CBL-JNP-SG4-IL	 g021265
Italy	16 A, 250 VAC	CEI 23-16	CBL-JNP-SG4-IT	 g021266
North America	20 A, 250 VAC	3-5958P4 to IEC 60320 C20	CBL-JNP-SG4-C20	 g050751
	16 A, 250 VAC	Locking NEMA L6-20P	CBL-JNP-SG4-US-L	 g021268
		NEMA 6-20P	CBL-JNP-SG4-US	 g021267
	15 A, 277 V	NEMA I7-20P	CBL-JNP-SG4-HVAC	 g101100

Table 16: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input (Continued)

Locale	Cord Set Rating	Plug Standard	Spare Juniper Model Number	Graphic
South Africa	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	 g021289
Switzerland	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-SZ	 g021266

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

The JNP10K-PWR-AC2 HVAC or HVDC power supplies require a high-current cable assembly when set for 30-A input. One end of the cable has an Anderson APP-400 connector, while the other end of the cable is bare wire. See [Figure 21 on page 47](#) and [Table 17 on page 48](#). 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 23 on page 49](#).

For connection to AC systems, Juniper Networks provides a cable with either a NEMA 30-A connector ([Figure 21 on page 47](#)) or an IEC 330P6W connector ([Figure 22 on page 48](#)).

Figure 21: NEMA 30-A Locking Connector

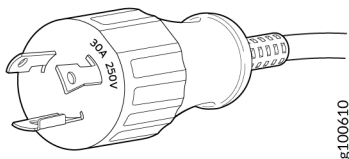


Figure 22: IEC 330P6W Connector

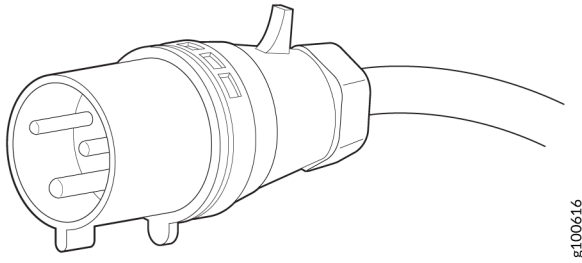
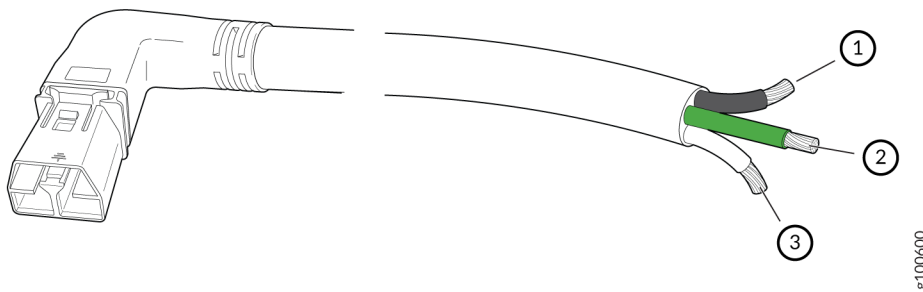


Table 17: 30-A Cabling Options

Option	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
HVAC/ HVDC power cord	Any	30 A 400 VAC	UL 950 and IEC 60950	Anderson/straight to bare wire	CBL-PWR2-BARE
	Any	30 A 400 VAC	UL 950 and IEC 60950	Anderson/right-angle to bare wire	CBL-PWR2-BARE-RA
AC power cord	Continental Europe	30 A 250 VAC	UL 950 and IEC332P6	Anderson/right-angle to IEC 332P6	CBL-PWR2-332P6W-RA
	Continental Europe	30 A 250 VAC	UL 950 and IEC332P6	Anderson/straight to IEC332P6	CBL-PWR2-332P6W
	Continental Europe	30 A 240 VAC	IEC330P6	Anderson/right-angle to IEC 330P6	CBL-PWR2-330P6W-RA
	Continental Europe	30 A 240 VAC	IEC330P6	Anderson/straight to IEC 330P6	CBL-PWR2-330P6W
	North America	30 A 250 VAC	UL 498 and CSA	Anderson/right-angle to L6-30P (NEMA-30A)	CBL-PWR2-L6-30P-RA

Table 17: 30-A Cabling Options (Continued)

Option	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
	North America	30 A 250 VAC	UL 498 and IEC5958P4	Anderson/straight to L6-30P (NEMA-30A)	CBL-PWR2-L6-30P
AC jumper power cord	Any	30 A 400 VAC	UL and CSA	Anderson/straight to Anderson	CG-CBL-APP-400-02

Figure 23: Right-Angle, Bare Cable with Anderson Connector

1– Black wire – “+” or “-” for HVDC and “Hot or neutral” for AC

3– White wire – “+” or “-” for HVDC and “Hot or neutral” for AC

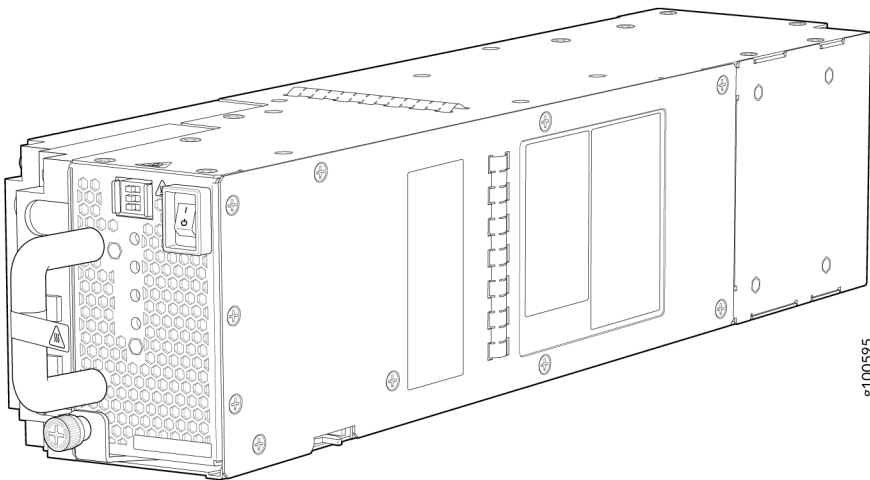
2– Green wire - Ground

JNP10K-PWR-DC2 Power Supply

The JNP10K-PWR-DC2 power supply provides two power supplies in a single housing that accepts either 60 A or 80 A using four redundant input power feeds. The two internal power supplies (PS_0 and PS_1) each have redundant input feeds: A0 and/or B0 for PS_0 and A1 and/or B1 for PS_1. You configure the input using a set of three DIP switches on the power supply faceplate that sets the combined output power for both internal power supplies. The output depends on the settings of these DIP switches. See [Table 18 on page 50](#) and [Figure 24 on page 50](#).

Table 18: DIP Switch Settings for JNP10K-PWR-DC2 Power Supplies

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

Figure 24: JNP10K-PWR-DC2 Power Supply

The JNP10K-PWR-DC2 power supply has internal fans that contribute to chassis cooling. Consequently, all three power supplies must be present in a running chassis to have adequate airflow. While all power supplies are required to be present in the chassis, they do not all need to be connected to power. If a power supply is installed in a slot but not connected to a power source, it draws power from the chassis to power the internal fans in the power supplies.



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



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

JNP10K-PWR-DC2 Power Specifications

Table 19 on page 51 lists the power specifications for the high-voltage direct current (HVDC) power supply used in MX10004 routers.

Table 19: 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

Table 19: Power Specifications for the JNP10K-PWR-DC2 Power Supply (Continued)

Item	Specifications
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 20 on page 52](#) shows the physical specifications for a JNP10K-PWR-DC2 power supply.

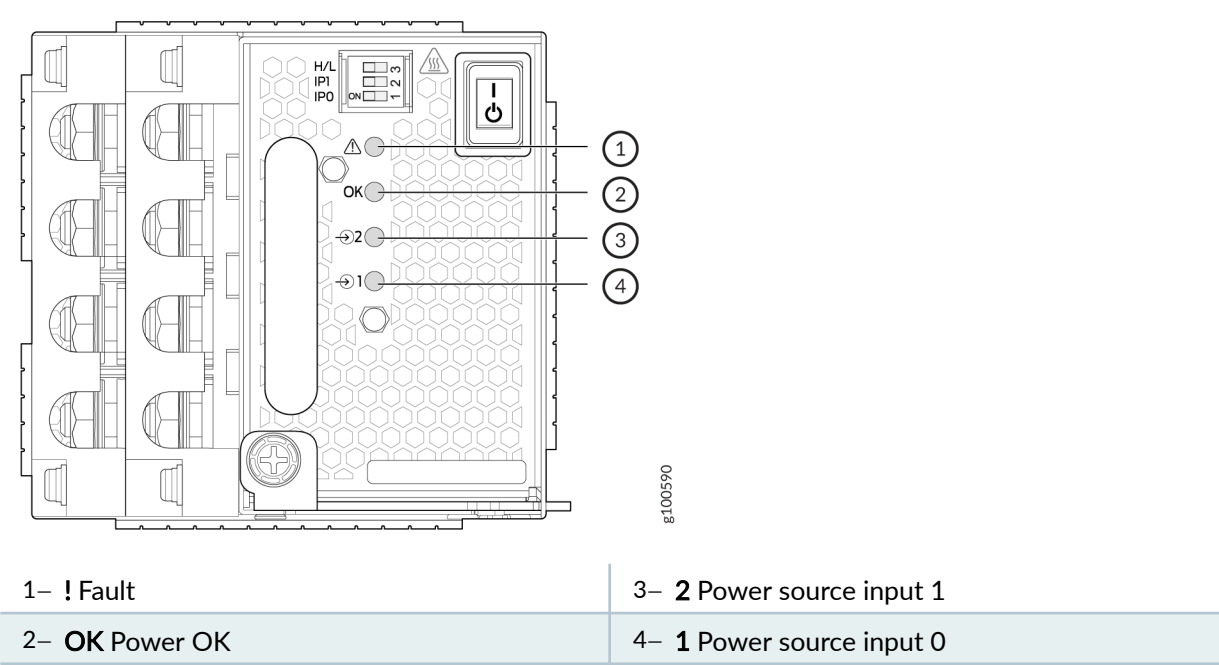
Table 20: Physical Specifications of a JNP10K-PWR-DC2 Power Supply

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 lb (3.67 kg)

JNP10K-PWR-DC2 Power Supply LEDs

A JNP10K-PWR-DC2 power supply has four LEDs on its faceplate: **1**, **2**, **OK**, and the symbol indicating a fault, **!**. These LEDs display information about the status of the power supply. See [Figure 25 on page 53](#).

Figure 25: LEDs on a JNP10K-PWR-DC2 Power Supply



You can find out the version of the firmware installed in the power supply from the output of `show system firmware` command. [Table 21 on page 53](#) 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 22 on page 55](#) 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 21: 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 21: 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 21: 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 22: 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)	Green	Solid	The DC power is within normal operating range (-40 VDC to -72 VDC).
	Orange	Solid	The DC power input voltage is not within normal operating range.
	Unlit	Off	The power supply is switched off.
OK (Power OK)	Green	Solid	The DC power output is within normal operating range.
	Orange	Blinking	The power supply output is out of the power limits.
! (Fault)	Red	Solid	The power supply has failed and must be replaced.

Table 22: LEDs on a JNP10K-PWR-DC2 Power Supply (with firmware lower than 300.300.208.208.304 installed in it) (Continued)

LED	Color	State	Description
	Unlit	Off	The power supply is functioning normally. Or, only one input is powered and the enable switch for the input that is not powered is set to ON . See "Install a JNP10K-PWR-DC2 Power Supply" on page 155 for more information about the enable switches.

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

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

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

MX10004 Grounding Cable and Lug Specifications

The router must be adequately grounded before power is connected to ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements. To ground an MX10004 chassis, connect a grounding cable to earth ground and then attach it to the chassis grounding point on the rear of the chassis beneath.

You must install the MX10004 in a restricted-access location and ensure that the chassis is always properly grounded. The MX10004 has a two-hole protective grounding terminal provided on the chassis. 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.



WARNING: To comply with GR-1089 requirements, all intrabuilding copper cabling used for SFP+, QSFP+, and higher 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 MX10004 Router to Earth Ground" on page 136](#). A cable with an incorrectly attached lug can damage the router.

Before you connect the router to earth ground, review the following information:

- Two threaded inserts (PEM nuts) are provided on the lower rear of the chassis to connect the router to earth ground. The protective earthing terminals 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 mm²) 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 (21.1 mm²) stranded wire. The 4 AWG (21.1 mm²) stranded wire should be rated 90° C or as specified by the local electrical code.
- The grounding cable that you provide for an MX10004 must be the same size as, or heavier than, the input wire of each power supply. Minimum recommendations are 6 AWG (13.3 mm²) stranded copper wire, Class B; 90° C wire, or as specified by local code.

MX10004 Routing and Control Board Components and Descriptions

IN THIS SECTION

- [MX10004 Routing and Control Board Description | 58](#)
- [MX10004 Routing and Control Board LEDs | 61](#)

MX10004 Routing and Control Board Description

IN THIS SECTION

- [Routing and Control Board Functions | 59](#)
- [Routing and Control Board Components | 60](#)

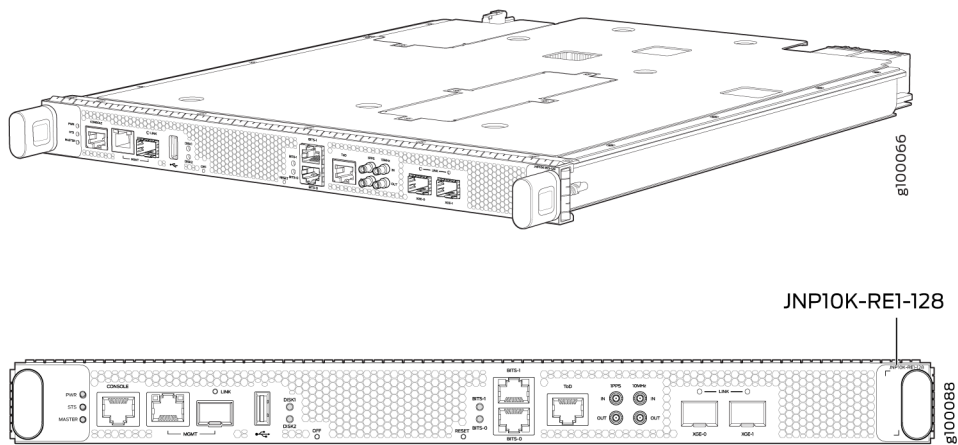
The Routing and Control Board (RCB) is an integrated board and a single field-replaceable unit (FRU) that provides Routing Engine and Control Board (CB) functionality. The Routing Engine performs all route-processing functions, whereas the CB performs chassis control and management plane functionality.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

The MX10004 Routing and Control Board (RCB) is responsible for system management in an MX10004 router (see [Figure 26 on page 59](#)). 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.

MX10004 supports the following Routing Engines:

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

Figure 26: JNP10K-RE1, JNP10K-RE1-LT, and JNP10K-RE1-128G Routing and Control Board



This topic covers:

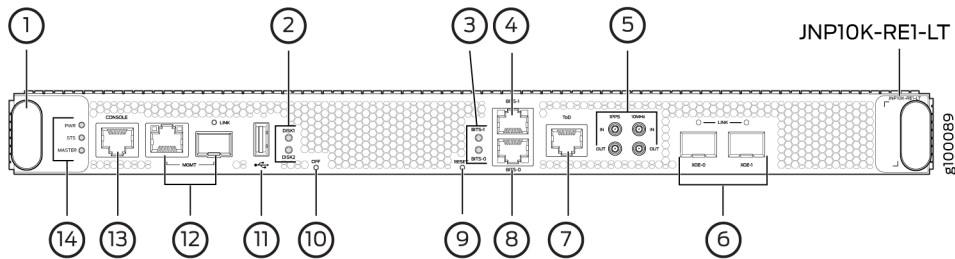
Routing and Control Board Functions

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 27: JNP10K-RE1, JNP10K-RE1-LT, and JNP10K-RE1-128G Routing and Control Board Faceplate



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 not used (reserved 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 fewer than 5 seconds for diagnostic purposes, the RCB does not reset. The press event is logged in the RCB FPGA register.
- When pressed for more than 5 seconds but fewer than 10 seconds, the RCB reboots and the reset-reason logs the button press event.
- When pressed for more 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.

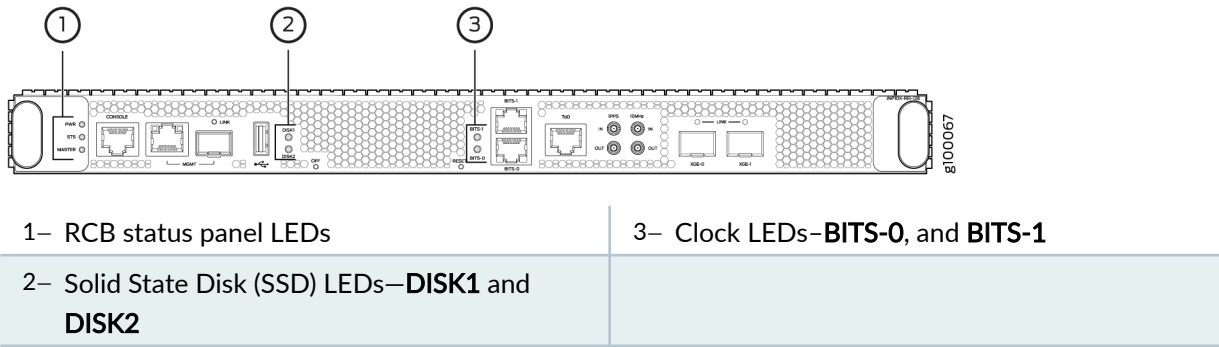
MX10004 Routing and Control Board LEDs

IN THIS SECTION

- [Routing and Control Board Status Panel LEDs | 62](#)
- [SATA SSD LEDs | 63](#)
- [Clock LEDs | 63](#)
- [MX10004 Management Port LEDs | 64](#)

The MX10004 Routing and Control Boards (RCBs) have various types of LED indicators. [Figure 28 on page 62](#) shows the LEDs on the Routing and Control Boards (JNP10K-RE1).

Figure 28: Routing and Control Board LEDs



Routing and Control Board Status Panel LEDs

Table 23 on page 62 describes the LEDs on the RCB status panel.

Table 23: Routing and Control Board Status LEDs

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

Table 23: Routing and Control Board Status LEDs (Continued)

LED	Color	State	Description
	Dark	Unlit	The RCB is the backup.

SATA SSD LEDs

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

[Table 24 on page 63](#) describes the LEDs for the secondary SATA drives.

Table 24: 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	The drive is not installed.

Clock LEDs

The clock LEDs indicate whether clocking is active.

[Table 25 on page 63](#) describes the clock LEDs.

Table 25: Routing and Control Board Clock Status LEDs

LED	Color	State	Description
Clock LEDs— BITS-0 and BITS-1	Red	Off	Clock is active.

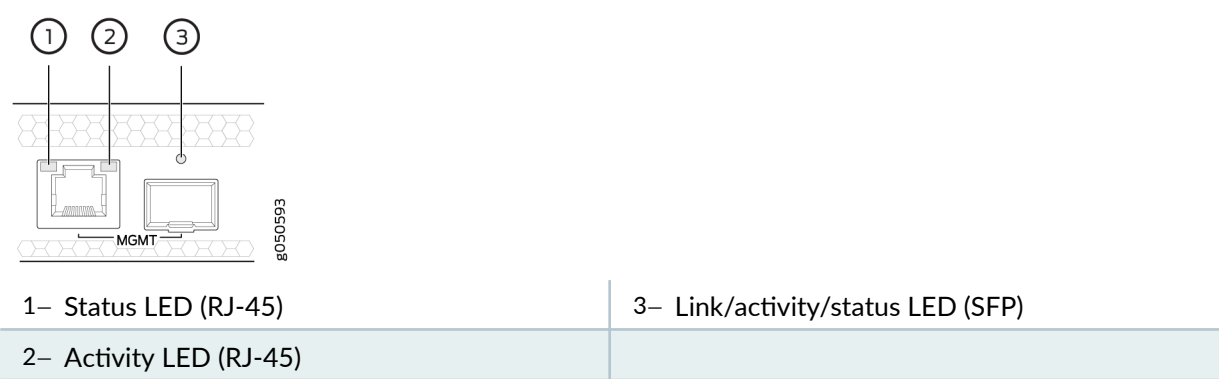
Table 25: Routing and Control Board Clock Status LEDs *(Continued)*

LED	Color	State	Description
		On steadily	Clock is not working.

MX10004 Management Port LEDs

The two management ports on the RCB of an MX10004 router have LEDs that indicate link status and link activity. These two ports, located on the RCB panel between the clocking connections and the USB port, are both labeled MGMT. The left management port (RJ-45) is for 10/100/1000 BASE-T connections, and the right port (SFP) is for 10/100/1000 BASE-T and small form-factor pluggable (SFP) 1000 BASE-X connections (see [Figure 29 on page 64](#)). The copper (RJ-45) port has separate LEDs for status and activity. The fiber (SFP) port has a combination link and activity LED.

Figure 29: Management Port LEDs on an MX10004



[Table 26 on page 64](#) describes the RJ-45 management port and SFP LEDs.

Table 26: RJ-45 Management Port LEDs on an MX10004 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.

Table 26: RJ-45 Management Port LEDs on an MX10004 Routing and Control Board (Continued)

LED	Color	State	Description
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 27 on page 65](#) describes the SFP management port LEDs.

Table 27: SFP Management Port LED on an MX10004 Routing and Control Board

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

MX10004 Switch Fabric Board

SUMMARY

The MX10004 Switch Fabric Boards (SFBs) form the switch fabric for the router.

IN THIS SECTION

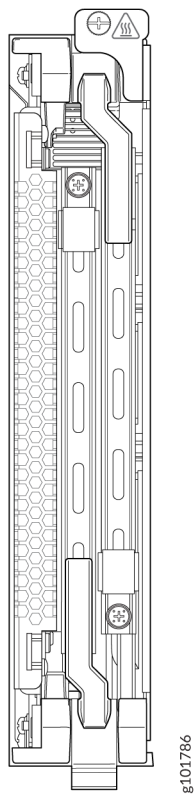
- [MX10004 Switch Fabric Board Description](#) | 66

MX10004 Switch Fabric Board Description

Switch Fabric Boards (SFBs) create the switch fabric for the MX10004. Each MX10004 contains between three and 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.

The ZF ASIC based JNP10004-SF2 SFBs make up the MX10004 switching plane that provide fabric inter-connect for the custom silicon line-cards with 2.4 Tbps, 480 Gbps and 9.6 Tbps throughput. Each SFB has four connectors that correspond to a matching connector on one of the four line cards (see [Figure 30 on page 67](#)).

Figure 30: JNP10004-SF2 Switch Fabric Board



MX10004 supports six SFBs. Depending on the type of line card used, there can be fabric card redundancy (5+1) or no redundancy.

Table 28 on page 67 shows the specifications of JNP10004-SF2 SFBs.

Table 28: JNP10004-SF2 SFB Specifications

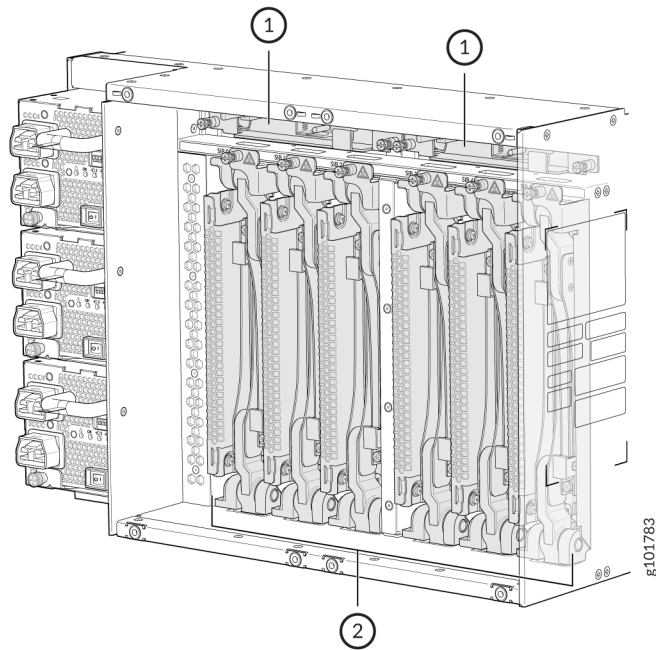
Specification	JNP10004-SF2
Operating system	Junos OS Release 22.3R1 and later
Supported line cards	1. MX10K-LC2101 2. MX10K-LC480 3. MX10K-LC9600

Table 28: JNP10004-SF2 SFB Specifications (Continued)

Specification	JNP10004-SF2
Number of SFBs required for maximum throughput	Based on the line card installed: 1. MX10K-LC2101 - 5+1 (fabric redundancy) 2. MX10K-LC480 - 5+1 (fabric redundancy) 3. MX10K-LC9600 - 6+0 (no fabric redundancy)
Switching Capacity	When all six SFBs are installed, based on the line card installed, the MX10004 has a net switching capacity of 38.4 Tbps.
Height	9.43 in. (23.95 cm)
Width	1.77 in. (4.48 cm)
Depth	13.4 in. (34.6 cm)
Weight	8 lb (3.6 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 31 on page 69](#).

Figure 31: SFBs Installed in an MX10004 Router

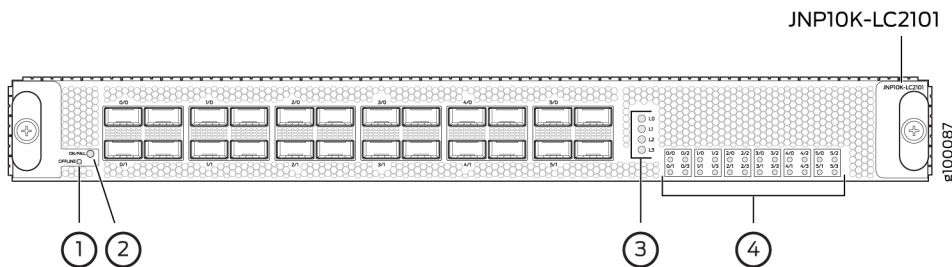


1– Fan tray controllers

2– Switch Fabric Boards

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

2– **OK/FAIL** LED

3– Lane LEDs

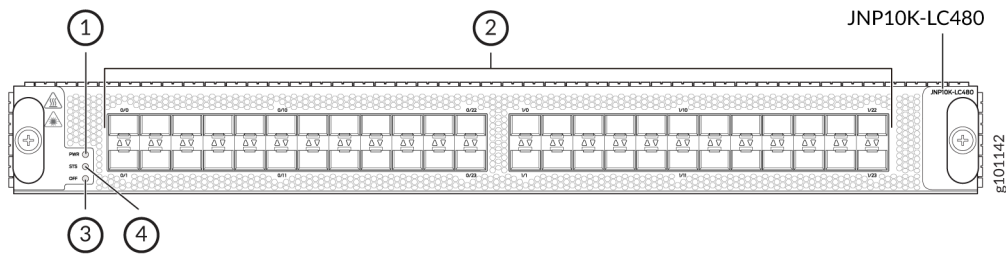
4– Port LEDs

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) (Exclude 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 Gbps (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 the 10-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 MPC 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, irrespective 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 supported 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)
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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.
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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:

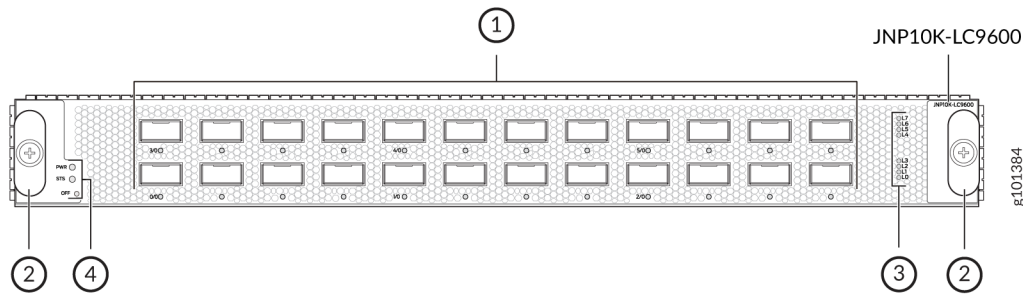
- We recommend that you use only 16 ports per line card with copper SFP modules - the last 8 ports on the MIC0 (0/16 through 0/23) and the first 8 ports on the MIC1 (1/0 through 1/7).
- The MX10008 router supports a maximum of 128 copper SFP modules of 1 Gbps capacity.
- The MX10016 router supports a 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 32: 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 forwarding 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.
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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)
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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](#).

2

CHAPTER

Site Planning, Preparation, and Specifications

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MX10004 Site Preparation Overview

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- [MX10004 Site Preparation Checklist | 82](#)
- [MX10004 Environmental Requirements and Specifications | 83](#)
- [MX10004 Site Electrical Wiring Guidelines | 85](#)
- [MX10004 Rack Requirements | 86](#)
- [MX10004 Clearance Requirements for Airflow and Hardware Maintenance | 89](#)

The following topics describe general site planning and preparation for sites with MX10004 routers. Specific topics include site specifications, environmental requirements, electrical and wiring requirements, rack requirements, and airflow requirements for optimal MX10004 router performance.

MX10004 General Site Guidelines

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

To plan and create an acceptable operating environment for your router 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 doesn't blow into the intake vents of the router.
- Follow the prescribed electrostatic discharge (ESD) prevention procedures to prevent damage to the equipment. Static discharge can cause components to fail completely or intermittently over time.
- Install the router in a secure area so that only authorized personnel can access the router.

MX10004 Site Preparation Checklist

The checklist in [Table 29 on page 82](#) summarizes the tasks you must perform to prepare a site for the MX10004 router.

Table 29: MX10004 Site Preparation Checklist

✓	Item or Task	For More Information
Environment		
□	Verify that environmental factors such as temperature and humidity are within router tolerances.	See " MX10004 Environmental Requirements and Specifications " on page 83.
Power		
□	Measure the distance between external power sources and the router installation site.	
□	Calculate the power consumption and requirements.	See " MX10004 Power Planning " on page 90.
Rack		
□	Verify that your rack meets the minimum requirements for router installation.	See " MX10004 Rack Requirements " on page 86.
□	Plan rack location, including required space clearances for optimal airflow.	See " MX10004 Clearance Requirements for Airflow and Hardware Maintenance " on page 89.
□	Secure the rack to the floor and the building structure.	
Cables		

Table 29: MX10004 Site Preparation Checklist *(Continued)*

✓	Item or Task	For More Information
□	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 cable length based on the distance between the hardware components to be connected.	The list of supported transceivers for the MX10004 line cards is located at https://apps.juniper.net/hct/product/#prd=MX10004 .
□	Plan the cable routing and management.	

MX10004 Environmental Requirements and Specifications

You must install the MX10004 router in a four-post rack. The router requires housing in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- Ensure that the site is 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. If the router overheats, the router temperature monitor might shut down the router to protect the hardware components.

Environmental tolerances for altitude and operating temperature depend on:

- The type of ESD front door installed—either the standard JNP10004-FRNT-PNL without an air filter or the JNP10004-FPNL1 with air filter that is available as a spare.
- The wattage of the type of optics being used—either 14 W or 21 W optics.
- The line card slot. Slot 0 has slightly different airflow and cooling.

Table 30: MX10004 Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation up to 6000 feet (1829 meters).
Relative humidity	• Normal operation ensured in a relative humidity range of 5% through 90%, noncondensing. • Short-term operation ensured in a relative humidity range of 5% through 93%, noncondensing. NOTE: As defined in NEBS GR-63-CORE, Issue 3: Short-term refers to a period of not more than 96 consecutive hours (four days) and not more than 360 hours (15 days) in 1 year.
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C). • Nonoperating storage temperature in shipping container: -40° F through 158° F (-40° C through 70° C). • Short-term operation ensured in temperature range of 32° F through 131° F (0° C through 55° C) at 6000 ft altitude. NOTE: As defined in NEBS GR-63-CORE, Issue 3: Short-term refers to a period of not more than 96 consecutive hours (four days) and not more than 360 hours (15 days) in 1 year. NOTE: Short-term operation is applicable only to MX10K-LC480 line card in the MX10004 chassis.
Seismic zone	Designed to comply with Zone 4 earthquake requirements according to NEBS GR-63-CORE, Issue 3.

NOTE: Install MX10004 routers only in restricted-access areas, such as dedicated equipment rooms and equipment closets. Install routers in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

MX10004 Site Electrical Wiring Guidelines

"MX10004 Environmental Requirements and Specifications" on page 83 describes the factors you must consider while you plan 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 31: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	To ensure that signaling functions optimally: • Install wires correctly. Improperly installed wires can emit radio interference. • Observe the recommended distances, and avoid passing 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 a 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 if you must exceed the recommended distances.

Table 31: Site Electrical Wiring Guidelines (Continued)

Site Wiring Factor	Guidelines
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 or ports of the equipment or subassembly are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding port or ports of the equipment or subassembly **MUST NOT** be metalically 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). The interfaces require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metalically to OSP wiring.

MX10004 Rack Requirements

The MX10004 router chassis is designed to be installed in four-post racks.

Rack requirements consist of:

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

[Table 32 on page 87](#) provides the rack requirements and specifications for the MX10004.

Table 32: Rack Requirements for the MX10004

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 and seismic requirements. We recommend that you use a Telect DR1250-84436 rack or an equivalent rack. A U is the standard rack unit defined in <i>Cabinets, Racks, Panels, and Associated Equipment</i> (document number EIA-310-D) published by the Electronics Industries Association (EIA). You can mount up to six MX10004 routers in a four-post rack if: • The rack is 42 U or taller. • The rack meets the strength requirements to support the weight and seismic requirements. • The facility can provide adequate power and cooling. TIP: Always mount devices starting at the bottom of the rack.
Rack-mount kit hole spacing	The holes in the rack-mount kit are spaced at 1 U (1.75 in. or 4.45 cm) so that the router can be mounted in any rack that provides holes spaced at that distance.

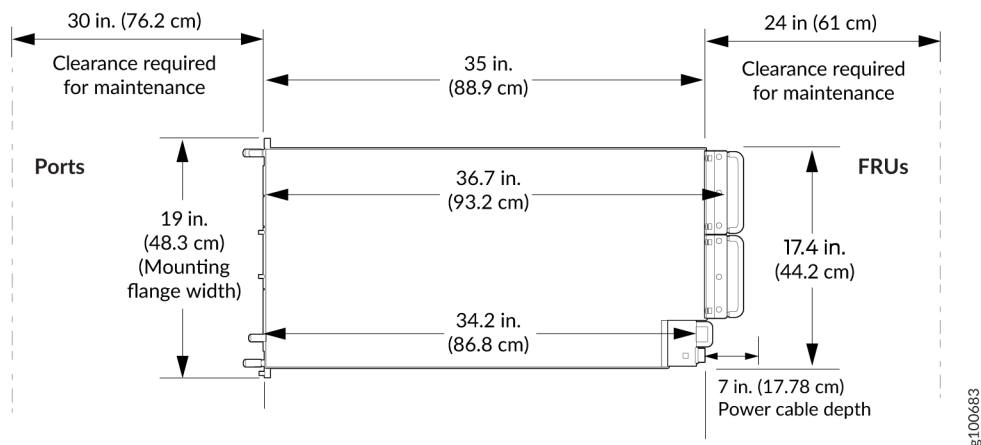
Table 32: Rack Requirements for the MX10004 (Continued)

Rack Requirement	Guidelines
Rack size and strength	• Ensure that the rack complies with the standards for a 19-in. wide rack as defined in <i>Cabinets, Racks, Panels, and Associated Equipment</i> (document number EIA-310-D) published by the EIA. • Use one of the standard rack lengths as defined in the four-part <i>Equipment Engineering (EE); European telecommunications standard for equipment practice</i> (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (ETSI) (http://www.etsi.org). • 23.62 in. (600 mm) • 30.0 in. (762 mm) • 31.5 in. (800 mm) • Ensure that the rack rails are spaced widely enough to accommodate the external dimensions of the router chassis. 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 "MX10004 Clearance Requirements for Airflow and Hardware Maintenance" on page 89.
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 and to the wall or floor for maximum stability.

MX10004 Clearance Requirements for Airflow and Hardware Maintenance

When you plan the site for an MX10004 router installation, you must allow sufficient clearance around the installed chassis for cooling and maintenance. See [Figure 33 on page 89](#) for a top view of clearance for the MX10004.

Figure 33: MX10004 Clearance Requirements



Follow these guidelines:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See ["MX10004 Cooling System" on page 25](#) for more information about the airflow through the chassis.
- If you plan to mount an MX10004 in a rack with other equipment, ensure that the exhaust from other equipment doesn't blow into the intake vents of the chassis.
- Leave at least 30 in. (76.2 cm) in front of the chassis and at least 24 in. (61 cm) behind the MX10004 so that service personnel can 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.

MX10004 Power Planning

IN THIS SECTION

- [Power Requirements for MX10004 Components | 90](#)
- [Calculate Power Requirements of an MX10004 Router | 91](#)

Use the information in this topic to calculate the power consumption for the Juniper Networks MX10004 router and plan your configuration’s power requirements.

Power Requirements for MX10004 Components

[Table 33 on page 90](#) lists the power requirements for different hardware components of an MX10004 router under typical voltage conditions and optics.

Table 33: Power Requirements for MX10004 Components

Component	Description	Power Requirements (Watts)		
		At 25° C	At 40° C	At 55° C
JNP10004-SF2	MX10004 SFB	225 W	225 W	225 W
JNP10004-FAN2	MX10004 fan tray	651 W	651 W	651 W
JNP10K-RE1	MX10004 RCB	100 W	175 W	175 W
MX10K-LC2101 line card	Line-rate throughput of up to 2.4 Tbps.	1335 W	1425 W	-

Table 33: Power Requirements for MX10004 Components (*Continued*)

Component	Description	Power Requirements (Watts)		
		At 25° C	At 40° C	At 55° C
MX10K-LC480 line card	Line-rate throughput of up to 480 Gbps.	430 W (10G)	450 W (10G)	480 W (10G)
		370 W (1G)	390 W (1G)	420 W (1G)
MX10K-LC9600 line card	Line-rate throughput of up to 9.6 Tbps.	1655 W	1770 W	-

Calculate Power Requirements of an MX10004 Router

IN THIS SECTION

- [How to Calculate the Power Consumption of Your MX10004 Router Configuration | 92](#)
- [How to Calculate the Number of Power Supplies Required for Your MX10004 Configuration | 94](#)

Use the information in this topic to calculate power requirements of your MX10004 configuration. You also need to determine the number of power supplies required for different MX10004 router configurations.



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

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

NOTE: The calculations in this topic represent the maximum power requirements that you need to budget for your MX10004 router configuration. The power consumption of your router will be less than the calculated results shown here. Power consumption 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 that you understand the different router configurations. See ["MX10004 Components and Configurations" on page 11](#).
- Ensure that you know the power requirements of different router components. See ["Power Requirements for MX10004 Components" on page 90](#).

How to Calculate the Power Consumption of Your MX10004 Router 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.

NOTE: The calculations in this topic represent the maximum power requirements that you need to budget for your MX10004 router configuration. The power consumption of your router will be less than the calculated results shown here. Power consumption 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.

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 34 on page 93](#) if your router is configured as either the standard base or the redundant configuration.

Table 34: Chassis Power Consumption for Standard Configurations

Chassis Component	MX10004-BASE Configuration	MX10004-PREMIUM Configuration	MX10004-3F-BASE Configuration	MX10004-4F-PREM Configuration
Fan tray	$651 \times 2 = 1302 \text{ W}$	$651 \times 2 = 1302 \text{ W}$	$651 \times 2 = 1302 \text{ W}$	$651 \times 2 = 1302 \text{ W}$
RCB	175 W	$175 \times 2 = 350 \text{ W}$	175 W	$175 \times 2 = 350 \text{ W}$
SFB	$225 \times 5 = 1125 \text{ W}$	$225 \times 6 = 1350 \text{ W}$	$225 \times 3 = 675 \text{ W}$	$225 \times 4 = 900 \text{ W}$
Total	2602 W	3002 W	2152 W	2552 W

- Calculate the maximum internal power consumption of the entire router by adding the maximum power requirements of each line card. See [Table 35 on page 93](#) for a chart of the power needed for line cards.

Table 35: Line Card Power Consumption

Number of Line Cards	MX10K-LC2101	MX10K-LC480	MX10K-LC9600
1	1425 W	450 W	1770 W
2	2850 W	900 W	3540 W
3	4275 W	1350 W	5310 W
4	5700 W	1800 W	7080 W

For example, for an MX10004-PREMIUM Configuration with four MX10K-LC9600 line cards, the maximum power consumption of the four line cards is 7080 W:

$$1770 \text{ W (power consumed by one MX10K-LC9600)} \times 4 \text{ line cards} = 7080 \text{ W}$$

- Add the power consumption from Step 1 (3002 W) and the total line card consumption from Step 2 (7080 W).

To continue from the previous example, add the wattage from four MX10K-LC9600 line cards (7080 W) to an MX10004-PREMIUM configuration (3002 W):

$$7080 \text{ W} + 3002 \text{ W} = 10082 \text{ W}$$

How to Calculate the Number of Power Supplies Required for Your MX10004 Configuration

The minimum power configuration for MX10004 routers is three power supplies. However, using the calculated minimum power configuration doesn't prevent the system from triggering a power alarm. To ensure that you don't trigger power alarms with a fully loaded chassis, you must configure your router for dual feed and high-power settings.

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

1. Determine the power available from the power supplies. The power supplies have a set of three DIP switches on the faceplate. These switches enable you to configure the power supply for either the high-power (30 A) or low-power (20 A) input mode. [Table 36 on page 94](#) and [Table 37 on page 95](#) shows the power available for the installed power supplies.

Table 36: Total Power Available

Power Supply Module Models	With Two Power Supplies	With Three Power Supplies
JNP10K-PWR-AC2 dual-feed, high power (30 A) setting	11,000 W	16,500 W
JNP10K-PWR-AC2 single-feed, high-power (30 A) setting	10,000 W	15,000 W
JNP10K-PWR-AC2, dual-feed, low-power (20 A) setting	6,000 W	9,000 W
JNP10K-PWR-AC2, single-feed, low-power (20 A) setting	5,400 W	8,100 W
JNP10K-PWR-DC2 dual-feed, high-power (80 A) setting	11,000 W	16,500 W
JNP10K-PWR-DC2 dual-feed, low-power (60 A) setting	8,800 W	13,200 W

Table 36: Total Power Available (Continued)

Power Supply Module Models	With Two Power Supplies	With Three Power Supplies
JNP10K-PWR-DC2 single-feed, high-power (80 A) setting	5,500 W	8,250 W
JNP10K-PWR-DC2 single-feed, low-power (60 A) setting	4,400 W	6,600 W

Table 37: Power Voltage Settings for JNP10K-PWR-AC2 and JNP10K-PWR-DC2 Power Supplies

INP0 (Switch 1)	INP1 (Switch 2)	H/L (High-Input/ Low-Input Switch 3)	Output Power
-----------------	-----------------	---	--------------

JNP10K-PWR-AC2

On	On	On (High 30 A)	5500 W
On	On	Off (Low 20 A)	3000 W
On	Off	On (High 30 A)	5000 W
Off	On	On (High 30 A)	5000 W
On	Off	Off (Low 20 A)	2700 W
Off	On	Off (Low 20 A)	2700 W

JNP10K-PWR-DC2

On	On	On (High 80 A)	5500 W
On	On	Off (Low 60 A)	4400 W

Table 37: Power Voltage Settings for JNP10K-PWR-AC2 and JNP10K-PWR-DC2 Power Supplies
(Continued)

INP0 (Switch 1)	INP1 (Switch 2)	H/L (High-Input/ Low-Input Switch 3)	Output Power
On	Off	On (High 80 A)	2750 W
Off	On	On (High 80 A)	2750 W
On	Off	Off (Low 60 A)	2200 W
Off	On	Off (Low 60 A)	2200 W

NOTE: If any JNP10K-PWR-AC2 power supply is set to 20 A, then the power budget for all power supplies installed in the system becomes 20 A, regardless of whether other power supplies are set at 30 A. This design is to prevent overloading of the power supply that is set to 20 A. See [Table 51 on page 152](#) 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, and then rounding up.

In the previous examples, we calculated that an MX10004-PREMIUM system requires 10082 W with four MX10K-LC9600 line cards. In this example, we calculate the total power available for two JNP10K-PWR-AC2 power supplies set for dual feed and low power in an MX10004-PREMIUM configuration:

$$10082 \text{ W (premium system)} / 3000 \text{ W (6000 W total, 3000 per device)} = 3.36$$

Round up the result to three JNP10K-PWR-AC power supplies. An MX10004-PREMIUM redundant AC system then has a sufficient number of 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 that each supply requires. Then, 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 power supplies running in MX10004 routers.

MX10004 Transceiver and Cable Specifications

SUMMARY

Your transceiver and network cable plan for the MX10004 router must take into consideration the fiber-optic cables you can use, including connector details and pinouts. For optimal router function, your site must meet cable power requirements and mitigate cable signal loss, attenuation, and dispersion.

IN THIS SECTION

- [MX10004 Optical Transceiver and Cable Support | 97](#)
- [MX10004 Cable Specifications for Console and Management Connections | 98](#)
- [MX10004 Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 99](#)
- [Calculate the Fiber-Optic Cable Power Budget for an MX10004 Router | 100](#)
- [Calculate the Fiber-Optic Cable Power Margin for an MX10004 Router | 101](#)

To ensure success, review fiber-optic cable characteristics. Plan the power budget and power margin for fiber-optic cables connected to your device by using the information in the following topics.

MX10004 Optical Transceiver and Cable Support

You can find information about the pluggable transceivers supported on your Juniper Networks device by using the Hardware Compatibility Tool. In addition to transceiver and connector type, compatibility tool documents the optical and cable characteristics—where applicable—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 MX10004 is located at [Hardware Compatibility Tool](#).



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.

MX10004 Cable Specifications for Console and Management Connections

Table 38 on page 98 lists the specifications for the cables that connect the MX10004 router to a management device.

NOTE: You can configure the MX10004 with small form-factor pluggable (SFP) management ports that support 1000BASE-SX transceivers.

Table 38: Cable Specifications for Console and Management Connections for the MX10004 Routers

Port on MX10004 Router	Cable Specification	Cable Supplied	Maximum Length	Device Receptacle
Console port	RS-232 (EIA-232) serial cable	One 7-foot (2.13-meter) long RJ-45 patch cable and RJ-45 to DB-9 adapter	2.13 meters	RJ-45
Management port	Category 5 cable or equivalent suitable for 1000BASE-T operation	One 7-foot (2.13-meter) long RJ-45 patch cable	100 meters	RJ-45

MX10004 Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cables | 99](#)
- [Attenuation and Dispersion in Fiber-Optic Cables | 99](#)

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 MX10004 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.

LEDs spray varying wavelengths of light into the multimode fiber, which reflects the light at different angles. Light rays travel in jagged lines through a multimode fiber, causing signal dispersion. Fiber cladding consists of layers of lower-refractive index material in close contact with a core material of higher-refractive index. When light traveling in the fiber core radiates into the fiber cladding, higher-order mode loss occurs. Together, these factors reduce the transmission distance of multimode fiber compared with 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 with multimode fiber, single-mode fiber has a higher bandwidth and can carry signals for longer distances. It is consequently more expensive.

For information about the maximum transmission distance and supported wavelength range for the types of single-mode and multimode fiber-optic cables that are connected to the MX Series, see the Juniper Networks [Hardware Compatibility Tool](#). Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

Attenuation and Dispersion in Fiber-Optic Cables

An optical data link functions correctly if the 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 transmissions. 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 caused by the different speeds of light rays.
- Modal dispersion, which is caused by the different propagation modes in the fiber.

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

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

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

Calculate the Fiber-Optic Cable Power Budget for an MX10004 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 the parts of a configured system don't operate at the worst-case levels. We cannot use the phrase "all parts . . . don't operate." You can write "none of the parts operate," however.

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, in the following example, we measure (P_T) and (P_R) in decibels per milliwatt (dBm):

$$P_T = -15 \text{ dBm}$$

$$P_R = -28 \text{ dBm}$$

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):

$$-15 \text{ dBm} - (-28 \text{ dBm}) = 13 \text{ dBm}$$

Calculate the Fiber-Optic Cable Power Margin for an MX10004 Router

Before you begin to calculate the power margin, calculate the power budget.

Calculate the link's power margin and distances when planning your fiber-optic cable layout. This will ensure that fiber-optic connections have sufficient signal power to overcome system losses and 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 you subtract attenuation or link loss (LL) 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 none of the parts of a configured system 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 does not exceed the maximum receiver input power. This means that the link will work. A power margin (P_M) that is zero or negative indicates insufficient power to operate the receiver. See the specification for your receiver to find the maximum receiver input power.

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

1. Determine the maximum value for LL by adding estimated values for applicable link-loss factors. For example, use the sample values for various factors as provided in [Table 39 on page 101](#): the link is 2 km long and multimode, and the (P_B) is 13 dBm.

Table 39: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link-Loss Value	Sample Link-Loss Calculation Values
Higher-order mode losses	Multimode—0.5 dBm	0.5 dBm
	Single mode—None	0 dBm

Table 39: Estimated Values for Factors Causing Link Loss (*Continued*)

Link-Loss Factor	Estimated Link-Loss Value	Sample Link-Loss Calculation Values
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.
	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 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):

$$P_B - LL = P_M$$

$$13 \text{ dBm} - 0.5 \text{ dBm [HOL]} - 5 (0.5 \text{ dBm}) - 2 (0.5 \text{ dBm}) - 2 \text{ km} (1.0 \text{ dBm/km}) - 1 \text{ dB [CRM]} = P_M$$

$$13 \text{ dBm} - 0.5 \text{ dBm} - 2.5 \text{ dBm} - 1 \text{ dBm} - 2 \text{ dBm} - 1 \text{ dBm} = P_M$$

$$P_M = 6 \text{ dBm}$$

The calculated power margin is 6 dBm. This value 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. See the specifications for your receiver to find the maximum receiver input power.

MX10004 Alarm and Management Cable Specifications and Pinouts

SUMMARY

The MX10004 router relies on connections through specific management cables, ports, and pinouts to communicate effectively with management devices such as laptops.

IN THIS SECTION

- [Console Port Connector Pinouts for an MX10004 Router | 103](#)
- [USB Port Specifications for the MX10004 Router | 104](#)
- [Management Port Pinouts for the MX10004 Router | 105](#)
- [RJ-45 Connector Pinouts for the External Clock Ports | 106](#)

Console Port Connector Pinouts for an MX10004 Router

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

[Table 40 on page 104](#) 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 Juniper Networks MX10004 router.

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 MX10004 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 40: Console Port Connector Pinouts for the MX10004 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
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

USB Port Specifications for the MX10004 Router

The following Juniper Networks USB flash drives are tested and supported for the USB port in the MX10004 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 MX10004 router has not been tested by Juniper Networks. The use of any unsupported USB memory product could expose your device to unpredictable behavior. The 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 MX10004 router. Failure to do so could expose your device to unpredictable behavior.

NOTE: USB flash drives used with the MX10004 router must support USB 2.0 or later.

Management Port Pinouts for the MX10004 Router

The 1000BASE-T RJ-45 management ports use an RJ-45 connector to connect to one of these points:

- The control plane and management network in an MX10004 router
- A management device for out-of-band management

[Table 41 on page 105](#) provides the pinout information of the RJ-45 management port connector. An RJ-45 cable is supplied with the MX10004 router.

Table 41: RJ-45 Management Port Connector Pinouts for the MX10004 Router

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1
2	TRP1-	Transmit/receive data pair 1
3	TRP2+	Transmit/receive data pair 2

Table 41: RJ-45 Management Port Connector Pinouts for the MX10004 Router (Continued)

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

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 42 on page 106](#) provides the pinout information of the RJ-45 management port connectors

Table 42: 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

Table 42: External Clock Pinouts (*Continued*)

Pin	Description	Direction
A6	Reserved	–
A7	Reserved	–
A8	Reserved	–
B1	PortB Rx, Ring	Input
B2	PortB Rx, Tip	Input
B3	Reserved	–
B4	PortB Rx, Ring	Output
B5	PortB Rx, Tip	Output
B6	Reserved	–
B7	Reserved	–
B8	Reserved	–

3

CHAPTER

Initial Installation and Configuration

[MX10004 Installation Overview | 109](#)

[Unpack the MX10004 Router | 110](#)

[Mount the Juniper Networks MX10004 Router Using the JNP10004-RMK-4POST Rack-Mount Kit | 122](#)

[Install the Front Door on an MX10004 Router | 128](#)

[Connect the MX10004 to Power | 135](#)

[Connect the MX10004 Router to External Devices | 140](#)

[Perform the Initial Configuration for the MX10004 Router | 142](#)

MX10004 Installation Overview

The MX10004 is a rigid sheet-metal router-chassis. It houses the other hardware components such as the Routing and Control Boards (RCBs), Switch Fabric Boards (SFBs), power supplies, fan trays, and line cards. The router chassis ships in a cardboard box that has a two-layer wooden pallet base. The router chassis is bolted to the pallet base. You can install an MX10004 router in a standard 19-in. (483-mm) equipment rack by using the supplied rack-mount kit.

Perform the following steps to install the MX10004:

1. Unpack the router following the instructions in ["Unpack the MX10004 Router" on page 110](#).
2. Mount the chassis in the rack following the instructions in ["Mount the Juniper Networks MX10004 Router Using the JNP10004-RMK-4POST Rack-Mount Kit" on page 122](#).
Because of the weight of the chassis, we recommend mounting using a mechanical lift. A mechanical lift is the easiest and safest method.
3. Install the line cards following the instructions in ["Install an MX10004 Line Card in the Router Chassis" on page 194](#).
4. Connect the chassis to earth ground following the instructions in ["Connect the MX10004 Router to Earth Ground" on page 136](#).
5. Connect power to the power supplies following the instructions in ["Connect the MX10004 to Power" on page 135](#).
6. Install the ESD front door following the instructions in ["Install the Front Door on an MX10004 Router" on page 128](#).
7. Connect the router to the network.
 - To connect the router to a network for out-of-band management, follow instructions in ["Connect the MX10004 Router to External Devices" on page 140](#).
 - To connect the router to a management console, follow instructions in ["Connect an MX10004 Router to a Management Console" on page 141](#).
8. Configure the router following the instructions in ["Perform the Initial Configuration for the MX10004 Router" on page 142](#).
9. Install optional equipment such as the cable management system. See ["Install the MX10004 Cable Management System" on page 199](#).

Unpack the MX10004 Router

SUMMARY

Unpack the router using the recommended tools and following the recommended procedure.

IN THIS SECTION

- [Unpack the MX10004 Shipping Pallet | 110](#)
- [Unpack Line Cards, Routing Control Boards, and Switch Fabric Boards for the MX10004 Router | 113](#)
- [Compare the MX10004 Router Order to the Packing List | 114](#)
- [Register Products—Mandatory to Validate SLAs | 121](#)

Unpack the MX10004 Shipping Pallet

Gather the following tools and parts to unpack the Juniper Networks MX10004 router:

- Phillips (+) screwdriver, number 2
- 1/2-in. or 13-mm open-end or socket wrench to remove bracket bolts from the shipping pallet
- A box cutter or packing knife to slice open the nylon straps and tape that seal the crate and boxes
- Blank panels to cover any slots not occupied by a component

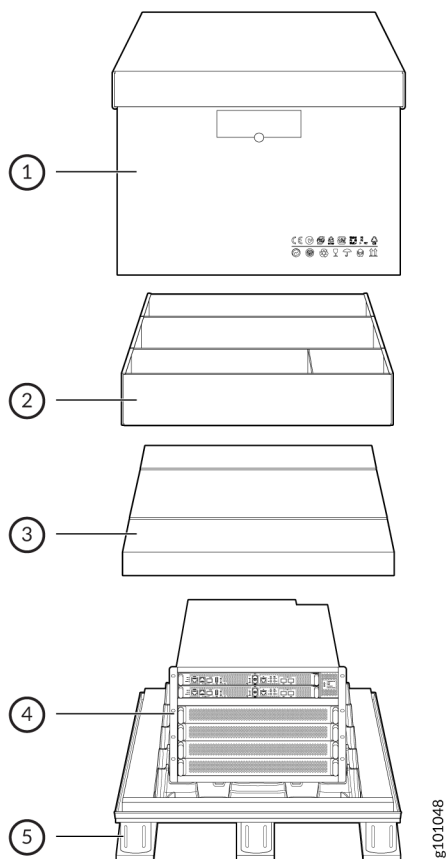
After you prepare the installation site as described in [Table 29 on page 82](#), you can unpack the router.

The MX10004 router chassis is a rigid sheet-metal structure that houses the hardware components. 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 carton also contains an accessory box and a rack-mount kit.

NOTE: The chassis is well protected inside the shipping box. Keep it secure in its packaging until you are ready to begin installation.

The shipper has the option to either ship the front panel separately or ship it along with the chassis. If the front panel arrives with the chassis, set aside the front panel box until you are ready to verify the contents of the order. See [Figure 34 on page 111](#).

Figure 34: Shipping Crate and Accessory Box



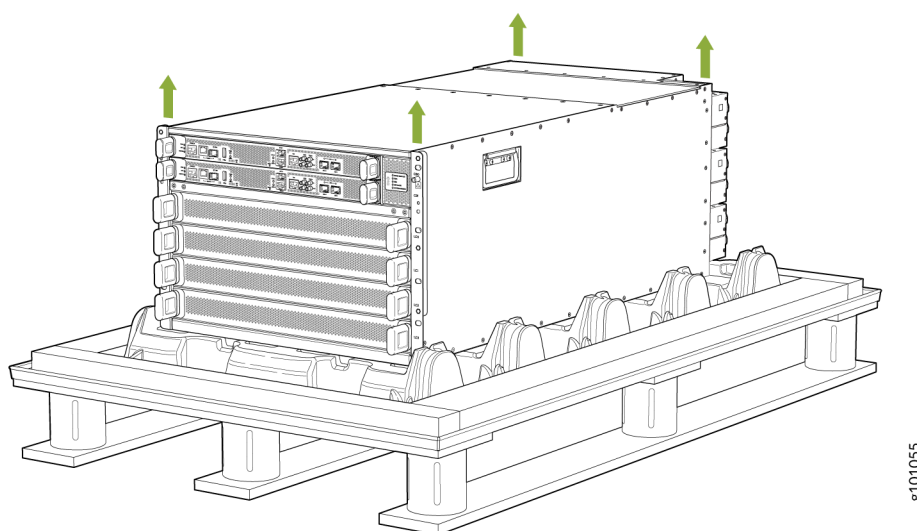
1– Cardboard shipping box	4– MX10004 chassis
2– Cardboard accessory box	5– Wood pallet
3– Foam cover	

To unpack the chassis:

1. Move the shipping box to a staging area as close to the installation site as possible. While the chassis is bolted to the pallet, you can use a forklift or pallet jack to move the shipping box. Make sure there is enough space to remove components from the chassis.
2. Position the shipping box with the arrows pointing up.
3. Use the box cutter to slice the nylon straps that secure the shipping box to the pallet.
4. Lift the shipping box off the chassis.

5. Remove the cardboard accessory box.
6. Remove the foam padding from the top of the box.
7. Remove the plastic cover from the router chassis.
8. Use a mechanical lift to lift the chassis from the shipping pallet. Otherwise, unload all of the components, except the fan tray controller, and manually lift the chassis from the shipping pallet. See [Figure 35 on page 112](#) and ["Mount the Juniper Networks MX10004 Router Using the JNP10004-RMK-4POST Rack-Mount Kit" on page 122](#).

Figure 35: Lift the Chassis Off the Pallet



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

9. Unpack the accessory box and lay out the contents so that they are ready for use.
10. Verify that your order includes all appropriate parts. See ["Compare the MX10004 Router Order to the Packing List" on page 114](#) and ["MX10004 Components and Configurations" on page 11](#) for information about base configurations and redundant configurations.
11. Save the shipping box and packing materials to move or ship the router at a later time.

Unpack Line Cards, Routing Control Boards, and Switch Fabric Boards for the MX10004 Router

Before you unpack a component of the Juniper Networks MX10004 router:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Ensure that you know how to handle and to store the component. See:
 - ["Handle a Routing and Control Board Properly" on page 185](#) and ["Store a Routing and Control Board in an Electrostatic Bag" on page 186](#).
 - ["Handle and Store MX10004 Line Cards Properly" on page 191](#).

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

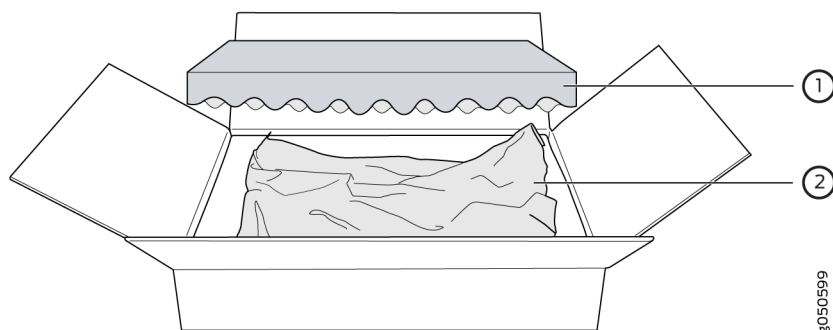


CAUTION: The components are well protected inside the shipping carton. Keep the components secured inside their packaging until you are ready to install the components in the router chassis.

To unpack an RCB, an SFB, or a line card:

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

Figure 36: Unpack a Line Card



1– Foam packing material

2– Paper packaging and antistatic bag

Compare the MX10004 Router Order to the Packing List

The Juniper Networks MX10004 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 USA or Canada by telephone at 1-888-314-5822. For international-dial or direct-dial options in countries without toll-free numbers, see <https://www.juniper.net/support/requesting-support.html>.

Items that ship separately from the chassis are:

- Line cards.
- Chassis front door kit (JNP10004-FRNT-PNL) or JNP10004-FRPNL1 with air filter.

NOTE: The kit is a spare part and can ship with the chassis or separately.

- Cable management kit (JLC-CBL-MGMT-KIT).

To compare the sales order and packing list against the contents of the chassis shipping crate:

1. Determine the configuration. See "[MX10004 Components and Configurations](#)" on page 11. The parts shipped depend on the configuration you order.
2. Compare the packing list accompanying the chassis with the configuration order:

- For MX10004-BASE configuration orders, see [Table 43 on page 115](#).
- For MX10004-3F-BASE configuration orders, see [Table 44 on page 116](#).
- For MX10004-PREMIUM configuration orders, see [Table 45 on page 117](#).
- For MX10004-4F-PREM configuration orders, see [Table 46 on page 118](#).

Table 43: MX10004-BASE Configuration Order

Component	MX10004 Quantity
Chassis, including power bus (JNP10004-CHAS)	1
Routing Control Board (RCB) (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128)	1
RCB cover (JNP10K-RE-BLNK)	1
Fan tray controllers (JNP10004-FTC2)	2
Fan trays (JNP10004-FAN2)	2
Power supplies: • JNP10K-PWR-AC2 • JNP10K-PWR-DC2	2
Power supply blank cover panel (JNP10K-PWR-BLNK)	1
Switch Fabric Board (SFB) (JNP10004-SF2)	5
SFB cover (JNP10004-SF-BLNK)	1
Line card blank cover panel (JNP10K-LC-BLNK)	4
Accessory kit (see Table 47 on page 119)	1

Table 43: MX10004-BASE Configuration Order (Continued)

Component	MX10004 Quantity
Rack-mount kit (see Table 48 on page 120)	1
Front panel kit (see Table 49 on page 121 or Table 50 on page 121)	1
Documentation Roadmap Card	1

Table 44: MX10004-3F-BASE Configuration Order

Component	MX10004 Quantity
Chassis, including power bus (JNP10004-CHAS)	1
Routing Control Board (RCB) (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128)	1
RCB cover (JNP10K-RE-BLNK)	1
Fan tray controllers (JNP10004-FTC2)	2
Fan trays (JNP10004-FAN2)	2
Power supplies: • JNP10K-PWR-AC2 • JNP10K-PWR-DC2	2
Power supply blank cover panel (JNP10K-PWR-BLNK)	1
Switch Fabric Board (SFB) (JNP10004-SF2)	3
SFB cover (JNP10004-SF-BLNK)	3

Table 44: MX10004-3F-BASE Configuration Order (Continued)

Component	MX10004 Quantity
Line card blank cover panel (JNP10K-LC-BLNK)	4
Accessory kit (see Table 47 on page 119)	1
Rack-mount kit (see Table 48 on page 120)	1
Front panel kit (see Table 49 on page 121 or Table 50 on page 121)	1
Documentation Roadmap Card	1

Table 45: MX10004-PREMIUM Configuration Order

Component	MX10004 Quantity
Chassis, including power bus (JNP10004-CHAS)	1
Routing Control Board (RCB) (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128)	2
Fan tray controllers (JNP10004-FTC2)	2
Fan trays (JNP10004-FAN2)	2
Power supplies: - JNP10K-PWR-AC2 - JNP10K-PWR-DC2	3
Switch Fabric Board (SFB) (JNP10004-SF2)	6
Line card blank cover panel (JNP10K-LC-BLNK)	4

Table 45: MX10004-PREMIUM Configuration Order (Continued)

Component	MX10004 Quantity
Accessory kit (see Table 47 on page 119)	1
Rack-mount kit (see Table 48 on page 120)	1
Front panel kit (see Table 49 on page 121 or Table 50 on page 121)	1
Documentation Roadmap Card	1

Table 46: MX10004-4F-PREM Configuration Order

Component	MX10004 Quantity
Chassis, including power bus (JNP10004-CHAS)	1
Routing Control Board (RCB) (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128)	2
Fan tray controllers (JNP10004-FTC2)	2
Fan trays (JNP10004-FAN2)	2
Power supplies: - JNP10K-PWR-AC2 - JNP10K-PWR-DC2	3
Switch Fabric Board (SFB) (JNP10004-SF2)	4
SFB cover (JNP10004-SF-BLNK)	2
Line card blank cover panel (JNP10K-LC-BLNK)	4

Table 46: MX10004-4F-PREM Configuration Order (Continued)

Component	MX10004 Quantity
Accessory kit (see Table 47 on page 119)	1
Rack-mount kit (see Table 48 on page 120)	1
Front panel kit (see Table 49 on page 121 or Table 50 on page 121)	1
Documentation Roadmap Card	1

3. Compare the contents of the accessory kit with [Table 47 on page 119](#).

Table 47: MX10004 Accessory Kit

Component	Quantity	
	AC Configurations	DC Configurations
Warranty card	1	1
End User License Agreement (EULA)	1	1
RJ-45 Ethernet cable	1	1
RJ-45 to DB9 rollover cable	1	1
Electrostatic discharge (ESD) wrist strap with cable	1	1
Media kit (flash drives and PCMCIA card adapter)	1	1

Table 47: MX10004 Accessory Kit (Continued)

Component	Quantity	
	AC Configurations	DC Configurations
Chassis ground lug (2-hole, 10-32, 6 AWG)	1	1
Power cord retainer clips	6	–
DC terminal lugs (2-hole, 10-32, 4 AWG)	–	PREMIUM configurations = 24 BASE configurations = 16
Antistatic bags	4	4

4. Compare the contents of the rack-mount kit with [Table 48 on page 120](#).

Table 48: MX10004 Rack-Mount Kit

Component	Quantity
Mounting tray	1
Mounting blades	2
Safety restraint	1
Phillips flat-head screws (8-32 x .375 in.)	12

5. Compare the contents of the ESD front door kit with [Table 49 on page 121](#) or [Table 50 on page 121](#).

Table 49: JNP10004-FRNT-PNL Front Door Kit

Component	Quantity
Front door	1

Table 50: JNP10004-FRPNL1 Front Door Kit with Air Filter

Component	Quantity
Front door with air filter	1
Line-card handle extensions	8
Cable tray	4
Cable seals	3

Register Products—Mandatory to Validate SLAs

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



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

Register your product(s) at <https://tools.juniper.net/svcreg/SRegSerialNum.jsp>.

Update your installation base at <https://www.juniper.net/customers/csc/management/updateinstallbase.jsp>.

Mount the Juniper Networks MX10004 Router Using the JNP10004-RMK-4POST Rack-Mount Kit

You can mount a Juniper Networks MX10004 router in a four-post closed-frame rack or a four-post open-frame rack by using a rack-mount kit. The rack-mount kit (part number JNP10004-RMK-4POST) ships with the router by default. This topic explains how to mount the router.

The router chassis weighs approximately 123 lb (56 kg) with only the fan tray controllers installed.

You can mount an MX10004 manually or by using a mechanical lift. Because of the router's size and weight, we strongly recommend that you use a mechanical lift to mount the MX10004.

If you are mounting the router by using a lift, ensure that you have a mechanical lift rated for 250 lbs (113.4 kg).

If you are mounting the router manually, ensure that at least three people are available to lift the chassis together.

Before you mount the MX10004 router:

- Prepare the site for installation as described in ["MX10004 Site Preparation Checklist" on page 82](#).
- Unpack the router as described in ["Compare the MX10004 Router Order to the Packing List" on page 114](#).
- Review the chassis lifting guidelines in ["Chassis and Component Lifting Guidelines" on page 242](#).

Ensure that you have the following parts and tools available:

- Twenty eight rack-mount screws appropriate for your rack to secure the mounting blades, mounting tray, chassis, and safety restraint to the rack (not provided)
- A Phillips (+) screwdriver, number 1, 2, or 3, depending on the size of your rack-mount screws (not provided)

The rack-mount kit consists of the following components:

- One mounting tray
- Two mounting blades
- One safety restraint
- 12 Phillips 8-32 x .375 flat-head screws



CAUTION: Mount the chassis securely, and then install line cards and other components in the secured chassis.



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

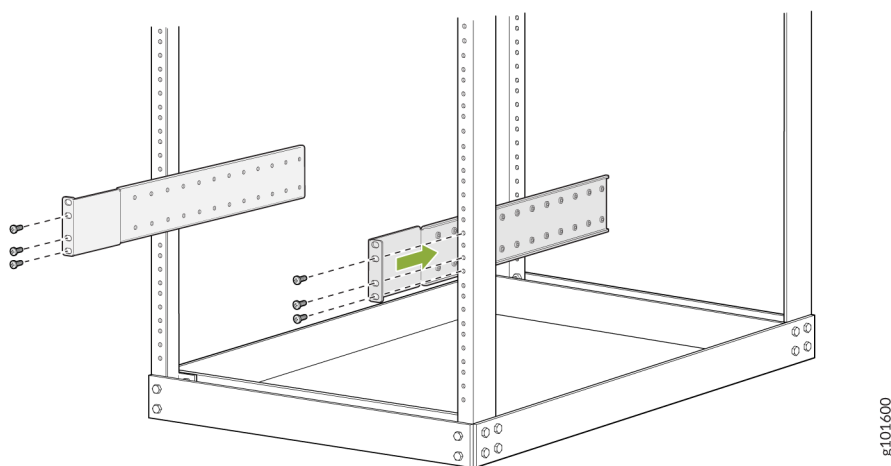


CAUTION: If you are mounting multiple units on a rack, plan to mount the first router at the bottom of the rack. Mount the heaviest unit at the bottom of the rack. Mount the other units from the bottom of the rack to the top in decreasing order of weight: heaviest unit on the bottom, lightest unit at the top.

To mount the router:

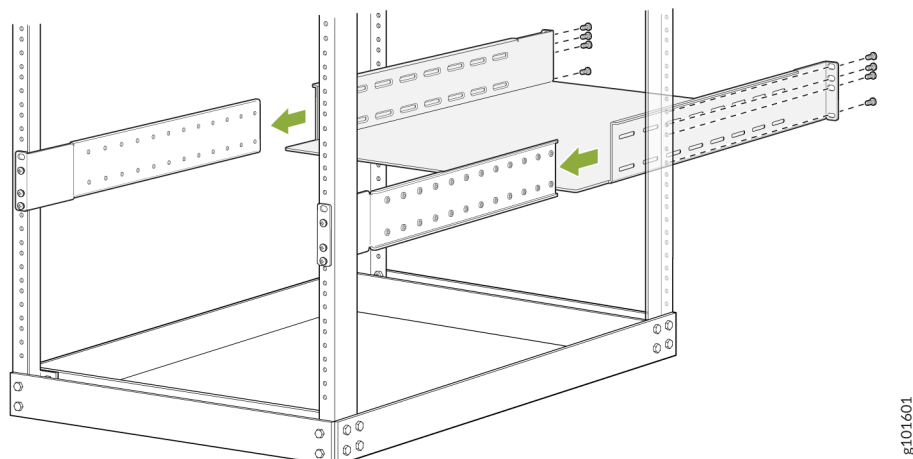
1. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end to a site ESD point.
2. Attach the mounting blades to the front rack posts by using six rack mount screws appropriate for your rack and a screwdriver (see [Figure 37 on page 123](#)).

Figure 37: Attach the Mounting Blades



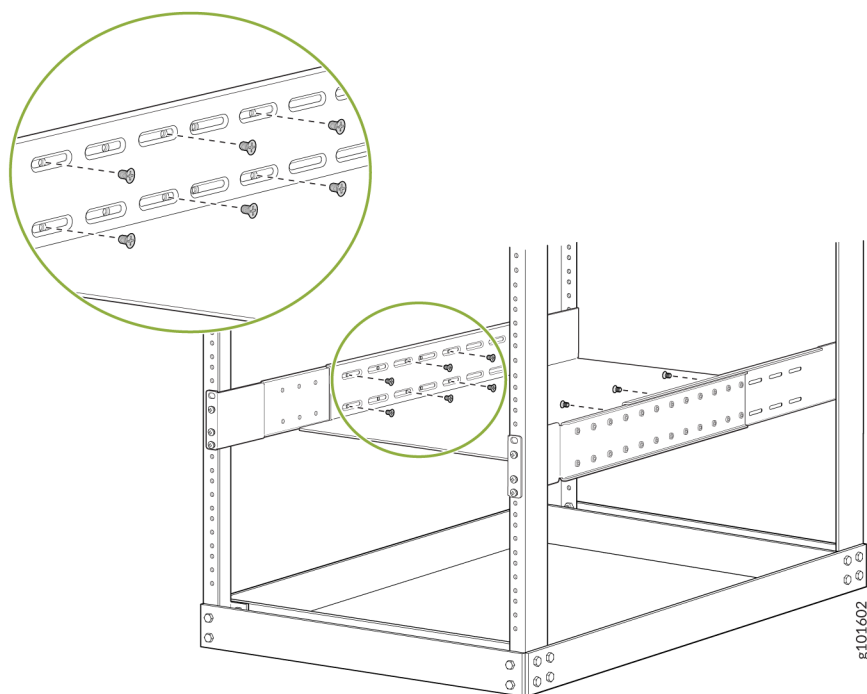
3. From the rear of the rack, slide the mounting tray into the rear posts of the rack such that the mounting blades slide into the grooves on the mounting tray. Attach the tray to the rear rack posts by using eight rack-mount screws appropriate for your rack (see [Figure 38 on page 124](#)).

Figure 38: Attach the Mounting Tray



4. Check that the mounting tray is level.
5. Attach the mounting blades to the tray with the 12 Phillips 8-32 x .375 in. flat-head screws (see [Figure 39 on page 124](#)).

Figure 39: Attach the Mounting Blades to the Mounting Tray



6. Mount the router into the rack.

If you are mounting the router by using a mechanical lift:

- a. Load the router onto the lift, making sure that it rests securely on the lift platform (see [Figure 40 on page 125](#)).

Figure 40: Load the MX10004 onto a Mechanical Lift



- b. Using the lift, align the router in front of the rack, centering it in front of the mounting tray.
- c. Lift the chassis approximately 0.75 in. (1.9 cm) above the surface of the mounting tray. Align the chassis as close as possible to the mounting tray.

If you are mounting the router manually:

- a. Align the router in front of the rack or cabinet, centering it in front of the mounting tray. Use a pallet jack if one is available.



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

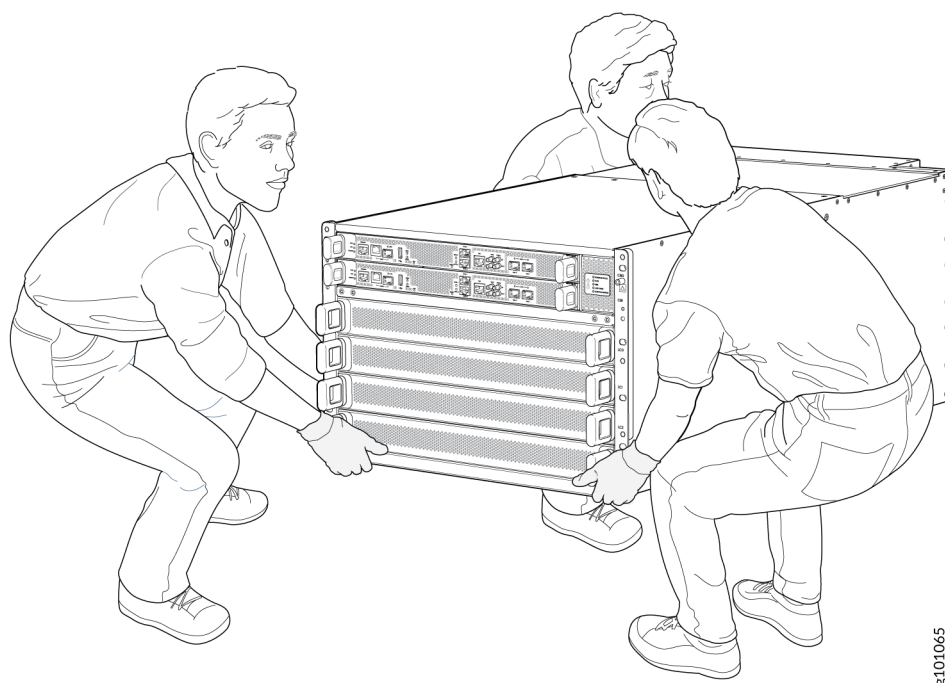


CAUTION: If you are mounting more than one router, mount the first one at the bottom of the rack. Do not attempt to mount a router manually in an upper position in a rack.

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

- b. With one person on each side and one person in the rear, hold the bottom of the chassis and carefully lift it onto the mounting tray (see [Figure 41 on page 126](#)).

Figure 41: Lift the MX10004 Manually

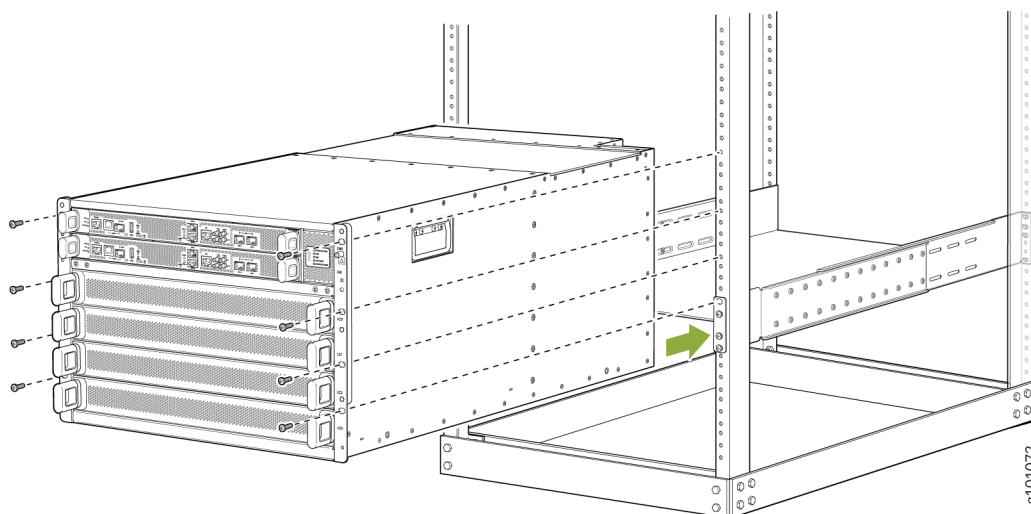


g101065

7. Carefully slide the chassis onto the mounting tray until the chassis flanges contact the rack rails. The mounting blades ensure that the holes in the chassis flanges line up with the holes in the rack rails.

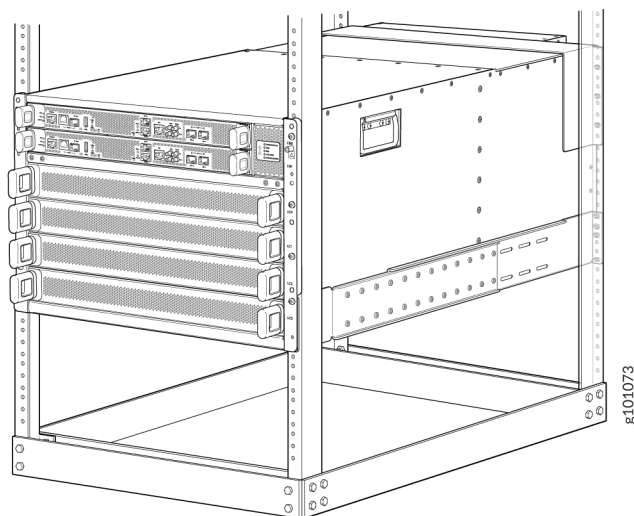
8. Starting at the bottom, attach the chassis to the rack by inserting eight rack mount screws through each open flange hole and rack hole (see [Figure 42 on page 127](#)).

Figure 42: Attach the Chassis to the Rack



9. If you used a lift to mount the router, move the lift away from the rack.
10. Check the alignment of the router. The mounting screws on each side of the rack should line up, and the router should be level. Tighten the screws.
11. Insert the safety restraint between the rear posts of the rack. It should rest on the top of the chassis and align with the holes in the rack.
12. Attach the restraint to the rack by inserting six mounting screws through each open flange hole and rack hole (see [Figure 43 on page 128](#)). Tighten the screws.

Figure 43: Attach the Safety Restraint



Install the Front Door on an MX10004 Router

SUMMARY

The front door (JNP10004-FRNT-PNL) on the Juniper Networks MX10004 router protects the fiber-optic cabling and protects the router from electromagnetic interference (EMI).

IN THIS SECTION

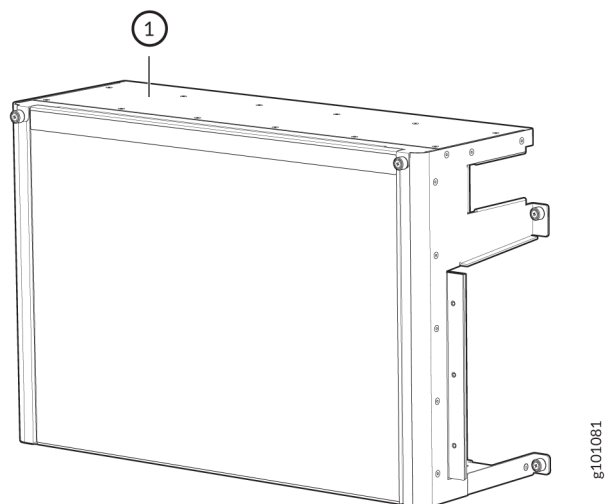
- [Install a Front Door Without the Air Filter on an MX10004 Router | 128](#)
- [Install a Front Door with Filter | 130](#)

You can install the front door with or without the optional cable management system. You can also order JNP10004-FPNL1 for installations that require an air filter.

Install a Front Door Without the Air Filter on an MX10004 Router

Use the front door provided with the router chassis. See [Figure 44 on page 129](#) to verify that you have the front door without an air filter.

Figure 44: Front Door Without Air Filter

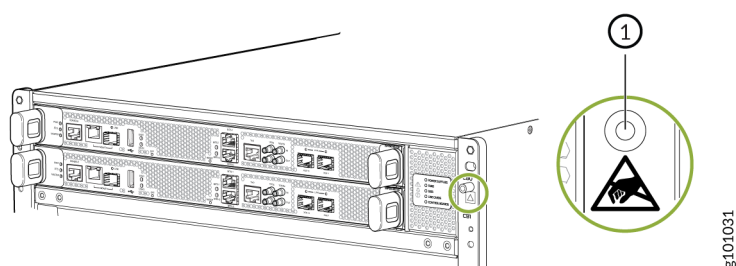


1– Front door

To install the front door:

1. Wrap and fasten one end of the Electrostatic Discharge (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 45 on page 129](#).

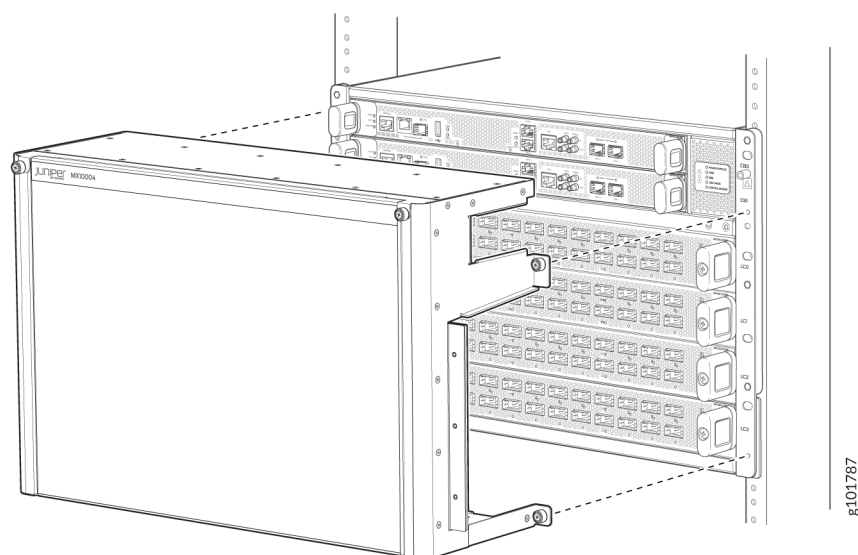
Figure 45: ESD Point for MX10004 Chassis Front



1– ESD point

2. Insert all optics.
3. Lift the front door and align the captive screws in the door with holes in the chassis flange. Fasten the door to the chassis and rack using the captive screws, and hand tighten. See [Figure 46 on page 130](#).

Figure 46: Attach Front Door Using the Captive Screws

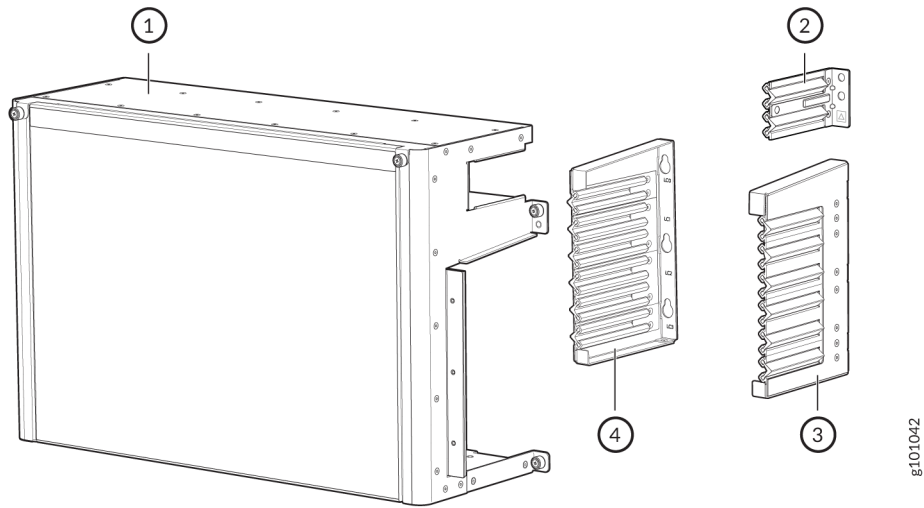


Install a Front Door with Filter

Be sure you have the following tools and parts before you begin:

- A Phillips(+) screwdriver, number 2 (not provided)
- Front door (provided)
- Three cable seals—Two seals for the right side and one for the left side (provided)
- Cable management system (provided)

See [Figure 47 on page 131](#) for the shipped components.

Figure 47: JNP10004-FRPNL1 Components

1– Front door with filter frame

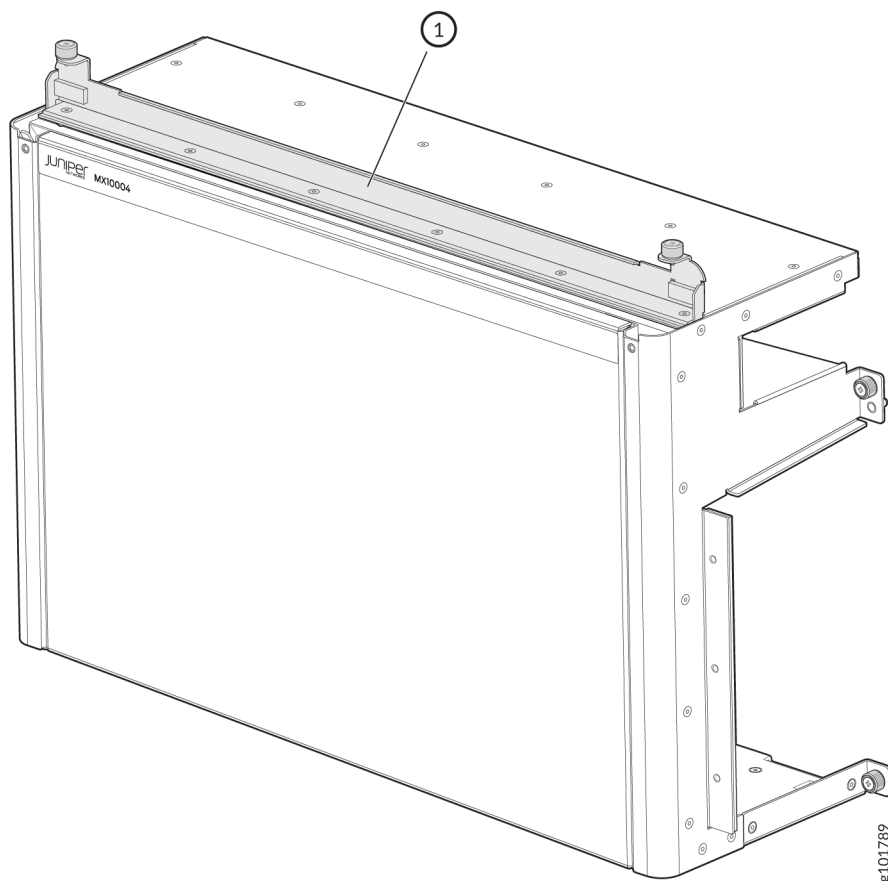
3– Right cable seal

2– Routing Control Board (RCB) cable seal

4– Left cable seal

The JNP10004-FRPNL1 EMI front door has an air filter. We recommend that you replace the air filter every six months. The order number for a spare filter is JNP10004-FLTR.

Figure 48: Air Filter in an MX10004 Front Door



1– Air filter frame

To install a front door with an air filter:

1. Install the cable management system. See ["Install the MX10004 Cable Management System" on page 199](#).

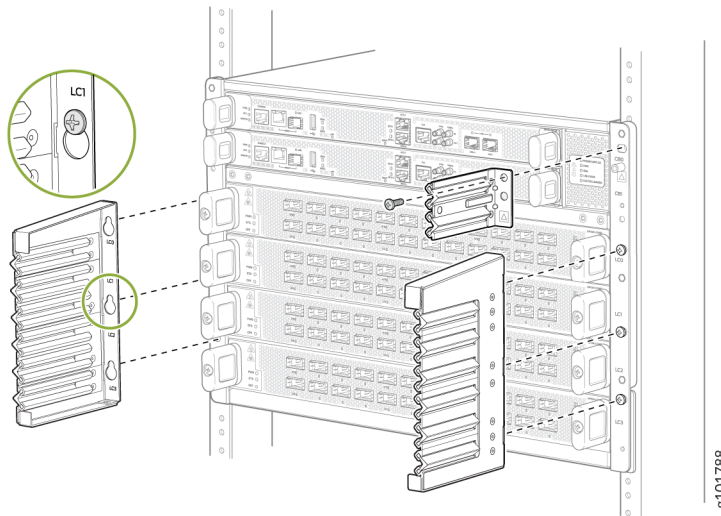


CAUTION: You must have the extended ejector handles of the cable management system installed to remove or install the line cards if you use the front door with an air filter.

2. Install the cable seals.
 - a. Remove the top right mounting screw next to the Routing and Control Board (RCB) with the Phillips screwdriver. The mounting screws attach the chassis flanges to the four-post rack.

- b. Line up the top hole of the RCB cable seal over the mounting hole in the flange and align the second hole over the ESD grounding point. Fasten the seal and flange to the rack using the Phillips screwdriver to tighten the mounting screw.
- c. Loosen the mounting screws next to the line card along one side of the chassis.
- d. Position the keyhole slots of one of the long cable seals over the mounting screws. The long cable seals are not interchangeable; there is a right seal and a left seal. Install the seals so that the keyhole slots are on the inside, next to the line card. See [Figure 49 on page 133](#).

Figure 49: Install the Cable Seals



- e. Slide the keyhole slot down behind the mounting screws and align the cable seal with the chassis. Tighten the mounting screw with a Phillips screwdriver.
 - f. Repeat [Step 2.c](#) through [Step 2.e](#) for the remaining cable seal.
- 3. Install optics and attach the front door.**
- a. 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 45 on page 129](#).
 - b. Insert all optics and thread the cables through the cable seals.
 - c. Lift the front door, and align the captive screws in the door with holes in the chassis flange below the cable seals. Fasten the door to the chassis and rack, and hand tighten.

To install the air filter in the front door:

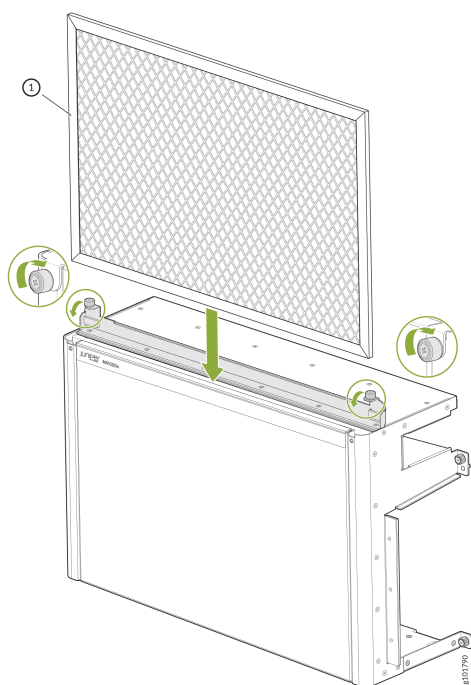
1. Turn the knobs on the air filter frame counter-clockwise, and flip the frame cover up to uncover the top of the front door.



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

2. Hold the air filter with both hands and insert it through the top of the front door until it stops. See [Figure 50 on page 134](#).

Figure 50: Insert the Air Filter into an MX10004 Front Door



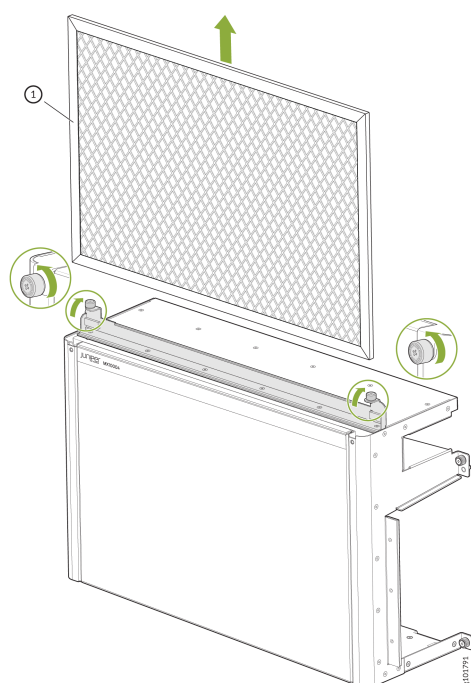
1– Air filter

3. Flip the air filter frame down, over the front door, and turn the knobs on the air filter frame clockwise to secure the frame over the air filter.

To remove the air filter from the front door:

1. Turn the knobs on both sides of the air filter frame counter-clockwise and flip the frame cover up to uncover the top of the front door.
2. Grasp the air filter with both hands and lift the air filter out through the top of the front door. See [Figure 51 on page 135](#).

Figure 51: Lift the Air Filter Out of the MX10004 Front Door



1– Air filter

Connect the MX10004 to Power

IN THIS SECTION

- [Connect the MX10004 Router to Earth Ground | 136](#)
- [Connect AC Power to an MX10004 Router | 138](#)
- [Connect DC Power to an MX10004 Router | 139](#)

The Juniper Networks MX10004 routers support AC, DC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) power supplies. To connect power to an MX10004 router, complete the tasks in this section.

NOTE: Do not mix power supply models in the same chassis in a running environment.

Connect the MX10004 Router to Earth Ground

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

You must install the Juniper Networks MX10004 router in a restricted-access location and ensure that the chassis is always properly grounded.

The MX10004 has a two-hole protective grounding terminal provided on the chassis. See [Figure 53 on page 138](#). Under all circumstances, use this grounding connection to ground the chassis.

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

If an external ground connection is required, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable you supply.



WARNING: 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 ["Mount the Juniper Networks MX10004 Router Using the JNP10004-RMK-4POST Rack-Mount Kit" on page 122](#).

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 MX10004 (not provided)—The grounding cable must be 4 AWG (21.1 mm²) stranded wire and should be rated 75 °C or per local electrical code.

- Grounding lug for your grounding cable (provided)—This bracket attaches to the lower left corner of the router chassis next to the bottom power supply, providing a protective earthing terminal for the router. The grounding lug required is a Panduit LCD6-14A-L or equivalent.
- A number 3 Pozidriv or Phillips screwdriver (not provided) to tighten the two screws that are mounted on the chassis.

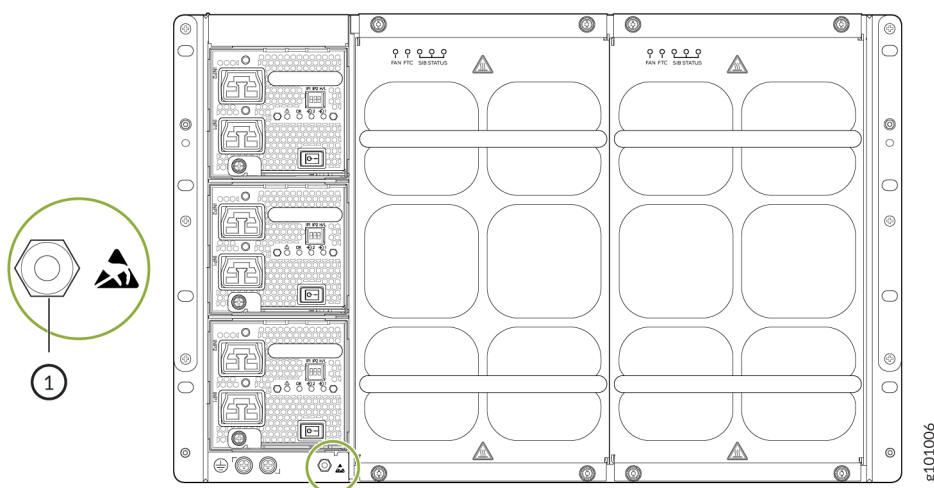
The provided terminal lugs for the JNP10K-PWR-DC2 are Panduit LCD4-14A-L, or equivalent, and sized for 4 AWG (21.1 mm²) power source cables. We recommend that you install heat-shrink tubing insulation around the crimped section of the power cables and lugs.

An AC-powered MX10004 gets additional grounding when you plug the power supply in the router into a grounded AC power outlet using an AC power cord appropriate for your geographical location. See ["MX10004 Power Cable Specifications" on page 43](#).

To connect the MX10004 router to earth ground:

1. Verify that a licensed electrician has attached the cable lug (provided in the accessory kit) to the grounding cable.
2. Connect the other end of the grounding cable to a proper earth ground, such as the rack in which the router is mounted.
3. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to one of the ESD points on the chassis. See [Figure 52 on page 137](#).

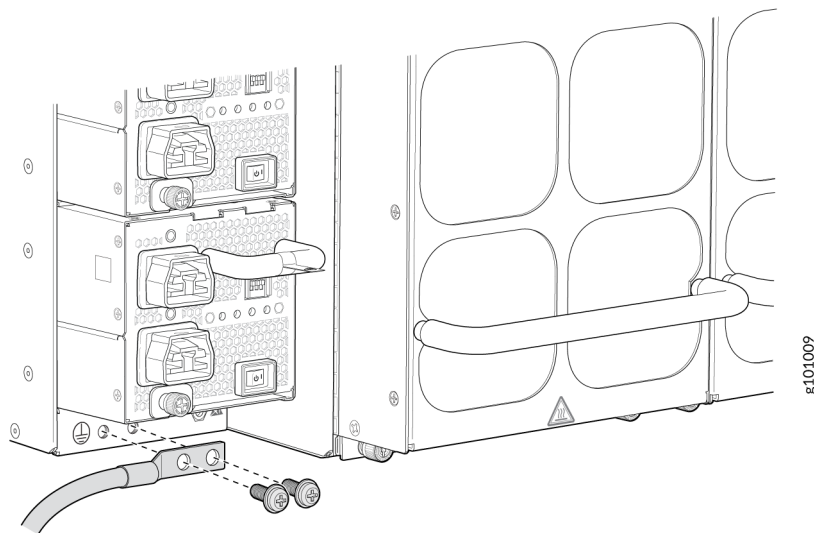
Figure 52: ESD Point for the MX10004



1– Grounding point

4. Remove the two M6 screws with attached washers on the chassis using either a Pozidriv or Phillips screwdriver.
5. Place the chassis grounding lug and cable over the screw holes with the cable connection pointing to the left. See [Figure 53 on page 138](#).

Figure 53: Connect a Grounding Cable to the MX10004



6. Place the two screws with attached washers over the grounding lug and grounding cable.
7. Tighten the two M-6 screws using a Pozidriv or Phillips screwdriver.
8. Secure the grounding cable and ensure that it doesn't touch or block access to other device components and that it doesn't drape where people can trip over it.

Connect AC Power to an MX10004 Router

Before you begin to connect power to the Juniper Networks MX10004 router, review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).

After you ground the router, add power supplies, and apply power to the router, the system initiates the power-on sequence. This sequence can start incrementally with a single power supply, but we do not recommend that you bring up an MX10004 system with fewer than three power supplies.

To connect AC power to an MX10004 router:

1. Connect the router to earth ground (see ["Connect the MX10004 Router to Earth Ground" on page 136](#)).



CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, ground the MX10004 properly before you connect it to power.

For installations that require a separate grounding conductor to the router's chassis, use the protective earthing terminal on the rear panel of the MX10004. Connect from that terminal to the earth ground.

NOTE: An MX10004 router gets additional grounding when you plug the power supply in the router into a grounded AC power outlet. Use the AC power cord appropriate for your geographical location to make this connection. See ["MX10004 Power Cable Specifications" on page 43](#).

2. Install power supplies in the router and apply power. See ["Install a JNP10K-PWR-AC2 Power Supply" on page 149](#).

Connect DC Power to an MX10004 Router

Before you begin to connect power to the Juniper Networks MX10004 router, review how to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).

The overall process of bringing up a DC-powered router involves the proper cabling of the individual power supplies, adding the power supplies to the router, and supplying power. The power-on sequence can start incrementally with a single power supply; however, we recommend that you use three or more power supplies.

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

To connect DC power to an MX10004 router:

1. Connect the router to earth ground (see ["Connect the MX10004 Router to Earth Ground" on page 136](#)).
2. To connect DC power to a JNP10K-PWR-DC2 power supply, see ["Install a JNP10K-PWR-DC2 Power Supply" on page 155](#).
3. To connect HVDC power to a JNP10K-PWR-AC2 power supply, see ["Install a JNP10K-PWR-AC2 Power Supply" on page 149](#).

RELATED DOCUMENTATION

[General Safety Guidelines and Warnings | 234](#)

[Grounded Equipment Warning | 246](#)

Connect the MX10004 Router to External Devices

IN THIS SECTION

- [Connect an MX10004 Router to a Network for Out-of-Band Management | 140](#)
- [Connect an MX10004 Router to a Management Console | 141](#)

You can manage the Juniper Networks MX10004 router using the two management ports. You can also manage it using the console port on the Routing and Control board (RCB) for out-of-band management.

The topics in this section describe how to connect an MX10004 router to external management devices.

Connect an MX10004 Router to a Network for Out-of-Band Management

Ensure that you have an appropriate cable available. See ["Management Port Pinouts for the MX10004 Router" on page 105](#) and ["Connect an MX10004 Router to a Management Console" on page 141](#).

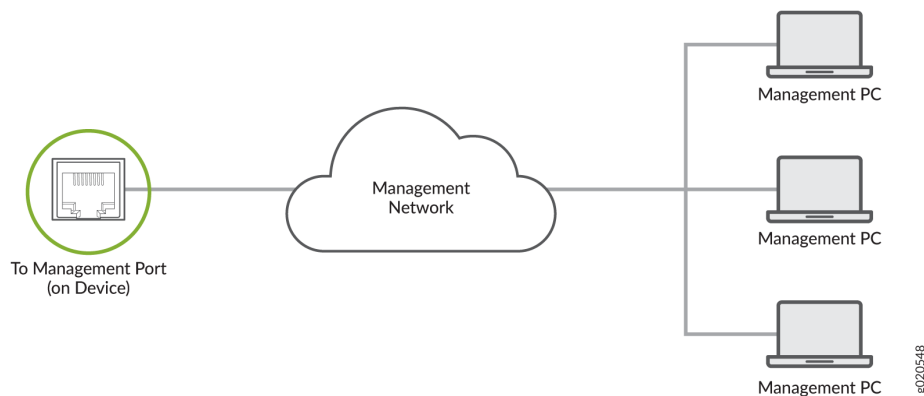
You can monitor and manage an MX10004 router using a dedicated management channel. Each MX10004 RCB has two management ports: a 10/100/1000BASE-T RJ-45 port for copper connections and a 1-Gigabit Ethernet (GbE) small form-factor pluggable (SFP) port for fiber connections. Use the management ports to connect the RCB to a network for out-of-band management.

NOTE: You must configure the management ports before you can successfully connect to the MX10004 using the management ports. You cannot use the management ports to perform the initial configuration of the MX10004. See ["Perform the Initial Configuration for the MX10004 Router" on page 142](#).

To connect an MX10004 router to a network for out-of-band management:

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 router.

Figure 54: Connect an MX10004 to a Network for Out-of-Band Management



Connect an MX10004 Router to a Management Console

The MX10004 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.

Before you begin, 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 connector pin (plug) and you want to connect your laptop or PC directly to the MX10004 router, use a combination: Use both 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.

To connect the MX10004 router to a management console:

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable to the console server (see [Figure 55 on page 142](#)) or management console (see [Figure 56 on page 142](#)).

Figure 55: Connect the MX10004 Router to a Management Console Through a Console Server

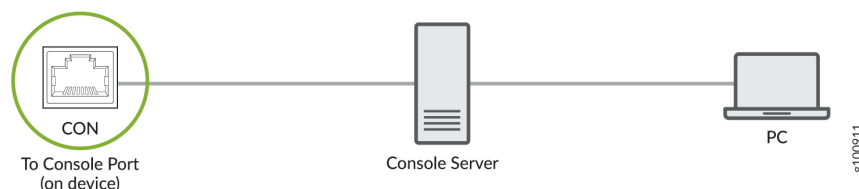


Figure 56: Connect the MX10004 Router Directly to a Management Console



Perform the Initial Configuration for the MX10004 Router

Before you begin configuring the router:

- Ensure that the Routing Control Board (RCB) has the Junos OS Release 22.3R1 or later operating system installed.
- If you want to use an RCB that has Junos OS release prior to 22.3R1 or if the `show version` command displays the router model as `mx10016-olive`, you must use the USB install method (not the CLI method) to upgrade the Junos OS release on the RCB to 22.3R1 or later.

You must perform the initial configuration of an MX10004 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. Verify that your laptop or PC has the following default values:
 - Baud Rate—9600

- Flow Control—None
 - Data—8
 - Parity—None
 - Stop Bits—1
 - DCD State—Disregard
3. Log in as **root**. There is no password. If the software boots before you connect to the console port, you might need to press the Enter key for the prompt to appear.

```
login: root
```

4. Start the CLI.

```
root@% cli
```

5. Enter configuration mode.

```
root> configure
```

6. 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
```

NOTE: Optionally, instead of configuring the root password at the [edit system] hierarchy level, you can use a configuration group to strengthen security.

7. (Optional) Configure the name of the router. If the name includes spaces, enclose the name in quotation marks (" ").

You can configure the router name at the [edit system] hierarchy level.

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

If your MX10004 router has two RCBs, it is recommended you use a configuration group. You can use group-name as **re0** or **re1**.

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

For Example:

```
[edit]
root@# set groups re0 system host-name alpha-router0
```

```
[edit]
root@# set groups re1 system host-name alpha-router1
```

8. Configure the default gateway.

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

9. 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
```

NOTE: The management port, em0 (**MGMT** for RJ-45 connections) is found on the front of the RCBs of the MX10004 router.

If your MX10004 router has two RCBs, you can configure each RCB with a separate IP address for the management Ethernet interface.

You can use group-name as **re0** or **re1**.

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

For Example:

```
[edit]
root@# set groups re0 interfaces em0 unit 0 family inet address address/prefix-length
```

```
[edit]
root@# set groups re1 interfaces em0 unit 0 family inet address address/prefix-length
```

10. (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
```

For example:

```
[edit]
root@# set routing-options static route 192.168.0.0/24 next-hop 10.0.3.2 retain no-readvertise
```

11. (Optional) Enable Telnet service.

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

NOTE: When Telnet is enabled, you cannot log in to an MX10004 through Telnet using root credentials. Root login is allowed only for SSH access.

12. (Optional) If you used one or more configuration groups, apply the configuration groups, substituting the appropriate group name.

```
[edit]
root@# set apply-groups group name
```

For example:

```
[edit]  
root@# set apply-groups global
```

global is a group where user log in details, routes, and other information is stored.

```
[edit]  
root@# set apply-groups re0
```

```
[edit]  
root@# set apply-groups re1
```

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

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

4

CHAPTER

Maintaining Components

[MX10004 Power System Maintenance | 148](#)

[MX10004 Cooling System Maintenance | 164](#)

[MX10004 Switch Fabric Board Maintenance | 173](#)

[MX10004 Routing and Control Board Maintenance | 185](#)

[MX10004 Line Card Maintenance | 191](#)

[MX10004 Transceiver and Fiber Optic Cable Installation and Removal | 203](#)

[Remove an MX10004 Router | 209](#)

MX10004 Power System Maintenance

SUMMARY

Maintaining a Juniper Networks MX10004 router includes replacing power supplies. Replacing includes removing a failed power supply and installing a functional power supply.

IN THIS SECTION

- [Install a JNP10K-PWR-AC2 Power Supply | 149](#)
- [Remove a JNP10K-PWR-AC2 Power Supply | 152](#)
- [Install a JNP10K-PWR-DC2 Power Supply | 155](#)
- [Remove a JNP10K-PWR-DC2 Power Supply | 162](#)

The MX10004 routers support AC, DC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) power supplies. All power supply models are hot-insertable and hot-removeable field-replaceable units (FRUs). You can install up to three power supplies in the rear of the chassis in the slots provided along the left side.

The following topics describe how to install and remove the power supplies in an MX10004.



CAUTION: Use the same type of power supply in all slots. Do not mix power supply models in the same chassis.

NOTE: See the heat symbol



. Wear heat-resistant hand gloves while accessing the fan tray and power supply.

Install a JNP10K-PWR-AC2 Power Supply



CAUTION: Use the same type of power supply in all slots. Do not mix AC and DC power supplies in a production chassis.



WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a running JNP10K-PWR-AC2 power supply from the chassis. The power supply can reach temperatures from 158° F to 176° F (70° C to 80° C) under running conditions.

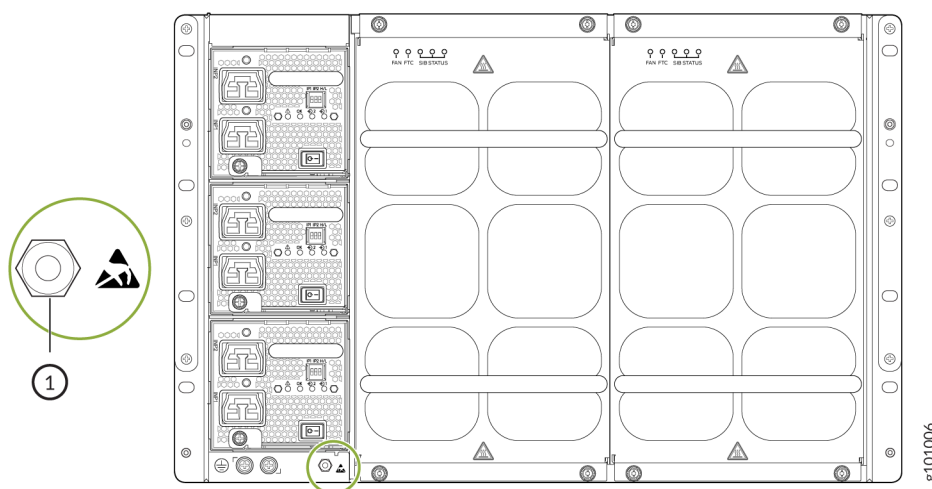
Before you install a JNP10K-PWR-AC2 power supply in the chassis:

- Ensure that you have followed all safety warnings and cautions.
- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- If the AC or DC power source outlets have a power switch, set them to the off (O) position.
- Have a qualified electrician install the HVAC and HVDC connectors and lugs.
- Ensure that you have the following parts and tools available to install the 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 ["MX10004 Power Cable Specifications" on page 43](#).

To install a JNP10K-PWR-AC2 power supply in an MX10004:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. An ESD point is located next to the protective earthing terminal and below **PSU2** on the rear of the MX10004 (see [Figure 57 on page 150](#)).

Figure 57: ESD Point on the Rear of the MX10004



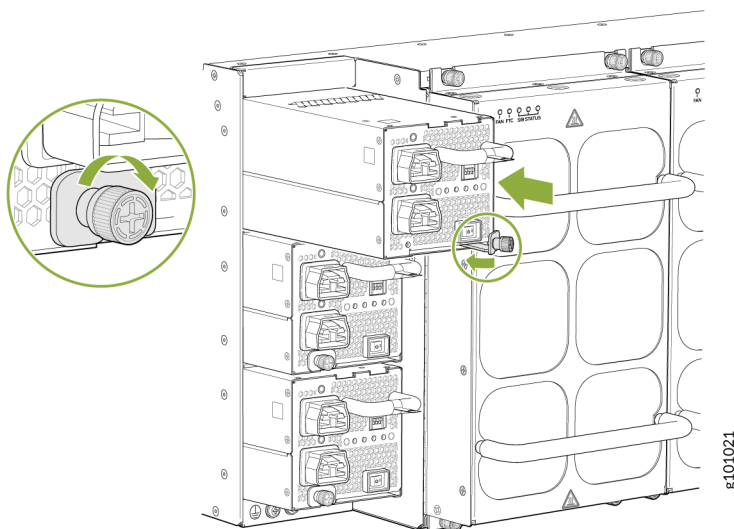
1– ESD point

2. Taking care not to touch power supply connections, remove the power supply from its bag.
3. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
4. Ensure that the power switch is set to the standby (O) position. This switch turns off the output voltage; it doesn't interrupt input power.
5. Unscrew the captive screw in the counterclockwise direction by using the Phillips (+) screwdriver, number 1.
6. 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 2** (top to bottom) on an MX10004.

7. Using both hands, place the power supply in the power supply slot on the rear of the system. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure that the power supply faceplate is flush with any adjacent power supply faceplates or power supply covers (see [Figure 58 on page 151](#)).

Figure 58: Install a JNP10K-PWR-AC2



8. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
9. Tighten the captive screw by turning it clockwise with the Phillips (+) screwdriver, number 1. When the screw is completely tight, the latch locks into the router chassis.
10. Attach each power cable to a dedicated power source (A and B). The JNP10K-PWR-AC2 only requires that each power supply be connected to a separate source.
11. For each power cable, insert the end of the cable with the Anderson connector into the JNP10K-PWR-AC2 power supply. The connector snaps and locks the cable into position.



WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

12. If the AC or DC power source outlets have a power switch, set them to the on (I) position.
13. 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 51 on page 152](#).

Set both switch **1** and switch **2** to the **on** position when using both power source inputs; power is shared. When not using source redundancy, set the unused source to the off (O) position. The LED turns red and indicates an error if a source input is not in use and the DIP switch is on (I).

Table 51: Set the JNP10K-PWR-AC2 DIP Switches

Switch	State	Description
1	On	INP0 is present.
	Off	INP0 is not present.
2	On	INP1 is present.
	Off	INP1 is not present.
3	On	Enabled for 30-A feed; 5000 W is for a single feed, and 5500 W is for dual feeds.
	Off	Enabled for 20-A feed; power supply capacity is 3000 W.

14. If the AC power source outlet has a power switch, turn it off before plugging in the AC power cord to the power outlet.
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 (I) position.

Remove a JNP10K-PWR-AC2 Power Supply

Before you remove a JNP10K-PWR-AC2 power supply from the chassis:

- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Ensure that you have the following parts and tools available:
 - Heat-protective gloves able to withstand temperatures of 158° F (70° C)
 - Electrostatic discharge (ESD) grounding strap
 - Phillips (+) screwdriver, number 1
 - Replacement power supply or a cover for the power supply slot



WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a working JNP10K-PWR-AC2 power supply from the chassis. These power supplies can reach temperatures from 158° F to 176° F (70° C to 80° C) under running conditions.



CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See ["Power Requirements for MX10004 Components" on page 90](#).



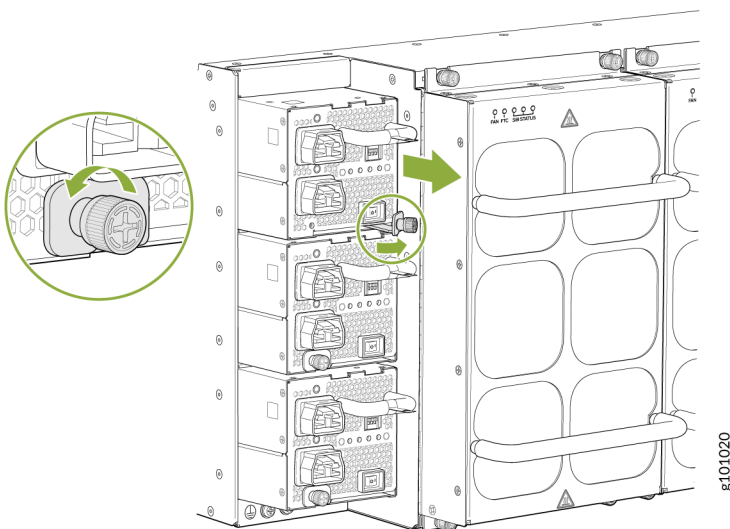
CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover over the empty slot.

To remove a JNP10K-PWR-AC2 power supply from an MX10004 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. An ESD point is located next to the protective earthing terminal and below **PSU 2** on the rear of the MX10004 (see [Figure 57 on page 150](#)).
2. Flip the power (I) switch next to the appliance inlet on the power supply to the standby position (O).
3. If the AC or DC power source outlets have a power switch, set them to the off (O) position.
4. Disconnect the Anderson connectors from each input on the JNP10K-PWR-AC2 power supply faceplate.
5. Unscrew the captive screw counterclockwise by using the Phillips (+) screwdriver, number 1. See [Figure 59 on page 154](#).

NOTE: To avoid scratching the chassis, ensure that the ejector is fully open.

Figure 59: Remove a JNP10K-PWR-AC2 Power Supply from an MX10004



6. Rotate the captive screw away from the faceplate of the power supply to release the latch.
7. Wear heat-protective gloves before you remove the power supply from the chassis.



8. Taking care not to touch the power supply output connections, pins, leads, or solder connections, place one gloved hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.



CAUTION: Do not bump the output connections. If the connection hits a solid object, it could damage the power supply.

9. Place the JNP10K-PWR-AC2 power supply on an antistatic surface for it to cool down before placing the power supply in an antistatic bag for storage.
10. Install the replacement JNP10K-PWR-AC2 power supply.



CAUTION: Use the same type of power supply in all slots. Do not mix AC and DC power supplies in a production chassis.

Install a JNP10K-PWR-DC2 Power Supply

Before you install a JNP10K-PWR-DC2 power supply in the chassis:

- Ensure that you follow all safety warnings and cautions.



WARNING: Before performing DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off (O) position, and tape the switch handle of the circuit breaker in the off position.



WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a working JNP10K-PWR-DC2 power supply from the chassis. JNP10K-PWR-DC2 power supplies can reach temperatures from 158° F to 176° F (70° C to 80° C) under running conditions.



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



CAUTION: Use the same type of power supply in all slots. Do not mix AC and DC power supplies in a production chassis.



CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the MX10004 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 MX10004 router to ground using a separate grounding conductor, see ["Connect the MX10004 Router to Earth Ground" on page 136](#).

NOTE: The battery returns of the JNP10K-PWR-DC2 power supply must be connected as an isolated DC return (DC-I).

- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258.](#)
- Ensure that you have the following parts and tools available to install a DC power supply:
 - Electrostatic discharge (ESD) grounding strap

- High-current cable assembly CBL-PWR2-BARE (not provided) with the cable lugs (provided) attached and with heat-shrink tubing insulation around the crimped section of the power cables and lugs

The provided terminal lugs for the JNP10K-PWR-DC2 (Panduit LCD4-14A-L, or equivalent) and sized for 4 AWG (21.1 mm²) power source cables

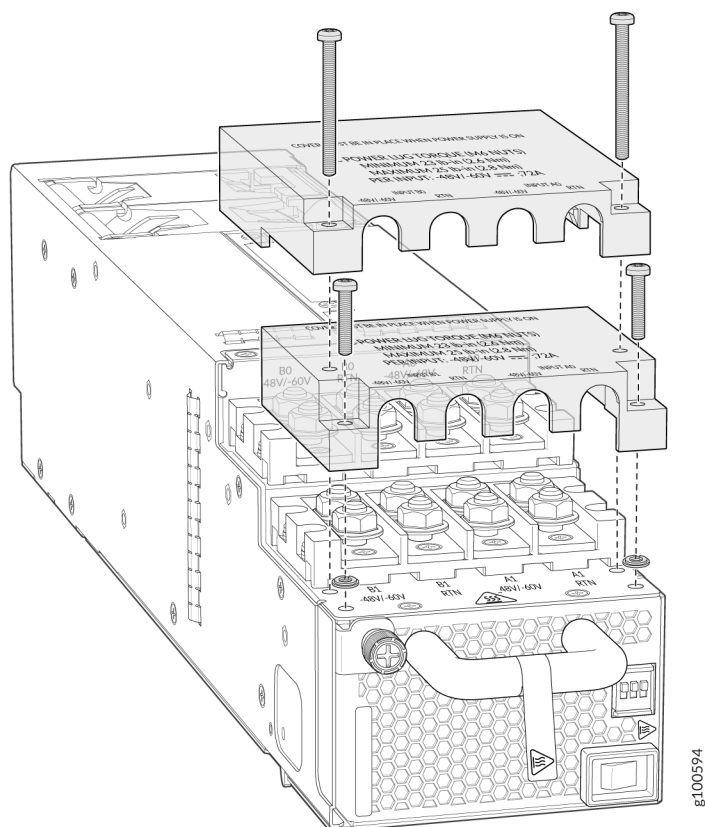
Power source cables as 4 AWG (21.1 mm²) stranded wire that is rated 75° C or per local electrical code

- 13/32 in. (10 mm) nut driver or socket wrench
- Phillips (+) screwdrivers, numbers 1 and 2
- Multimeter

To install a JNP10K-PWR-DC2 power supply in an MX10004:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. An ESD point is located next to the protective earthing terminal and below **PSU 5** on the rear of the MX10004 (see [Figure 57 on page 150](#)).
2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
3. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
4. Ensure that the power switch is set to the standby (O) position. This switch turns off the output voltage; it doesn't 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 60 on page 157](#)).

Figure 60: Remove the Plastic Cable Cover on a JNP10K-PWR-DC2 Power Supply



6. Remove the nuts from each DC power input terminal, using the 13/32 in. (10 mm) nut driver or socket wrench.
7. Ensure that the power source circuit breaker is open so that the voltage across the DC power source cable leads is 0 V. Also ensure that the cable leads don't become active while you connect DC power.
8. Verify that the DC power cables are labeled correctly 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 **-48 V** 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 **-48 V** (input) DC power input terminal.
 - The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the **RTN** (return) DC power input terminal.

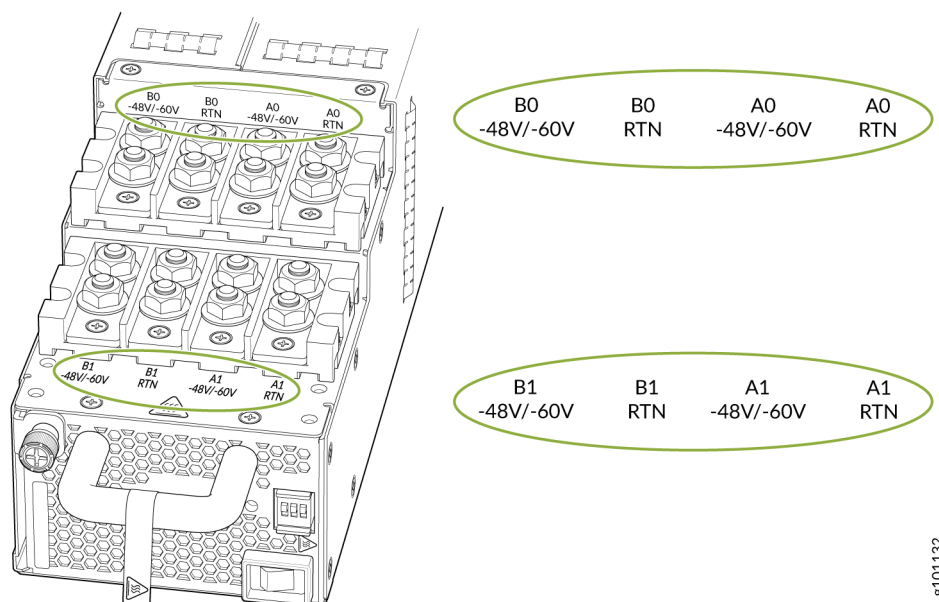
The JNP10K-PWR-DC2 power supply is the equivalent of two power supplies in a single housing. Each JNP10K-PWR-DC2 has four independent sets of DC power input terminals:

- **INPUT A0: : RTN -48 V/-60 V**

- INPUT B0: : RTN -48 V/-60 V
- INPUT A1: : RTN -48 V/-60 V
- INPUT B1: : RTN -48 V/-60 V

We recommend source redundancy (source A and source B) to all inputs to ensure reliability of the system. If two power sources are not available, then use two feeds from the same source to provide power distribution reliability. Two feeds mean two independent power distribution routes from the source to the system. See [Figure 61 on page 158](#).

Figure 61: JNP10K-PWR-DC2 Input Terminal Marking

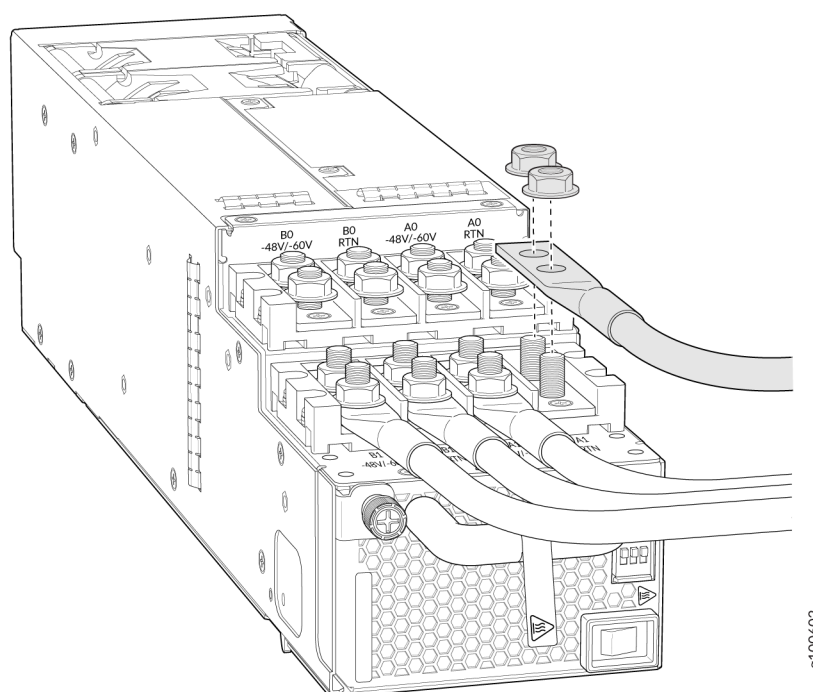


CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (-) to indicate their polarity. There is no standard color coding for DC power cables.

9. Install each power cable lug on the relevant DC power input terminal, securing each cable lug with the nut (see [Figure 62 on page 159](#)). Apply between 24 lb-in. (2.7 Nm) and 25 lb-in. (2.8 Nm) of torque to each nut. (Use the 13/32 in. [10 mm] nut driver or socket wrench.)
 - a. Secure each positive (+) DC source power cable lug to the **RTN** (return) DC power input terminal.

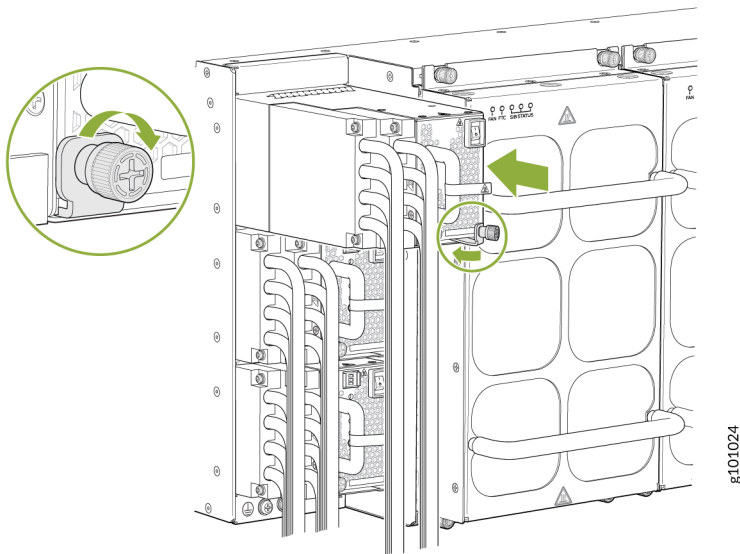
- b. Secure each negative (-) DC source power cable lug to the **-48 V** (input) DC power input terminal.

Figure 62: Connect the DC Power Source Cables to a JNP10K-PWR-DC2 Power Supply



10. Install the plastic cable cover over each set of power cables and tighten the screws by using the Phillips (+) screwdriver, number 2.
11. Unscrew the captive screw in the counterclockwise direction by using the Phillips (+) screwdriver, number 1.
12. Rotate the captive screw away from the faceplate of the power supply to release the latch.
13. 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. (See [Figure 63 on page 160](#)).
14. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
15. Tighten the captive screw by turning it clockwise with the Phillips (+) screwdriver, number 1. When the screw is completely tight, the latch locks into the router chassis.

Figure 63: Install a JNP10K-PWR-DC2 in an MX10004



16. Route INP1 cables to a power source and INP2 to another power source. The JNP10K-PWR-DC2 shares power, so if power dips on one input, the power supply is able to load balance internally.



WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

17. Set the three DIP switches to indicate the number of input sources and to indicate high or low power. See [Table 52 on page 160](#) and [Figure 64 on page 161](#).

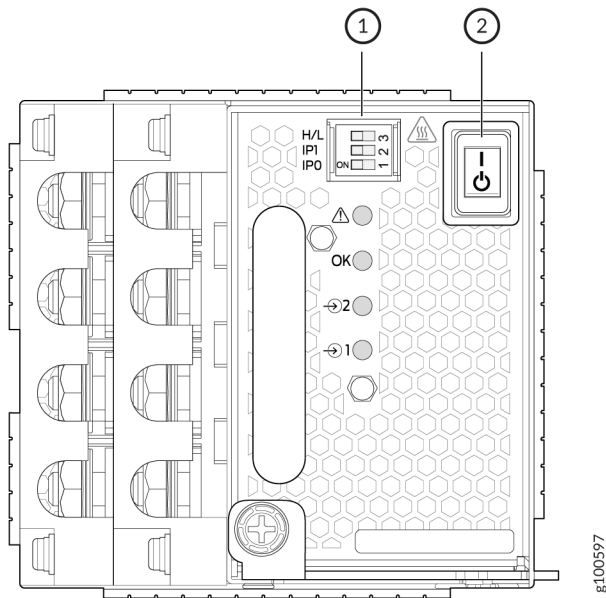
Set both enable switches to the **on** position when using both source inputs. When not using source redundancy, set the unused source to the **off** position. The LED turns red and indicates an error if a source input is not in use and the enable switch is **on**.

Table 52: Set the JNP10K-PWR-DC2 DIP Switches

Switch	State	Description
1	On	IP0 is present.
	Off	IP0 is not present.
2	On	IP1 is present.

Table 52: Set the JNP10K-PWR-DC2 DIP Switches (Continued)

Switch	State	Description
	Off	IP1 is not present.
3	On	Enabled for 80-A feed; 2750 W is for a single feed, and 5500 W is for dual feeds.
	Off	Enabled for 60-A feed; 2200 W is for a single feed, and 4400 W is for dual feeds.

Figure 64: Set the Enable Switches for the Power Source

1– DIP switches

2– Power switch: on (I) and standby (O)

18. Verify that the input 1 and 2 LEDs on the power supply faceplate are lit and are on steadily.
19. Press the power switch to the on (I) position.

Remove a JNP10K-PWR-DC2 Power Supply

Before you remove a DC power supply from the router:

- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Ensure that you have the following parts and tools available to remove a JNP10K-PWR-DC2 power supply:
 - Heat-protective gloves that can withstand temperatures from 158° F to 176° F (70° C to 80° C)
 - Electrostatic discharge (ESD) grounding strap
 - Phillips (+) screwdriver, numbers 1 and 2
 - 13/32 in. (10 mm) nut driver or socket wrench
 - Replacement power supply or a cover for the power supply slot



CAUTION: A working JNP10K-PWR-DC2 power supply can reach temperatures of 158° F to 176° F (70° C to 80° C) under running conditions. In order to avoid injury, do not touch a running power supply with your bare hands.



CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See ["MX10004 Power Planning" on page 90](#) and ["Power Requirements for MX10004 Components" on page 90](#).



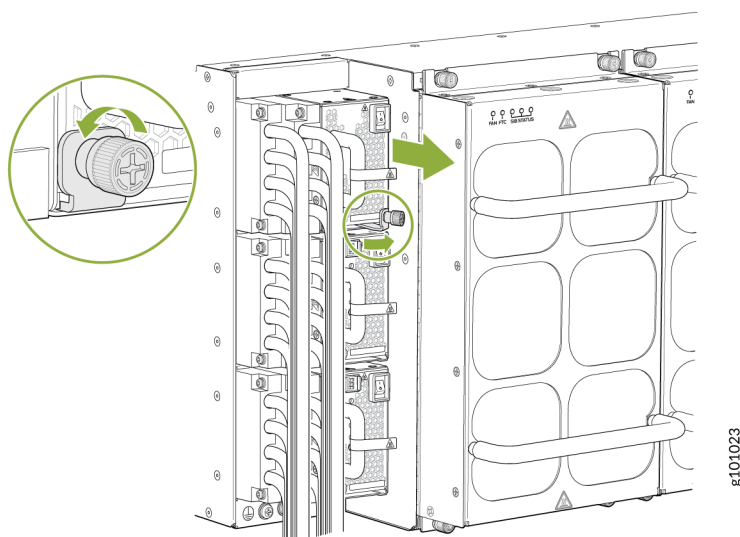
CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover over the empty slot.

To remove a JNP10K-PWR-DC2 power supply from an MX10004 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. An ESD point is located next to the protective earthing terminal and below **PSU 5** on the rear of the MX10004 (see [Figure 57 on page 150](#)).

2. Make sure that the voltage across the DC power source cable leads is 0 V.
3. Ensure that 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 using the Phillips (+) screwdriver, number 1. (See [Figure 65 on page 163](#))

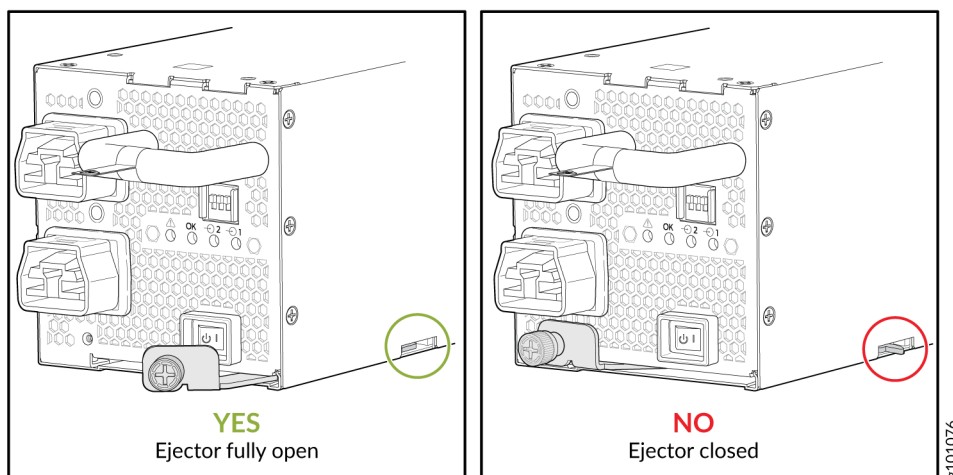
Figure 65: Remove a JNP10K-PWR-DC2 Power Supply on an MX10004



5. Rotate the captive screw away from the faceplate of the power supply to release the latch.

NOTE: Ensure that the ejector is fully open to prevent damaging the chassis. See [Figure 66 on page 164](#).

Figure 66: Open Power Supply Ejector



6. Wear the heat-resistant gloves to protect your hands from the hot power supply.
7. Taking care not to touch power supply components, pins, leads, or solder connections, place one gloved hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.
8. If you are not replacing the power supply, install the cover over the slot. To install the cover, insert your thumb and forefinger into the finger holes of the cover, squeeze to retract the spring latches, and place the cover in the slot. Do not run the chassis without a power supply or cover in place.
9. Unscrew the screw on the plastic cable cover that shields the input terminal studs. Turn the screw 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.

MX10004 Cooling System Maintenance

SUMMARY

Maintaining the Juniper Networks MX10004 router includes removing and installing fan trays and the fan tray controller.

IN THIS SECTION

- [Install an MX10004 Fan Tray | 165](#)
- [Remove an MX10004 Fan Tray | 167](#)

- [Install an MX10004 Fan Tray Controller | 169](#)
- [Remove an MX10004 Fan Tray Controller | 171](#)

The MX10004 router has two independent, field-replaceable fan trays. The following topics describe how to install or remove a fan tray and the fan tray controller.

Install an MX10004 Fan Tray

Before you begin to install a fan tray in a Juniper Networks MX10004 router:

- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Ensure that you have the following parts and tools available to install a fan tray in an MX10004 router:
 - Electrostatic discharge (ESD) grounding strap
 - A Phillips (+) screwdriver (optional), number 1 or 2, for the captive screws
 - A replacement fan tray



CAUTION: You can remove and replace one fan tray while the router is operating. Replace the fan tray as soon as possible to prevent thermal alarms and to prevent the chassis from overheating.

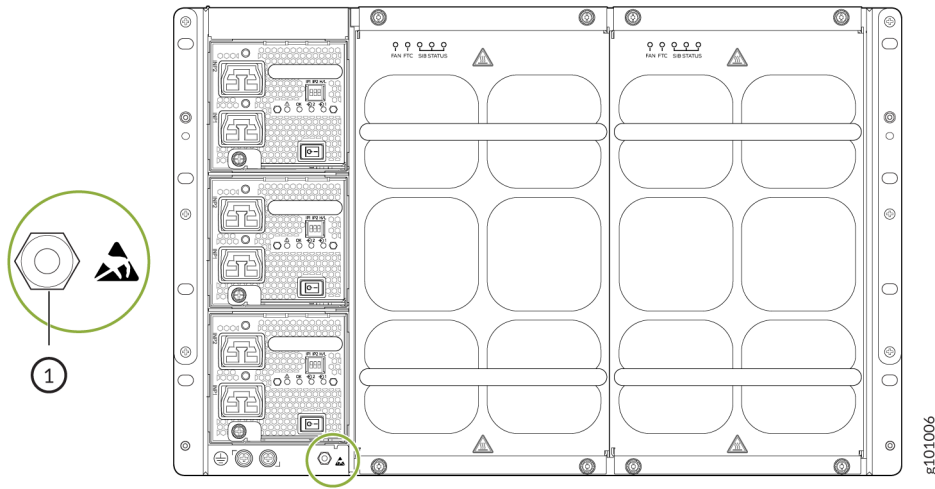
Each JNP10004-FAN2 fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU). You can remove and replace the fan tray while the router is running without turning off power to the router or disrupting routing functions.

Each fan tray is installed vertically on the rear, or FRU side, of the chassis.

To install an MX10004 fan tray:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see [Figure 67 on page 166](#)).

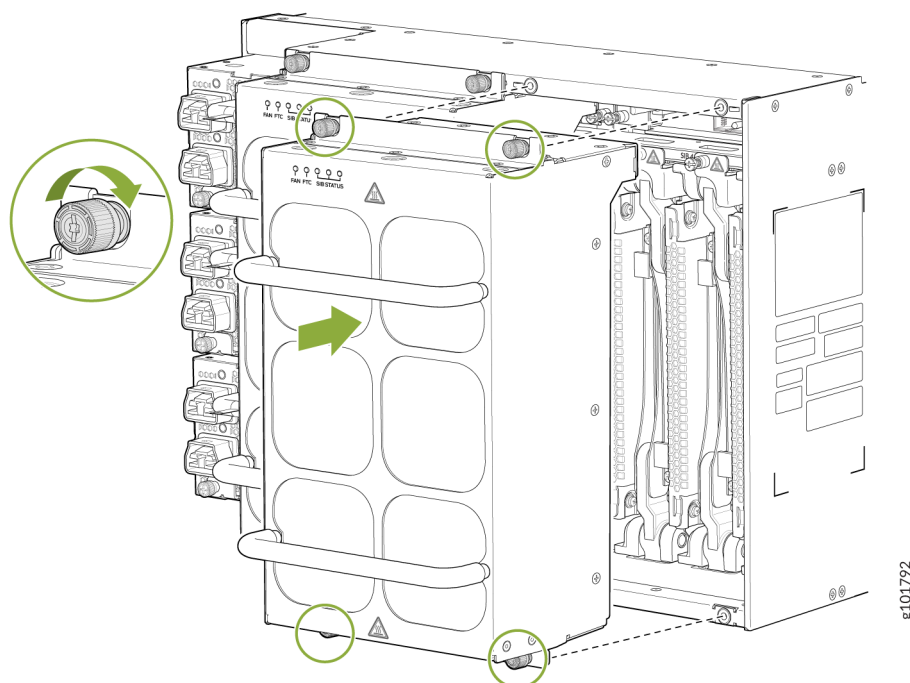
Figure 67: ESD Point on the Rear of the MX10004



1– ESD point

2. Grasp the top and bottom fan tray handles and align the fan tray so that it makes contact with the side wall.
3. Push the fan tray into place until it is fully seated.
4. Tighten the captive screws with the Phillips screwdriver, or hand tighten until the screws are tight. See [Figure 68 on page 167](#).

Figure 68: Install the JNP10004-FAN2 Fan Tray in an MX10004



5. Set the fan speed to normal by using the test chassis fan tray 0 speed *normal* and test chassis fan tray 1 speed *normal* commands.

Remove an MX10004 Fan Tray

The Juniper Networks MX10004 router chassis has two independent, field-replaceable fan trays (JNP10004-FAN2). Each fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU). You can remove and replace a single fan tray while the router is running without turning off power to the router or disrupting routing functions.



CAUTION: Remove the fan tray only if you have a replacement fan tray available and ready to use.

If you remove a fan tray, you have a limited amount of time before the removal triggers a thermal alarm.

Before you remove a fan tray:

- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Ensure that you have the following parts and tools available to remove a fan tray from an MX10004:

- Electrostatic discharge (ESD) grounding strap
- Replacement fan tray
- A Phillips (+) screwdriver (optional), number 1 or 2, for the captive screws

NOTE: When replacing the fan trays 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.

After replacing the fans or SFBs, set the fans to normal speed using the test chassis fan tray 0 speed *normal* and test chassis fan tray 1 speed *normal* command.

You install fan trays vertically on the rear of the chassis.

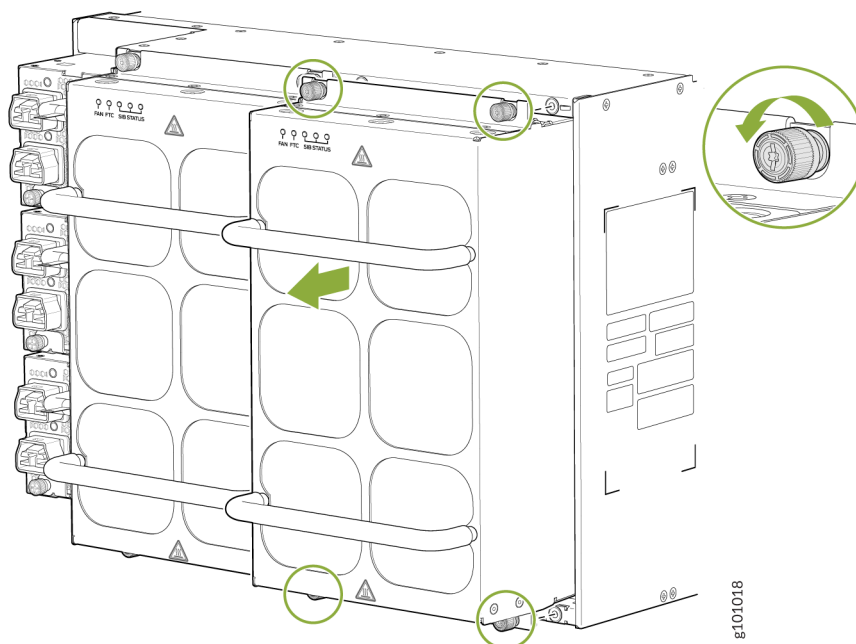


CAUTION: You can replace one fan tray while the router is operating. However, if you remove both fan trays at the same time, you'll trigger a thermal alarm and the system will shut down. See [Figure 69 on page 169](#).

To remove an MX10004 fan tray:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see [Figure 67 on page 166](#)).
2. Loosen the four captive screws either by hand or with a Phillips screwdriver.
3. Grasp the top and bottom handles and pull the fan tray out about 3 in. (7.6 cm). See [Figure 69 on page 169](#).

Figure 69: Remove an MX10004 Fan Tray

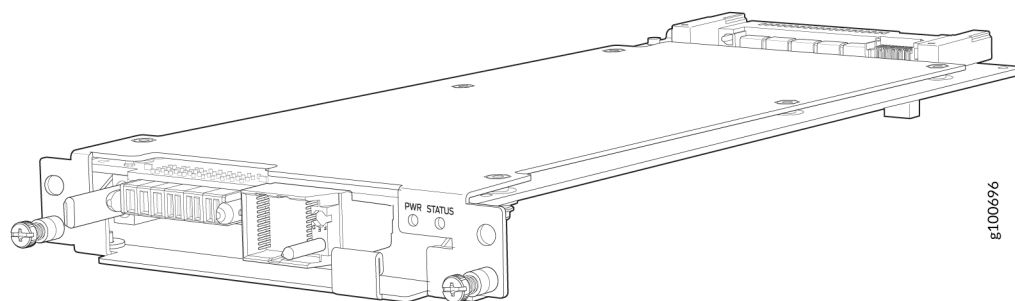


4. Tilt the top of the fan tray forward.
5. Using both hands, lift the fan tray out of the slot and rest it on a flat surface with the handles to the side.

Install an MX10004 Fan Tray Controller

For each of the two fan trays, there is a JNP10004-FTC2 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. See [Figure 72 on page 172](#).

Figure 70: JNP10004-FTC2 Fan Tray Controller



CAUTION: Remove the fan tray controller only if you have a replacement controller available.

To install a fan tray controller, you must first remove the associated fan tray. With the fan tray removed, you can install the fan tray controller horizontally above the Switch Fabric Boards (SFBs) at the top of the chassis.

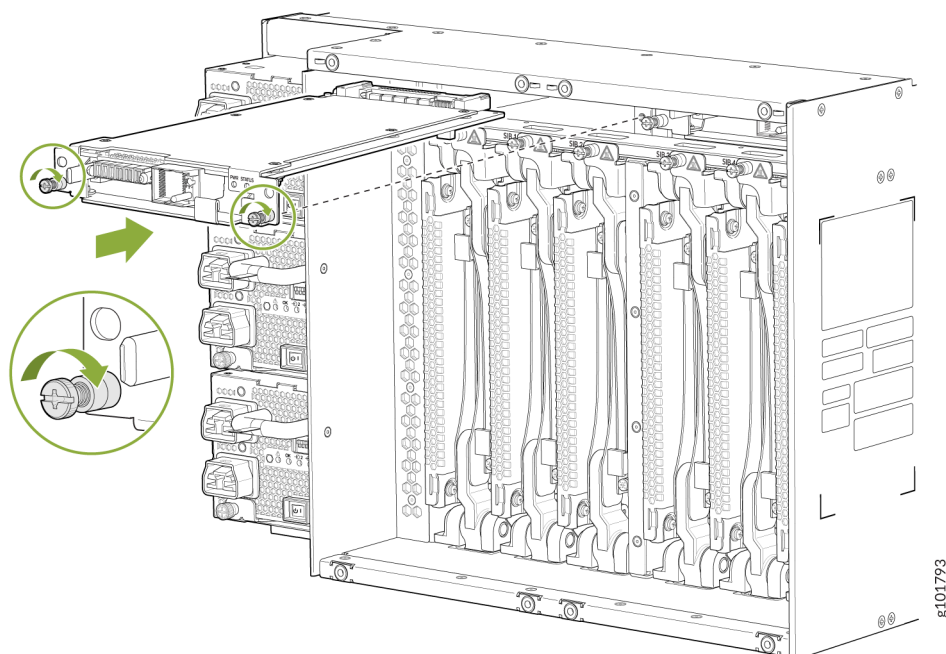
Before you install a fan tray controller:

- Ensure that you have removed the associated fan tray and fan tray controller. See [Figure 69 on page 169](#) and ["Remove an MX10004 Fan Tray Controller" on page 171](#).
- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Ensure that you have the following parts and tools available to install a fan tray controller in an MX10004:
 - Electrostatic discharge (ESD) grounding strap
 - Replacement fan tray controller (JNP10004-FTC2)
 - A Phillips (+) screwdriver, number 1, for the captive screws (optional)

To install a fan tray controller:

1. Remove the replacement fan tray controller from the antistatic bag.
2. Carefully slide the fan tray controller into the fan tray controller slot until it is flush with the mounting holes. See [Figure 71 on page 171](#).

Figure 71: Install the MX10004 Fan Tray Controller

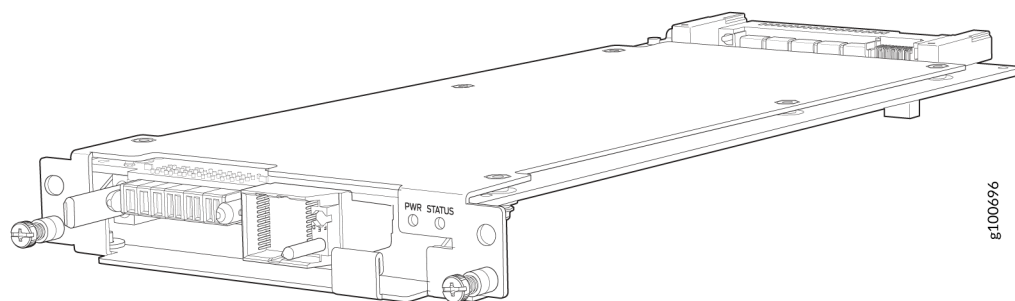


3. Tighten the captive screws for the fan tray controller by hand or with a Phillips screwdriver.
4. Reinstall the fan tray. See ["Install an MX10004 Fan Tray" on page 165](#).

Remove an MX10004 Fan Tray Controller

For each of the two fan trays, there is a JNP10004-FTC2 fan tray controller. Each fan tray 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. See [Figure 70 on page 170](#).

Figure 72: JNP10004-FTC2 Fan Tray Controller



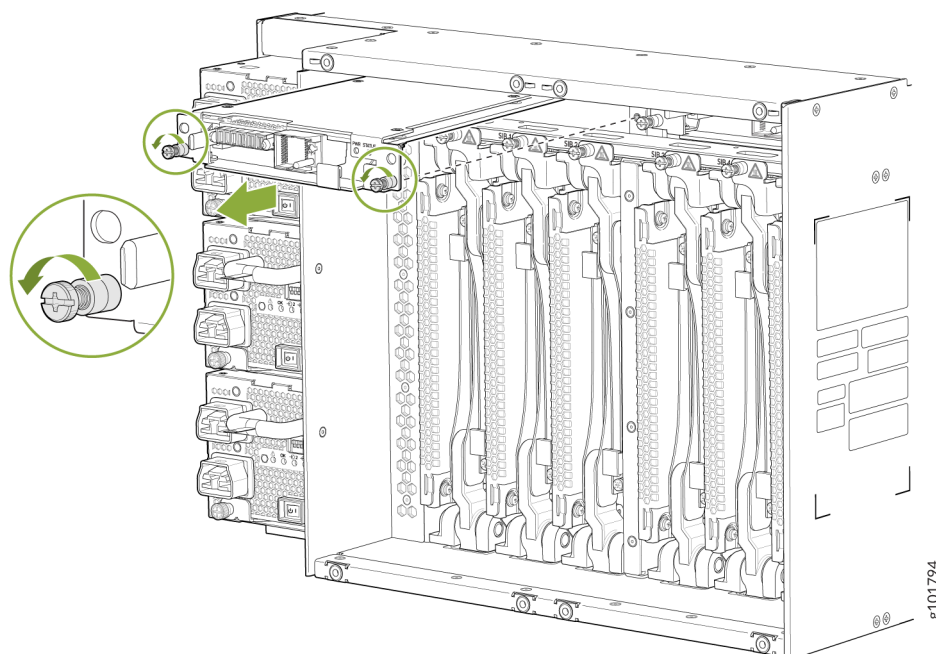
CAUTION: Remove the fan tray controller only if you have a replacement controller available.

To access a fan tray controller, you must first remove the fan tray. With the fan tray removed, you can install the fan tray controller horizontally above the Switch Fabric boards (SFBs) at the top of the chassis.

Before you remove a fan tray controller:

- Review how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
 - Ensure that you have the following parts and tools available to remove a fan tray controller from an MX10004:
 - Electrostatic discharge (ESD) grounding strap
 - An electrostatic bag or an antistatic mat
 - Replacement fan tray controller
 - A Phillips (+) screwdriver (optional), number 1, for the captive screws
1. Remove the fan tray. See ["Remove an MX10004 Fan Tray" on page 167](#).
 2. Loosen the two captive screws on each side of the fan tray controller by hand or with a Phillips screwdriver.
 3. Grasp the fan tray controller and pull it straight out of the slot. See [Figure 73 on page 173](#).

Figure 73: Remove the JNP10004-FTC2 Fan Tray Controller



4. Place the fan tray controller in an antistatic bag or on an antistatic mat.

MX10004 Switch Fabric Board Maintenance

IN THIS SECTION

- [How to Handle and Store MX10004 Switch Fabric Board | 174](#)
- [Install an MX10004 Switch Fabric Board | 176](#)
- [Remove an MX10004 Switch Fabric Board | 180](#)

Each Juniper Networks MX10004 router contains a minimum of three and a maximum of six JNP10004-SF2 Switch Fabric Boards (SFBs). These boards are installed vertically, mid-chassis, between the line cards and the Routing and Control Boards (RCBs) in the front and the fan trays in the rear. The topics in this section describe how to install or remove the switch fabric boards in a router.

How to Handle and Store MX10004 Switch Fabric Board

IN THIS SECTION

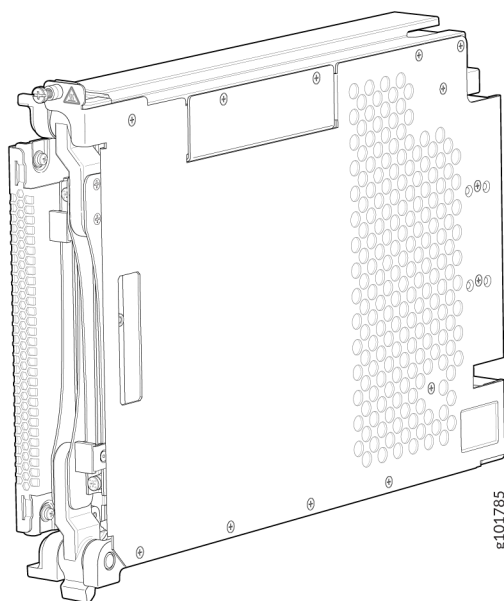
- [How to Hold an SFB | 174](#)
- [How to Store a Switch Fabric Board | 175](#)

The MX10004 SFBs have fragile components. To prevent damage to the SFBs, be sure you follow safe handling practices.

How to Hold an SFB

You install Juniper Networks Switch Fabric Boards (SFBs) vertically and hold them vertically until they are clear of the router. Then, you rotate them 90 degrees and place them on an antistatic mat or in an antistatic bag for storage. See [Figure 74 on page 174](#).

Figure 74: JNP10004-SF2 Switch Fabric Board



The proper method of holding an SFB is to:

1. Hold the SFB by the ejectors while keeping 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: Hold the SFB by the ejectors. Never hold the SFB by the connector edge. The connectors are fragile and the SFB won't align and seat properly if the connector is damaged.



CAUTION: Keep SFBs separate. Don't stack SFBs on top of one another or on top of any other component.

How to Store a Switch Fabric Board

You must store Juniper Networks Switch Fabric Boards (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: We recommend that two people insert the SFB into the bag because these units are heavy and antistatic bags are fragile.

NOTE: The JNP10004-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 JNP10004-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 store an SFB in an antistatic bag if two people are available to lift the unit:

1. Hold the unit horizontally with the faceplate toward you.
2. Slide the opening of the bag over the connector edge.

To store an SFB in an antistatic bag if you must insert the 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.

- Carefully insert the connector edge into the opening of the bag and pull the bag toward you to cover the unit.

Install an MX10004 Switch Fabric Board

A Juniper Networks MX10004 router has up to six 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 install an SFB. See ["Remove an MX10004 Fan Tray" on page 167](#).

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.

After replacing the fans or SFBs, set the fans to normal speed using the test chassis fan tray 0 speed normal and test chassis fan tray 1 speed normal command.

If you plan to replace one or more Switch Fabric Boards (SFBs), make sure you calculate the time required to remove the fan tray, add or replace the SFBs, and install the fan tray in the chassis. To calculate the time allowed for replacing a SFB, see [Table 53 on page 176](#).

Table 53: Switch Fabric Board Removal Alarm Times

Line Card Type	Ambient Temperature (°C)	Traffic (%)	Duration
MX10K-LC9600	25	100%	2 min 23 sec
	35	100%	1 min 26 sec
	40	100%	1 min 36 sec
MX10K-LC2101	33	100%	3 min 28 sec
	40	100%	2 min 4 sec

Table 53: Switch Fabric Board Removal Alarm Times (Continued)

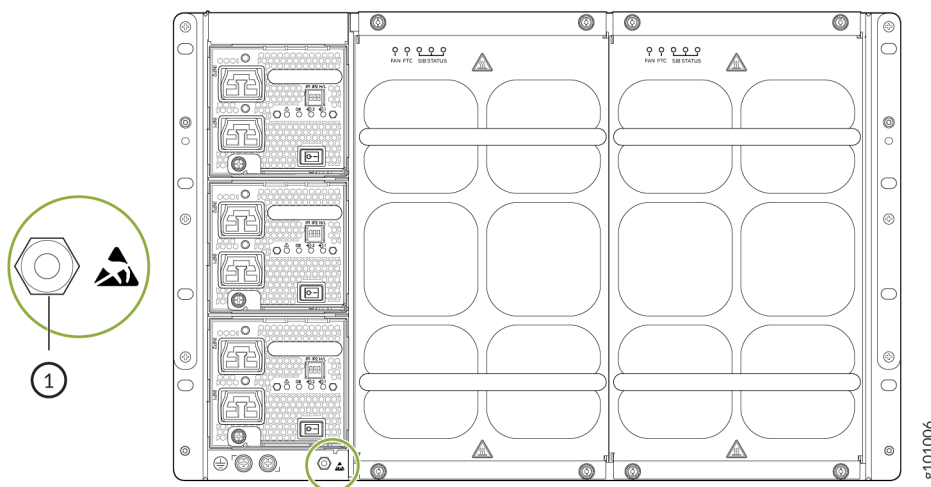
Line Card Type	Ambient Temperature (°C)	Traffic (%)	Duration
MX10K-LC480	40	100%	6 min

Ensure that you have the following equipment before you install an SFB:

- Antistatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap
- Phillips (+) number 2 screwdriver (optional)
- Replacement SFB

To install an MX10004 Switch Fabric Board:

1. Place an antistatic bag or an antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. An ESD point is located next to the protective earthing terminal and below the bottom power supply on the rear of the MX10004 (see [Figure 75 on page 177](#)).

Figure 75: ESD Point on the Rear of the MX10004

1— ESD point

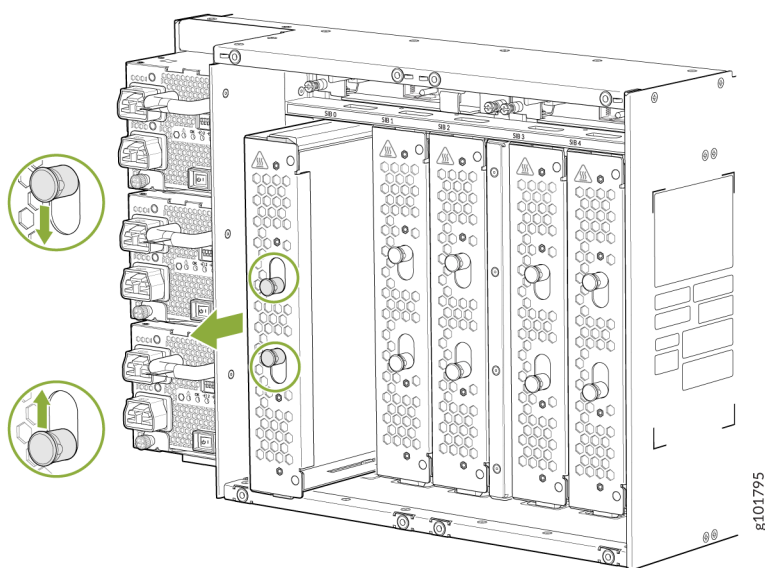
3. Remove the appropriate fan tray (see ["Remove an MX10004 Fan Tray" on page 167](#)).



CAUTION: Do not remove both fan trays at the same time. Remove and replace one fan tray at a time. If you remove both fan trays, the system triggers a thermal alarm and shuts down the router.

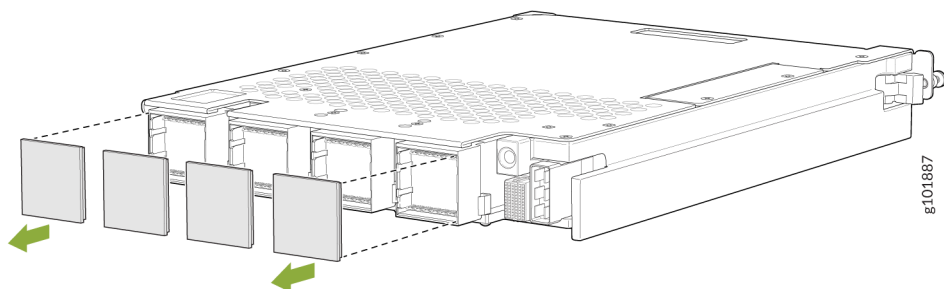
4. Either remove the failing SFB (see ["Remove an MX10004 Switch Fabric Board" on page 180](#)) or remove the cover by grasping each side of the plate and pulling straight out (see [Figure 76 on page 178](#)).

Figure 76: Remove an SFB Cover on an MX10004



5. Remove the protective plastic covers that are on the fabric interface connectors of the SFB. Save the plastic covers for future use (see [Figure 77 on page 178](#)).

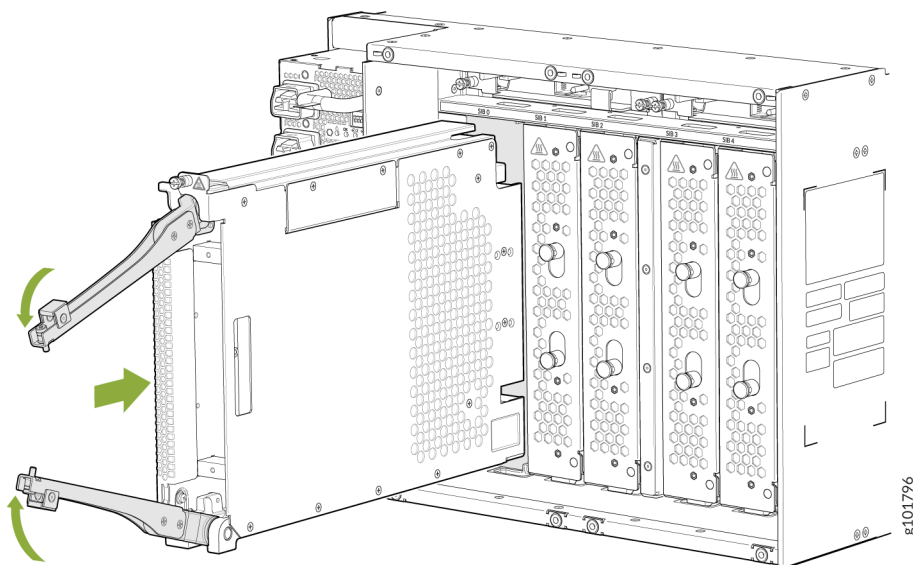
Figure 77: Remove Protective Plastic Covers from JNP10004-SF2 SFB Interface Connectors



6. Lift the SFB by the handle with one hand and support the lower edge with the other hand.

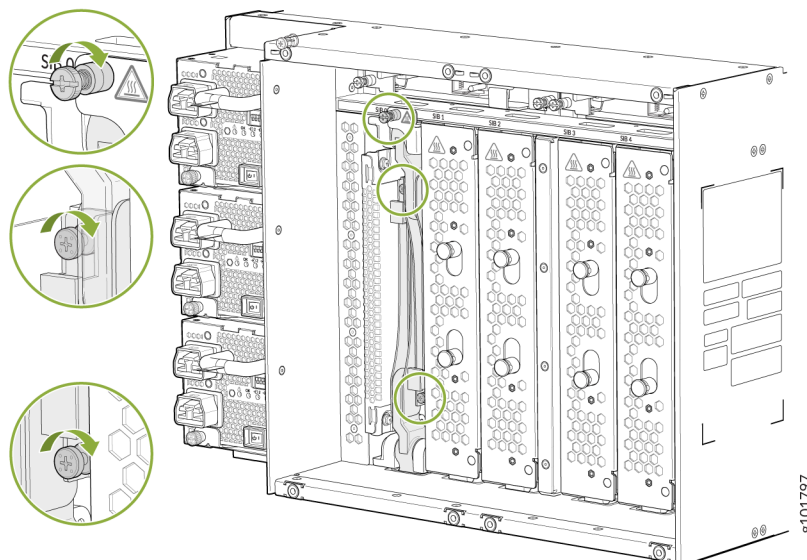
7. Hold the SFB vertically and slide the SFB into the open slot until the ejector handles engage and start to close.
8. Grasp the two ejector handles and fold them inward until they latch to seat the SFB (see [Figure 78 on page 179](#)).

Figure 78: Install an MX10004 Switch Fabric Board



9. Tighten the captive screws at the top and bottom of the SFB by hand or with a Phillips screwdriver (see [Figure 79 on page 180](#)).

Figure 79: Tighten the Captive Screws on the SFB



10. Install the appropriate fan tray (see ["Install an MX10004 Fan Tray" on page 165](#)).
 11. Set the fans to normal speed using the test chassis fan tray speed 0 normal and test chassis fan tray speed 1 normal command.
 12. Bring the SFB online using the request chassis sfb slot *slot-number* online command.
- You can check the status of the SFB using the show chassis sfb and the show chassis fabric summary commands.

NOTE: If you completely powered off the SFB using the set chassis sfb *slot-number* offline command, you must delete the configuration to bring the SFB online. To delete the configuration and bring a replacement SFB online, use the delete chassis sfb *slot-number* offline command.

Remove an MX10004 Switch Fabric Board

A Juniper Networks MX10004 router has up to 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 ["Remove an MX10004 Fan Tray" on page 167](#).

If you plan to replace one or more Switch Fabric Boards (SFBs), make sure you calculate the time required to remove the fan tray, add or replace the SFBs, and install the fan tray in the chassis. To calculate the time allowed for replacing a SFB, see [Table 53 on page 176](#).

Ensure that you have the following equipment on hand before replacing a SFB:

- Electrostatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap
- Phillips (+) number 2 screwdriver (optional)
- Replacement SFB or SFB cover (JNP10K-SF-BLNK) for the empty slot



CAUTION: Do not remove the SFB unless you have a replacement SFB or a SFB cover (JNP10004-SF-BLNK) available.

NOTE: If you are not installing another SFB into the empty card slot within a short time, install the SFB cover into the slot to maintain proper airflow in the card cage.

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.

After replacing the fans or SFBs, set the fans to normal speed using the test chassis fan tray 0 speed *normal* and test chassis fan tray 1 speed *normal* command.

To remove an MX10004 Switch Fabric Board:

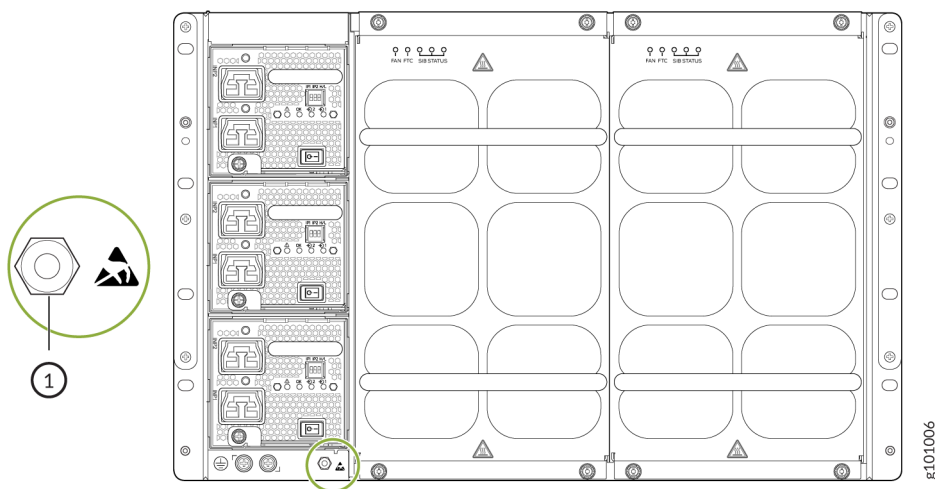
1. Take the SFB offline using the request chassis sfb slot *slot-number* offline command.

NOTE: If you suspect the SFB is faulty and want to ensure that packets do not flow through the SFB, power off the SFB instead of taking the SFB offline. To power down the SFB, use the set chassis sfb *slot-number* offline command. Before you bring a new SFB in that slot online, you must delete the old configuration using the delete chassis sfb slot *slot-number* offline command.

2. Place an electrostatic bag or an antistatic mat on a flat, stable surface.

3. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. An ESD point is located next to the protective earthing terminal and below the bottom power supply on the rear of the MX10004 (see [Figure 80 on page 182](#)).

Figure 80: ESD Point on the Rear of the MX10004



1– ESD point

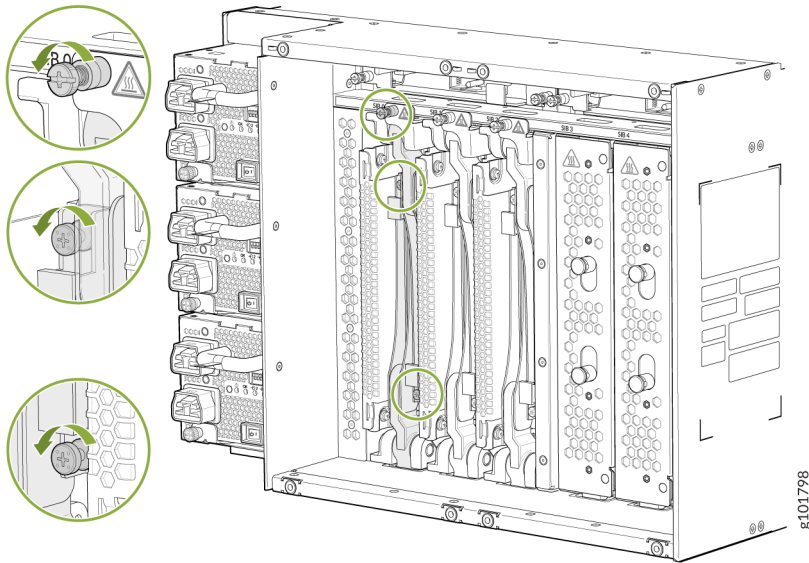
4. Remove the appropriate fan tray (see ["Remove an MX10004 Fan Tray" on page 167](#)).



CAUTION: Do not remove both fan trays at the same time. Remove and replace one fan tray at a time. If you remove both fan trays, the system triggers a thermal alarm and shuts down the chassis.

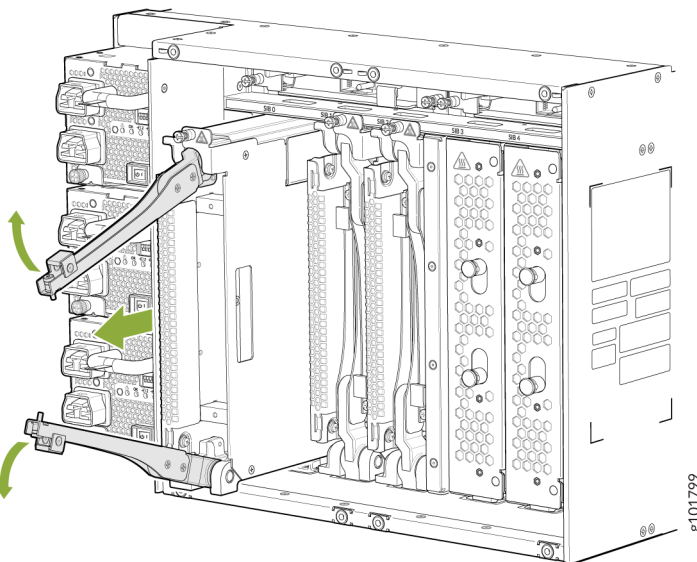
5. Loosen the captive screws at the top and bottom of the SFB by hand or with a Phillips screwdriver. See [Figure 81 on page 183](#).

Figure 81: Loosen the Captive Screws on the SFB



6. Grasp both handles and spread them apart. The SFB slides about a quarter of the way out of the slot.
See [Figure 82 on page 183](#).

Figure 82: Join the Ejector Handles



7. Grasp the ejector handles with one hand and place your other hand under the SFB for support as you slide the SFB out of the slot.



CAUTION: The SFB surface and handles may be hot. Allow a few minutes for the surface and handles to cool by pulling the SFB halfway out of the chassis. Wear proper protective, heat-resistant gloves while removing an SFB.

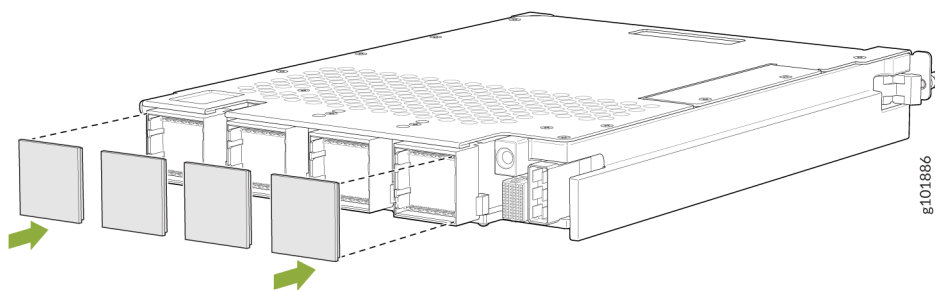
8. Support the SFB as you rotate the SFB 90 degrees and place it on the antistatic mat with the printed circuit board (PCB) facing upward. Be careful to handle the SFB by the ejectors. Be careful not to bump or handle the SFB by the connectors. If you don't have an antistatic mat, have another person help you slide the antistatic bag over the SFB before you place it on a 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.

9. 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 83 on page 184](#)).

Figure 83: Insert the Protective Plastic Covers on the JNP10004-SF2 SFB Interface Connectors



MX10004 Routing and Control Board Maintenance

SUMMARY

Maintaining a Juniper Networks MX10004 router includes removing and installing the Routing and Control Board (RCB).

IN THIS SECTION

- [Handle and Store Routing and Control Boards Properly | 185](#)
- [Install an MX10004 Routing and Control Board | 187](#)
- [Remove an MX10004 Routing and Control Board | 189](#)

Handle and Store Routing and Control Boards Properly

SUMMARY

This topic will explain how to handle an RCB when you are installing or after removing an RCB. It also explains how store the RCB.

IN THIS SECTION

- [Handle a Routing and Control Board Properly | 185](#)
- [Store a Routing and Control Board in an Electrostatic Bag | 186](#)

Handle a Routing and Control Board Properly

Pay attention to the way you handle a Routing and Control Board (RCB). You install RCBs horizontally. It is best to hold them by the sides when they are not in the chassis, to prevent damage to the connectors.

To handle 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 one or more of the connectors are 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.

Store a Routing and Control Board in an Electrostatic Bag

You must store Routing and Control Boards (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 antistatic bags are fragile, two people should insert the RCB into the bag.

To store an RCB in 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.

Install an MX10004 Routing and Control Board

A Juniper Networks MX10004 router can have one or two Routing and Control Boards (RCBs), depending on the configuration. You can install RCBs in either of the two top slots on the front of the chassis.

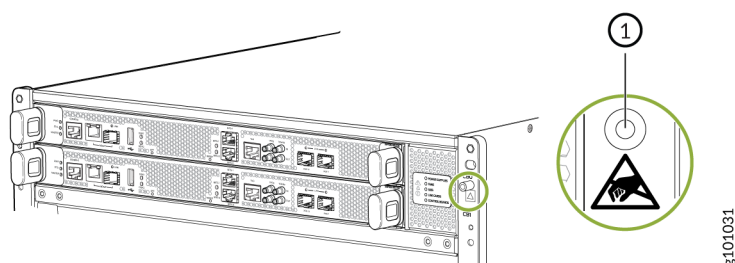
In redundant configurations, an RCB is a hot-removable and hot-insertable field-replaceable unit (FRU). In base configurations, you need to install a second RCB before removing a failing RCB in order to prevent the router from shutting down.

Before you install an RCB, ensure that you have an electrostatic discharge (ESD) grounding strap.

To install an MX10004 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 the MX10004 (see [Figure 84 on page 187](#)).

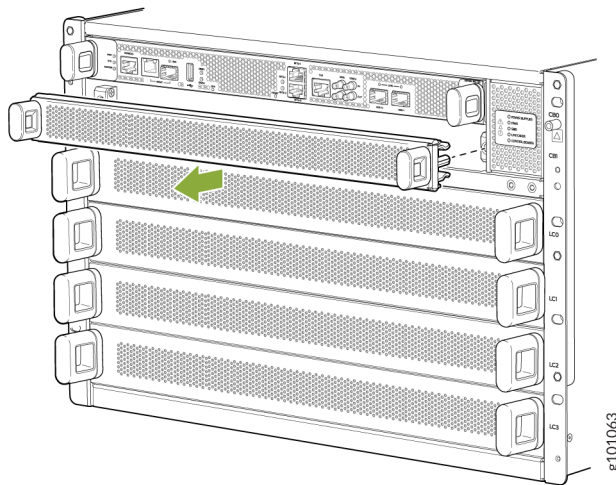
Figure 84: ESD Point for MX10004 Chassis Front



1– ESD point

2. Either remove the cover panel from the available RCB slot (see [Figure 85 on page 188](#)) or remove the failing RCB (see ["Remove an MX10004 Routing and Control Board" on page 189](#)).

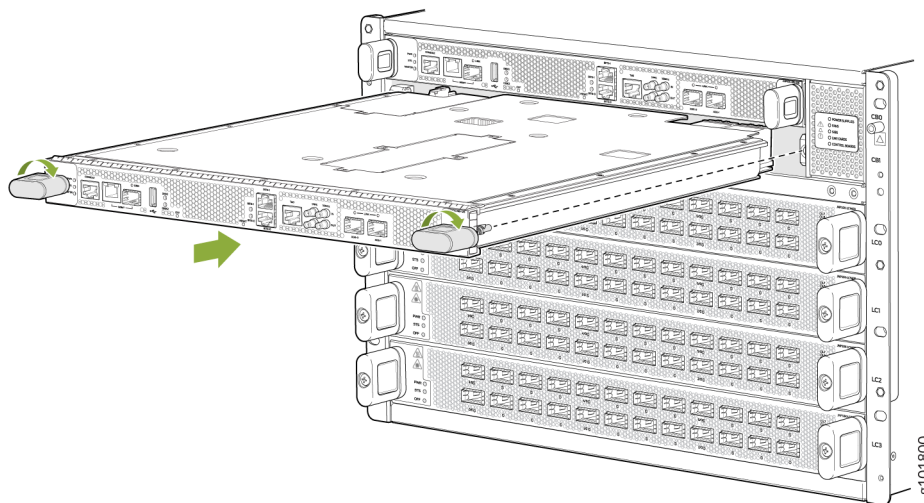
Figure 85: Removing a Routing and Control Board Cover Panel



3. Remove the new RCB from the electrostatic bag and inspect it for any damage before installing it in 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 aligned correctly.
7. Grasp both handles and rotate them clockwise simultaneously until the RCB is fully seated and the handles are vertical (see [Figure 86 on page 188](#)).

The RCB begins the power-on sequence after it is fully seated.

Figure 86: 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, the available power might be insufficient. Ensure that you have adequate power for the additional unit.

You can also use the **show chassis environment cb** command to verify that the RCB is online.

Remove an MX10004 Routing and Control Board

A Juniper Networks MX10004 router can have one or two Routing and Control Boards (RCBs), depending on the configuration. You can install RCBs 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 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
- A 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 functioning RCB causes the system to reboot and start the election process for a new primary.

To remove an MX10004 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
```

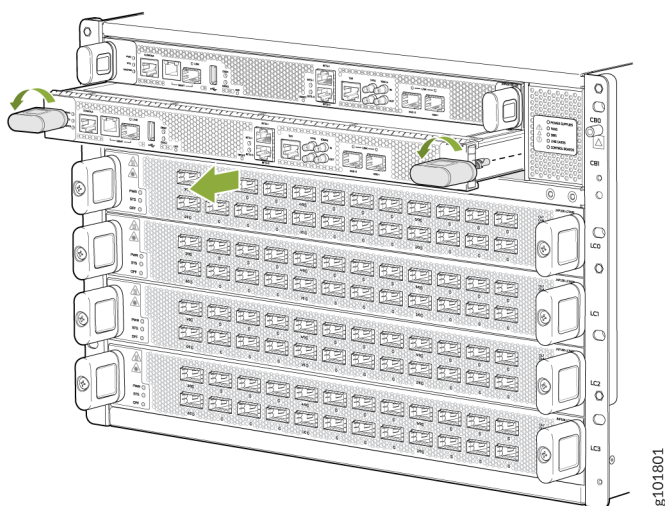
You can use the `show chassis environment cb | match State` CLI command to verify that the RCB is offline.

```
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 84 on page 187](#)).
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 87 on page 190](#)).

Figure 87: 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.

MX10004 Line Card Maintenance

SUMMARY

Maintaining Juniper Networks MX10004 routers includes removing and reinstalling line cards.

IN THIS SECTION

- [Handle and Store MX10004 Line Cards Properly | 191](#)
- [Handle an MX10004 Line Card Properly | 191](#)
- [Store a Line Card Properly | 192](#)
- [Bring an MX10004 Line Card Online or Take It Offline | 193](#)
- [Install an MX10004 Line Card in the Router Chassis | 194](#)
- [Remove a Line Card from an MX10004 Router Chassis | 197](#)
- [Install the MX10004 Cable Management System | 199](#)

Line cards in the MX10004 are field-replaceable units (FRUs) that can be installed in any of the line card slots on the front of the chassis. The line cards are hot-insertable and hot-removable: you can remove and replace them without powering off the router or disrupting router functions.

Handle and Store MX10004 Line Cards Properly

The MX10004 line cards have fragile components. To avoid damaging the line cards, be sure you follow safe handling practices.

Handle an MX10004 Line Card Properly

Pay attention to the way you handle the line cards. Line cards are installed horizontally, and it is best to hold them by the sides of the units when they are not in the chassis.

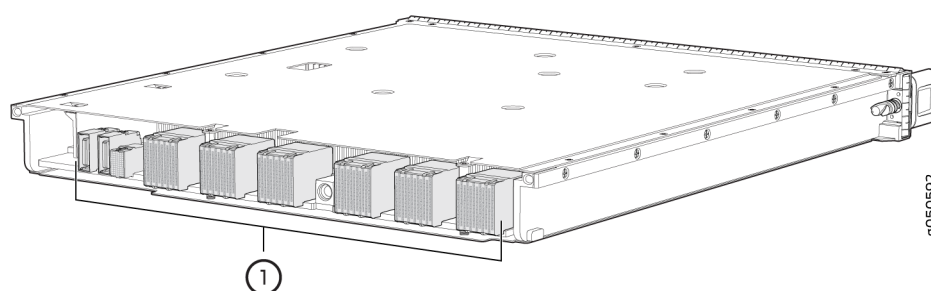
To handle an MX10004 line card properly:

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



CAUTION: Never hold the line card by the connector edge. The connectors are fragile and the line card won't seat properly if the connector is damaged. See [Figure 88 on page 192](#).

Figure 88: Connector Edge of a Line Card



1– Connectors

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



CAUTION: Do not stack line cards on top of one another or on top of any other component.

5. Place each line card separately in an electrostatic bag or on an antistatic mat placed on a flat, stable surface.

Store a Line Card Properly

You must store line cards either in the chassis or in a spare shipping container, horizontally and sheet-metal side down. Don't stack these units on top of one another or on top of any other component.

You must 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 antistatic bags are fragile, two people should insert the line card into the bag.

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 store a line card properly in an antistatic bag:

1. Hold the unit horizontally with the faceplate toward you.
2. Slide the opening of the antistatic bag over the connector edge.

If you must insert the line card into an antistatic 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.

Bring an MX10004 Line Card Online or Take It Offline

The offline/online (**OFF**) button is recessed below the faceplate directly below the status (**STS**) LED. You can bring any of the MX10004 line cards online or take them offline using either of these two methods:

- Press the **OFF** button with a non-conductive pin tool, such as a toothpick, until the **STS** LED turns off after about 5 seconds.
- Issue the CLI command:

```
user@host> request chassis fpc slot slot-number offline
```

Install an MX10004 Line Card in the Router Chassis

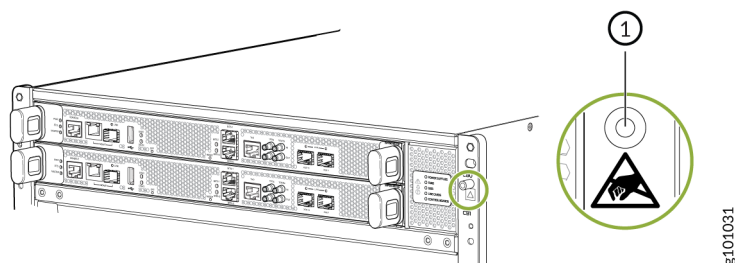
Before you install a line card in the router chassis:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Review how to handle and store the line card. See ["Handle and Store MX10004 Line Cards Properly" on page 191](#).
- Inspect the connector edge of the line card for physical damage. Installing a damaged line card might damage the router.
- Ensure that the router has sufficient power to power the line card while maintaining its $n+1$ power redundancy. To determine whether the router has enough power available for the line card, use the `show chassis power detail` command.
- Ensure that you have the following parts and tools available to install a line card in the router:
 - ESD grounding strap
 - Phillips (+) screwdriver, number 2

To install an MX10004 line card in the router chassis:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis. An ESD point is located above the status LED panel on the front of the router chassis. See [Figure 89 on page 194](#).

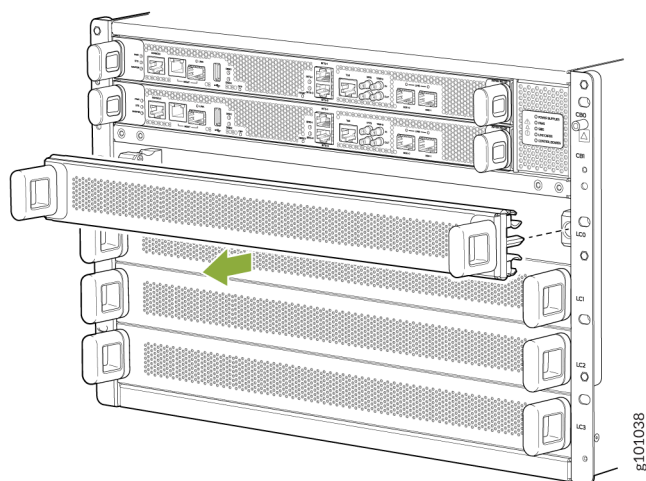
Figure 89: ESD Point on the Front of the MX10004



1– ESD point

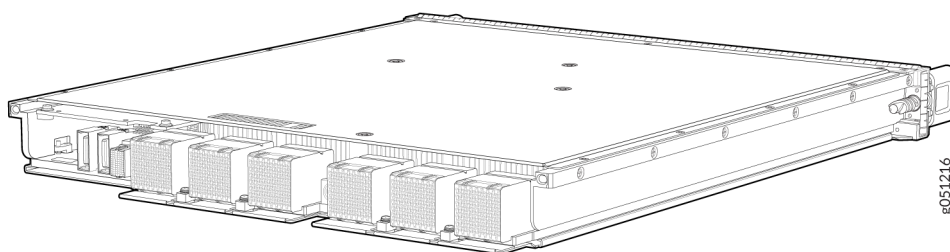
2. Remove the line card cover by grasping the handles and pulling them straight out to expose the slot for the line card. See [Figure 90 on page 195](#).

Figure 90: Remove the Cover for a Line Card



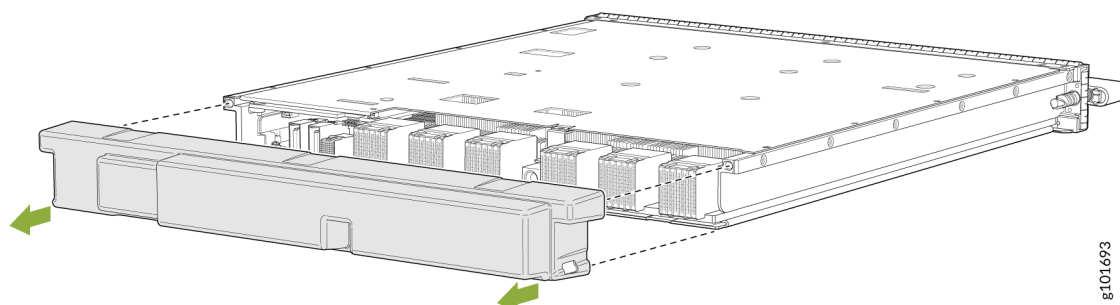
CAUTION: Do not lift the line card by holding the edge connectors or the handles on the faceplate. Neither the handles nor the edge connectors can support the weight of the line card. Lifting the line card by the handles or edge connectors might bend them. If the edge connectors are bent, you may not be able to seat the line card in the chassis properly. See [Figure 91 on page 195](#).

Figure 91: Line-Card Connectors



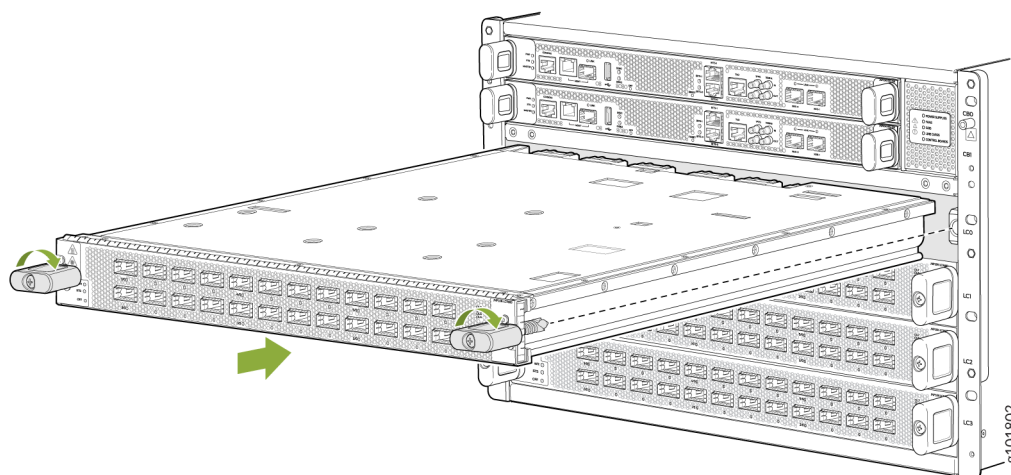
3. Remove the line card from the antistatic bag and inspect it for any damage before you install it in the chassis.
4. If you are installing MX10K-LC9600, remove the protective plastic cover on the fabric interface connectors. Save the plastic cover for future use (see [Figure 92 on page 196](#))

Figure 92: Remove Protective Plastic Cover from the MX10K-LC9600 Interface Connectors



5. Grasp and lift the line card by the sides.
6. Slide the line card all the way into the slot until the handle holes align. See [Figure 93 on page 196](#).

Figure 93: Insert the Line Card into the Slot and Rotate the Handles



7. Rotate the handles simultaneously until the line card is fully seated and the handles are vertical.
8. If the router is not powered, the line card automatically comes online when you apply power to the router. If you are adding the line card to a running system, issue the following command to bring the line card online:

```
request chassis fpc slot slot-number online
```

You can install the optional cable management kit after you install the line cards.

Remove a Line Card from an MX10004 Router Chassis

If you have the optional line-card cable management system, it's not necessary to remove the cable management system before removing the line card.

Before you remove a line card from the router chassis:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- If any optical cables (including transceivers are installed in the line card), remove them before you remove the line card. See ["Disconnect a Fiber-Optic Cable from an Optical Transceiver on an MX10004 Router" on page 207](#).
- Review how to handle and store the line card. See ["Handle and Store MX10004 Line Cards Properly" on page 191](#).
- Ensure that you have the following parts and tools available to remove a line card from an MX10004 chassis:
 - ESD grounding strap
 - An antistatic bag or antistatic mat

NOTE: Placing a line card in an electrostatic bag might require a second person to assist with sliding the line card into the bag.

- Replacement line card or a cover (JNP10K-LC-BLNK) for the empty slot



CAUTION: Do not remove the line card unless you have a replacement line card or a line card cover (JNP10K-LC-BLNK) available.

NOTE: If you are not installing another line card into the empty card slot within a short time, install the line card cover into the slot to maintain proper airflow in the card cage. The air filters in the line card covers will prevent dust and other particles entering the chassis. If an empty line card slot is not covered, dust and other particles may accumulate on the connector pins of the installed line cards and SFBs and affect the performance of the router.

To remove a line card from an MX10004 router chassis:

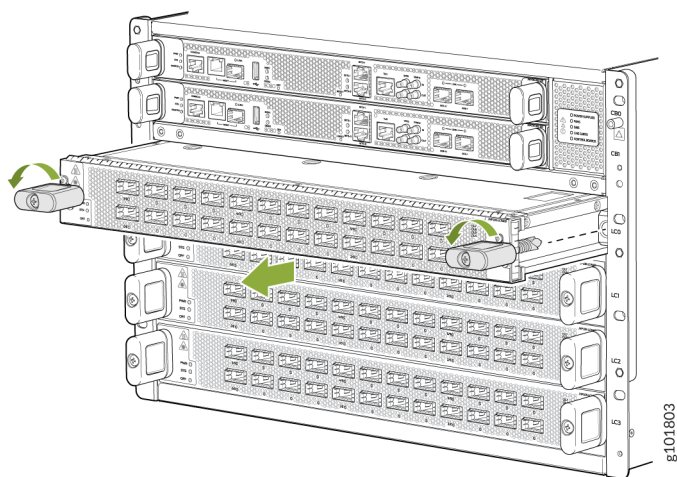
1. Place the antistatic bag or antistatic mat on a flat, stable surface.

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 89 on page 194](#).
3. Label the cables connected to each port on the line card so that you can reconnect the cables to the correct ports.
4. Issue the following CLI command to take the line card offline:

```
request chassis fpc slot slot-number offline
```

5. Unscrew the line card from the chassis by continually turning the handles to the left until the line card is fully unseated. See [Figure 94 on page 198](#).

Figure 94: Remove an MX10004 Line Card



6. Using the handles, slide the line card halfway out of the chassis.



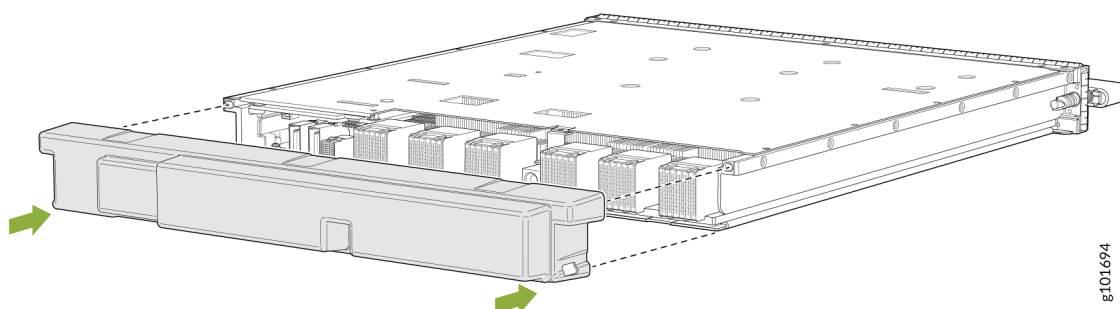
CAUTION: Do not stack line cards on top of one another or on top of any other component. Place each line card separately in the antistatic bag or on the antistatic mat placed on a flat, stable surface.



CAUTION: Be prepared to support the full weight of the line card as you slide it out of the chassis.

7. Grasp both sides of the line card at midpoint and remove the line card from the chassis. Either have someone assist you in placing the line card into the antistatic bag or rest the card on the antistatic mat. Take care not to bump or store the line cards on the connectors. See [Figure 91 on page 195](#).
8. 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 95 on page 199](#)).

Figure 95: Insert Protective Plastic Cover on MX10K-LC9600 Interface Connectors



9. If you are not installing a line card in the emptied line-card slot within a short time, install a cover over the slot. Do this to protect the interior of the chassis from dust or other foreign substances and to ensure that the airflow inside the chassis is not disrupted.

Install the MX10004 Cable Management System

The Juniper Networks MX10004 router's cable management system is an optional, orderable kit (JLC-CBL-MGMT-KIT). This kit organizes and protects optical cabling attached to the line cards. After you install a line card, you can still remove the line card without needing to remove the cable management system.

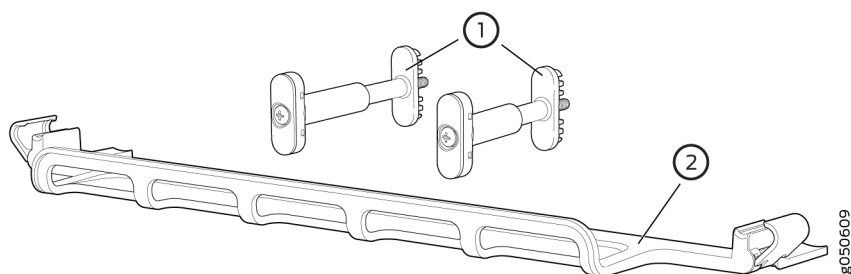
Ensure that you have the following tool available to install the MX10004 cable management system on a line card:

Phillips (+) screwdriver, number 2

To install the MX10004 cable management system (see [Figure 96 on page 200](#)):

1. Open the shipping carton for the cable management system and check that you have:
 - Two handle extensions
 - One cable tray

Figure 96: Cable Management System Components

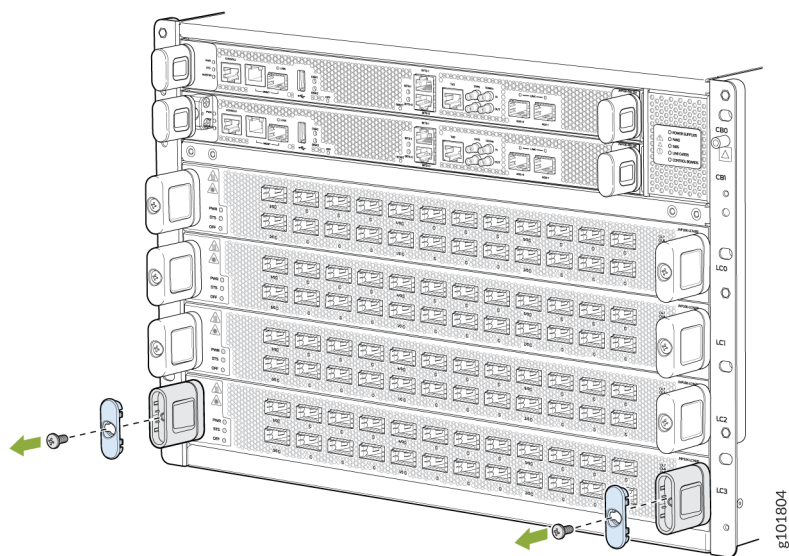


1– Handle extensions

2– Cable tray

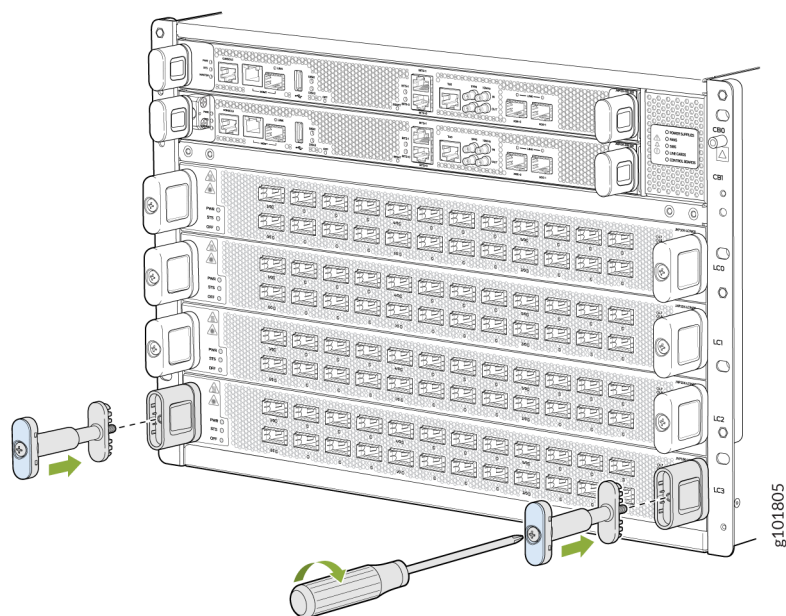
2. Use the Phillips screwdriver to loosen and remove the screws on the two line-card handles (see [Figure 97 on page 200](#)).

Figure 97: Remove the Handle Screws



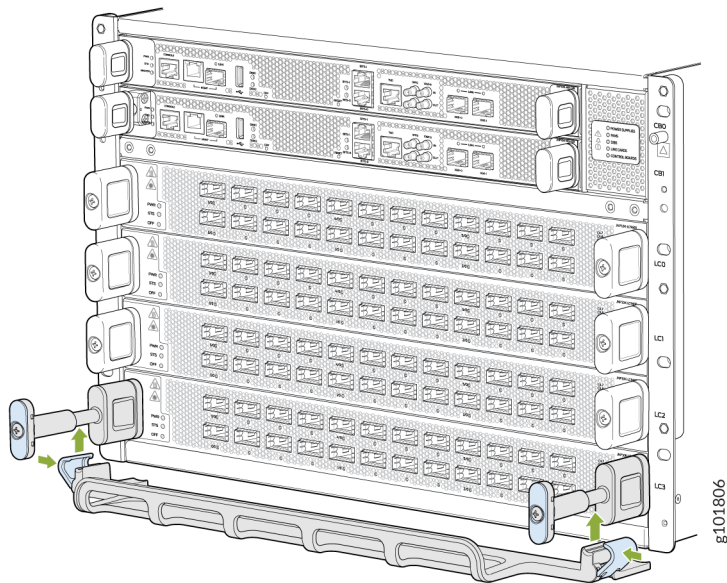
3. Replace the blue cap on the line-card handle with the two handle extensions (see [Figure 98 on page 201](#)).

Figure 98: Attach the Handle Extensions



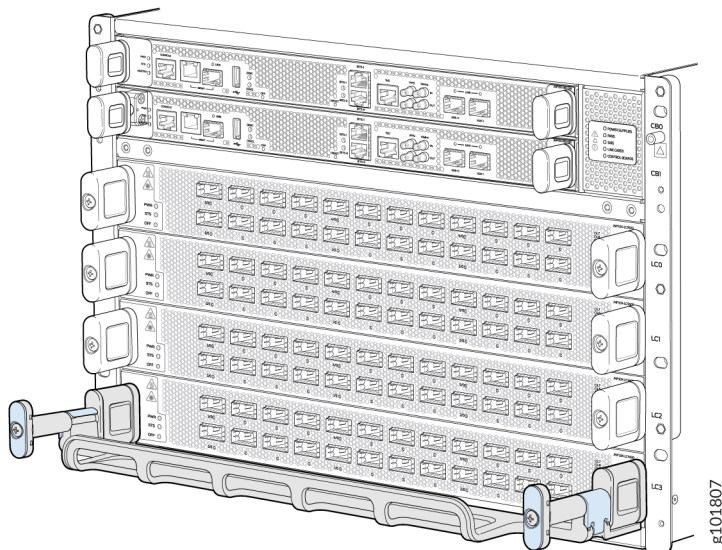
4. Tighten the screws into the handle extensions.
5. Snap open the blue clips on the ends of the cable tray with your hands.
6. Place the cable tray across the front of the line card so that the two ends of the cable tray are under the handle extensions.
7. Snap to close the blue clips of the cable tray around the handle extensions (see [Figure 99 on page 202](#)).

Figure 99: Add the Cable Tray



8. Drape and tie the optical cables to the side (see [Figure 100 on page 202](#)). Another option is to drape some of the cables under the handle extension and some cables over the handle extension.

Figure 100: Completed Cable Management System



MX10004 Transceiver and Fiber Optic Cable Installation and Removal

IN THIS SECTION

- [Install a Transceiver in an MX10004 Line Card | 203](#)
- [Remove a Transceiver from an MX10004 Line Card | 205](#)
- [Connect a Fiber-Optic Cable to an Optical Transceiver in an MX10004 Router | 206](#)
- [Disconnect a Fiber-Optic Cable from an Optical Transceiver on an MX10004 Router | 207](#)
- [Fiber-Optic Cable Maintenance for an MX10004 Router | 208](#)

The transceivers for the Juniper Networks MX10004 router are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace them without powering off the device or disrupting device functions.

To understand how to install or remove a transceiver of an MX10004 router, read the following sections.

Install a Transceiver in an MX10004 Line Card

Before you begin to install a transceiver in a Juniper Networks MX10004 line card, ensure that you have taken the necessary precautions for safe handling of lasers (see "[Laser and LED Safety Guidelines and Warnings](#)" on page 248).

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

To install a transceiver in an MX10004 line card:



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

1. Remove the transceiver from its bag.
2. Check to see whether the transceiver is covered by a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.



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

3. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover and save it in case you need to cover the port later.
4. Using both hands, carefully place the transceiver in the empty port. The connectors must face the device chassis.



CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the transceiver unusable. On MX10004 line cards, the ports are designed belly to belly, which requires you to turn the transceiver over on the bottom port row. See [Figure 101 on page 204](#) and [Figure 102 on page 205](#) for the correct orientation for your device.

5. Slide the transceiver in gently until it is fully seated.
6. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.



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

Figure 101: Install an SFP Transceiver

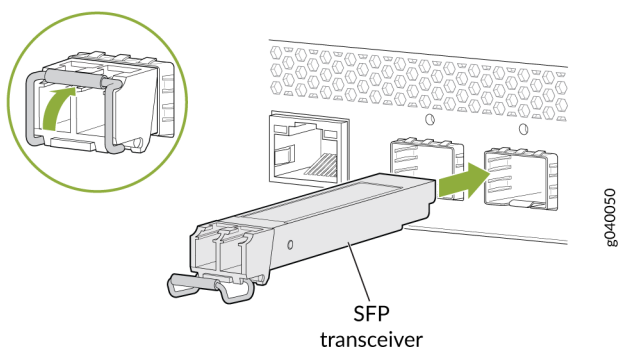
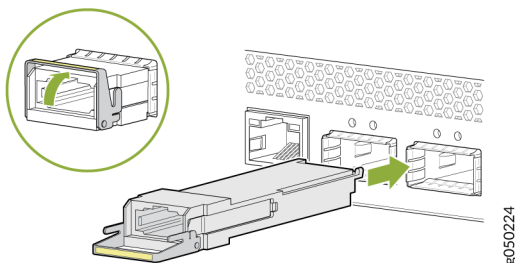


Figure 102: Install a QSFP+, QSFP28, or QSFP56-DD Transceiver



Remove a Transceiver from an MX10004 Line Card

Before you begin to remove a transceiver from the MX10004 line card, ensure that you have taken the necessary precautions for safe handling of lasers (see ["Laser and LED Safety Guidelines and Warnings" on page 248](#)).

Ensure that you have the following parts and tools available:

- Antistatic bag or an antistatic mat
- Rubber safety caps to cover the transceiver and fiber-optic cable connector
- Dust cover to cover the port

To remove a transceiver from an MX10004 line card:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the router.
3. Label the cable connected to the transceiver so that you can reconnect it correctly.



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



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



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

4. Remove the cable connected to the transceiver (see ["Disconnect a Fiber-Optic Cable from an Optical Transceiver on an MX10004 Router" on page 207](#)). Cover the transceiver and the end of each fiber-optic cable connector with a rubber safety cap immediately after you disconnect the fiber-optic cables.
5. Using your fingers, pull the ejector lever away from the transceiver to unlock the transceiver.



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

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



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

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

Connect a Fiber-Optic Cable to an Optical Transceiver in an MX10004 Router

Before you connect a fiber-optic cable to an optical transceiver installed in the MX10004 router, ensure that you have taken the necessary precautions for safe handling of lasers (see ["Laser and LED Safety Guidelines and Warnings" on page 248](#)).

To connect a fiber-optic cable to an optical transceiver in an MX10004 router:



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



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

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. If the optical transceiver is covered by a rubber safety cap, remove the cap. Save the cap.
3. Insert the cable connector into the optical transceiver.
4. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.



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



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

Disconnect a Fiber-Optic Cable from an Optical Transceiver on an MX10004 Router

Before you disconnect a fiber-optic cable from an optical transceiver installed in an MX10004 router, ensure that you have taken the necessary precautions for safe handling of lasers (see "[Laser and LED Safety Guidelines and Warnings](#)" on page 248).

Ensure that you have the following parts and tools available:

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

To disconnect a fiber-optic cable from an optical transceiver on an MX10004 router:

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



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



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

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



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

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

Fiber-Optic Cable Maintenance for an MX10004 Router

To maintain fiber-optic cables in an MX10004 router:

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

- Keep fiber-optic cable connections clean. Microdeposits of oil and dust in the canal of the transceiver or cable connector can cause loss of light, reduction in signal power, and possibly intermittent problems with the optical connection.

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

After you clean 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.

Remove an MX10004 Router

IN THIS SECTION

- [Power Off an MX10004 Router | 209](#)
- [Remove an MX10004 Router from a Four-Post Rack Using a Mechanical Lift | 211](#)
- [Manually Remove an MX10004 Router from a Four-Post Rack | 213](#)

The following sections explain how to power off and remove an MX10004 router.

Power Off an MX10004 Router

Before you power off a Juniper Networks MX10004 router:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "[Prevention of Electrostatic Discharge Damage](#)" on page 258.
- Ensure that you don't need to forward traffic through the router.
- Ensure that you have the following parts and tools available to power off the router:
 - An ESD grounding strap
 - An external management device such as a PC

- An RJ-45-to-DB-9 rollover cable to connect the external management device to the console port on one of the Routing and Control Boards (RCBs)

To power off an MX10004 router:

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 ["Connect an MX10004 Router to a Management Console" on page 141.](#)
 - Connect a management device to one of the two management (**MGMT**) ports on the RCB by following the instructions in ["Connect an MX10004 Router to a Network for Out-of-Band Management" on page 140.](#)
2. Shut down Junos OS from the external management device by using the `request vmhost power-off` operational mode CLI command followed by the `request chassis cb slot slot-number offline`. These commands shut down a single RCB gracefully and preserve system state information. When you issued this command on a redundant system, it shuts down the partner RCB. A message appears on the other RCB console, confirming that the operating system has halted. For example, if you want to shut down the backup RCB, issue the command on the primary RCB. You view the output on the backup RCB.
3. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the router chassis. One ESD point is located above the status LED panel on the front of the chassis, and the other ESD point is located in the rear below the power supplies.
4. Disconnect power to the router by performing one of the following tasks:
 - AC power supply—Set the enable router switch to the off (**O**) position and gently pull out the coupler for the power cord from the faceplate.
 - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.
5. Remove the power source cable from the power supply faceplate:
 - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the power cord plug that is connected to the power supply faceplate.
 - DC power supply—Loosen the thumbscrews by 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 you remove the chassis from the rack.

Remove an MX10004 Router from a Four-Post Rack Using a Mechanical Lift

Before you remove the Juniper Networks MX10004 router using a mechanical lift:

- Ensure that the rack is stable and secured to the building.
- Ensure that there is enough space to place the removed router in its new location and that the path to the new location is clear. See ["MX10004 Clearance Requirements for Airflow and Hardware Maintenance" on page 89](#).
- Review ["General Safety Guidelines and Warnings" on page 234](#).
- Review the chassis lifting guidelines described in ["Chassis and Component Lifting Guidelines" on page 242](#).
- Ensure that the router is safely powered off (see ["Power Off an MX10004 Router" on page 209](#)).
- Ensure that you have the following parts and tools to remove the router:
 - A mechanical lift rated for 250 lbs (113.4 kg)
 - A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack-mount screws



CAUTION: When removing more than one router chassis from a rack, remove the routers in order from top to bottom.

Because of the router's size and weight, we strongly recommend that you use a mechanical lift to remove the MX10004. Lifting the chassis and removing it from a rack or cabinet requires at least three people.

Make sure the chassis is empty (contains only the fan tray controllers) before you lift it.

NOTE: For instructions on removing a router without using a mechanical lift, see ["Manually Remove an MX10004 Router from a Four-Post Rack" on page 213](#).

To remove an MX10004 router from a four-post rack using a mechanical lift:

1. Remove all optics, line cards, RCBs, power supplies, fan trays, and SFBs before you attempt to move the router chassis. See the following topics:
 - ["Remove a Line Card from an MX10004 Router Chassis" on page 197](#)

- ["Remove an MX10004 Routing and Control Board" on page 189](#)
- ["Remove a JNP10K-PWR-AC2 Power Supply" on page 152](#)
- ["Remove a JNP10K-PWR-DC2 Power Supply" on page 162](#)
- ["Remove an MX10004 Fan Tray" on page 167](#)
- ["Remove an MX10004 Switch Fabric Board" on page 180](#)

Ensure that all of the removed components are stored in antistatic bags.

2. Use the appropriate Phillips (+) screwdriver to remove the screws that attach the chassis to the rack.
3. Move the lift to the rack and position it so that its platform is centered about 0.5 in. (1.27 cm) below the bottom of the router chassis and as close to it as possible.
4. Carefully slide the router from the mounting tray attached to the rack onto the lift.
5. Move the lift away from the rack and lower the platform on the lift (see [Figure 103 on page 212](#)).
6. Use the lift to transport the router to its new location.

After moving the router to its new location, install the components in the chassis or store the components in antistatic bags.

Figure 103: Move the MX10004 Using a Mechanical Lift



Manually Remove an MX10004 Router from a Four-Post Rack

Before you manually remove a Juniper Networks MX10004 router from a rack:

- Ensure that the rack is stable and secured to the building.
- Ensure that there is enough space to place the removed router in its new location and that the path to the new location is clear. ["MX10004 Clearance Requirements for Airflow and Hardware Maintenance" on page 89.](#)
- Review ["General Safety Guidelines and Warnings" on page 234.](#)
- Review the chassis lifting guidelines described in ["Chassis and Component Lifting Guidelines" on page 242.](#)
- Ensure that the router is safely powered off (see ["Power Off an MX10004 Router" on page 209.](#))
- Ensure that you have a Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack-mount screws.

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



CAUTION: Because of the router's size and weight, we strongly recommend that you use a mechanical lift to remove the MX10004. Lifting the chassis and removing it from a rack or cabinet requires at least three people.

Make sure the chassis is empty (contains only the fan tray controllers) before you lift it.



CAUTION: When removing more than one router chassis from a rack, remove the routers in order from top to bottom.

To manually remove an MX10004 router from a four-post rack:

1. Remove all optics, line cards, RCBs, power supplies, fan trays, and SFBs before you attempt to move the router chassis. See the following topics:
 - ["Remove a Line Card from an MX10004 Router Chassis" on page 197](#)
 - ["Remove an MX10004 Routing and Control Board" on page 189](#)
 - ["Remove a JNP10K-PWR-AC2 Power Supply" on page 152](#)
 - ["Remove a JNP10K-PWR-DC2 Power Supply" on page 162](#)
 - ["Remove an MX10004 Fan Tray" on page 167](#)

- ["Remove an MX10004 Switch Fabric Board" on page 180](#)

Ensure that all the removed components are stored in antistatic bags.

2. Use the appropriate Phillips (+) screwdriver to remove the screws that attach the chassis to the rack.



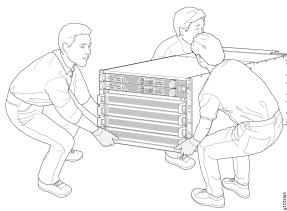
WARNING: To prevent injury, keep your back straight and lift with your legs, not your back. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.

3. Position one person on each side of the rack and another in the rear of the chassis.

NOTE: The two handles on the side of the chassis are meant only to help guide the empty chassis out of the base and rear brackets; they are not for lifting.

4. On each side, hold the bottom of the chassis and carefully lift it up from the mounting tray attached to the rack.
5. Carefully lift the chassis out of rack. If you have a pallet jack, move the router onto the pallet jack. See [Figure 104 on page 214](#).

Figure 104: Lift the MX10004 Without Using a Mechanical Lift



6. Carefully move the chassis to its new location.
After moving the router to its new location, install the components in the chassis or store the components in antistatic bags.

5

CHAPTER

Troubleshooting the MX10004 Router

[Alarm Messages](#) | 216

Alarm Messages

IN THIS SECTION

- [Understanding Alarms | 216](#)
- [Interface Alarm Messages | 218](#)

Understanding Alarms

The Juniper Networks MX10004 router supports different alarm types and severity levels. [Table 54 on page 216](#) provides a list of alarm terms and definitions that can help you in monitoring the device.

Table 54: 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 54: 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 you can 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 MX10004 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.

6

CHAPTER

Contacting Customer Support and Returning the Chassis or Components

[Return Procedures for the MX10004 Chassis or Components](#) | 220

Return Procedures for the MX10004 Chassis or Components

IN THIS SECTION

- [Return Procedure Overview | 220](#)
- [Locate the Serial Number on an MX10004 Chassis or Component | 221](#)
- [Contact Customer Support to Obtain a Return Materials Authorization for an MX10004 Router or Component | 226](#)
- [How to Pack an MX10004 Router or Component for Shipping | 227](#)

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

Return Procedure Overview

If you need to return an MX10004 chassis or an MX10004 component to Juniper Networks for repair or replacement, follow these steps:

1. Determine the serial number of the component. For instructions, see ["Locate the Serial Number on an MX10004 Chassis or Component" on page 221](#).
2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC), as described in ["Contact Customer Support to Obtain a Return Materials Authorization for an MX10004 Router or Component" on page 226](#).

NOTE: Obtain an RMA number before you attempt to return any component to Juniper Networks. Juniper Networks reserves the right to refuse shipments that do not have an RMA. Refused shipments are returned to the customer through collect freight.

3. Pack the router or component for shipping, as described in ["How to Pack an MX10004 Router or Component for Shipping" on page 227](#).

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

Locate the Serial Number on an MX10004 Chassis or Component

IN THIS SECTION

- [List the MX10004 Chassis and Component Details Using the CLI | 221](#)
- [Locate the Chassis Serial Number ID Label on an MX10004 Chassis | 222](#)
- [Locate the Serial Number ID Label on an MX10004 Power Supply | 222](#)
- [Locate the Serial Number ID Labels on MX10004 Fan Trays and Fan Tray Controllers | 223](#)
- [Locate the Serial Number ID Labels on MX10004 Routing and Control Boards | 224](#)
- [Locate the Serial Number ID Labels on an MX10004 Line Card | 225](#)
- [Locate the Serial Number ID Labels on an MX10004 Switch Fabric Board | 226](#)

If you want to return 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 an RMA. See "[Contact Customer Support to Obtain a Return Materials Authorization for an MX10004 Router or Component](#)" on page 226.

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

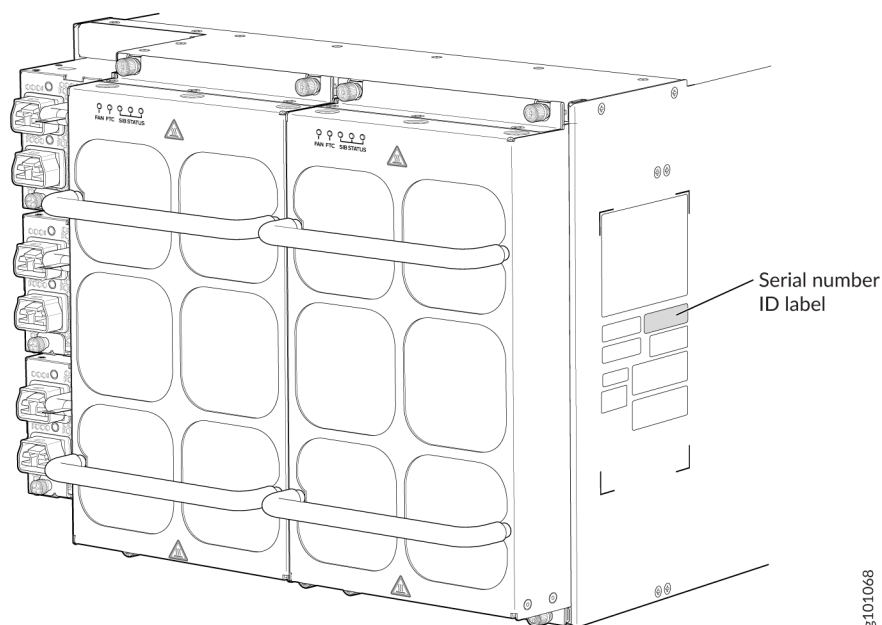
List the MX10004 Chassis and Component Details Using the CLI

To list the MX10004 router chassis and the components and their serial numbers, use the `show chassis hardware` CLI operational mode command.

Locate the Chassis Serial Number ID Label on an MX10004 Chassis

The serial number ID label is located on a label on the left side as you face the front of the router chassis. See [Figure 105 on page 222](#) for the location on an MX10004 router.

Figure 105: MX10004 Serial Number Label

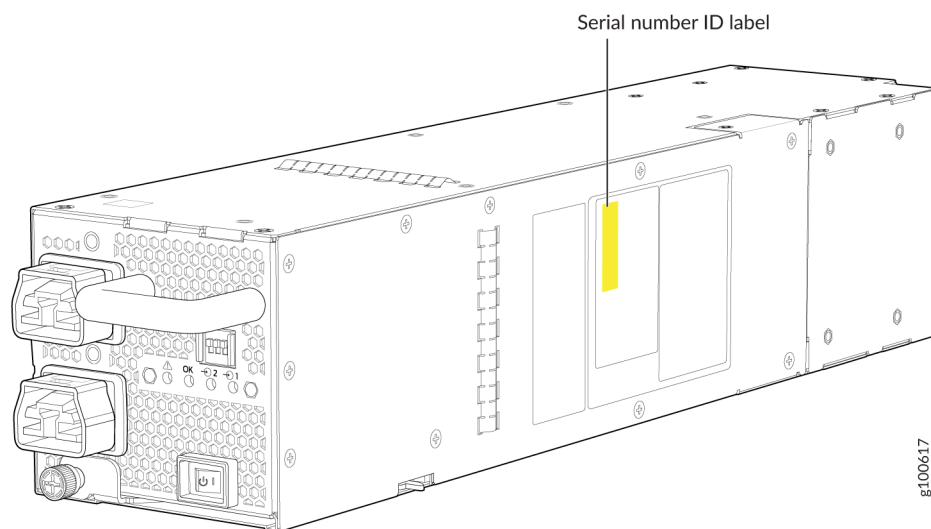


Locate the Serial Number ID Label on an MX10004 Power Supply

The power supplies installed in an MX10004 routers 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.

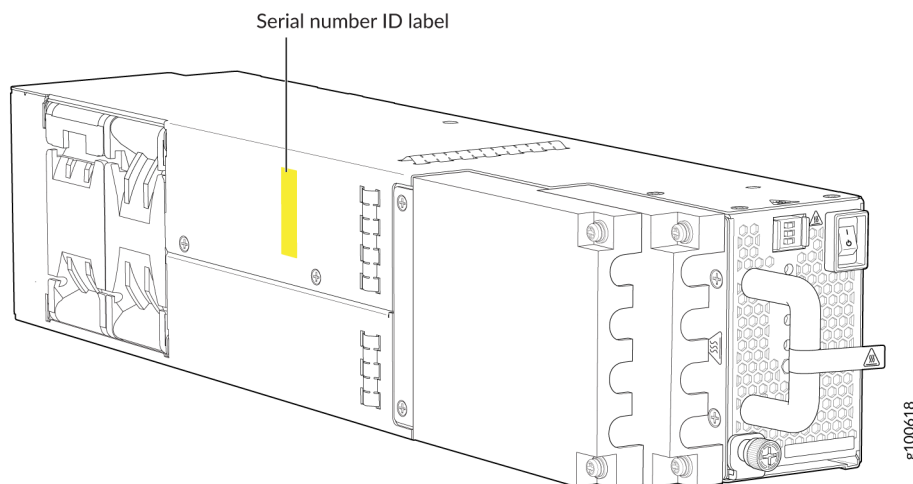
- JNP10K-PWR-AC2 power supply—The serial ID label is on the right side of the power supply. See [Figure 106 on page 223](#).

Figure 106: JNP10K-PWR-AC2 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 107 on page 223](#).

Figure 107: JNP10K-PWR-DC2 Power Supply Serial Number Location

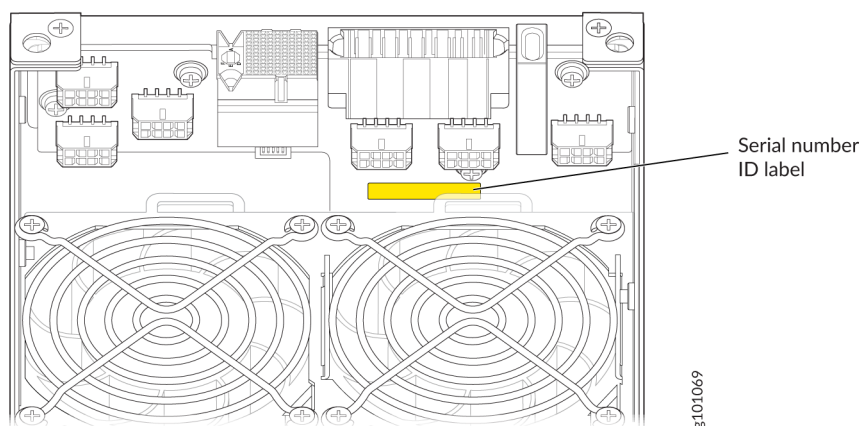


Locate the Serial Number ID Labels on MX10004 Fan Trays and Fan Tray Controllers

The two fan trays and their associated fan tray controllers installed in an MX10004 router 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.

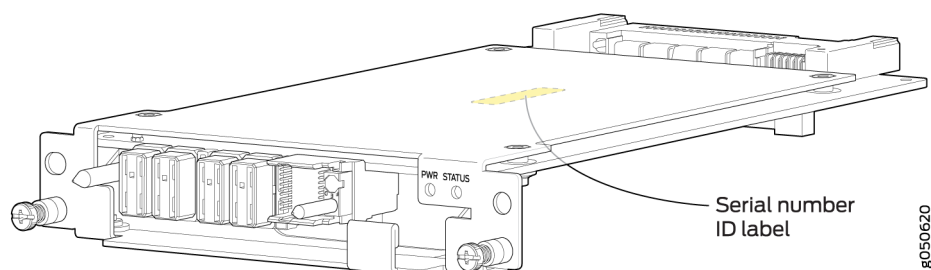
- Fan tray–The serial number ID label for the fan tray (JNP10004-FAN2) is located on the inside of the fan tray at the base of the fan tray Control Board (CB). See [Figure 108 on page 224](#).

Figure 108: MX10004 Fan Tray Serial Number Location



- Fan tray controller–The serial number ID label for the fan tray controller (JNP10004-FTC2) is located on the top of the fan tray controller. See [Figure 109 on page 224](#).

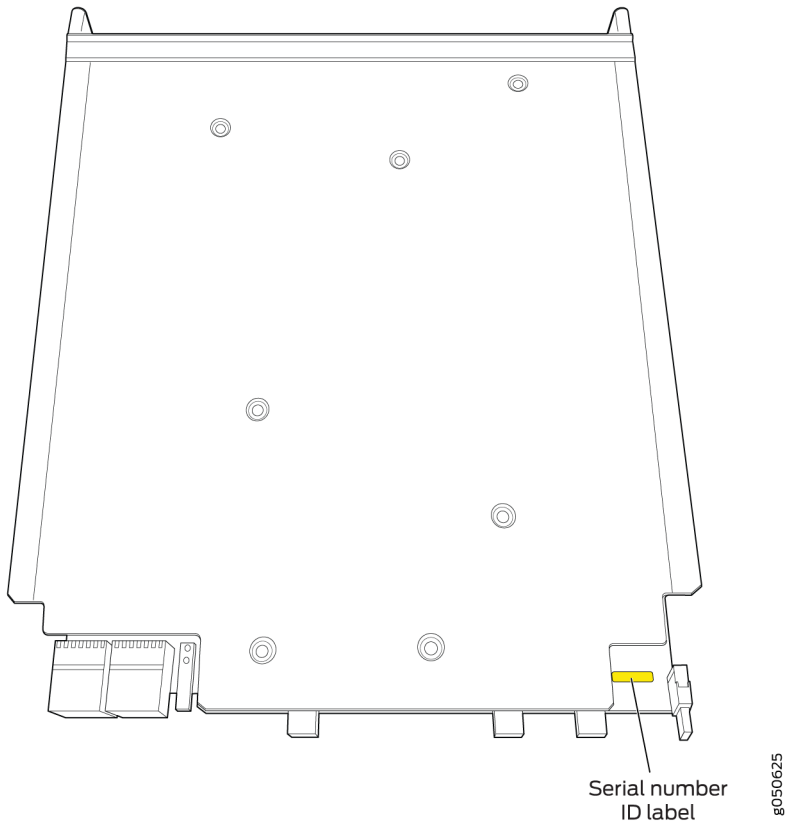
Figure 109: MX10004 Fan Tray Controller Serial Number Location



Locate the Serial Number ID Labels on MX10004 Routing and Control Boards

The serial number ID label for a Routing and Control Board (RCB) is located on the connector end of the unit. See [Figure 110 on page 225](#).

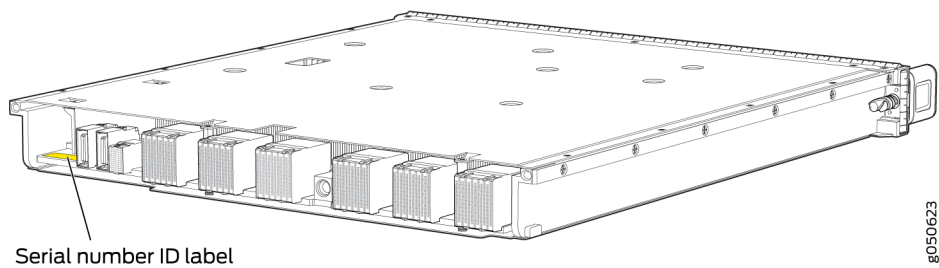
Figure 110: MX10004 Routing and Control Board Serial Number Location



Locate the Serial Number ID Labels on an MX10004 Line Card

The serial number ID label for an MX10004 line card is located on the connector end of the card (see [Figure 111 on page 225](#)).

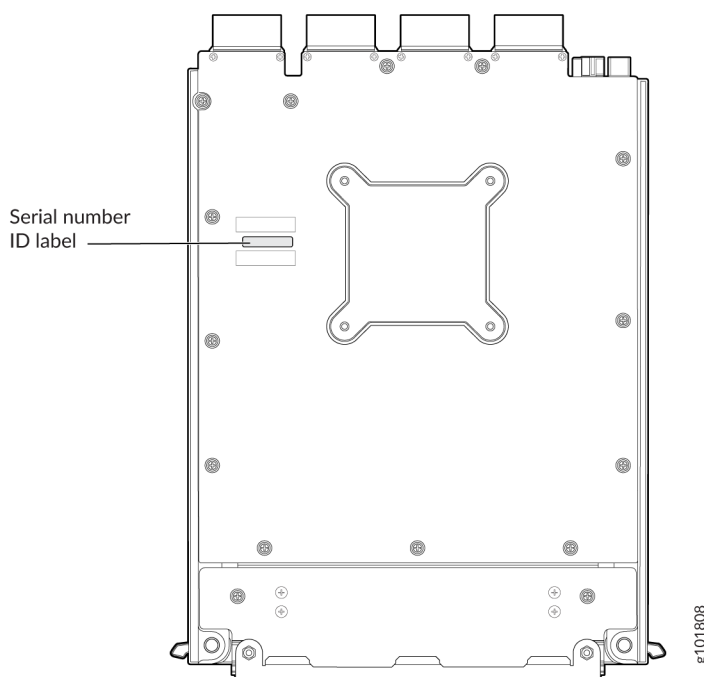
Figure 111: Line Card Serial Number Location



Locate the Serial Number ID Labels on an MX10004 Switch Fabric Board

The serial number ID label for an MX10004 Switch Fabric Board (SFB) is located on the side of the board. See [Figure 112 on page 226](#).

Figure 112: MX10004 SFB Serial Number Location



Contact Customer Support to Obtain a Return Materials Authorization for an MX10004 Router or Component

If you want to return an MX10004 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 the Juniper Networks Technical Assistance Center (JTAC) on the Web or by telephone.

For instructions on locating the serial number of the device or component you want to return, see the following device instructions:

- "Locate the Serial Number on an MX10004 Chassis or Component" on page 221

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 or hash (#) key for an existing case, or press the star (*) key to be routed to the next available support engineer.

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

How to Pack an MX10004 Router or Component for Shipping

IN THIS SECTION

- Pack an MX10004 Chassis for Shipping | 228
- Pack MX10004 Components for Shipping | 231

Follow this procedure if you want to return an MX10004 chassis or router component to Juniper Networks for repair or replacement.

Before you pack an MX10004 router or router component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 258](#).
- Pack your chassis or component using one of these sets of materials:
 - Use the packing material from the replacement chassis or component.
 - Retrieve the original shipping carton and packing materials.

If you do not have either set of packing materials, contact your JTAC representative to learn about approved packing materials. See ["Contact Customer Support to Obtain a Return Materials Authorization for an MX10004 Router or Component" on page 226](#).

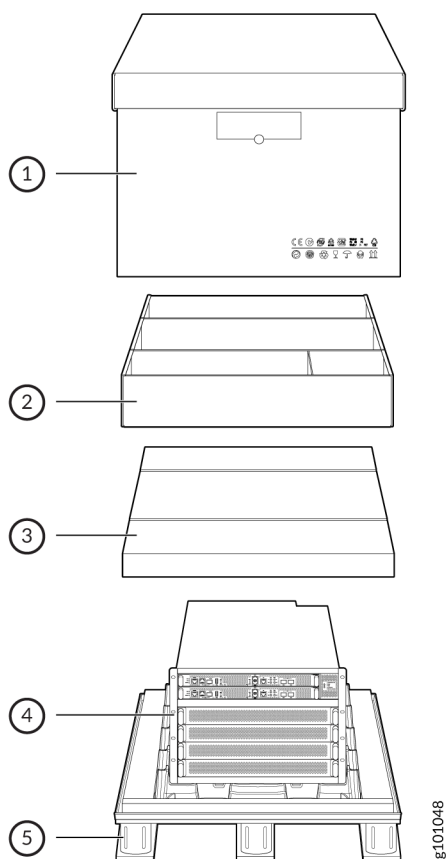
Ensure that you have the following parts and tools available:

- ESD grounding strap
- Electrostatic bag for each component
- If you want to return 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

Pack an MX10004 Chassis for Shipping

The MX10004 router chassis 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 113 on page 229](#) for the stacking configuration of the MX10004 chassis.

Figure 113: Stacking Configuration for Packing the MX10004 Chassis



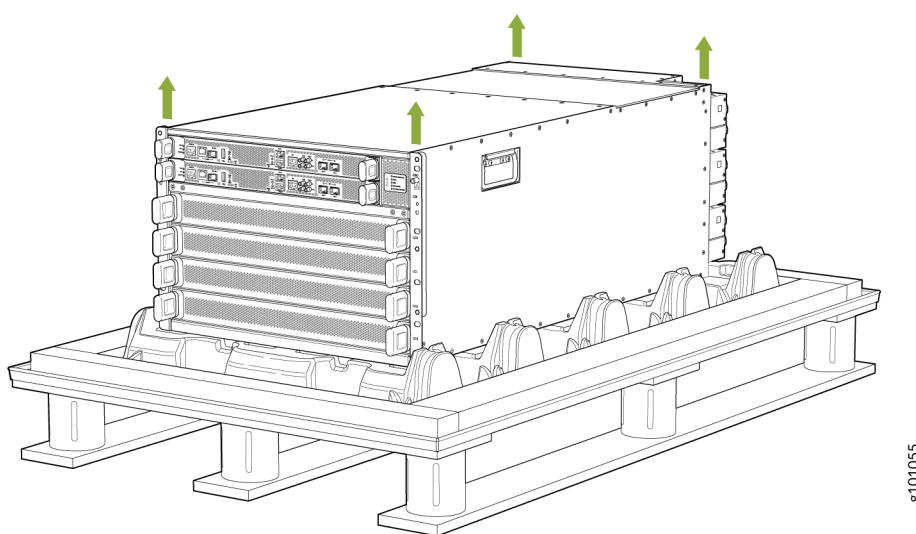
To pack an MX10004 chassis for shipping:

1. Power down the chassis and remove the power cables. See ["Remove an MX10004 Router" on page 209](#).
2. Remove the cables that connect the MX10004 chassis to all external devices.
3. Remove all line cards and pack them in their original shipping containers. See ["Remove a Line Card from an MX10004 Router Chassis" on page 197](#) and ["Store a Line Card Properly" on page 192](#).
4. Install covers over blank slots.
Leave components that came installed in the chassis, inside the chassis. These components may include RCBs or power supplies.
5. Move the wooden pallet and packing material to a staging area as close to the router as possible. Make sure that there is enough space to move the router chassis from the rack to the wooden pallet.
6. Position a mechanical lift under the router. 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 router chassis mounting brackets to the rack. For MX10004

removal, see ["Remove an MX10004 Router from a Four-Post Rack Using a Mechanical Lift" on page 211](#) or ["Manually Remove an MX10004 Router from a Four-Post Rack" on page 213](#).

7. Remove the router from the rack (see ["Chassis and Component Lifting Guidelines" on page 242](#)) 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 router 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 router chassis to the wooden pallet.
9. Slide the plastic cover over the router chassis. The plastic cover is part of the router's original packing materials.
10. Place the packing foam on top of and around the router.
11. Place the power cords in the box.
12. Remove the rack-mount kit from the rack and place the kit and the connecting screws in the accessory box.
13. If you want to return accessories or FRUs with the router, pack them as instructed in ["Pack MX10004 Components for Shipping" on page 231](#).
14. Verify that all accessories are present. See ["Compare the MX10004 Router Order to the Packing List" on page 114](#).
15. Slide the cardboard box over the router 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 114 on page 230](#).

Figure 114: Attach the MX10004 Router to the Pallet



g101055

17. Write the RMA number on the exterior of the box to ensure proper tracking.

Pack MX10004 Components for Shipping

Before you begin to pack a router component, ensure that you have the following parts and tools available:

- Antistatic bag 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 MX10004 components for shipping:

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 that 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 cannot move 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.

7

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General Safety Guidelines and Warnings

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

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

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



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

Definitions of Safety Warning Levels

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

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



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

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



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

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



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

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

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

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

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

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

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være 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 | 238](#)
- [Fire Suppression Equipment | 238](#)

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.

Varoituis Lue asennusohjeet ennen järjestelmän yhdistämistä virtälähteeseen.

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.

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.

Chassis and Component Lifting Guidelines

- Before moving the device to a site, ensure that the site meets the power, environmental, and clearance requirements.
- Before lifting or moving the device, disconnect all external cables and wires.
- As when lifting any heavy object, ensure that your legs bear most of the weight rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
- Use the following lifting guidelines to lift devices and components:
 - Up to 39.7 lb (18 kg): One person.
 - From 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
 - From 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
 - Above 121.2 lb (55 kg): Use material handling systems (such as levers, slings, lifts, and so on). When this is not practical, engage specially trained persons or systems (such as riggers or movers).

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 vältetään 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 edifício.
- 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, oerriormente 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 emitteres 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 a 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 | 249](#)
- [Class 1 Laser Product Warning | 249](#)
- [Class 1 LED Product Warning | 250](#)
- [Laser Beam Warning | 250](#)

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.

Warning! 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 | 251](#)
- [Jewelry Removal Warning | 252](#)
- [Lightning Activity Warning | 254](#)
- [Operating Temperature Warning | 255](#)
- [Product Disposal Warning | 256](#)

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 suosittama. 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 batería 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 metalically 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 metalically 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.

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 115 on page 259](#)) 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.

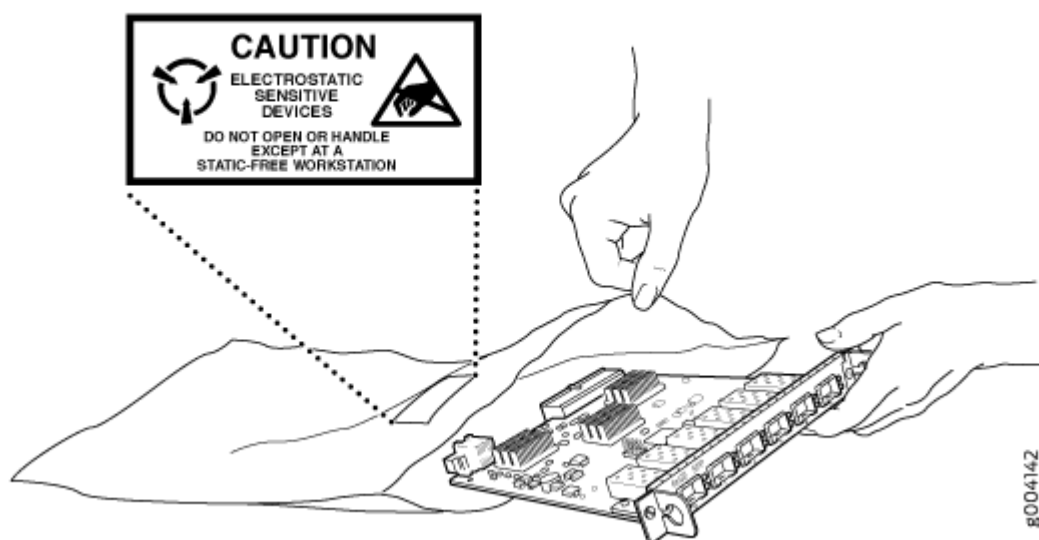
Avertissement Par mesure de sécurité, vérifiez régulièrement la résistance du bracelet antistatique. Cette valeur doit être comprise entre 1 et 10 mégohms (Mohms).

- 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 115 on page 259](#)). If you are returning a component, place it in an antistatic bag before packing it.

Figure 115: 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.

Site Electrical Wiring Guidelines

Table 55 on page 260 describes the factors you must consider while planning the electrical wiring at your site.



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

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

Table 55: Site Electrical Wiring Guidelines

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

Table 55: Site Electrical Wiring Guidelines (*Continued*)

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

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。

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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 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).

Warning! 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.

Warning! 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 yhdistettävä kytkentäjärjestys on maajohto maajohtoon, +RTN varten +RTN, -48 V varten - 48 V. Oikea irrotettava kytkentäjärjestys on -48 V varten - 48 V, +RTN varten +RTN, maajohto maajohtoon.

Avertissement Câblez l'alimentation 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 na Extremidade da fiação. Ao conectar a potência, a sequência apropriada da fiação é moída para moer, +RTN a +RTN, então -48 V a -48 V. Ao desconectar a potência, a sequência 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 aansluitpunten, 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 johdinliitääntä, esimerkiksi suljettua silmukkaa tai kourumaista liitääntä, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitääntöjen 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 forcilla 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.

Warning! 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 Kojе 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.

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.

Agency Approvals for MX10004 Routers

IN THIS SECTION

- [Compliance Statement for Argentina | 271](#)

The MX10004 routers comply with the following standards:

- Safety
 - CAN/CSA C22.2 No. 62368-1-14 and 60950-1
 - UL 62368-1 and 60950-1
 - IEC 62368-1 and 60950-1 (All country deviations): CB Scheme report
 - IEC 62368-3 for USB and PoE: CB Scheme report
 - CFR, Title 21, Chapter 1, Subchapter J, Part 1040
 - REDR c 1370 OR CAN/CSA-E 60825-1- Part 1
 - IEC 60825-1
 - IEC 60825-2
- EMC
 - FCC 47 CFR Part 15
 - ICES-003 / ICES-GEN
 - EN 300 386 V1.6.1
 - EN 300 386 V2.1.1

- EN 55032
- CISPR 32
- EN 55024
- CISPR 24
- EN 55035
- CISPR 35
- IEC/EN 61000 Series
- AS/NZS CISPR 32
- VCCI-CISPR 32
- BSMI CNS 13438
- KN32 and KN35
- KN 61000 Series
- TEC/SD/DD/EMC-221/05/OCT-16
- TCVN 7189
- TCVN 7317

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements for the MX10004 Router

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This topic describes the EMC requirements for the MX10004 routers for:

Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment

malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.



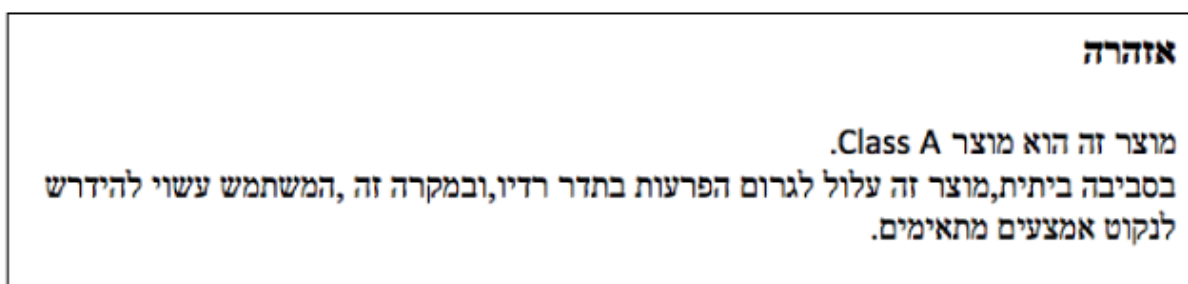
CAUTION: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

European Community

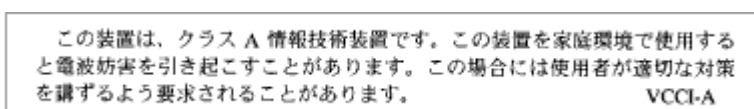
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Israel



Translation from Hebrew–Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

Japan



The preceding translates as follows:

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

VCCI-A

Korea

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 MX10004 devices have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Nonregulatory Environmental Standards

These MX10004 is designed to be Network Equipment Building System (NEBS) compliant:

Those device product SKUs are designed to meet the following NEBS compliance standards:

- GR-3160 for TELCO Data centers
- GR-1089-Core: EMC and Electrical Safety 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
 - 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).