MX204 Universal Routing Platform Hardware Guide

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MX204 Universal Routing Platform Hardware Guide

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

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Documentation Conventions

Table 1 on page xiv defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xiv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*

Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric *metric*>;**
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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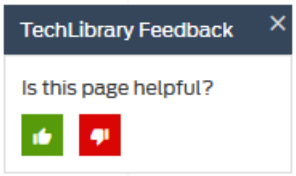

  - Click the thumbs-up icon if the information on the page was helpful to you.
  - Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.

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- Find product documentation: https://www.juniper.net/documentation/
- Find solutions and answer questions using our Knowledge Base: https://kb.juniper.net/
- Download the latest versions of software and review release notes: https://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://kb.juniper.net/InfoCenter/

- Join and participate in the Juniper Networks Community Forum: https://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: https://www.juniper.net/cm/

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://entitlementsearch.juniper.net/entitlementsearch/

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For international or direct-dial options in countries without toll-free numbers, see https://www.juniper.net/support/requesting-support.html.

CHAPTER 1

Overview

MX204 Router Overview

The Juniper Networks MX204 Universal Routing Platform is an Ethernet-optimized edge router with 400-Gbps capacity that provides both switching and carrier-class Ethernet routing. The MX204 router runs Junos operating system (Junos OS), enabling a wide range of business and residential applications and services, including high-speed transport and virtual private network (VPN) services, next-generation broadband multiplay services, and high-volume Internet data center internetworking. Each router provides full duplex, high-density Ethernet interfaces and high-capacity switching throughput and uses the Junos Trio chipset for increased scalability of Layer 2 and Layer 3 packet forwarding, buffering, and queuing.

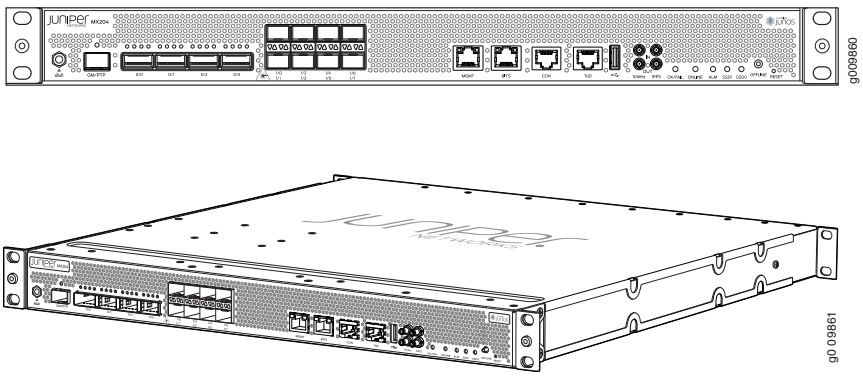
The MX204 router is compact and one rack unit (1 U) tall. Several routers can be stacked in a single floor-to-ceiling rack for increased port density per unit of floor space.

The MX204 router is a fixed-configuration router, and supports one built-in Routing Engine. The router runs on AC or DC power, with two dedicated power supply modules on each device. Cooling is handled by three fan modules.

The MX204 has four rate-selectable ports that can be configured as 100-Gigabit Ethernet ports or 40-Gigabit Ethernet ports, or each port can be configured as four 10-Gigabit Ethernet ports (by using a breakout cable). The MX204 also has eight 10-Gigabit Ethernet ports. The four rate-selectable ports support QSFP28 and QSFP+ transceivers, whereas the eight 10-Gigabit Ethernet ports support SFP+ transceivers.

Figure 1 on page 20 shows the front view of the MX204 router.

Figure 1: Front View of the MX204 Router



The MX204 router is a fixed-configuration router, and supports one built-in Routing Engine. The router runs on AC or DC power, with two dedicated power supply modules on each device. Cooling is handled by three fan modules. Table 3 on page 20 shows the components supported on the router.

Table 3: MX204 Router Components

Component	Description
Power supply module	2
Fan module	3

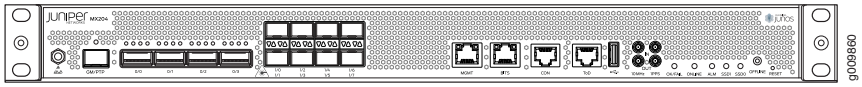
MX204 Chassis

- MX204 Chassis Description on page 20
- MX204 Component Redundancy on page 23
- MX204 Field-Replaceable Units on page 23
- MX204 Hardware Components and CLI Terminology on page 24
- MX204 Front and Rear Panel Components on page 25
- Alarm LEDs on the MX204 Front Panel on page 25

MX204 Chassis Description

The router chassis is a rigid sheet metal structure that houses all the other router components. Figure 2 on page 21 shows the front of the fully configured chassis. The chassis measures 1.72 in. (4.37 cm) high, 19 in. (48.26 cm) wide, and 18.5 in. (47.0 cm) deep. You can install the router chassis in standard 760-mm deep (or larger) enclosed cabinets, 19-in. equipment racks, or telco open-frame racks. The total weight of fully loaded router is 22.7 lb (10.3 kg). For more information, see "MX204 Router Physical Specifications" on page 44.

Figure 2: Front View of the MX204 Router



The MX204 has four rate-selectable ports that can be configured as 100-Gigabit Ethernet ports or 40-Gigabit Ethernet ports, or each port can be configured as four 10-Gigabit Ethernet ports (by using a breakout cable). The MX204 also has eight 10-Gigabit Ethernet ports. The four rate-selectable ports support QSFP28 and QSFP+ transceivers, whereas the eight 10-Gigabit Ethernet ports support SFP+ transceivers.

Starting in Junos OS Release 18.3R1, you can use the Mellanox 10-Gbps pluggable adapter (QSFP+ to SFP+ adapter or QSA; model number: MAM1Q00A-QSA) to convert four lane-based ports to a single lane-based SFP+ port. The QSA adapter has the QSFP+ form factor with a receptacle for the SFP+ module. Use the QSA adapter to convert a 40-Gbps port to a 10-Gbps or a 1-Gbps port.

NOTE:

- The interface name prefix must be xe.
- Rate selectability at PIC level and port level does not support 1-Gbps speed.
- For the link to come up, you must configure the no-auto-neg statement on the egress interface.

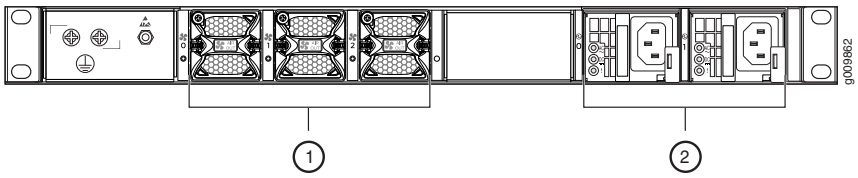
The following optics are supported with the QSA adapter:

- EX-SFP-10GE-SR
- QFX-SFP-10GE-SR
- SRX-SFP-10GE-SR
- EX-SFP-10GE-LR
- QFX-SFP-10GE-LR
- SRX-SFP-10GE-LR
- SFPP-10GE-LRM
- SRX-SFP-10GE-LRM
- EX-SFP-10GE-LRM
- EX-SFP-10GE-ER
- QFX-SFP-10GE-ER
- SRX-SFP-10GE-ER
- SFPP-10GE-SR

- SFPP-10GE-ZR
- SFPP-10GE-ER
- SFPP-10GE-LR
- SFPP-10GE-ER-XT
- SFP-1GE-LX
- SFP-1GE-SX
- SFP-1GE-T

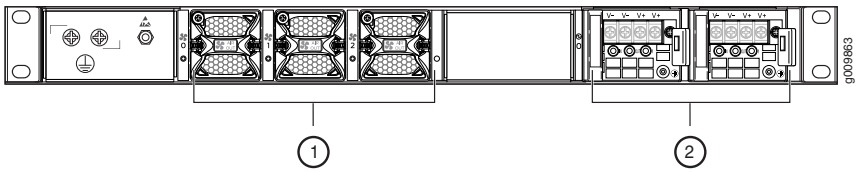
The router comes in two variants–AC-powered and DC-powered. Figure 3 on page 22 and Figure 4 on page 22 shows the rear of the fully configured chassis.

Figure 3: Rear View of the AC-Powered MX204 Router



1—Fan modules	2—Power supply modules (AC)

Figure 4: Rear View of the DC-Powered MX204 Router

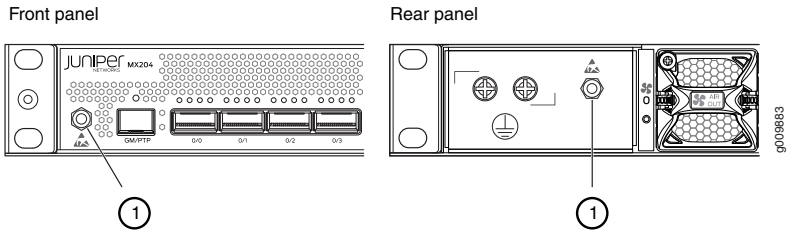


1—Fan modules	2—Power supply modules (DC)

The electrostatic discharge (ESD) points on the router are located both on the front and on the rear of the chassis. Figure 5 on page 23 shows the electrostatic discharge (ESD) point on the router.

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

Figure 5: ESD Points on the MX204 Router



1— ESD points	

MX204 Component Redundancy

A fully configured router is designed so that at no single point of failure can cause the entire system to fail. Only a fully configured router provides complete redundancy. All other configurations provide partial redundancy. The following major hardware components are redundant:

- Power supplies—The router supports two power supply modules. The MX204 router provides 1+1 redundancy for the system. Both AC and DC systems can withstand the failure of a single power supply without system interruption in 1+1 redundancy mode. If one power supply fails in a fully redundant system, the other power supply can provide full power to the router indefinitely.
- Cooling system—The cooling system has a total of three fan modules, which are controlled and monitored by the host subsystem. A fully configured router needs all the fan modules to operate normal. The fan modules are at the rear and are used to cool the router. If a fan fails or the temperature of the chassis rises above the temperature threshold, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range.

CAUTION: **For a fully configured router, all the three fan modules and the two power supply modules must be operational, and in the event of any module failure the failed module must be replaced immediately.**

See Also

- Locating the Serial Number on an MX204 Router or Component on page 112
- Guidelines for Packing Hardware Components for Shipment on page 115
- *Returning a Hardware Component to Juniper Networks, Inc.*

MX204 Field-Replaceable Units

Field-replaceable units (FRUs) are router components that can be replaced at the customer site. Replacing most FRUs requires minimal router downtime. The router uses the following types of FRUs:

- Power supply modules (if redundant)

- Fan modules (if redundant)
- Transceiver modules

See Also
- Replacing an MX204 AC Power Supply on page 103
- Replacing an MX204 DC Power Supply on page 105
- Replacing an MX204 Fan Module on page 100

MX204 Hardware Components and CLI Terminology

The MX204 router support the components in Table 4 on page 24, listed in alphabetic order.

Table 4: MX204 Router Hardware Components and CLI Terminology

Component	Hardware Model Number	CLI Name	Description
Chassis	MX204	**JNP204 [MX204]**	"MX204 Chassis Description" on page 20
Cooling system			"MX204 Cooling System Description" on page 26
Fan module	JNP-FAN-1RU	**Fan Tray, Front to Back Airflow - AFO**	
Power system components			"MX204 Power System Description" on page 29
Power supply module	• JPSU-650W-AC-AO • JPSU-650W-DC-AFO	• **AC AFO 650W PSU** • **DC AFO 650W PSU**	
MIC	N/A (built-in)	**PIC**	N/A
MPC	N/A (built-in)	**FPC**	N/A
Routing Engine	N/A (built-in)	**RE-S-2X00x6**	N/A
Transceiver	See *MX Series Interface Module Reference*.	**Xcvr**	Hardware Compatibility Tool

Table 5 on page 24 lists the spare parts and blank panels available for the router.

Table 5: MX204 Spare Parts and Blank Panels

Model Number	Description
JNP204-CHAS	MX204 chassis, spare
JNP-PWR-BLNK-1	MX204 power blank cover panel

MX204 Front and Rear Panel Components

Front Panel Components

The front panel on the front of the router enables you to view status and troubleshooting information at a glance. The front panel contains LEDs for the router components, online/offline and reset buttons, auxiliary and console ports, clocking ports, and interface ports. "MX204 Chassis Description" on page 20 shows the front of the fully configured chassis.

Rear Panel Components

The rear panel of the router has slots for the power supply modules and fan modules. The power and fan modules are installed from the rear of the router. "MX204 Chassis Description" on page 20 and "MX204 Chassis Description" on page 20 shows the rear of the fully configured chassis.

Table 6 on page 25 lists the components on the rear panel of the MX204 router.

Table 6: Rear Panel Components in a Fully Configured MX204 Router

Component	Slots	Number of FRUs
Power supply module	0 and 1	2
Fan module	0 through 2	3

Alarm LEDs on the MX204 Front Panel

One alarm LED—labeled **ALM**—is located on the front panel of the router. A red light indicates a critical condition that can result in a system shutdown, and a yellow light indicates a less severe condition that requires monitoring or maintenance.

Table 7 on page 25 describes the alarm LED in more detail.

Table 7: Alarm LED on the MX204 Front Panel

Shape	Color	Description
	Red	Critical alarm—Indicates a critical condition that can cause the router to stop functioning. Possible causes include component removal, failure, or overheating.
	Yellow	Warning alarm—Indicates a serious but nonfatal error condition, such as a maintenance alert or a significant increase in component temperature.

See Also

- Routine Maintenance Procedures for MX204 Routers on page 93

MX204 Cooling System

MX204 Cooling System Description

The cooling system components work together to keep all router components within the acceptable temperature range.

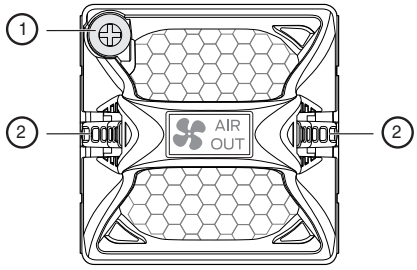
The cooling system consists of the following features and components:

Fan Trays

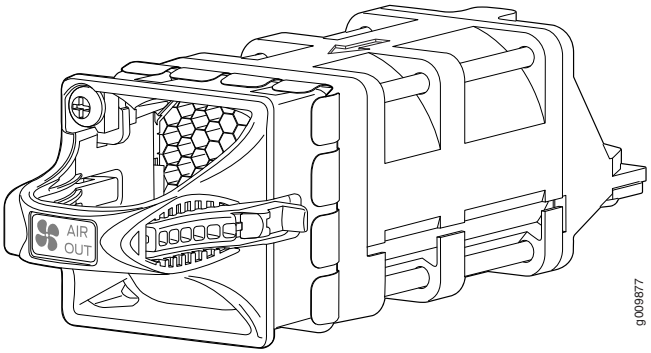
The chassis monitors the temperature of the router components. When the router is operating normally, the fans function at lower than full speed. If a fan fails or the ambient temperature rises above a threshold, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range. If the ambient maximum temperature specification is exceeded and the system cannot be adequately cooled, the Routing Engine shuts down the system by disabling output power from each power supply.

The router has three fan modules (or fan trays) that install in the rear of the router. Each fan modules contain one counter-rotating fan. The fan modules are hot-insertable and hot-removable field-replaceable units (FRUs) (see Figure 6 on page 27).

Figure 6: Fan Module



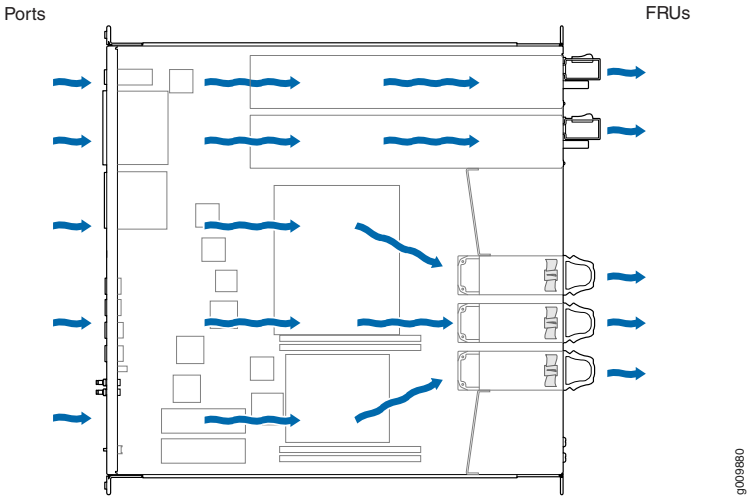
1—Captive screw	2—Latch



Airflow

The router has front-to-back (AIR OUT) cooling system (see Figure 7 on page 27). Air is pulled through the front the chassis toward the fan tray, where it is exhausted out of the system.

Figure 7: Airflow Through the Router



Power Supply Cooling System

The power supply modules are self-cooling and are located in the rear of the router. Each power supply module has it's own built-in fan that cools the power supply module. The exhaust for the power supply modules are also located on the rear of the chassis.

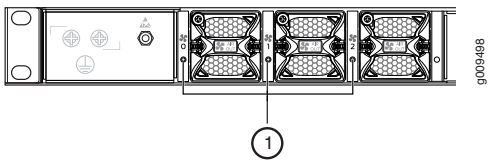
See Also

- Maintaining the MX204 Fan Module on page 99
- Maintaining the MX204 Power Supplies on page 102
- Maintaining the MX204 Routing Engine on page 93
- Replacing an MX204 AC Power Supply on page 103
- Replacing an MX204 DC Power Supply on page 105
- Replacing an MX204 Fan Module on page 100
-

MX204 Fan Status LED

The MX204 fan module does not have any LED—the fan status LEDs are located on the MX204 chassis. Figure 8 on page 28 shows the fan status LEDs.

Figure 8: Fan Status LEDs on the Router



1— Fan status LEDs	

The fan status LED is a bicolor LED. Table 8 on page 28 describes the behavior of the fan status LED.

Table 8: Fan Status LED

Color	State	Description
Green	Blinking	Fan module hardware initialization is complete and software initialization is pending.
	On steadily	Software initialization is complete and the fan is functioning normally.
Red	On steadily	Fan module is faulty and not functioning normally.
–	Off	Fan module not present

See Also

- Replacing an MX204 Fan Module on page 100

- Maintaining the MX204 Fan Module on page 99

MX204 AC Power System

- MX204 Power System Description on page 29
- MX204 Power Supply Module LEDs on page 31
- MX204 Router AC Power Specifications on page 33
- AC Power Circuit Breaker Requirements for the MX204 Router on page 34
- AC Power Cord Specifications for MX204 Routers on page 34

MX204 Power System Description

The MX204 is powered using either AC or DC power. It supports two power supply modules (PSMs) located at the rear of the chassis in slots **0** and **1**. Figure 9 on page 30 and Figure 10 on page 30 show the MX204 PSMs. The AC or DC power supply modules directly plug on to main board and are placed on the right side of the rear chassis. Each power supply has a handle, an ejector lever, and status LEDs. The power supply modules connect to the PSM board, which distributes the different output voltages produced by the power supply modules to the router components, depending on their voltage requirements. When both the power supply modules are present, they share power almost equally within a fully populated system. If the first power supply in a redundant configuration fails or is removed, the second power supply assumes the entire electrical load without interruption. A single power supply provides the maximum configuration with full power for as long as the router is operational. A second power supply can be installed for redundancy. The chassis is designed to support 1+1 feed redundancy.

Redundant power supply is hot-removable and hot-insertable. If you remove a power supply from a router that uses only one power supply, then the router shuts down.

CAUTION: **Do not mix AC and DC power supply modules in the same chassis.**

NOTE: **Routers configured with only one power supply are shipped with a blank panel installed over the power supply slot that is not populated.**

The power supply modules are cooled by its own internal cooling system. A fan present in the power supply module monitors and maintains the temperature inside.

- AC Power Supply Description on page 29
- DC Power Supply Description on page 30

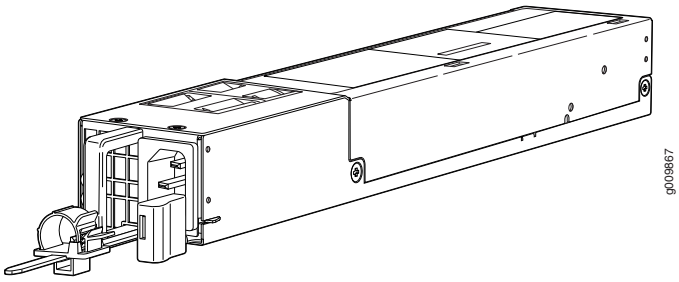
AC Power Supply Description

Each AC power supply weighs approximately 2.2 lb (1 kg) and consists of a handle, an ejector lever, an AC appliance inlet, a fan, and status LEDs to monitor the status of the power supply. Figure 9 on page 30 shows the AC power supply.

Each inlet requires a dedicated AC power feed and a dedicated customer-site circuit breaker. We recommend that you use a minimum 20 A (110 VAC) or 16 A (220 VAC) customer-site circuit breaker, or as required by local code.

WARNING: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal (sized for 10–32 screws) provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth.

Figure 9: AC Power Supply

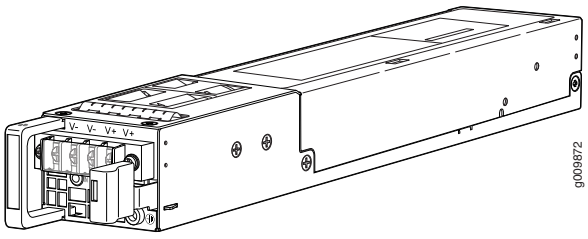


DC Power Supply Description

Each DC power supply weighs approximately 2.2 lb (1 kg) and consists of a handle, an ejection lever, status LEDs, and a terminal block that provides a single DC input (–48 VDC and return) that requires a dedicated customer site circuit breaker. We recommend that you use a dedicated customer-site circuit breaker rated for 25 A (–48 VDC) minimum, or as required by local code.

Figure 10 on page 30 shows the DC power supply.

Figure 10: DC Power Supply



See Also

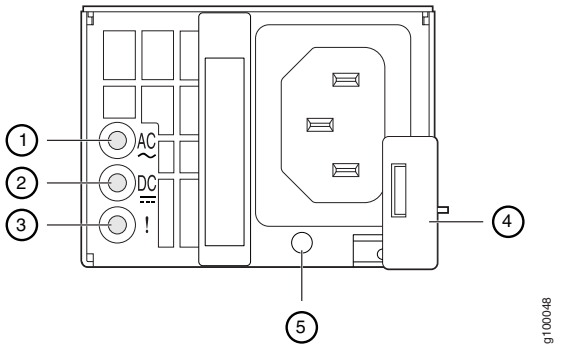
- Maintaining the MX204 Power Supplies on page 102

MX204 Power Supply Module LEDs

AC Power Supply Module LEDs

Figure 11 on page 31 shows the AC power supply module components along with the status LEDs.

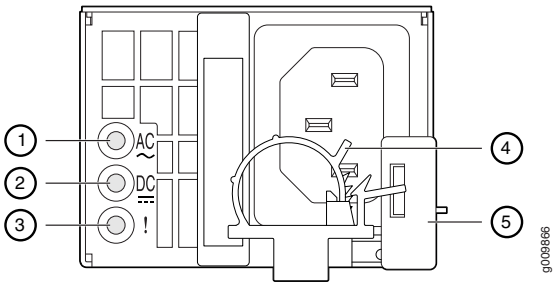
Figure 11: AC Power Supply Module LEDs and Components



1—Input status LED	4—Ejector lever
2—Output status LED	5—AC power cord retainer port
3—Fault LED	

Figure 12 on page 31 shows the AC power supply module components with the AC power cord retainer along with the status LEDs.

Figure 12: AC Power Supply Module LEDs and Components—with the AC Power Cord Retainer



1—Input status LED	4—AC power cord retainer installed
2—Output status LED	5—Ejector lever
3—Fault LED	

Table 9 on page 32 describes the LEDs on the AC power supply modules.

Table 9: AC Power Supply Module LEDs

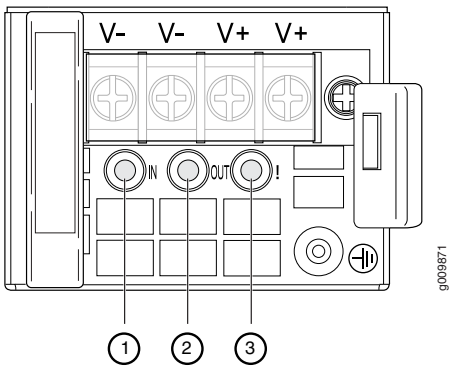
Label	Color	State	Description
AC OK	Unlit	Off	The power supply is disconnected from power source, or the power supply is not receiving power.
	Green	On steadily	Power supply is receiving power.
DC OK	Unlit	Off	Power supply output is off.
	Green	On steadily	The power supply is sending out power correctly.
! (Fault)	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

NOTE: If the AC OK LED and the DC OK LED are unlit, either the AC power cord is not installed properly or the power supply fuse has failed. If the AC OK LED is lit and the DC OK LED is unlit, the AC power supply is installed properly, but the power supply has an internal failure.

DC Power Supply Module LEDs

Figure 13 on page 32 shows the DC power supply modules status LEDs.

Figure 13: DC Power Suppy Module LEDs



1—Input LED	3—Fault LED
2—Output LED	

CAUTION: On the DC power supply, the V+ terminals are shunted internally together, as are the V– terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Table 10 on page 33 describes the LEDs on the DC power supply modules.

Table 10: DC Power Supply Module LEDs

Label	Color	State	Description
IN (Input)	Unlit	Off	The power supply is disconnected from power source, or the power supply is not receiving power.
	Green	On steadily	Power supply is receiving power.
OUT (Output)	Unlit	Off	Power supply output is off.
	Green	On steadily	The power supply is sending out power correctly.
! (Fault)	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

See Also

- Routine Maintenance Procedures for MX204 Routers on page 93
- Maintaining the MX204 Power Supplies on page 102

MX204 Router AC Power Specifications

Table 11 on page 33 lists the AC power system electrical specifications.

Table 11: AC Power System Electrical Specifications

Item	Specification
AC input voltage	Operating range: 100 through 240 VAC
AC input line frequency	50 through 60 Hz (nominal)
AC system current rating	3.2 A @ 100 VAC 1.37 A @ 240 VAC
AC system input power	312 W

Table 12 on page 33 lists the AC power supply electrical specifications.

Table 12: AC Power Supply Electrical Specifications

Item	Specification
Maximum output power	650 W

Table 12: AC Power Supply Electrical Specifications (continued)

Item	Specification
AC input voltage	Operating range: 100 through 127 VAC 200 through 240 VAC
AC input line frequency	50 to 60 Hz (nominal)
AC input current rating	7.8 A @ 100 VAC 3.8 A @ 240 VAC

See Also

- Maintaining the MX204 Power Supplies on page 102

AC Power Circuit Breaker Requirements for the MX204 Router

We recommend that you use a dedicated customer-site circuit breaker rated for 20 A (110 VAC) minimum or 16 A (220 VAC) minimum for each AC power feed, or as required by local code. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure.

See Also

- Replacing an MX204 AC Power Supply on page 103
- Power Consumption for an AC-Powered MX204 Router on page 56
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

AC Power Cord Specifications for MX204 Routers

A detachable AC power cord is supplied with the AC power supply modules. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

CAUTION: The AC power cord provided with each power supply is intended for use with that power supply only and not for any other use.

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

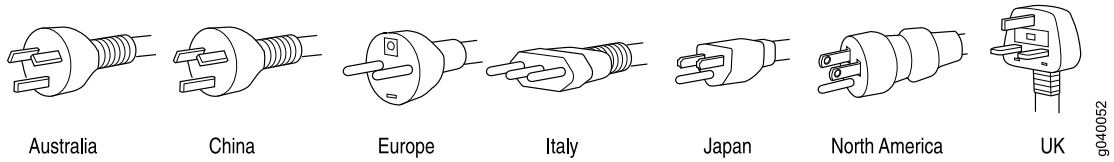
Table 13 on page 35 gives the AC power cord specifications for the countries and regions listed in the table.

Table 13: AC Power Cord Specifications

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR
China	250 VAC, 10 A, 50 Hz	GB 1002-1996 Type PRC/3	CBL-EX-PWR-C13-CH
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C13-EU
India	250 VAC, 10 A, 50 Hz	IS 1293 Type IND/3	CBL-EX-PWR-C13-IN
Israel	250 VAC, 10 A, 50 Hz	SI 32/1971 Type IL/3G	CBL-EX-PWR-C13-IL
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-EX-PWR-C13-IT
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	SS-00259 Type VCTF	CBL-EX-PWR-C13-JP
Korea	250 VAC, 10 A, 50 Hz or 60 Hz	CEE (7) VII Type VIIGK	CBL-EX-PWR-C13-KR
North America	125 VAC, 13 A, 60 Hz	NEMA 5-15 Type N5-15	CBL-EX-PWR-C13-US
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/13	CBL-EX-PWR-C13-SA
Switzerland	250 VAC, 10 A, 50 Hz	SEV 6534-2 Type 12G	CBL-EX-PWR-C13-SZ
Taiwan	125 VAC, 11 A and 15 A, 50 Hz	NEMA 5-15P Type N5-15P	CBL-EX-PWR-C13-TW
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C13-UK

Figure 14 on page 36 illustrates the plug on the power cord for some of the countries or regions listed in Table 13 on page 35.

Figure 14: AC Plug Types



See Also

- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

MX204 DC Power System

- MX204 Router DC Power Specifications on page 36
- DC Power Circuit Breaker Requirements for the MX204 Router on page 37
- DC Power Source Cabling for MX204 Router on page 37
- DC Power Cable Specifications for MX204 Router on page 38

MX204 Router DC Power Specifications

Table 14 on page 36 lists the DC power system electrical specifications.

Table 14: DC Power System Electrical Specifications

Item	Specification
DC input voltage	Operating range: –40 through –72 VDC
DC system input current rating	20 A @ –44 VDC (maximum)
DC system input power	331 W 7.75 A @ –44 VDC

Table 15 on page 36 lists the DC power supply electrical specifications.

Table 15: DC Power Supply Electrical Specifications

Item	Specification
Maximum output power	650 W
DC input voltage	Minimum: –40 VDC Nominal: –48 VDC, –60 VDC Operating range: –40 to –72 VDC
DC input current rating	20 A @ –44 VDC

See Also
- Maintaining the MX204 Power Supplies on page 102
- Replacing an MX204 DC Power Supply on page 105

DC Power Circuit Breaker Requirements for the MX204 Router

Each DC power supply has a single DC input (–48 VDC and return) that requires a dedicated circuit breaker. We recommend that you use a dedicated customer-site circuit breaker rated for 25 A (–48 VDC) minimum, or as required by local code. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure.

If you plan to operate a DC-powered router at less than the maximum configuration and do not provision a 25 A (–48 VDC) circuit breaker, we recommend that you provision a dedicated customer-site circuit breaker for each DC power supply rated for at least 125 percent of the continuous current that the system draws at –48 VDC.

See Also
- Replacing an MX204 DC Power Supply on page 105
- Power Consumption for a DC-Powered MX204 Router on page 57
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

DC Power Source Cabling for MX204 Router

The DC power supply in **PS0** must be powered by a dedicated power feed derived from feed **A**, and the DC power supply in **PS1** must be powered by a dedicated power feed derived from feed **B**. This configuration provides the commonly deployed **A/B** feed redundancy for the system.

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

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

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

See Also
- Replacing an MX204 DC Power Supply on page 105

- Power Consumption for a DC-Powered MX204 Router on page 57
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

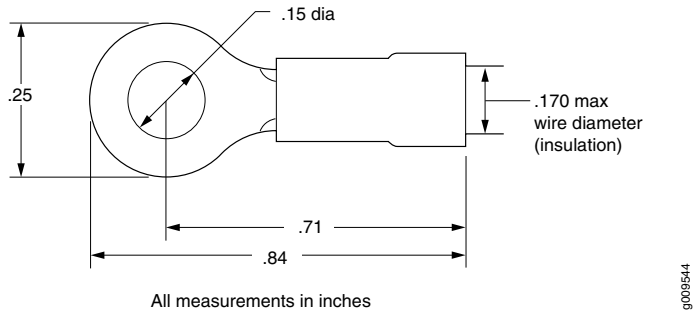
DC Power Cable Specifications for MX204 Router

- DC Power Cable Lug Specifications on page 38
- DC Power Cable Specifications on page 38

DC Power Cable Lug Specifications

The accessory box shipped with the router includes the cable lugs that attach to the terminal of each power supply.

Figure 15: DC Power Cable Lug



CAUTION: Before router installation begins, 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.

DC Power Cable Specifications

You must supply four DC power cables that meet the following specifications: 12-AWG (2.5 mm^2), minimum 60º C wire, or as required by the local code.

See Also

- Replacing an MX204 DC Power Supply on page 105
- Power Consumption for a DC-Powered MX204 Router on page 57

MX204 Host Subsystem

- MX204 Routing Engine Description on page 39
- MX204 Routing Engine LEDs on page 41

MX204 Routing Engine Description

The host subsystem provides routing protocol processes, as well as software processes that control the router's interface, the chassis components, system management, and user access to the router. These routing processes run on top of a kernel that interacts with the Packet Forwarding Engine. The MX204 host subsystem consists of a single built-in Routing Engine.

This topic covers:

Routing Engine Functions

The Routing Engine is built-in on the MX204 baseboard and cannot be replaced. The Routing Engine performs all route-processing functions, and provides performs chassis control and management plane functionality. The Routing Engine also provides control plane functions.

The Routing Engine supports the following functionalities to manage the operation of the router:

- System control functions such as environmental monitoring
- Routing Layer 2 and Layer 3 protocols
- Communication to components such as line cards, power supply, and cooling system
- Transparent clocking
- Alarm and logging functions

Routing Engine Components

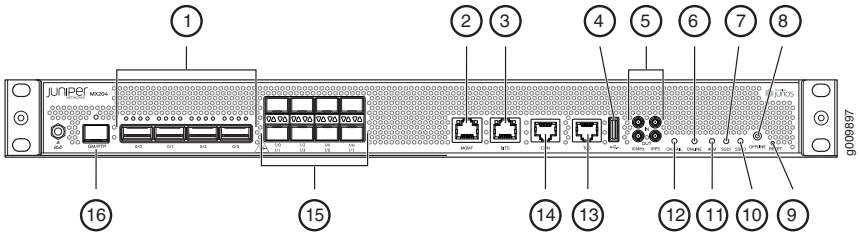
The Routing Engine consists of the following internal components:

- High-performance 1.6-GHz Intel 8 Core X86 CPU
- 32-GB DDR4 RAM
- 100-GB SATA SSD

Routing Engine Front Panel

Figure 16 on page 40 shows the front panel of the MX204 chassis.

Figure 16: MX204 Ports



1—Rate-selectable ports	9—**RESET** button
2—Management (**MGMT**) port	10—**SSD0** LED
3—**BITS** port with LEDs	11—Alarm (**ALM**) LED
4—USB port	12—**OK/FAIL** LED
5—**1PPS** and **10MHz** GPS input and output ports	13—Time of day (**ToD**) port with LEDs (This port is reserved for future use)
6—**ONLINE** LED	14—Console (**CON**) port
7—**SSD1** LED	15—10-Gigabit Ethernet SFP+ ports
8—**OFFLINE** button	16—PTP grandmaster clock (**GM/PTP**) port

Routing Engine Interface Ports

The ports located on the router connect the Routing Engine to one or more external devices on which system administrators can issue Junos OS CLI commands to manage the router. In addition, ports to connect external clock interfaces for BITS and GPS function are also available on the router.

The Routing Engine interface ports with the indicated labels function are as follows (see Figure 16 on page 40):

- **CON**—Connects the Routing Engine to a system console through a serial cable with an RJ-45 connector.
- **MGMT**—Connects the Routing Engine through an Ethernet connection to a management LAN (or any other device that plugs into an Ethernet connection) for out-of-band management. The port uses an autosensing RJ-45 connector to support 10-Mbps, 100-Mbps, or 1000-Mbps connections. Two small LEDs on the port indicate the connection in use: the LED flashes yellow or green for a 10-Mbps, 100-Mbps, or 1000-Mbps connection, and the LED is lit green when traffic is passing through the port.
- **BITS**—Building-integrated timing supply (BITS) external clocking interface for connecting to external clocking devices.
- **ToD**—Time-of-day (TOD) port on the front panel of the router that enables you to connect external timing signal sources.

NOTE: This port is reserved for future use.

- **10MHZ** (one input and one output)—The 10-MHz timing connectors on the front panel of the router that connect to external clock signal sources. The clocking ports provide the synchronized output clocks from any one of the reference clock inputs based on the clock's priority.
- **PPS** (one input and one output)—1-pulse-per-second (PPS) connectors on the front panel of the router that connect to external clock signal sources. The clocking ports provide the synchronized output clocks from any one of the reference clock inputs based on the clock's priority.
- USB—Provides a removable media interface through which you can install Junos OS manually. Junos OS supports USB version 1.0 and later.

See Also

- RJ-45 Connector Pinouts for MX Series CB-RE or RCB Auxillary and Console Ports on page 55
- RJ-45 Connector Pinouts for an MX Series CB-RE or RCB Management Port on page 55
- MX204 Chassis Description on page 20

MX204 Routing Engine LEDs

The Routing Engine is built-in on the MX204 and is attached to the baseboard and cannot be replaced. The status of the Routing Engine is displayed by the **ONLINE** and **OK/FAIL** LEDs on the front panel of the MX204 chassis.

Table 16 on page 41 describes the functions and LEDs on the MX204 router.

NOTE: The functioning of the MX204 router is controlled by the Routing Engine, and the LEDs present on the front panel of the router displays the status and functioning of the MX204 router.

Table 16: MX204 LEDs

Label	Color	State	Description
ONLINE	Green	On steadily	Both Junos OS and Linux are successfully loaded on the router.
		Blinking	Router is starting Junos OS.
	Red	On steadily	Router has loaded Linux.
		Blinking	Router is starting Linux.
	–	Off	Router is offline.

Table 16: MX204 LEDs (continued)

Label	Color	State	Description
OK/FAIL	Green	On steadily	Router is functioning normally.
	Red	Blinking	Router has failed.
	–	Off	Router is not powered on.
ALM	Red	On steadily	Critical alarm—Indicates a critical condition that can cause the router to stop functioning. Possible causes include component failure, or any major software failure.
	Yellow	On steadily	Warning alarm—Indicates a serious but nonfatal error condition, such as a maintenance alert or a significant increase in component temperature.
	–	Off	There is no alarm.
SSD0	Green	Blinking	SSD0 is being accessed by the router.
	–	Off	SSD0 is not active or not being accessed.
SSD1	Green	Blinking	SSD1 is being accessed by the router.
	–	Off	SSD1 is not active or not being accessed.
BITS	Green	On Steadily (Activity LED; left)	When there is no loss (BITS is in locked state).
	–	Off (Activity LED; left)	When there is loss of signal or loss of line.
	Amber	On steadily (Link LED; right)	When there is loss of signal or loss of line.
	–	Off (Link LED; right)	When there is no loss (BITS is in locked state).

CHAPTER 2

Site Planning, Preparation, and Specifications

MX204 Site Preparation Checklist

The checklist in Table 17 on page 43 summarizes the tasks you must perform when preparing a site for router installation.

Table 17: MX204 Site Preparation Checklist

Item or Task	For More Information	Performed by	Date
Environment			
Verify that environmental factors such as temperature and humidity do not exceed router tolerances.	"MX204 Router Environmental Specifications" on page 45		
Power			
Locate sites for connection of system grounding.	"MX204 Router Grounding Specifications" on page 46		
Measure distance between external power sources and router installation site.	"MX204 Router DC Power Specifications" on page 36 "MX204 Router AC Power Specifications" on page 33		
Calculate the power consumption and requirements.	"Power Consumption for a DC-Powered MX204 Router" on page 57 "Power Consumption for an AC-Powered MX204 Router" on page 56		

Table 17: MX204 Site Preparation Checklist (continued)

Item or Task	For More Information	Performed by	Date
Rack			
Select the type of rack or cabinet.	"MX204 Router Rack Requirements" on page 49 "MX204 Router Cabinet Requirements and Specifications" on page 47		
Plan rack or cabinet location, including required space clearances.	"MX204 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 49		
If a rack is used, secure rack to floor and building structure.	"MX204 Router Rack Requirements" on page 49		
Cables			
Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.	"Calculating Power Budget and Power Margin for Fiber-Optic Cables" on page 51		

Related Documentation

- MX204 Installation Overview on page 61
- Tools Required to Install the MX204 Chassis in Rack on page 65
- Installing the MX204 Chassis in a Rack on page 65

MX204 Site Guidelines and Requirements

- MX204 Router Physical Specifications on page 44
- MX204 Router Environmental Specifications on page 45
- MX204 Router Grounding Specifications on page 46
- MX204 Router Cabinet Requirements and Specifications on page 47
- MX204 Router Clearance Requirements for Airflow and Hardware Maintenance on page 49
- MX204 Router Rack Requirements on page 49

MX204 Router Physical Specifications

Table 18 on page 45 summarizes the physical specifications for the router.

Table 18: Router Physical Specifications

Description	Weight	Width	Depth	Height
Chassis fully loaded with all FRUs	AC-powered chassis: 22.7 lb (10.3 kg)	19 in. (48.26 cm)	18.50 in. (47.0 cm) 20.43 in. (51.89 cm) with fan and power handles	1.72 in. (4.37 cm; 1 U)
Fan tray	1.5 lb (0.68 kg)	1.89 in. (4.8 cm)	5.78 in. (14.68 cm)	1.64 in. (4.17 cm)
AC power supply	2.2 lb (1 kg)	2.23 in. (5.66 cm)	14.50 in. (36.83 cm)	1.58 in. (4.01 cm)
DC power supply	2.2 lb (1 kg)	2.23 in. (5.66 cm)	14.53 in. (36.91 cm)	1.67 in. (4.24 cm)

See Also
- MX204 Router Overview on page 19
- MX204 Chassis Description on page 20

MX204 Router Environmental Specifications

Table 19 on page 45 specifies the environmental specifications required for normal router operation. In addition, the site should be as dust-free as possible.

Table 19: Router Environmental Specifications

Description	Value
Altitude	No performance degradation up to 10,000 ft (3048 m)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing
Temperature	• Normal operation ensured in temperature range of 32°F (0°C) through 104°F (40°C) • Short-term operation ensured in temperature range of 23° F (–5° C) through 131° F (55° C). NOTE: As defined in NEBS GR-63-CORE, Issue 4, short-term events can be up to 96 hours in duration but not more than 15 days per year. • Nonoperating storage temperature in shipping container: –40°F (–40°C) through 158°F (70°C)
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements
Maximum thermal output	1705 BTU/hour (500 W)

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

See Also

- Routine Maintenance Procedures for MX204 Routers on page 93
- *General Safety Guidelines for Juniper Networks Devices*
- General Safety Warnings for Juniper Networks Devices on page 120

MX204 Router Grounding Specifications

Grounding Points Specifications

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the router must be adequately grounded before power is connected. To ground AC-powered and DC-powered routers, you must connect a grounding cable to earth ground and then attach it to the chassis grounding points by using the two screws provided.

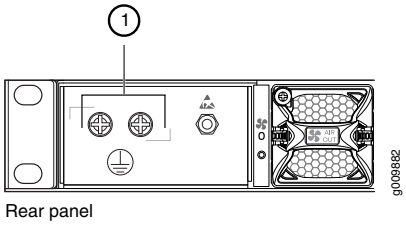
Figure 17 on page 46 shows the grounding point location on the router.

A protective earthing terminal bracket is required for connecting the chassis to earth ground. This two-holed bracket attaches on the side of the chassis through the mounting rail and provides a protective earthing terminal for the router. The grounding points are studs sized for 10–32 screws. The 10–32 screws are provided with the MX204 router. The grounding points are spaced at 0.75-in. (19.1-mm) centers.

Two threaded holes are provided on the rear left side of the chassis for connecting the router to earth ground. The grounding points fit 10–32 screws.

NOTE: Additional grounding is provided to an AC-powered router when you plug its power supply modules into grounded AC power receptacles.

Figure 17: Grounding Points on the Router



Grounding Cable Lug Specifications

You must provide one grounding cable lug that attaches to the grounding cable and 10–32 screws used to secure the grounding cable to the grounding points.

CAUTION: Before router installation begins, 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.

Grounding Cable Specifications

The grounding lug required is a Panduit LCD10-10A-L or equivalent (not provided). The grounding lug accommodates 12 AWG (2.5 mm^2) stranded wire. The grounding cable that you provide for the chassis must be the same size or heavier than the input wire of each power supply module. Minimum recommendations are 12 AWG (2.5 mm^2) stranded wire, 60° C wire, or as permitted by local code.

See Also

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Prevention of Electrostatic Discharge Damage on page 138
- MX204 Router AC Power Specifications on page 33
- MX204 Router DC Power Specifications on page 36

MX204 Router Cabinet Requirements and Specifications

Table 20 on page 47 summarizes cabinet requirements and specifications for the MX204 router.

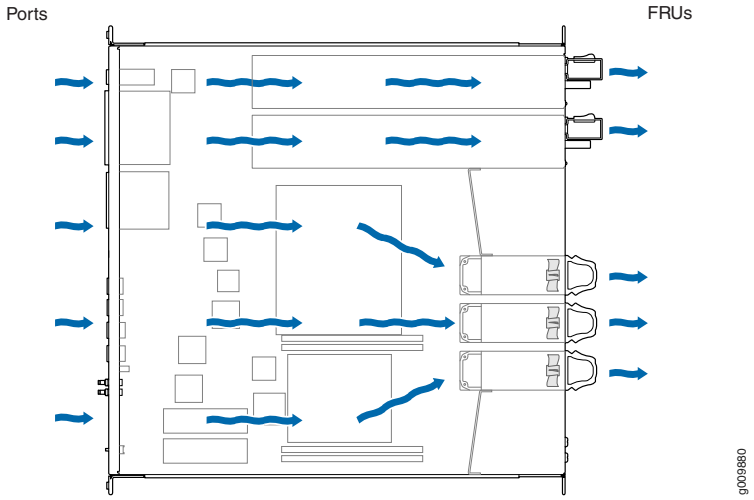
Table 20: Cabinet Requirements and Specifications for an MX204 Router

Cabinet Requirement	Guidelines for the MX204 Router
Cabinet size and clearance	• The minimum-sized cabinet that can accommodate the router is 19-in. (482-mm) wide, and 23.62-in. (600-mm) deep. A cabinet larger than the minimum requirement provides better airflow and reduces the chance of overheating. If you provide adequate cooling air and airflow clearance, you can stack several routers in a cabinet that has sufficient usable vertical space. Each router requires 1 U. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronic Components Industry Association (ECIA) (http://www.ecianow.org). • With adequate cooling air and airflow clearance, you can stack multiple MX204 routers in a cabinet with a four-post rack. In all cases, the rack must meet the strength requirements to support the weight. • The minimum total clearance inside the cabinet is 30.7 in. (780 mm) between the inside of the front door and the inside of the rear door.

Table 20: Cabinet Requirements and Specifications for an MX204 Router (continued)

Cabinet Requirement	Guidelines for the MX204 Router
Cabinet airflow requirements	When you install the router in a cabinet, you must ensure that ventilation through the cabinet is sufficient to prevent overheating. Consider the following requirements to when planning for chassis cooling: • Airflow must always be from front to back with respect to the rack. If the device has side to rear airflow, then provisions must be made to ensure that fresh air from the front of the rack is supplied to the inlets, and exhaust exits from the rear of the rack. The device must not interfere with the cooling of other systems in the rack. Fillers must be used as appropriate in the rack to ensure there is no recirculation of heated exhaust air back to the front of the rack. Care must also be taken around cables to ensure no leakage of air in situations where recirculation might result. • Ensure that the cabinet allows the chassis hot exhaust air to exit from the cabinet without recirculating into the router. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust. For an illustration of chassis airflow, see Figure 18 on page 48. • Ensure that the cool air supply you provide through the cabinet can adequately dissipate the thermal output of the router. • Route and dress all cables to minimize the blockage of airflow to and from the chassis. • Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the router and rack as specified in "MX204 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 49. • Install the router as close as possible to the front of the cabinet so that the chassis just clears the inside of the front door. This maximizes the clearance in the rear of the cabinet for critical airflow.

Figure 18: Airflow Through MX204 Chassis



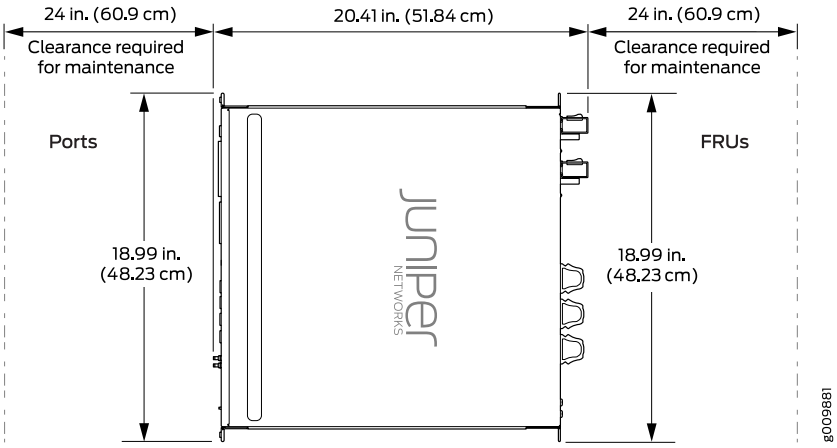
See Also
- MX204 Installation Overview on page 61
- MX204 Cooling System Description on page 26

MX204 Router Clearance Requirements for Airflow and Hardware Maintenance

When planning the installation site, allow sufficient clearance around the rack (see Figure 19 on page 49):

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. Allow at least 6 in. (15.2 cm) of clearance between side-cooled routers. Allow 2.8 in. (7 cm) between the side of the chassis and any non-heat-producing surface such as a wall.
- For service personnel to remove and install hardware components, there must be adequate space at the front and back of the router. At least 24 in. (61 cm) are required both in front of and behind the router. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack and 24 in. (61 cm) behind the router.
- To accommodate power cable bend radius at the rear of the chassis and the interface cable bend radius at the front of the chassis, provide at least 2.75 in. (7 cm) at the rear and 3.5 in. (8.9 cm) at the front.

Figure 19: MX204 Chassis Dimensions and Clearance Requirements



MX204 Router Rack Requirements

The MX204 router can be installed in a standard 19-in. rack. Many types of racks are acceptable, including four-post (telco) racks and open-frame racks. Table 21 on page 50 summarizes rack requirements and specifications for the router.

Table 21: Rack Requirements and Specifications for an MX204 Router

Rack Requirement	Guidelines
Rack type and mounting bracket hole spacing	Use a four-post rack. You can mount the router on any four-post rack that provides bracket holes or hole patterns spaced at 1 U (1.75-in./4.44-cm) increments and that meets the size and strength requirements specified in this table. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Components Industry Association (http://www.ecianow.org/).

Rack size and strength	• Ensure that the rack is a 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Components Industry Association (http://www.ecianow.org/).
	• Ensure that the rack is one of the following standard lengths:
	  ◦ 23.6 in. (600 mm)
	  ◦ 30.0 in. (762 mm)
	  ◦ 31.5 in. (800 mm)
	• The rack rails must be spaced widely enough to accommodate the router chassis's external dimensions (see "MX204 Router Physical Specifications" on page 44). The outer edges of the mounting brackets extend the width to 19 in. (48.3 cm). The spacing of rails and adjacent racks must also allow for the clearances around the router and rack.
	• The router ships with the front-mounting brackets fixed in the front-mount position on the chassis. You can move the rear-mounting brackets based on the depth of the rack.
	• The chassis height of 1.72 in. (4.37 cm) is approximately 1 U (rack unit).
	• The rack must be strong enough to support the weight of the fully configured router, up to 22.7 lb (10.3 kg).
	• Either end of the router must be mounted flush with the rack and still be adjustable for racks with different depths. The front and rear rack rails must be spaced between 23.62 in. (600 mm) and 31.5 in. (800 mm) front to back.
	• Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the router and rack.

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

See Also
- MX204 Installation Overview on page 61

MX204 Network Cable and Transceiver Planning

Calculating Power Budget and Power Margin for Fiber-Optic Cables

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

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

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

1. Calculating Power Budget for Fiber-Optic Cable on page 51
2. Calculating Power Margin for Fiber-Optic Cable on page 51

Calculating Power Budget for Fiber-Optic Cable

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

$$P_B = P_T - P_R$$

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

$$P_B = P_T - P_R$$

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

$$P_B = 13 \text{ dB}$$

Calculating Power Margin for Fiber-Optic Cable

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

$$P_M = P_B - LL$$

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

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. Table 22 on page 52 lists an estimated amount of loss for the factors used in the following sample calculations. For information about the actual amount of signal loss caused by equipment and other factors, refer to vendor documentation.

Table 22: Estimated Values for Factors Causing Link Loss

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

The following sample calculation for a 2-km-long multimode link with a power budget (P_B) of 13 dB uses the estimated values from Table 22 on page 52 to calculate link loss (LL) as the sum of fiber attenuation (2 km @ 1 dB/km, or 2 dB) and loss for five connectors (0.5 dB per connector, or 2.5 dB) and two splices (0.5 dB per splice, or 1 dB) as well as higher-order mode losses (0.5 dB). The power margin (P_M) is calculated as follows:

$P_M = P_B – LL$

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

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

$P_M = 7 dB$

The following sample calculation for an 8-km-long single-mode link with a power budget (P_B) of 13 dB uses the estimated values from Table 22 on page 52 to calculate link loss (LL) as the sum of fiber attenuation (8 km @ 0.5 dB/km, or 4 dB) and loss for seven connectors (0.5 dB per connector, or 3.5 dB). The power margin (P_M) is calculated as follows:

$P_M = P_B – LL$

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

$P_M = 13 dB – 4 dB – 3.5 dB$

$P_M = 5.5 dB$

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

CB-RE and RCB Interface Cable and Wire Specifications for MX Series Routers

Table 23 on page 53 lists the specifications for the cables that connect to management ports and the wires that connect to the alarm relay contacts.

NOTE: In routers where the Routing Engine (RE) and Control Board (CB) are integrated into a single board, a CB-RE is known as Routing and Control Board (RCB). The RCB is a single FRU that provides RE and CB functionality.

Table 23: Cable and Wire Specifications for Routing Engine and RCB Management and Alarm Interfaces

Port	Cable Specification	Cable/Wire Supplied	Maximum Length	Router Receptacle
Routing Engine console or auxiliary interface	RS-232 (EIA-232) serial cable	1.83-m length with RJ-45/DB-9 connectors	1.83 m	RJ-45 female
Routing Engine Ethernet interface	Category 5 cable or equivalent suitable for 100Base-T operation	One 4.57-m length with RJ-45/RJ-45 connectors	100 m	RJ-45 autosensing
Alarm relay contacts	Wire with gauge between 28-AWG and 14-AWG (0.08 and 2.08 mm^2)	No	None	—

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

This topic describes signal loss, attenuation, and dispersion in fiber-optic cable.

- Signal Loss in Multimode and Single-Mode Fiber-Optic Cable on page 53
- Attenuation and Dispersion in Fiber-Optic Cable on page 54

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

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

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

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

Attenuation and Dispersion in Fiber-Optic Cable

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

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

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

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

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

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

MX204 Management and Console Port Specifications and Pinouts

- RJ-45 Connector Pinouts for MX Series CB-RE or RCB Auxillary and Console Ports on page 55
- RJ-45 Connector Pinouts for an MX Series CB-RE or RCB Management Port on page 55

RJ-45 Connector Pinouts for MX Series CB-RE or RCB Auxillary and Console Ports

The ports—labeled—**AUX** and **CONSOLE**—on the Control Board and Routing Engine (CB-RE) or the Routing and Control Board (RCB) are asynchronous serial interfaces that accept an RJ-45 connector. The ports connect the Routing Engine to an auxiliary or console management device. Table 24 on page 55 describes the RJ-45 connector pinout.

NOTE: In routers where the Routing Engine and Control Board (CB) are integrated into a single board, a CB-RE is known as Routing and Control Board (RCB). The RCB is a single FRU that provides Routing Engine and CB functionality.

Table 24: RJ-45 Connector Pinout for the AUX and CONSOLE Ports

Pin	Signal	Description
1	RTS	Request to Send
2	DTR	Data Terminal Ready
3	TXD	Transmit Data
4	Ground	Signal Ground
5	Ground	Signal Ground
6	RXD	Receive Data
7	DSR/DCD	Data Set Ready
8	CTS	Clear to Send

RJ-45 Connector Pinouts for an MX Series CB-RE or RCB Management Port

The port on the Control Board and Routing Engine (CB-RE; Routing and Control Board (RCB)) labeled **MGMT** is an autosensing 10/100-Mbps Ethernet RJ-45 receptacle that accepts an Ethernet cable for connecting the Routing Engine to a management LAN (or other device that supports out-of-band management).

NOTE: In routers where the Routing Engine and Control Board (CB) are integrated into a single board, a CB-RE is known as Routing and Control Board (RCB). The RCB is a single FRU that provides Routing Engine and CB functionality.

Table 25 on page 56 describes the RJ-45 connector pinout.

Table 25: RJ-45 Connector Pinout for the CB-RE or RCB MGMT Port

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

MX204 Power Planning

Power Consumption for an AC-Powered MX204 Router

Use the information in this topic to determine the power consumption for your router and plan the amount of power you need to provide to the router.

Power Requirements for MX204 Components

Table 26 on page 56 lists the power requirements for various hardware components when the router is operating under typical and maximum voltage conditions.

Table 26: Power Requirements for MX204 Components

Component	Power Requirement at 25° C (Watts; Typical)	Power Requirement at 55° C (Watts; Maximum)
Fully loaded MX204 router	240 W	280 W

Table 27 on page 57 lists the power requirements for the fully configured AC-powered routers operating under typical voltage conditions.

Table 27: MX204 Router AC Router Power Requirements at Typical Temperature (25° C)

Chassis Configuration	Power Requirement at 25° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity	240 W	266 W

Table 28 on page 57 lists the power requirements for the fully configured AC-powered routers operating under maximum voltage conditions.

Table 28: MX204 Router AC Router Power Requirements at Maximum Temperature (55° C)

Chassis Configuration	Power Requirement at 55° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity	280 W	311 W

Calculating System Thermal Output

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

For example, in Table 27 on page 57 we calculated the power consumption for a fully configured chassis running at high activity at 25° C typical temperature to be 240 W. Using that information we can calculate the system thermal output for the configuration:

```
Power consumption in watts * 3.41 = system thermal output in BTU/hr
240 W * 3.41 = 818.4 BTU/hr
```

See Also

- MX204 Power System Description on page 29
- Replacing an MX204 AC Power Supply on page 103
- AC Power Cord Specifications for MX204 Routers on page 34
- AC Power Circuit Breaker Requirements for the MX204 Router on page 34
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Power Consumption for a DC-Powered MX204 Router

Use the information in this topic to determine the power consumption for your router and plan the amount of power you need to provide to the router.

- Power Requirements for MX204 Components on page 58

- Calculating System Thermal Output on page 58

Power Requirements for MX204 Components

Table 29 on page 58 lists the power requirements for various hardware components when the router is operating under typical and maximum voltage conditions.

Table 29: Power Requirements for MX204 Components

Component	Power Requirement at 25° C (Watts; Typical)	Power Requirement at 55° C (Watts; Maximum)
Fully loaded MX204 router	240 W	280 W

Table 30 on page 58 lists the power requirements for the fully configured DC-powered routers operating under typical voltage conditions.

Table 30: MX204 Router DC Router Power Requirements at Typical Temperature (25° C)

Chassis Configuration	Power Requirement at 25° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity	240 W	266 W

Table 31 on page 58 lists the power requirements for the fully configured DC-powered routers operating under maximum voltage conditions.

Table 31: MX204 Router DC Router Power Requirements at Maximum Temperature (55° C)

Chassis Configuration	Power Requirement at 55° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity	280 W	311 W

Calculating System Thermal Output

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

For example, in Table 30 on page 58 we calculated the power consumption for a fully configured chassis running at high activity at 25° C typical temperature to be 240 W. Using that information we can calculate the system thermal output for the configuration:

```
Power consumption in watts * 3.41 = system thermal output in BTU/hr
240 W * 3.41 = 818.4 BTU/hr
```

See Also

- MX204 Power System Description on page 29
- Replacing an MX204 DC Power Supply on page 105
- DC Power Circuit Breaker Requirements for the MX204 Router on page 37
- DC Power Source Cabling for MX204 Router on page 37
- DC Power Cable Specifications for MX204 Router on page 38
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

CHAPTER 3

Initial Installation and Configuration

MX204 Installation Overview

To install the router:

1. Prepare your installation site.

   See "MX204 Site Preparation Checklist" on page 43.

2. Review the safety guidelines and warnings:
   - See "General Safety Guidelines and Warnings" on page 119.
   - See "General Safety Warnings for Juniper Networks Devices" on page 120.
3. Unpack the router and verify the parts:
   a. See "Unpacking MX204 Router" on page 63.

   b. See "Verifying the MX204 Router Parts Received" on page 63.

4. (*Optional*) Remove components from the MX204 router chassis before Installing It in a rack.

   See individual topics listed in *Removing, Installing, and Upgrading Components* for removing components.

5. Install the router in the rack.

   See "Installing the MX204 Chassis in a Rack" on page 65.

6. (*Optional*; Required only if you have removed the components from the router in step 4) Reinstall components in the MX204 router after installing the chassis in a rack.

   See individual topics listed in *Removing, Installing, and Upgrading Components* for installing components.

7. Connect cables to the network and external devices.

   See "Connecting the MX204 Router to External Devices and Cables" on page 82.

8. Connect the grounding cable.

   See "Grounding the MX204 Router" on page 72.

9. Connect the AC power cord or DC power cables:
   - See "Connecting Power to an AC-Powered MX204 Router" on page 73.
   - See "Connecting Power to a DC-Powered MX204 Router" on page 77.
10. Power on the router:
    - See "Powering On an AC-Powered MX204 Router" on page 76.
    - See "Powering On a DC-Powered MX204 Router" on page 79.
11. Perform the initial system configuration.

    See "Performing the Initial Software Configuration for the MX204 Router" on page 87.

Related Documentation

- MX204 Router Rack Requirements on page 49
- MX204 Router Clearance Requirements for Airflow and Hardware Maintenance on page 49
- MX204 Router Cabinet Requirements and Specifications on page 47

Unpacking the MX204

Tools and Parts Required to Unpack the MX204 Router

To unpack the router and prepare for installation, you need the following tools:

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

See Also

- MX204 Chassis Description on page 20

- MX204 Field-Replaceable Units on page 23
- Unpacking MX204 Router on page 63

Unpacking MX204 Router

The router is shipped in a cardboard carton and secured with foam packing material. The carton also contains an accessory box and quick start instructions.

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

To unpack the router:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the router.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box, and verify the contents against the parts inventory on the label attached to the carton.
5. Pull out the packing material holding the router in place.
6. Verify the contents of the carton against the packing list included with the router.
7. Save the shipping carton and packing materials in case you later need to move or ship the router.

See Also

- MX204 Site Preparation Checklist on page 43

Verifying the MX204 Router Parts Received

A packing list is included in each shipment. Check the parts in the shipment against the items on the packing list. The packing list specifies the part numbers and descriptions of each part in your order.

If any part is missing, contact a customer service representative.

A fully configured router contains the router chassis with installed components, listed in Table 32 on page 64, and an accessory box, which contains the parts listed in Table 33 on page 64. The parts shipped with your router can vary depending on the configuration you ordered.

Table 32: Parts List for a Fully Configured Router

Component	Quantity
Chassis	1
AC or DC power supply	2
Fan module	3
Documentation Roadmap and Product Warranty	1
Blank panels for slots without components installed	One blank panel for each slot not occupied by a component
Rack mount kit	2
Philips M4x7mm flat head screws	16

Table 33: Accessory Box Parts List

Part	Quantity
Screws to mount chassis	16
Screws to secure the ground cable lug	2
DC power fork terminal lugs, 16-14 AWG, sized for #6 screw	8
Label, “Small Parts Enclosed”	1
Label, “Accessories Contents”	1
USB flash drive with Junos OS	1
Read me first document	1
Affidavit for T1 connection	1
Juniper Networks Product Warranty	1
End User License Agreement	1
Document sleeve	1
3 in. x 5 in. pink bag	2
9 in. x 12 in. pink bag, ESD	2
Accessory box, 19 in. x 12 in. x 3 in.	1

Table 33: Accessory Box Parts List (continued)

Part	Quantity
Ethernet cable, RJ-45 to DB-9	1
ESD wrist strap with cable	1
ETSI brackets	4

See Also
- MX204 Site Preparation Checklist on page 43

Installing the MX204

Tools Required to Install the MX204 Chassis in Rack

To install the router, you need the following tools and parts:

- Phillips (+) screwdriver, number 2
- ESD grounding wrist strap
- Blank panels to cover any slots not occupied by a component
- Mounting brackets, supplied with the router
- Sixteen screws for securing the mounting brackets to the chassis, supplied with therouter
- Four mounting screws, supplied with the router

See Also
- MX204 Site Preparation Checklist on page 43

Installing the MX204 Chassis in a Rack

CAUTION:

- If you are installing more than one router in a rack, install the lowest one first. Installing a router in an upper position in a rack or cabinet requires a lift.
- Before front-mounting the router in a rack, have a qualified technician verify that the rack is strong enough to support the router's weight and is adequately supported at the installation site.
- Lifting the chassis and mounting it in a rack requires two people (one person to hold the router in place and a second person to install the screws). The fully loaded chassis weighs approximately 22.7 lb (10.3 kg).

The MX204 router is designed for installation in a rack that complies with either of the following standards:

- 19-in. rack—A 19-in. (450 mm) rack as defined in Cabinets, Racks, Panels, and Associated Equipment (document number EIA-310-D) published by the Electronics Industry Association (http://www.ecianow.org/).
- ETSI rack—A 21-in. (500 mm) ETSI rack as defined in the European Telecommunications Standards Institute (ETS 300 119) published by the European Telecommunications Standards Institute (ETSI).

Based on the rack, follow the steps mentioned on the below topics to install the router:

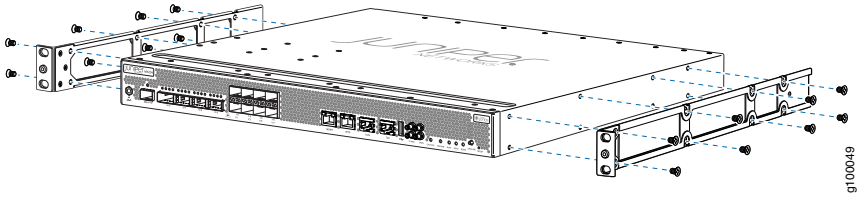
- Installing the MX204 Chassis in a 19-in. Rack on page 66
- Installing the MX204 in a 21-in. ETSI Rack on page 68

Installing the MX204 Chassis in a 19-in. Rack

To install the router in a 19-in. rack or cabinet:

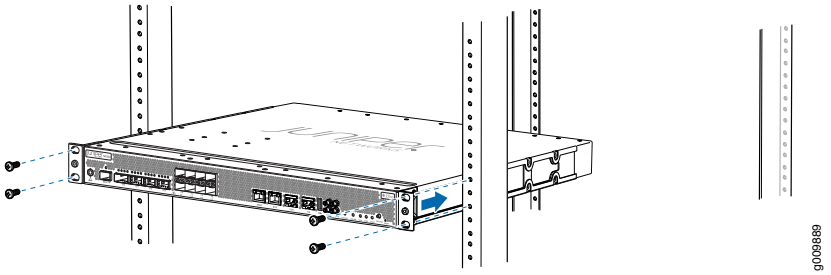
1. Position the router in front of the rack or cabinet.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and to a site ESD point.
3. Align the holes in the front mounting brackets with the holes on the side of the chassis (see Figure 20 on page 66).

Figure 20: Attaching the Mounting Brackets



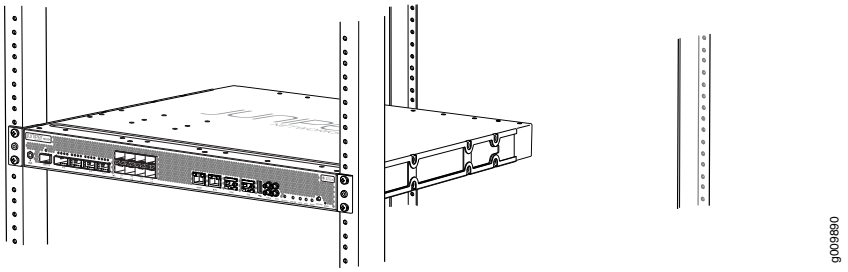
4. Using a Phillips (+) number 2 screwdriver, secure the mounting brackets to the router using the mounting screws.
5. With one person on each side, hold on to the bottom of the chassis and carefully lift it so that the mounting brackets contact the rack rails.
6. Carefully slide the router onto the mounting brackets until the front-mounting brackets attached to the chassis contact the rack rails (see Figure 21 on page 67).

Figure 21: Installing the Router in a Four-Post Rack



7. Install mounting screws into each of the open front-mounting holes aligned with the rack, starting from the bottom, and secure them tightly. Figure 22 on page 67 shows the router fully secured to the front rails of the four-post rack.

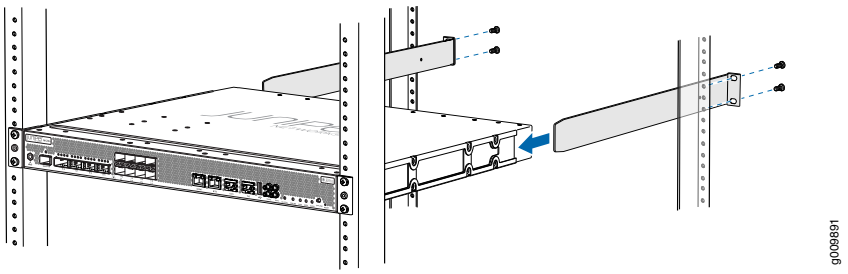
Figure 22: Router Secured by Front-Mounting Brackets



8. On the rear of the chassis, slide the rear-mounting brackets on either side of the chassis until the rear-mounting brackets contact the rack rails (see Figure 23 on page 67).

   The rear-mounting brackets on each side of the chassis are movable. You can adjust the brackets according to the depth of the rack.

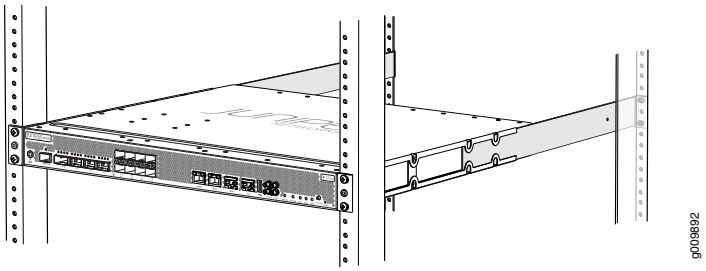
Figure 23: Installing the Rear-Mounting Brackets



9. Install mounting screws into each of the open rear-mounting holes aligned with the rack, starting from the bottom, and secure them tightly.

10. Visually inspect the alignment of the chassis. If the chassis is installed properly in the rack, all the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side and the router is level. Figure 24 on page 68 shows the router fully secured and installed in a four-post rack.

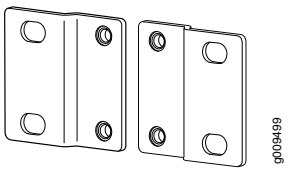
Figure 24: Router Installed in the Rack



Installing the MX204 in a 21-in. ETSI Rack

The ETSI racks are little wider than the standard 19-in. rack. To install the router in an ETSI rack, you need to install the ETSI brackets on to the router. Figure 25 on page 68 shows the ETSI brackets supported by MX204 router.

Figure 25: ETSI Brackets



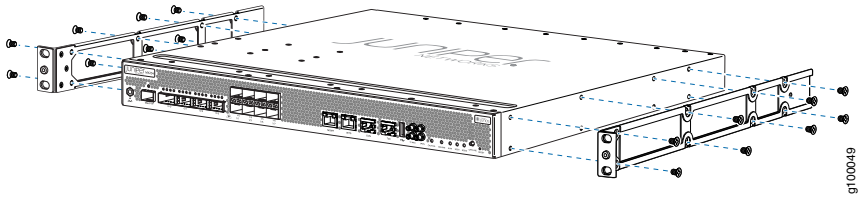
To install the router in a 21-in. ETSI rack or cabinet:

1. Position the router in front of the rack or cabinet.

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and to a site ESD point.

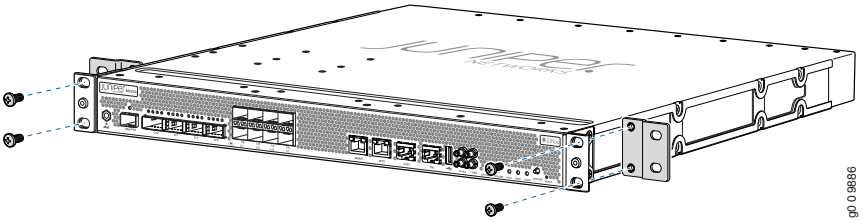
3. Align the holes in the front mounting brackets with the holes on the side of the chassis (see Figure 26 on page 69).

Figure 26: Attaching the Mounting Brackets



4. Install the two front ETSI brackets on the front-mounting brackets on each side of the chassis (see Figure 27 on page 69).

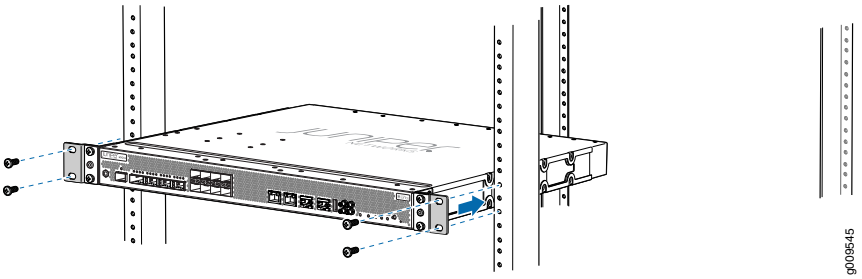
Figure 27: Installing the Front ETSI Brackets



5. With one person on each side, hold on to the bottom of the chassis and carefully lift it so that the mounting brackets contact the rack rails.

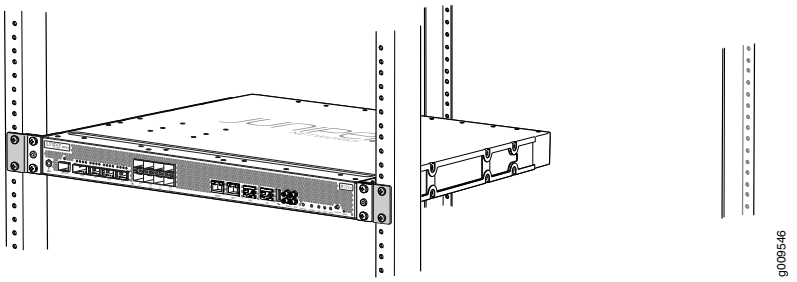
6. Carefully slide the router onto the mounting brackets until the front-mounting brackets attached to the chassis contact the rack rails (see Figure 28 on page 69).

Figure 28: Installing the Router in a Four-Post Rack



7. Install mounting screws into each of the open front-mounting holes aligned with the rack, starting from the bottom, and secure them tightly. Figure 29 on page 70 shows the router fully secured to the front rails of the four-post rack.

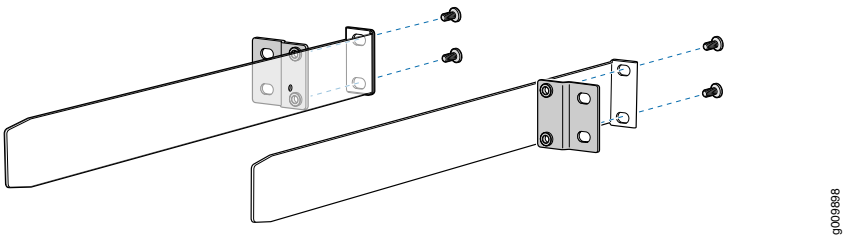
Figure 29: Router Secured by Front-Mounting Brackets with ETSI Brackets



8. Install the two rear ETSI brackets on the rear-mounting brackets (see Figure 30 on page 70).

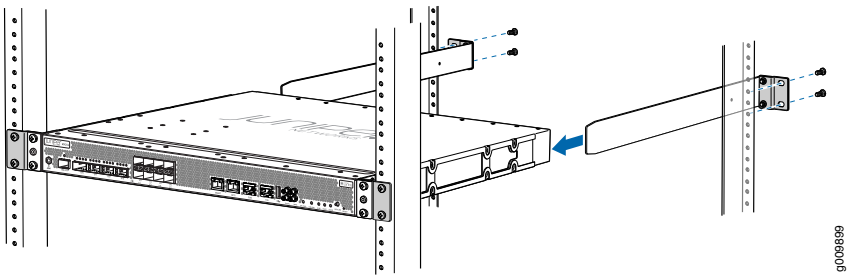
   The rear-mounting brackets on each side of the chassis are movable. You can adjust the brackets according to the depth of the rack.

Figure 30: Installing the Rear ETSI Brackets



9. On the rear of the chassis, slide the rear-mounting brackets (with the ETSI brackets installed) on either side of the chassis until the rear-mounting brackets contact the rack rails (see Figure 31 on page 70).

Figure 31: Installing the Rear-Mounting Brackets with ETSI Brackets

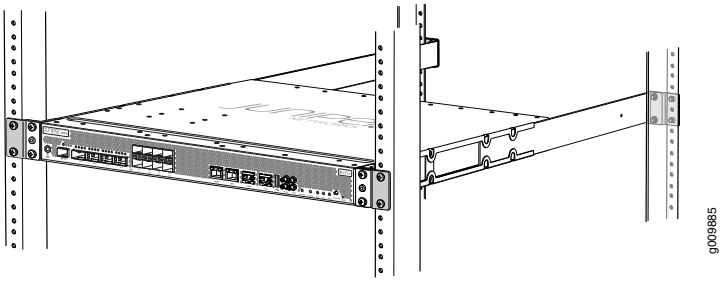


10. Install mounting screws into each of the open rear-mounting holes aligned with the rack, starting from the bottom, and secure them tightly.

11. Visually inspect the alignment of the chassis. If the chassis is installed properly in the rack, all the mounting screws on one side of the rack are aligned with the mounting

screws on the opposite side and the router is level. Figure 32 on page 71 shows the router fully secured and installed in a four-post rack with ETSI brackets.

Figure 32: Router Installed in the Rack with ETSI Brackets



See Also

- MX204 Site Preparation Checklist on page 43
- MX204 Router Grounding Specifications on page 46
- MX204 Router Clearance Requirements for Airflow and Hardware Maintenance on page 49

Connecting the MX204 to Power

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Grounding the MX204 Router on page 72
- Connecting Power to an AC-Powered MX204 Router on page 73
- Powering On an AC-Powered MX204 Router on page 76
- Connecting Power to a DC-Powered MX204 Router on page 77
- Powering On a DC-Powered MX204 Router on page 79
- Powering Off the MX204 Router on page 81

Tools and Parts Required for MX204 Router Grounding and Power Connections

To ground and provide power to the router, you need the following tools and parts:

- Phillips (+) screwdrivers, numbers 1 and 2
- Socket nut driver
- 2.5-mm flat-blade (–) screwdriver
- Torque-controlled driver, with a maximum torque capacity of 6 lb-in. (0.7 Nm), for tightening screws to terminals on each power supply on a DC-powered router

CAUTION: The maximum torque rating of the terminal screws on the DC power supply is 6 lb-in. (0.7 Nm). The terminal screws might be damaged if excessive torque is applied. Use only a torque-controlled driver to tighten

screws on the DC power supply terminals. Use an appropriately sized driver, with a maximum torque capacity of 6 lb-in. or less. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You might want to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

- Wire cutters
- Electrostatic discharge (ESD) grounding wrist strap

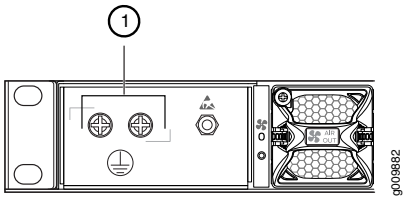
See Also

- MX204 Router Grounding Specifications on page 46
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Grounding the MX204 Router

You ground the router by connecting a grounding cable to earth ground and then attaching it to the chassis grounding points by using two 10–32 screws. Figure 33 on page 72 shows the grounding point location on the chassis. You must provide the grounding cables (the cable lugs are supplied with the router). For grounding cable specifications, see "MX204 Router Grounding Specifications" on page 46.

Figure 33: Grounding Point on the MX204 Router



1— Grounding point	

To ground the router:

1. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.
3. Ensure that all grounding surfaces are clean and brought to a bright finish before grounding connections are made.
4. Connect the grounding cable to a proper earth ground.

5. Detach the ESD grounding strap from the site ESD grounding point.

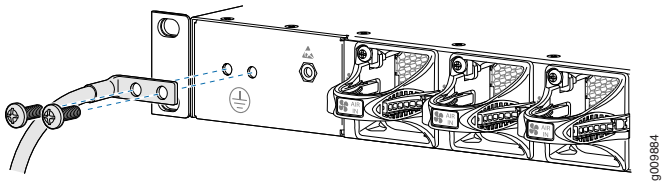
6. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

7. Place the grounding cable lug over the grounding point on the chassis.

8. Secure the grounding cable lug with the screws. The holes are sized for 10–32 screws (see Figure 34 on page 73).

9. Dress the grounding cable, and verify that it does not touch or block access to router components, and that it does not drape where people could trip on it.

Figure 34: Connecting Grounding Lug to the MX204 Router



See Also

- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Connecting Power to an AC-Powered MX204 Router

CAUTION: **Do not mix AC and DC power supply modules within the same router. Damage to the router might occur.**

You connect AC power to the router by attaching power cords from the AC power sources to the AC appliance inlets located on the power supply modules.

To connect the AC power cords to the router for each power supply module:

1. Locate power cords that have a plug appropriate for your geographic location. For more information, see "AC Power Cord Specifications for MX204 Routers" on page 34.

2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Power off the AC input appliance inlet on the source power supply.

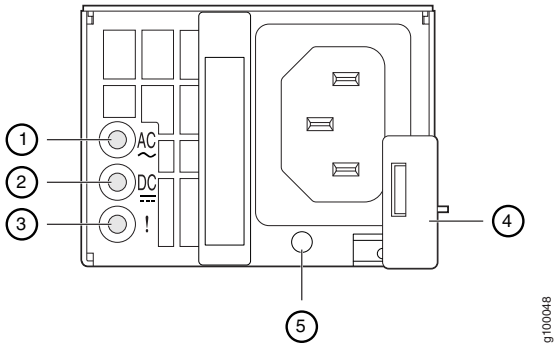
4. Connect the power cord to the power supply source.

NOTE: Each power supply must be connected to a dedicated AC power feed and a dedicated customer-site circuit breaker. We recommend that you use a dedicated customer-site circuit breaker rated for 20 A (110 VAC) or 16 A (220 VAC) minimum, or as required by local code.

5. Push the end of the AC power cord retainer strip into the hole next to the inlet on the power supply face plate on the router until it snaps into place. Ensure that the loop in the retainer strip faces toward the power cord.

   Figure 35 on page 74 shows the port on the AC power supply module where the power cord retainer is installed.

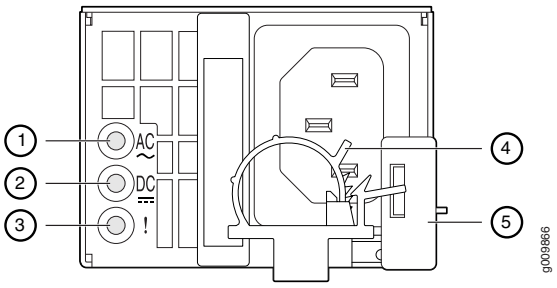
Figure 35: Power Cord Retainer Port on the AC Power Supply Module



1—Input status LED	4—Ejector lever
2—Output status LED	5—AC power cord retainer port
3—Fault LED	

Figure 36 on page 75 shows the power cord retainer installed on the AC power supply module.

Figure 36: Power Cord Retainer Installed on the AC Power Supply Module



1—Input status LED	4—AC power cord retainer installed
2—Output status LED	5—Ejector lever
3—Fault LED	

6. Press the small tab on the retainer strip to loosen the loop. Slide the loop until you have enough space to insert the power cord coupler into the inlet.

7. Insert the power cord coupler firmly into the inlet.

8. Slide the loop toward the power supply until it is snug against the base of the coupler.

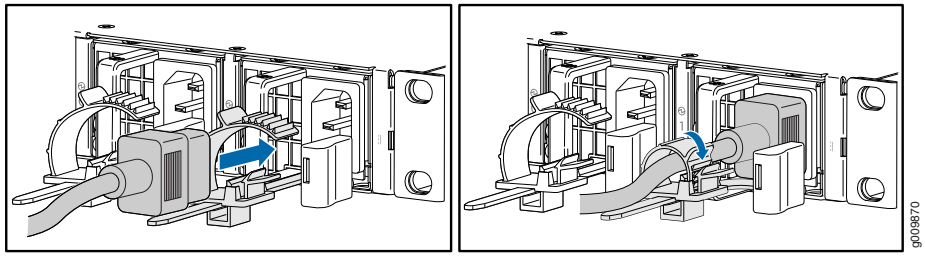
9. Press the tab on the loop and draw out the loop into a tight circle (see Figure 37 on page 75).

10. Route the power cord appropriately. Verify that the power cord does not block the air exhaust and access to router components, or drape where people could trip on it.

11. Power on the power supply at source.

12. Repeat Step 1 through Step 10 for the installing the remaining power supply.

Figure 37: Connecting AC Power to the Router



See Also

- MX204 Router Grounding Specifications on page 46
- General Safety Guidelines and Warnings on page 119

- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Powering On an AC-Powered MX204 Router

To power on an AC-powered router:

1. Verify that the power supply modules are fully inserted in the chassis.
2. Verify that each AC power cord is securely inserted into its appliance inlet.
3. Verify that an external management device is connected to the **CON** port on the chassis.
4. Turn on power to the external management device.
5. Switch on the dedicated customer-site circuit breakers for the power supply modules. Follow the instructions for your site.
6. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
7. Observe the status LED on each power supply faceplate. If an AC power supply is correctly installed and functioning normally, the status LED on the router beside the AC power supply lights steadily green.

   If the status LED on the power supply is lit red, the power supply is not functioning normally. Repeat the installation and cabling procedures.

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

If the system is completely powered off when you power on the power supply, the Routing Engine (or RCB) boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the system again, first issue the CLI **request system halt** command.

After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the status LEDs on the power supply and the **show chassis** command display—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

8. On the external management device connected to the Routing Engine, monitor the startup process to verify that the system has booted properly.

See Also

- MX204 Router Grounding Specifications on page 46
- *request system halt*
- *show chassis power*
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Connecting Power to a DC-Powered MX204 Router

CAUTION: Do not mix AC and DC power supply modules within the same router. Damage to the router might occur.

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 position, and tape the switch handle of the circuit breaker in the off position.

You connect DC power to the router by attaching power cables from the external DC power sources to the terminal on the power supply faceplate. You must provide the

power cables (the cable lugs are supplied with the router). For power cable specifications, see "DC Power Cable Specifications for MX204 Router" on page 38.

To connect the DC source power cables to the router for each power supply:

1. Switch off the dedicated customer-site circuit breakers. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.

2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the **–48V** and **RTN** DC cables to chassis ground:

   - The cable with very large resistance (indicating an open circuit) to chassis ground is **–48V**.
   - The cable with very low resistance (indicating a closed circuit) to chassis ground is **RTN**.

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

4. Remove the screws from the terminals.

5. Secure each power cable lug to the terminal with the screws (see Figure 38 on page 79). Apply between 5 lb-in. (0.6 Nm) and 6 lb-in. (0.7 Nm) of torque to the screws. Do not overtighten the screws. (Use a socket nut driver.)

   a. Secure the positive (+) DC source power cable lug to the **RTN** (return) terminal.

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

   CAUTION: Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the screws. Ensure that each nut is properly threaded into the terminal. Applying installation torque to the screws when improperly threaded can result in damage to the terminal.

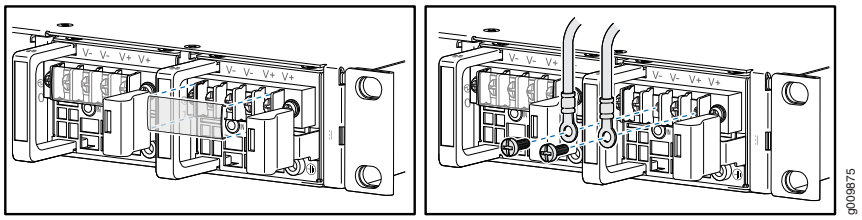
CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color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

NOTE: For information about connecting to DC power sources, see "MX204 Router DC Power Specifications" on page 36.

6. Verify that the power cables are connected correctly, that they do not touch or block access to router components, and that they do not drape where people could trip on them.

7. Repeat Step 1 through Step 6 for installing the other power supply modules.

Figure 38: Connecting DC Power to the Router



See Also

- MX204 Router Grounding Specifications on page 46
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Powering On a DC-Powered MX204 Router

To power on a DC-powered router:

1. Verify that an external management device is connected to the **CON** port on the chassis.

2. Turn on power to the external management device.

3. Verify that the power supply modules are fully inserted in the chassis.

4. Verify that the source power cables are connected to the appropriate terminal: the positive (+) source cable to the return terminal (labeled **RTN**) and the negative (–) source cable to the input terminal (labeled **–48V**).

5. Switch on the dedicated customer-site circuit breakers to provide power to the DC power cables.

6. Check that the status LED on the power supply faceplate is lit steadily green to verify that power is present.

7. If power is not present:

   - Verify that the fuse is installed correctly, and turn on the breaker at the battery distribution fuse board or fuse bay.
   - Check the voltage with a meter at the terminals of the power supply for correct voltage level and polarity.

8. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

9. Observe the status LED on each power supply faceplate. If a DC power supply is correctly installed and functioning normally, the status LED lights green steadily.

   If the status LED on the power supply is unlit, the power supply is not functioning normally. Repeat the installation and cabling procedures.

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

   If the system is completely powered off when you power on the power supply, the Routing Engine (or RCB) boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the system again, first issue the CLI **request system halt** command.

   After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the status LEDs on the power supply and the **show chassis** command display—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

10. On the external management device connected to the Routing Engine, monitor the startup process to verify that the system has booted properly.

See Also

- MX204 Router Grounding Specifications on page 46

- *request system halt*
- *show chassis power*
- General Safety Guidelines and Warnings on page 119
- General Electrical Safety Guidelines and Warnings on page 137
- Prevention of Electrostatic Discharge Damage on page 138

Powering Off the MX204 Router

Before you power off an MX204:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 138.
- Ensure that you do not need to route traffic through the MX204.
- Ensure that you have the following parts and tools available to power off the MX204:
  - 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

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

To power off the router:

1. Connect a management device to the console (see "Connecting the MX204 Router to External Devices and Cables" on page 82).

2. On the external management device connected to the Routing Engine, issue the **request system halt** command.

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

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

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

   System going down IMMEDIATELY
   ```

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

3. Wait until a message appears on the console confirming that the operating system has halted. For more information about the command, see the CLI Explorer.

4. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

5. Switch off the power supply source.

See Also
- *request vmhost halt*

Connecting the MX204 to the Network

Tools and Parts Required to Connect the MX204 Router to External Devices

To connect the router to external devices, you need the following tools and parts:

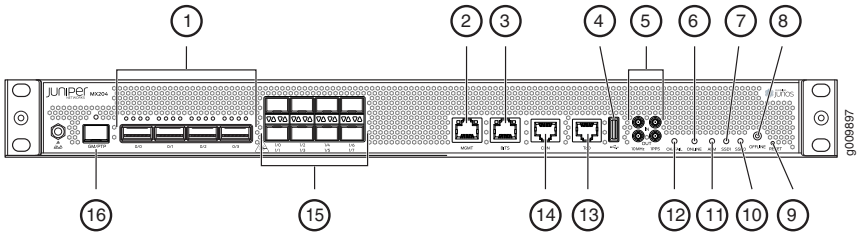
- 2.5-mm flat-blade (–) screwdriver for the alarm relay contacts
- Electrostatic discharge (ESD) grounding wrist strap (provided in the accessory kit)

See Also
- Verifying the MX204 Router Parts Received on page 63
- Prevention of Electrostatic Discharge Damage on page 138

Connecting the MX204 Router to External Devices and Cables

Figure 39 on page 83 shows the front panel of the MX204 router. All the connections to the router are made through the front panel.

Figure 39: MX204 Front Panel Ports, LEDs and Buttons



1—Rate-selectable ports	9—**RESET** button
2—Management (**MGMT**) port	10—**SSD0** LED
3—**BITS** port with LEDs	11—Alarm (**ALM**) LED
4—USB port	12—**OK/FAIL** LED
5—**1PPS** and **10MHz** GPS input and output ports	13—Time of day (**ToD**) port with LEDs
6—**ONLINE** LED	14—Console (**CON**) port
7—**SSD1** LED	15—10-Gigabit Ethernet SFP+ ports
8—**OFFLINE** button	16—PTP grandmaster clock (**GM/PTP**) port

- Connecting the Router to a Network for Out-of-Band Management on page 83
- Connecting the Router to a Console Device on page 84
- Connecting the Router to External Clocking and Timing Devices on page 85

Connecting the Router to a Network for Out-of-Band Management

To connect the router to a network for out-of-band management, connect an Ethernet cable with RJ-45 connectors to the **MGMT** port on the router. One Ethernet cable is provided with the router.

NOTE: **Use shielded CAT5e cable for the CON and MGMT ports on the chassis.**

To connect to the **MGMT** port on the router faceplate:

1. Turn off power to the management device.
2. Plug one end of the Ethernet cable (Figure 40 on page 83 shows the connector) into the **MGMT** port on the router.
3. Plug the other end of the cable into the network device.

Figure 40: Out-of-Band Management Cable Connector

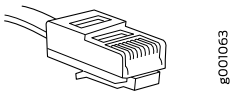


Table 34: Out-of-Band Management Port on the MX204 Router

Callout	Label	Description
2 (See Figure 39 on page 83)	**MGMT**	Dedicated management channel for device maintenance. It is also used by system administrators to monitor and manage the router remotely.

Connecting the Router to a Console Device

To use a system console to configure and manage the router, connect it to the appropriate **CON** port on the router. The console port is used to connect a laptop or console terminal to configure the router (see Figure 42 on page 85 and Figure 43 on page 85). The console port accepts a cable with an RJ-45 connector. One serial cable with an RJ-45 connector and a DB-9 connector is provided with the router.

NOTE: **Use shielded CAT5e cable for connecting the CON and MGMT ports on the MX204 router.**

To connect a management console:

1. Turn off power to the console device.
2. Plug the RJ-45 end of the serial cable (see Figure 41 on page 84) into the **CON** port on the router.
3. Plug the female DB-9 end into the device's serial port.

NOTE:

For console devices, configure the serial port to the following values:

- **Baud rate—9600**
- **Parity—N**
- **Data bits—8**
- **Stop bits—1**
- **Flow control—none**

Figure 41: Console and Auxiliary Cable Connector

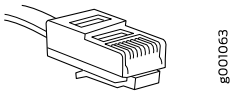


Figure 42: Connecting the MX204 Router to a Management Console Through a Console Server

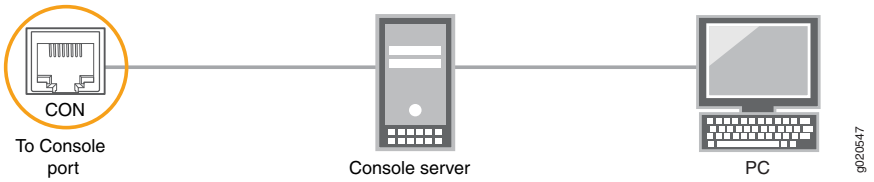


Figure 43: Connecting the MX204 Router Directly to a Management Console

Table 35: Console Port on the MX204 Router

Callout	Label	Description
14 (See Figure 39 on page 83)	**CON**	Connect a laptop or console terminal to configure the router.

Connecting the Router to External Clocking and Timing Devices

The router supports external clock synchronization for Synchronous Ethernet, and external inputs.

- Connecting 1-PPS and 10-MHz Timing Devices to the Router on page 85
- Connecting a Time-of-Day Device to the Router on page 86
- Connecting a BITS External Clocking Device to the Router on page 86

Connecting 1-PPS and 10-MHz Timing Devices to the Router

The router has four SubMiniature B (SMB) connectors that support 1-PPS and 10-MHz timing devices.

NOTE: **Ensure that a cable of 3 m or less in length is used for the 10-MHz and 1-PPS connectors.**

To connect the SMB coaxial cable to the external clocking input port:

1. Connect one end of the SMB coaxial cable to either the 1-PPS SMB connector or the 10-MHz SMB connector on the router.
2. Connect the other end of the SMB coaxial cable to the 10-MHz or 1-PPS source network equipment.

NOTE: Ensure that the 10-MHz or 1-PPS source network equipment contains low voltage complementary metal oxide semiconductor (LVCMOS) or is compatible with low-voltage (3.3 V) transistor–transistor logic (LVTTL).

Table 36: Clocking Port on the MX204 Router

Callout	Label	Description
5 (See Figure 39 on page 83)	**10MHz** **1PPS**	GPS input and output ports.

Connecting a Time-of-Day Device to the Router

A time-of-day port, labeled **ToD**, on the front panel of the router enables you to connect external timing devices.

To connect the router to a ToD external timing device:

1. Attach an electrostatic discharge (ESD) grounding trap on your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Plug one end of the RJ-45 cable into the **ToD** port on the front panel of the router.
3. Plug the other end of the RJ-45 cable into the ToD timing device.
4. Verify that the LEDs for the **ToD** port on the router are lit steadily green.
5. Configure the port. See *Configuring Clock Synchronization Interface on MX Series Routers*.

Table 37: Time-of-Day Port on the MX204 Router

Callout	Label	Description
13 (See Figure 39 on page 83)	**ToD**	ToD RJ-45 port with LED.

Connecting a BITS External Clocking Device to the Router

The router has an external building-integrated timing supply (BITS) port, labeled **BITS**, on the front panel of the router.

To connect the router to a BITS external clocking device:

1. Attach an electrostatic discharge (ESD) grounding trap on your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Plug one end of the RJ-45 cable into the internal clock port on the craft interface.
3. Plug the other end of the RJ-45 cable into the BITS external clocking device.
4. Verify that the LEDs for the **BITS** port are lit steadily green.
5. Configure the port. See *Configuring Clock Synchronization Interface on MX Series Routers*.

Table 38: BITS Port on the MX204 Router

Callout	Label	Description
3 (See Figure 39 on page 83)	**BITS**	Building-Integrated Timing Supply (BITS) clock interface port with LED.

See Also

- MX204 Routing Engine Description on page 39
- Prevention of Electrostatic Discharge Damage on page 138

Performing the Initial Software Configuration for the MX204 Router

The router is shipped with the Junos operating system (OS) preinstalled and ready to be configured when the router is powered on. Two 16-MB internal NAND Flash memory devices are located on the baseboard for BIOS storage. The USB storage device can be inserted into the USB slot on the chassis faceplate. The router also supports two built-in M.2-based solid-state drive (SSD) slots. These two SSD devices act as the primary boot devices (**SSD0** and **SSD1**). When the router boots, it first attempts to start the Junos OS image on the USB flash drive if it detects one. If a USB flash drive is not inserted into the router, or the attempt otherwise fails, the router next tries the primary boot device, and then tries the secondary boot device.

You configure the router by issuing Junos OS command-line interface (CLI) commands, either on a console device attached to the **CON** port on the front panel, or over a Telnet connection to a network connected to the **MGMT** port on the front panel.

Gather the following information before configuring the router:

- Name the router will use on the network
- Domain name the router will use
- IP address and prefix length information for the Ethernet interface

- IP address of a default router
- IP address of a DNS server
- Password for the root user

This procedure connects the router to the network but does not enable it to forward traffic. For complete information about enabling the router to forward traffic, including examples, see the Junos OS configuration guides.

To configure the software:

1. Verify that the router is powered on.

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

3. Start the CLI. For more information about CLI commands, see the CLI Explorer.

```
root# cli
root@>
```

4. Enter configuration mode.

```
cli> configure
[edit]
root@#
```

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

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

6. Create a management console user account.

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

7. Set the user account class to **super-user**.

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

8. Configure the router’s domain name.

```
[edit]
```

```
root@# set system domain-name domain-name
```

9. Configure the IP address and prefix length for the router's Ethernet interface.

```
[edit]
root@# set interfaces fxp0 unit 0 family inet address address/prefix-length
```

10. Configure the IP address of a backup router, which is used only while the routing protocol is not running.

```
[edit]
root@# set system backup-router address
```

11. Configure the IP address of a DNS server.

```
[edit]
root@# set system name-server address
```

12. Set the root authentication password by entering either a cleartext password, an encrypted password, or an SSH public key string (DSA or RSA).

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

or

```
[edit]
root@# set system root-authentication encrypted-password encrypted-password
```

or

```
[edit]
root@# set system root-authentication ssh-dsa public-key
```

or

```
[edit]
root@# set system root-authentication ssh-rsa public-key
```

13. (Optional) Configure the static routes to remote subnets with access to the management port. Access to the management port is limited to the local subnet. To access the management port from a remote subnet, you need to add a static route to that subnet within the routing table. For more information about static routes, see the *Junos OS Administration Library*.

```
[edit]
```

```
root@# set routing-options static route remote-subnet next-hop destination-IP retain
  no-readvertise
```

14. Configure the Telnet service at the **[edit system services]** hierarchy level.

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

15. (Optional) Display the configuration to verify that it is correct.

```
[edit]
root@# show
system {
   host-name host-name;
   domain-name domain-name;
   backup-router address;
   root-authentication {
      authentication-method (password | public-key);
   }
   name-server {
      address;
   }
}
interfaces {
   fxp0 {
      unit 0 {
         family inet {
            address address/prefix-length;
         }
      }
   }
}
```

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

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

17. (Optional) Configure additional properties by adding the necessary configuration statements. Then commit the changes to activate them on the router.

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

18. When you have finished configuring the router, exit configuration mode.

```
[edit]
root@host# exit
root@host>
```

Related Documentation

- Prevention of Electrostatic Discharge Damage on page 138

CHAPTER 4

Maintaining Components

Maintaining MX204 Components

Routine Maintenance Procedures for MX204 Routers

Purpose For optimum router performance, perform preventive maintenance procedures.

Action
- Inspect the installation site for moisture, loose wires or cables, and excessive dust. Make sure that airflow is unobstructed around the router and into the air intake vents.
- Check the status-reporting devices on the font panel—system alarms and LEDs.

See Also
- Alarm LEDs on the MX204 Front Panel on page 25

Maintaining the MX204 Routing Engine

Purpose For optimum router performance, verify the condition of the Routing Engine on a regular basis.

Action On a regular basis:

- Check the LEDs on the front panel to view information about the status of the Routing Engine.
- To check the status of the Routing Engine on the router, issue the **show chassis routing-engine** command. The output is similar to the following:

```
user@host> show chassis routing-engine
Routing Engine status:
    Temperature                 53 degrees C / 127 degrees F
    CPU temperature             53 degrees C / 127 degrees F
    DRAM                     16341 MB (16384 MB installed)
    Memory utilization          6 percent
    5 sec CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    0 percent
      Interrupt                 0 percent
      Idle                    100 percent
    1 min CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    0 percent
      Interrupt                 0 percent
      Idle                    100 percent
    5 min CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    0 percent
      Interrupt                 0 percent
      Idle                    100 percent
    15 min CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    0 percent
      Interrupt                 0 percent
      Idle                    100 percent
    Model                       RE-S-2X00x6
    Start time                  2017-11-29 19:04:56 PST
    Uptime                      5 days, 4 hours, 58 minutes, 44 seconds
    Last reboot reason          0x2000:hypervisor reboot
    Load averages:              1 minute   5 minute  15 minute
                                    0.10       0.14       0.15
```

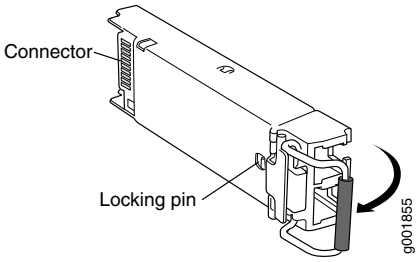
See Also

- MX204 Routing Engine Description on page 39
- MX204 Routing Engine LEDs on page 41
- *show chassis routing-engine*

Replacing a SFP+ Transceiver

Small form-factor pluggable plus transceivers (SFP+) are enhanced SFP transceivers that provides support for data rates of up to 10 Gbps for fiber-optic or copper interfaces. SFP+ transceivers are hot-insertable and hot-removable. Removing an SFP+ transceiver does not interrupt router functioning, but the removed SFP+ transceiver no longer receives or transmits data.

Figure 44: Small Form-Factor Pluggable (SFP) Transceiver



- Removing an SFP+ Transceiver on page 95
- Installing a SFP+ Transceiver on page 96

Removing an SFP+ Transceiver

To remove an SFP+ transceiver:

1. Have ready a replacement transceiver or a transceiver slot plug, an antistatic mat, and a rubber safety cap for the transceiver.

2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Label the cables connected to the transceiver so that you can reconnect them correctly later.

4. Remove the cable connector from the transceiver. Immediately cover the transceiver and the end of the cable with a rubber safety cap.

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

5. Pull the ejector handle out from the transceiver to unlock the transceiver.

   CAUTION: **Make sure that you open the ejector handle completely until you hear it click. This prevents damage to the transceiver.**

   Use needlenose pliers to pull the ejector handle out from the transceiver.

6. Grasp the transceiver ejector handle, and pull the transceiver approximately 0.5 in. (1.3 cm) out of the interface port.

7. Using your fingers, grasp the body of the transceiver, and pull it the rest of the way out of the interface port.

8. Place a rubber safety cap over the transceiver.

9. Place the removed transceiver on an antistatic mat or in an electrostatic bag.

CAUTION: After removing a transceiver from the chassis, wait at least 30 seconds before reinserting it or inserting a transceiver into a different slot.

Installing a SFP+ Transceiver

To install an SFP+ transceiver:

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

2. Take each transceiver to be installed out of its electrostatic bag, and identify the slot on the component where it will be installed.

3. Verify that each transceiver is covered by a rubber safety cap. If it is not, cover the transceiver with a safety cap.

4. Carefully align the transceiver with the slots in the component. The connectors should face the component.

5. Slide the transceiver until the connector is seated in the component slot. If you are unable to fully insert the transceiver, make sure the connector is facing the right way.

6. Close the ejector handle of the transceiver.

7. Remove the rubber safety cap from the transceiver and the end of the cable. Insert the cable into the transceiver.

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

8. Verify that the status LEDs on the component faceplate indicate that the SFP is functioning correctly. For more information about the component LEDs, see the *MX Series Interface Module Reference*.

Replacing a QSFP28 Transceiver

28-Gbps quad small form-factor pluggable (QSFP28) transceivers are optical ACX5448 installed in an MPC, a MIC, or a router. QSFP28 transceivers are hot-insertable and

hot-removable. Removing a QSFP28 transceiver does not interrupt router functioning, but the removed QSFP28 transceiver no longer receives or transmits data.

- Removing a QSFP28 Transceiver on page 97
- Installing a QSFP28 Transceiver on page 98

Removing a QSFP28 Transceiver

To remove a QSFP28 transceiver (see Figure 45 on page 98):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the QSFP28 transceiver. Have ready a rubber safety cap for the QSFP28 transceiver and the cable.

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

3. Label the cable connected to the QSFP28 transceiver so that you can later reconnect it to the correct QSFP28 transceiver.

4. Disconnect the cable from the transceiver. Immediately cover the transceiver and the end of the cable with a rubber safety cap.

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

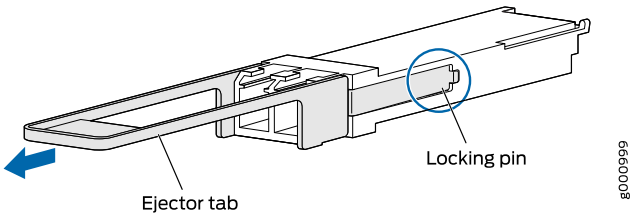
CAUTION: **Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.**

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

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

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

Figure 45: 28-Gbps Quad Small Form-Factor Pluggable (QSFP28) Transceiver



Installing a QSFP28 Transceiver

To install a replacement QSFP28 transceiver:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.

2. Verify that a rubber safety cap covers the QSFP28 transceiver.

3. Orient the transceiver over the port in the MIC, MPC, or router so that the QSFP28 connector faces the appropriate direction.

4. Slide the transceiver into the slot until the locking pins lock in place. If there is resistance, remove the transciever and flip it so that the connector faces the other direction.

5. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

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

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

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

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

7. Verify that the status LEDs on the MPC, MIC, or router faceplate indicate that the QSFP28 transciever is functioning correctly. For more information about the MPC, MIC, or router LEDs, see the *MX Series Interface Module Reference*. You can also verify interface port functioning by issuing the **show chassis fpc pic-status** command.

Maintaining MX204 Cooling System Components

Maintaining the MX204 Fan Module

Purpose For optimum cooling, verify the condition of the fans.

Action

- Monitor the status of the fans. A fan module contains multiple fans that work in unison to cool the router components. If one fan fails, the router adjusts the speed of the remaining fans to maintain proper cooling. A red alarm is triggered when a fan fails, and a yellow alarm and a red alarm are triggered when a fan module is removed.
- To display the status of the cooling system, issue the **show chassis environment** command. The output is similar to the following:

```
user@host> show chassis environment
Class Item                           Status     Measurement
Temp  CB 0 Top Right Inlet Sensor    OK         35 degrees C / 95 degrees F
      CB 0 Top Left Inlet Sensor     OK         38 degrees C / 100 degrees F
      CB 0 Top Right Exhaust Sensor  OK         45 degrees C / 113 degrees F
      CB 0 Top Left Exhaust Sensor   OK         64 degrees C / 147 degrees F
      CB 0 CPU Core-0 Temp           OK         49 degrees C / 120 degrees F
      CB 0 CPU Core-1 Temp           OK         49 degrees C / 120 degrees F
      CB 0 CPU Core-2 Temp           OK         48 degrees C / 118 degrees F
      CB 0 CPU Core-3 Temp           OK         49 degrees C / 120 degrees F
```

```
      CB 0 CPU Core-4 Temp           OK          49 degrees C / 120 degrees F
      CB 0 CPU Core-5 Temp           OK          48 degrees C / 118 degrees F
      CB 0 CPU Core-6 Temp           OK          48 degrees C / 118 degrees F
      CB 0 CPU Core-7 Temp           OK          48 degrees C / 118 degrees F
      FPC 0 EA0_HMC0 Logic die       OK          81 degrees C / 177 degrees F
      FPC 0 EA0_HMC0 DRAM botm       OK          78 degrees C / 172 degrees F
      FPC 0 EA0_HMC1 Logic die       OK          85 degrees C / 185 degrees F
      FPC 0 EA0_HMC1 DRAM botm       OK          82 degrees C / 179 degrees F
      FPC 0 EA0 Chip                 OK          93 degrees C / 199 degrees F
      FPC 0 EA0-XR0 Chip             OK          69 degrees C / 156 degrees F
      FPC 0 EA0-XR1 Chip             OK          73 degrees C / 163 degrees F
Power PEM 0                          ok
      PEM 1                          OK          49 degrees C / 120 degrees F
Fans  Fan Tray 0 Fan 0               OK          Spinning at normal speed
      Fan Tray 0 Fan 1               OK          Spinning at normal speed
      Fan Tray 1 Fan 0               OK          Spinning at normal speed
      Fan Tray 1 Fan 1               OK          Spinning at normal speed
      Fan Tray 2 Fan 0               OK          Spinning at normal speed
      Fan Tray 2 Fan 1               OK          Spinning at normal speed
```

See Also

- MX204 Cooling System Description on page 26
- *show chassis environment*

Replacing an MX204 Fan Module

- Removing an MX204 Fan Module on page 100
- Installing an MX204 Fan Module on page 101

Removing an MX204 Fan Module

NOTE: To prevent overheating, install the replacement fan module immediately after removing the existing fan module.

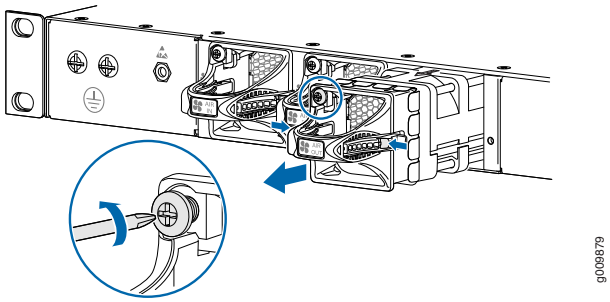
To remove the fan module (see Figure 46 on page 101):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Loosen the captive screw on the fan module faceplate (use a number-2 Phillips screwdriver).
3. Hold and press the latch located on the inside of the fan module to release it from the chassis.

WARNING: To avoid injury, keep tools and your fingers away from the fans as you slide the fan module out of the chassis. The fans might still be spinning.

4. Place one hand under the fan module to support it, and pull the fan module completely out of the chassis.

Figure 46: Removing the Fan Module



Installing an MX204 Fan Module

To install the fan module (see Figure 47 on page 101):

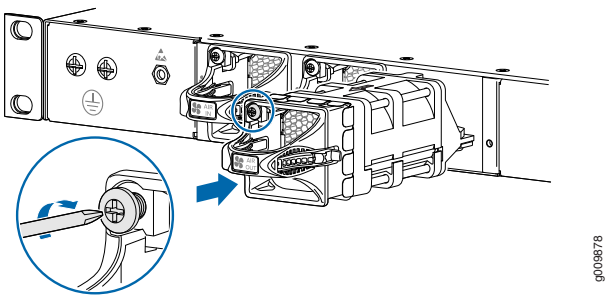
1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

2. Grasp the fan module by the handle, and place one hand under the fan module for support.

3. Place the fan module on the respective slot, and carefully push the fan module into the chassis until the socket lock snaps into place and holds it.

4. Using a number-2 Phillips screwdriver, turn the locking screw on the fan module faceplate until it is tight and secured.

Figure 47: Installing the Fan Module



See Also
- MX204 Cooling System Description on page 26
- Prevention of Electrostatic Discharge Damage on page 138

Maintaining MX204 Power System Components

- Maintaining the MX204 Power Supplies on page 102
- Replacing an MX204 AC Power Supply on page 103
- Replacing an MX204 DC Power Supply on page 105

Maintaining the MX204 Power Supplies

Purpose For optimum router performance, verify the condition of the power supply modules.

Action On a regular basis, check the power supply status:

- To check the power supply status, issue the **show chassis environment** CLI command. The output is similar to the following:

```
user@host> show chassis environment
Class Item                            Status     Measurement
Temp  CB 0 Top Right Inlet Sensor     OK         26 degrees C / 78 degrees F
      CB 0 Top Left Inlet Sensor      OK         22 degrees C / 71 degrees F
      CB 0 Top Right Exhaust Sensor   OK         31 degrees C / 87 degrees F
      CB 0 Top Left Exhaust Sensor    OK         44 degrees C / 111 degrees F
      CB 0 CPU Core-0 Temp            OK         35 degrees C / 95 degrees F
      CB 0 CPU Core-1 Temp            OK         34 degrees C / 93 degrees F
      CB 0 CPU Core-2 Temp            OK         34 degrees C / 93 degrees F
      CB 0 CPU Core-3 Temp            OK         34 degrees C / 93 degrees F
      CB 0 CPU Core-4 Temp            OK         33 degrees C / 91 degrees F
      CB 0 CPU Core-5 Temp            OK         33 degrees C / 91 degrees F
      CB 0 CPU Core-6 Temp            OK         33 degrees C / 91 degrees F
      CB 0 CPU Core-7 Temp            OK         33 degrees C / 91 degrees F
      FPC 0 EA0_HMC0 Logic die        OK         55 degrees C / 131 degrees F
      FPC 0 EA0_HMC0 DRAM botm        OK         52 degrees C / 125 degrees F
      FPC 0 EA0_HMC1 Logic die        OK         55 degrees C / 131 degrees F
      FPC 0 EA0_HMC1 DRAM botm        OK         52 degrees C / 125 degrees F
      FPC 0 EA0 Chip                  OK         64 degrees C / 147 degrees F
      FPC 0 EA0-XR0 Chip              OK         56 degrees C / 132 degrees F
      FPC 0 EA0-XR1 Chip              OK         57 degrees C / 134 degrees F
Power PEM 0                           OK
      PEM 1                           Ok
Fans  Fan Tray 0 Fan 0                OK         Spinning at normal speed
      Fan Tray 0 Fan 1                OK         Spinning at normal speed
      Fan Tray 1 Fan 0                OK         Spinning at normal speed
      Fan Tray 1 Fan 1                OK         Spinning at normal speed
      Fan Tray 2 Fan 0                OK         Spinning at normal speed
      Fan Tray 2 Fan 1                OK         Spinning at normal speed
```

- Make sure that the power and grounding cables are arranged so that they do not obstruct access to other router components.

- Routinely check the status LEDs on the power supply faceplates and the craft interface to determine if the power supplies are functioning normally.
- Check the red and yellow alarm LEDs on the craft interface. Power supply failure or removal triggers an alarm that causes one or both of the LEDs to light. You can display the associated error messages by issuing the following command:

  ```
  user@host> show chassis alarms
  ```

- Periodically inspect the site to ensure that the grounding and power cables connected to the router are securely in place and that there is no moisture accumulating near the router.

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

See Also

- MX204 Power System Description on page 29
- MX204 Power Supply Module LEDs on page 31

Replacing an MX204 AC Power Supply

- Removing an MX204 AC Power Supply on page 103
- Installing an MX204 AC Power Supply on page 104

Removing an MX204 AC Power Supply

Before you remove a power supply, be aware of the following:

NOTE: The minimum required number of power supply modules must be present in the router at all times.

CAUTION: To maintain proper cooling and prevent thermal shutdown of the operating power supply unit, each power supply slot must contain either a power supply or a blank panel. If you remove a power supply, you must install a replacement power supply or a blank panel shortly after the removal.

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

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

To remove an AC power supply (see Figure 48 on page 104):

1. Switch off the dedicated customer-site circuit breaker for the power supply, and remove the power cord from the AC power source. Follow the instructions for your site.

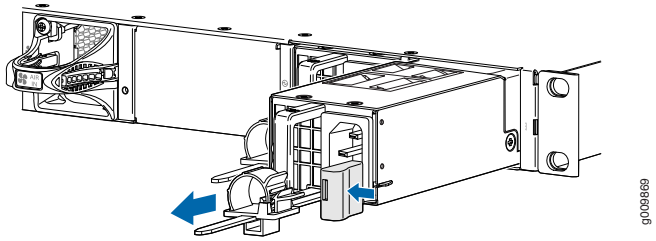
2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Remove the power cord from the power supply.

4. Press the release latch on the side of the AC power supply to disconnect the power supply from the chassis (see Figure 48 on page 104).

5. Pull the power supply straight out of the chassis.

Figure 48: Removing an AC Power Supply



Installing an MX204 AC Power Supply

To install an AC power supply (see Figure 49 on page 105):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

2. Using both hands, hold and slide the AC power supply straight into the chassis until the power supply is fully seated in the chassis slot. The power supply faceplate must alligned with any adjacent power supply faceplate or blank installed in the power supply slot.

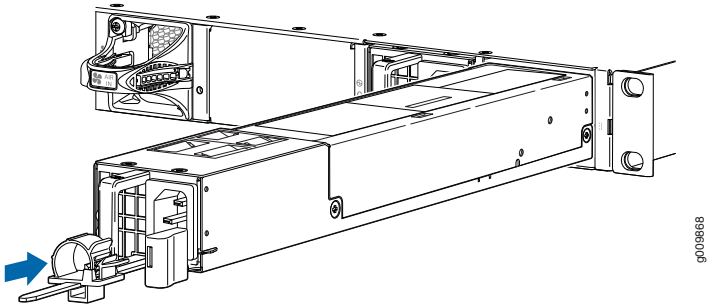
3. Press the latch located on the side of the power supply to slide it into the chassis.

4. Attach the power cord to the power supply.

5. Attach the power cord to the AC power source, and switch on the dedicated customer-site circuit breaker. Follow the instructions for your site.

6. Observe the status LED on the power supply faceplate. If the power supply is correctly installed and functioning normally, the status LED lights green steadily.

Figure 49: Installing an AC Power Supply



See Also

- MX204 Power System Description on page 29
- MX204 Router AC Power Specifications on page 33
- AC Power Circuit Breaker Requirements for the MX204 Router on page 34
- Prevention of Electrostatic Discharge Damage on page 138

Replacing an MX204 DC Power Supply

- Removing an MX204 DC Power Supply on page 105
- Installing an MX204 DC Power Supply on page 107

Removing an MX204 DC Power Supply

Before you remove a power supply, be aware of the following:

NOTE: The minimum required number of power supply modules must be present in the router at all times.

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 position, and tape the switch handle of the circuit breaker in the off position.

CAUTION: To maintain proper cooling and prevent thermal shutdown of the operating power supply unit, each power supply slot must contain either a power supply or a blank panel. If you remove a power supply, you must install a replacement power supply or a blank panel shortly after the removal.

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

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

To remove a DC power supply:

1. Switch off the dedicated customer-site circuit breaker for the power supply being removed. Follow your site's procedures for ESD.
2. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Verify that the status LED on the power supply is not lit.
4. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
5. Remove the clear plastic cover protecting the terminal studs on the faceplate.
6. Using a socket screw driver, remove the screw from each of the DC power terminals (see Figure 50 on page 107).
7. Remove the cable lugs from the terminals.
8. Carefully move the power cables out of the way.
9. Press the latch located on the DC power supply, to release it from the chassis.
10. Pull the power supply straight out of the chassis (see Figure 51 on page 107).

Figure 50: Disconnecting the DC Power Cables

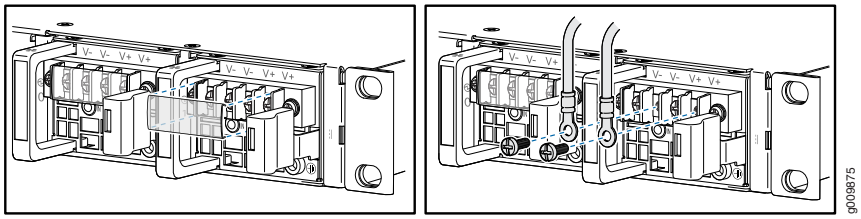
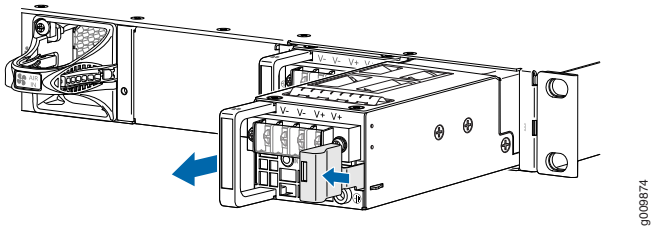


Figure 51: Removing a DC Power Supply



Installing an MX204 DC Power Supply

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 position, and tape the switch handle of the circuit breaker in the off position.**

To install a DC power supply (see Figure 52 on page 109):

1. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.

2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Using both hands, slide the DC power supply straight into the chassis until the power supply is fully seated in the chassis slot. The power supply faceplate must alligned with any adjacent power supply faceplate or blank installed in the power supply slot.

4. Remove the clear plastic cover protecting the terminal on the faceplate.

5. Remove the screws from the terminals.

6. Secure each power cable lug to the terminal with the screw (see Figure 53 on page 109). Apply between 5 lb-in. (0.6 Nm) and 6 lb-in. (0.7 Nm) of torque to the screw. Do not overtighten the screw (use a socket nut driver).

   a. Secure the positive (+) DC source power cable lug to the **RTN** (return) terminal.

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

CAUTION: Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the screws. Ensure that each screw is properly threaded into the terminal. Applying installation torque to the screw when improperly threaded can result in damage to the terminal.

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

7. Replace the clear plastic cover over the terminals on the faceplate.

8. Verify that the power cabling is correct, that the cables do not touch or block access to router components, and that they do not drape where people could trip on them.

9. Attach the power cable to the DC power source, and switch on the dedicated customer-site circuit breaker. Follow the instructions for your site.

NOTE: If more than one power supply is being installed, turn on all power supply modules at the same time.

10. Observe the status LED on the power supply faceplate. If the power supply is correctly installed and functioning normally, the status LED lights green steadily.

Figure 52: Installing a DC Power Supply

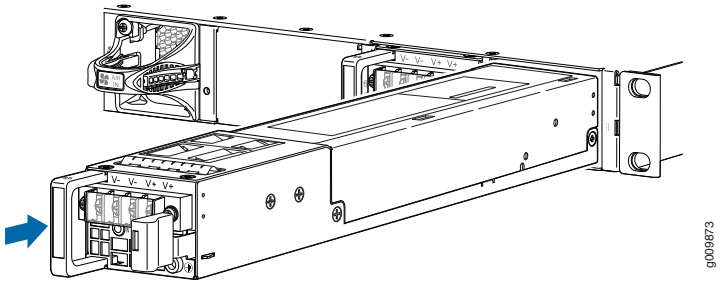
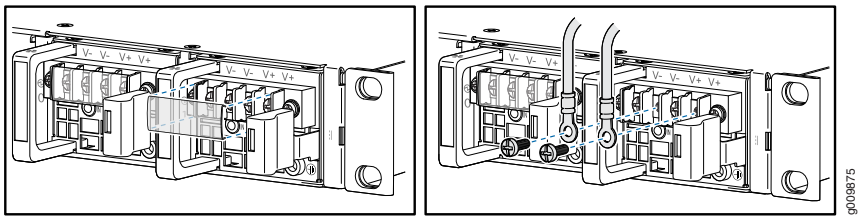


Figure 53: Connecting the DC Power Cables



See Also

- MX204 Power System Description on page 29
- MX204 Router DC Power Specifications on page 36
- DC Power Circuit Breaker Requirements for the MX204 Router on page 37
- DC Power Source Cabling for MX204 Router on page 37
- DC Power Cable Specifications for MX204 Router on page 38
- Prevention of Electrostatic Discharge Damage on page 138

CHAPTER 5

Contacting Customer Support and Returning the Chassis or Components

Contacting Customer Support and Returning the Chassis or Components

Contacting Customer Support

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

- On the Web, using the Case Manager link at:

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

- By telephone:

  From the US and Canada: 1-888-314-JTAC

  From all other locations: 1-408-745-9500

  If contacting JTAC by phone, enter your 12-digit case number followed by the # key if this is an existing case, or press the * key to be routed to the next available support engineer.

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

- Your existing case number, if you have one
- Details of the failure or problem
- Type of activity being performed on the platform when the problem occurred
- Configuration data using one or more of the show commands

Contacting Customer Support to Obtain Return Material Authorization

If you are returning a device or hardware component to Juniper Networks for repair or replacement, obtain a Return Material Authorization (RMA) number from Juniper Networks Technical Assistance Center (JTAC).

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

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

- Your existing case 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:

- Case Manager at CSC: https://www.juniper.net/cm/
- Telephone: +1-888-314-JTAC1-888-314-5822, toll free in U.S., Canada, and Mexico

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

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

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

Locating the Serial Number on an MX204 Router or Component

If you are returning a router or component to Juniper Networks for repair or replacement, you must locate the serial number of the router or component. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain a Return Materials Authorization (RMA). See "Contacting Customer Support to Obtain Return Material Authorization" on page 112.

If the router is operational and you can access the command-line interface (CLI), you can list serial numbers for the router and for some components with a CLI command. If you do not have access to the CLI or if the serial number for the component does not

appear in the command output, you can locate the serial number ID label on the router or component.

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

Listing the Chassis and Component Details Using the CLI

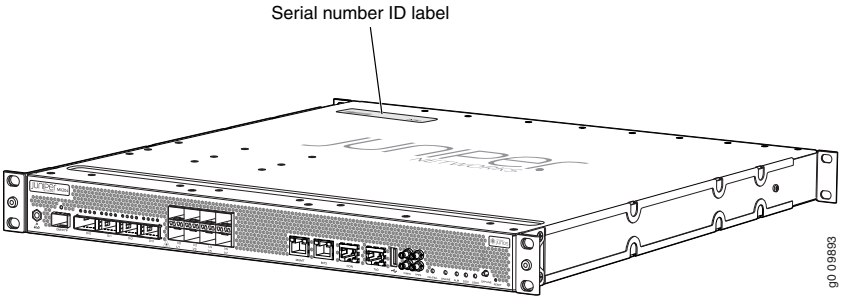
To list the MX204 chassis and the components and their serial numbers, use the **show chassis hardware** CLI operational mode command.

```
user@device> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                BB768             JNP204 [MX204]
Routing Engine 0          BUILTIN      BUILTIN           RE-S-2X00x6
CB 0             REV 11   750-069579   CAJD3113          JNP204 [MX204]
FPC 0                     BUILTIN      BUILTIN           MPC
  PIC 0                   BUILTIN      BUILTIN           4XQSFP28 PIC
    Xcvr 0       REV 01   740-058732   F5I2018309        QSFP-100GBASE-LR4
    Xcvr 1       REV 01   740-054053   QF027546          QSFP+-4X10G-SR
    Xcvr 2       REV 01   740-058732   1AMQA14203X       QSFP-100GBASE-LR4
    Xcvr 3       REV 01   740-058732   1GCQA0370CK       QSFP-100GBASE-LR4
  PIC 1                   BUILTIN      BUILTIN           8XSFPP PIC
PEM 0            REV 02   740-070749   1F186390026       AC AFO 650W PSU
PEM 1            REV 04   740-043886   1GA46361256       JPSU-650W-DC-AFO
Fan Tray 0                                               Fan Tray, Front to Back
 Airflow - AFO
Fan Tray 1                                               Fan Tray, Front to Back
 Airflow - AFO
Fan Tray 2                                               Fan Tray, Front to Back
 Airflow - AFO
```

Locating the Chassis Serial Number ID Label on an MX204

The serial number ID label is located on a label on the top of the chassis. See Figure 54 on page 114 for the location on an MX204.

Figure 54: MX204 Chassis Serial Number Label

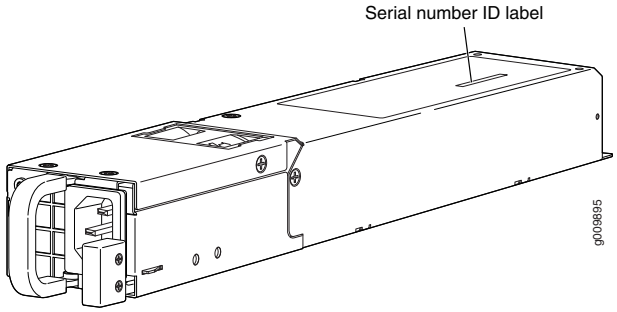


Locating the Serial Number ID Labels on MX204 Power Supplies

The power supplies installed in an MX204 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.

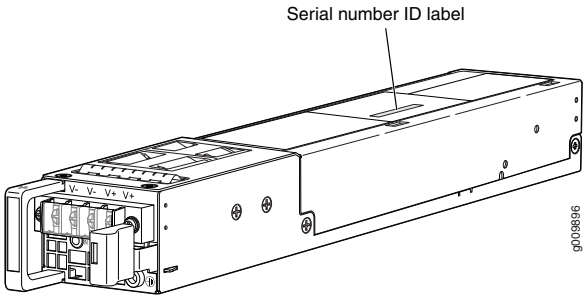
- AC power supply—The serial number ID label is on the top of the AC power supply. See Figure 55 on page 114.

Figure 55: MX204 AC Power Supply Serial Number Location



- DC power supply—The serial number ID label is on the top of the DC power supply. See Figure 56 on page 114.

Figure 56: MX204 DC Power Supply Serial Number Location

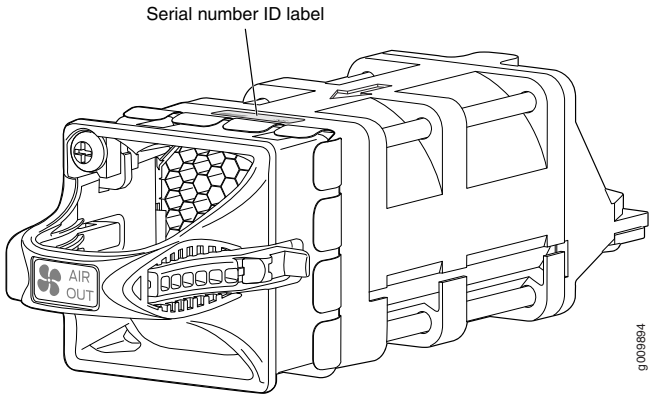


Locating the Serial Number ID Label on an MX204 Fan Module

The fan modules installed in an MX204 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 module–The serial number ID label is located at the base of the fan module. See Figure 57 on page 115.

Figure 57: MX204 Fan Module Serial Number Location



See Also

- MX204 Hardware Components and CLI Terminology on page 24

Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

- When you return components, make sure they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
- Use the original shipping materials if they are available.
- Place individual components in antistatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.

CAUTION: Do not stack any of the hardware components.

CHAPTER 6

Safety and Compliance Information

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.

WARNING: This symbol alerts you to the risk of personal injury from a 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 be familiar 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.

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

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

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi

apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

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

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

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

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

Related Documentation

- *Laser and LED Safety Guidelines and Warnings for the ACX5000 Router*
- *Laser and LED Safety Guidelines and Warnings for the QFX Series*
- *Laser and LED Safety Guidelines and Warnings for the PTX10008 and PTX10016*

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.
- Ensure that the separate protective earthing terminal provided on this device is permanently connected 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 of the 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.

General Safety Warnings for Juniper Networks Devices

Qualified Personnel Warning

WARNING: **Only trained and qualified personnel should install or replace the hardware equipment.**

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.

Attention 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.

Restricted-Access Area Warning

WARNING: The hardware equipment 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.

Attention 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.

Related Documentation

- *Installation Safety Warnings for Juniper Networks Devices*
- *Maintenance and Operational Safety Warnings for Juniper Networks Devices*
- *General Electrical Safety Warnings for Juniper Networks Devices*
- *DC Power Electrical Safety Warnings for Juniper Networks Devices*

Fire Safety Requirements

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

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

Fire Suppression

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

Fire Suppression Equipment

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

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers). The primary ingredient in these fire extinguishers is monoammonium phosphate, which is very sticky and difficult to clean. In addition, in the presence of minute amounts of moisture, monoammonium phosphate can become highly corrosive and corrodes most metals.

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

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

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

Installation Instructions Warning

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

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

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

Attention 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.

Related Documentation

- General Safety Guidelines and Warnings on page 119
- Laser and LED Safety Guidelines and Warnings on page 129
- *Laser and LED Safety Guidelines and Warnings for the ACX5000 Router*

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 most of the weight is borne by your legs 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.
- 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
- 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
- Above 121.2 lbs (55 kg): Material handling systems (such as levers, slings, lifts and so on) must be used. When this is not practical, specially trained persons or systems must be used (riggers or movers).

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.

Attention Ne pas utiliser une rampe dont l'inclinaison est supérieure à 10 degrés.

Warnung Keine Rampen mit einer Neigung von mehr als 10 Grad verwenden.

Avvertenza Non usare una rampa con pendenza superiore a 10 gradi.

Advarsel Bruk aldri en rampe som heller mer enn 10 grader.

Aviso Não utilize uma rampa com uma inclinação superior a 10 graus.

¡Atención! No usar una rampa inclinada más de 10 grados

Varning! Använd inte ramp med en lutning på mer än 10 grader.

Rack-Mounting and Cabinet-Mounting Warnings

Ensure that the rack or cabinet in which the device is installed is evenly and securely supported. Uneven mechanical loading could lead to a hazardous condition.

WARNING: To prevent bodily injury when mounting or servicing the device in a rack, take the following precautions to ensure that the system remains stable. The following directives help maintain your safety:

- The device must be installed in a rack that is secured to the building structure.
- The device should be mounted at the bottom of the rack if it is the only unit in the rack.

- When mounting the device on a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

Waarschuwing Om lichamelijk letsel te voorkomen wanneer u dit toestel in een rek monteert of het daar een servicebeurt geeft, moet u speciale voorzorgsmaatregelen nemen om ervoor te zorgen dat het toestel stabiel blijft. De onderstaande richtlijnen worden verstrekt om uw veiligheid te verzekeren:

- De Juniper Networks switch moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.
- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

Varoitus Kun laite asetetaan telineeseen tai huolletaan sen ollessa telineessä, on noudatettava erityisiä varotoimia järjestelmän vakavuuden säilyttämiseksi, jotta vältytään loukkaantumiselta. Noudata seuraavia turvallisuusohjeita:

- Juniper Networks switch on asennettava telineeseen, joka on kiinnitetty rakennukseen.
- Jos telineessä ei ole muita laitteita, aseta laite telineen alaosaan.
- Jos laite asetetaan osaksi täytettyyn telineeseen, aloita kuormittaminen sen alaosasta kaikkein raskaimmalla esineellä ja siirry sitten sen yläosaan.
- Jos telinettä varten on vakaimet, asenna ne ennen laitteen asettamista telineeseen tai sen huoltamista siinä.

Attention Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel:

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.

- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

Warnung Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt. Die folgenden Richtlinien sollen zur Gewährleistung Ihrer Sicherheit dienen:

- Der Juniper Networks switch muß in einem Gestell installiert werden, das in der Gebäudestruktur verankert ist.
- Wenn diese Einheit die einzige im Gestell ist, sollte sie unten im Gestell angebracht werden.
- Bei Anbringung dieser Einheit in einem zum Teil gefüllten Gestell ist das Gestell von unten nach oben zu laden, wobei das schwerste Bauteil unten im Gestell anzubringen ist.
- Wird das Gestell mit Stabilisierungszubehör geliefert, sind zuerst die Stabilisatoren zu installieren, bevor Sie die Einheit im Gestell anbringen oder sie warten.

Avvertenza Per evitare infortuni fisici durante il montaggio o la manutenzione di questa unità in un supporto, occorre osservare speciali precauzioni per garantire che il sistema rimanga stabile. Le seguenti direttive vengono fornite per garantire la sicurezza personale:

- Il Juniper Networks switch deve essere installato in un telaio, il quale deve essere fissato alla struttura dell'edificio.
- Questa unità deve venire montata sul fondo del supporto, se si tratta dell'unica unità da montare nel supporto.
- Quando questa unità viene montata in un supporto parzialmente pieno, caricare il supporto dal basso all'alto, con il componente più pesante sistemato sul fondo del supporto.
- Se il supporto è dotato di dispositivi stabilizzanti, installare tali dispositivi prima di montare o di procedere alla manutenzione dell'unità nel supporto.

Advarsel Unngå fysiske skader under montering eller reparasjonsarbeid på denne enheten når den befinner seg i et kabinett. Vær nøye med at systemet er stabilt. Følgende retningslinjer er gitt for å verne om sikkerheten:

- Juniper Networks switch må installeres i et stativ som er forankret til bygningsstrukturen.
- Denne enheten bør monteres nederst i kabinettet hvis dette er den eneste enheten i kabinettet.

- Ved montering av denne enheten i et kabinett som er delvis fylt, skal kabinettet lastes fra bunnen og opp med den tyngste komponenten nederst i kabinettet.
- Hvis kabinettet er utstyrt med stabiliseringsutstyr, skal stabilisatorene installeres før montering eller utføring av reparasjonsarbeid på enheten i kabinettet.

Aviso Para se prevenir contra danos corporais ao montar ou reparar esta unidade numa estante, deverá tomar precauções especiais para se certificar de que o sistema possui um suporte estável. As seguintes directrizes ajudá-lo-ão a efectuar o seu trabalho com segurança:

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do edificio.
- Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
- Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.
- Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.

¡Atención! Para evitar lesiones durante el montaje de este equipo sobre un bastidor, oeriormente durante su mantenimiento, se debe poner mucho cuidado en que el sistema quede bien estable. Para garantizar su seguridad, proceda según las siguientes instrucciones:

- El Juniper Networks switch debe instalarse en un bastidor fijado a la estructura del edificio.
- Colocar el equipo en la parte inferior del bastidor, cuando sea la única unidad en el mismo.
- Cuando este equipo se vaya a instalar en un bastidor parcialmente ocupado, comenzar la instalación desde la parte inferior hacia la superior colocando el equipo más pesado en la parte inferior.
- Si el bastidor dispone de dispositivos estabilizadores, instalar éstos antes de montar o proceder al mantenimiento del equipo instalado en el bastidor.

Varning! För att undvika kroppsskada när du installerar eller utför underhållsarbete på denna enhet på en ställning måste du vidta särskilda försiktighetsåtgärder för att försäkra dig om att systemet står stadigt. Följande riktlinjer ges för att trygga din säkerhet:

- Juniper Networks switch måste installeras i en ställning som är förankrad i byggnadens struktur.
- Om denna enhet är den enda enheten på ställningen skall den installeras längst ned på ställningen.
- Om denna enhet installeras på en delvis fylld ställning skall ställningen fyllas nedifrån och upp, med de tyngsta enheterna längst ned på ställningen.
- Om ställningen är försedd med stabiliseringsdon skall dessa monteras fast innan enheten installeras eller underhålls på ställningen.

Laser and LED Safety Guidelines and Warnings

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 EN 60825-1 requirements.

Observe the following guidelines and warnings:

- General Laser Safety Guidelines on page 129
- Class 1 Laser Product Warning on page 129
- Class 1 LED Product Warning on page 130
- Laser Beam Warning on page 130

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.

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.

Class 1 Laser Product Warning

WARNING: Class 1 laser product.

Waarschuwing Klasse-1 laser produkt.

Varoitus Luokan 1 lasertuote.

Attention 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

WARNING: Class 1 LED product.

Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Attention 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

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.

Attention Ne pas fixer le faisceau des yeux, ni l'observer directement à l'aide d'instruments optiques.

Warnung Nicht direkt in den Strahl blicken und ihn nicht direkt mit optischen Geräten prüfen.

Avvertenza Non fissare il raggio con gli occhi né usare strumenti ottici per osservarlo direttamente.

Advarsel Stirr eller se ikke direkte p strlen med optiske instrumenter.

Aviso Não olhe fixamente para o raio, nem olhe para ele directamente com instrumentos ópticos.

¡Atención! No mirar fijamente el haz ni observarlo directamente con instrumentos ópticos.

Varning! Rikta inte blicken in mot strålen och titta inte direkt på den genom optiska instrument.

Radiation from Open Port Apertures Warning

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.

Attention Des radiations invisibles à l'il nu pouvant traverser l'ouverture du port lorsqu'aucun câble en fibre optique n'y est connecté, il est recommandé de ne pas regarder fixement l'intérieur de ces ouvertures.

Warnung Aus der Port-Öffnung können unsichtbare Strahlen emittieren, wenn kein Glasfaserkabel angeschlossen ist. Vermeiden Sie es, sich den Strahlungen auszusetzen, und starren Sie nicht in die Öffnungen!

Avvertenza Quando i cavi in fibra non sono inseriti, radiazioni invisibili possono essere emesse attraverso l'apertura della porta. Evitate di esporvi alle radiazioni e non guardate direttamente nelle aperture.

Advarsel Unngå utsettelse for stråling, og stirr ikke inn i åpninger som er åpne, fordi usynlig stråling kan emiteres fra portens åpning når det ikke er tilkoblet en fiberkabel.

Aviso Dada a possibilidade de emissão de radiação invisível através do orifício da via de acesso, quando esta não tiver nenhum cabo de fibra conectado,

deverá evitar 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.

Maintenance and Operational Safety Guidelines and Warnings

While performing the maintenance activities for devices, observe the following guidelines and warnings:

Battery Handling Warning

WARNING: **Replacing a battery incorrectly might result in an explosion. Replace a battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.**

Waarschuwing Er is ontploffingsgevaar als de batterij verkeerd vervangen wordt. Vervang de batterij slechts met hetzelfde of een equivalent type dat door de fabrikant aanbevolen is. Gebruikte batterijen dienen overeenkomstig fabrieksvoorschriften weggeworpen te worden.

Varoitus Räjähdyksen vaara, jos akku on vaihdettu väärään akkuun. Käytä vaihtamiseen ainoastaan saman- tai vastaavantyyppistä akkua, joka on valmistajan suosittelema. Hävitä käytetyt akut valmistajan ohjeiden mukaan.

Attention 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.

Attention 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.

Attention 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.

Attention 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.

Attention 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 requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the device are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

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.

- 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.
- 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 grounding surfaces are cleaned and brought to a bright finish before grounding connections are made.
- 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 58 on page 139) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.

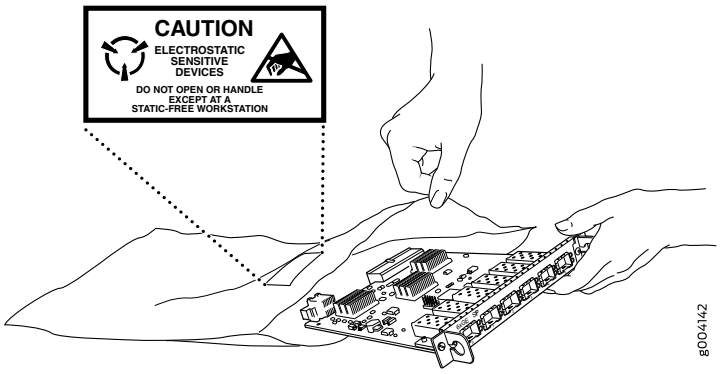
  WARNING: **For safety, periodically check the resistance value of the ESD grounding strap. The measurement must be in the range 1 through 10 Mohms.**

- 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 58 on page 139). If you are returning a component, place it in an antistatic bag before packing it.

Figure 58: 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.

Site Electrical Wiring Guidelines

Table 39 on page 139 describes the factors you must consider while planning the electrical wiring at your site.

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

Table 39: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a twisted-pair cable with a good distribution of grounding conductors. • If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

Table 39: Site Electrical Wiring Guidelines (continued)

Site Wiring Factor	Guidelines
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Some of the problems caused by strong sources of electromagnetic interference (EMI) are: • 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

CAUTION: **For devices with AC power supplies, an external surge protective device (SPD) must be used at the AC power source.**

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。

g017253

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.

Attention 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.

Attention Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

Warnung Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

Avvertenza Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

Advarsel Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

Aviso Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

¡Atención! Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF), y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

Varning! Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

DC Power Grounding Requirements and Warning

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors but is identifiable by green and yellow stripes is installed as part of the branch circuit that supplies the device. The grounding conductor is a separately derived system at the supply transformer or motor generator set.

WARNING: When you install the device, the ground connection must always be made first and disconnected last.

Waarschuwing Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

Varoitus Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

Attention Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

Warnung Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

Avvertenza In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

Advarsel Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

Aviso Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

¡Atención! Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

Varning! Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

DC Power Wiring Sequence Warning

WARNING: Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, +RTN to +RTN, then –48 V to –48 V. When disconnecting power, the proper wiring sequence is –48 V to –48 V, +RTN to +RTN, then ground to ground. Note that the ground wire must always be connected first and disconnected last.

Waarschuwing De juiste bedradingsvolgorde verbonden is aarde naar aarde, +RTN naar +RTN, en –48 V naar – 48 V. De juiste bedradingsvolgorde losgemaakt is en –48 naar –48 V, +RTN naar +RTN, aarde naar aarde.

Varoitus Oikea yhdistettava kytkentajarjestys on maajohto maajohtoon, +RTN varten +RTN, –48 V varten – 48 V. Oikea irrotettava kytkentajarjestys on –48 V varten – 48 V, +RTN varten +RTN, maajohto maajohtoon.

Attention Câblez l'approvisionnement d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, +RTN à +RTN, puis –48 V à –48 V. En débranchant la puissance, l'ordre approprié de câblage est –48 V à –48 V, +RTN à +RTN, a alors rectifié pour rectifier. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

Warnung Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

Avvertenza Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

Advarsel Riktig tilkoples tilkoplingssekvens er jord til jord, +RTN til +RTN, –48 V til – 48 V. Riktig frakoples tilkoplingssekvens er –48 V til – 48 V, +RTN til +RTN, jord til jord.

Aviso Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, +RTN a +RTN, entonces –48 V a –48 V. Al desconectar potencia, la secuencia apropiada del cableado es –48 V a –48 V, +RTN a +RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

¡Atención! Wire a fonte de alimentação de DC Usando os talões apropriados na extremidade da fiação. Ao conectar a potência, a seqüência apropriada da fiação é moída para moer, +RTN a +RTN, então –48 V a –48 V. Ao desconectar a potência, a seqüência apropriada da fiação é –48 V a –48 V, +RTN a +RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

Varning! Korrekt kopplingssekvens ar jord till jord, +RTN till +RTN, –48 V till –48 V. Korrekt kopplas kopplingssekvens ar –48 V till –48 V, +RTN till +RTN, jord till jord.

DC Power Wiring Terminations Warning

WARNING: When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations must be the appropriate size for the wires and must clamp both the insulation and conductor.

Waarschuwing Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Attention Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la

taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

Avvertenza Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

Advarsel Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

Aviso Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

¡Atención! Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

Multiple Power Supplies Disconnection Warning

WARNING: The network device has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

Waarschuwing Deze eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

Varoitus Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

Attention Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

Warnung Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

Avvertenza Questa unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

Advarsel Denne enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

Aviso Este dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

¡Atención! Esta unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

Varning! Denna enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

TN Power Warning

WARNING: The device is designed to work with a TN power system.

Waarschuwing Het apparaat is ontworpen om te functioneren met TN energiesystemen.

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

Attention 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, then call for help.

Agency Approvals for MX204 Router

The router comply with the following standards:

- Safety
  - CAN/CSA-C22.2 No. 60950-1, Safety of Information Technology Equipment
  - UL 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements
  - EN 60950-1 European Norm, Safety of Information Technology Equipment
  - IEC 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements (with country deviations)
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC
  - EN 300 386 V1.6.1 Telecom Network Equipment - EMC requirements Class A
  - EN 300 386 V2.1.1 Telecom Network Equipment - EMC requirements Class A
  - EN 55032:2012 + EN55032:2012/AC:2013 Electromagnetic compatibility of multimedia equipment - Emission requirements Class A
  - CISPR 32:2012 Electromagnetic compatibility of multimedia equipment – Emission Requirements Class A
  - EN 55022:2010/AC:2011 European Radiated Emissions Class A

  - CISPR 22 edition 6.0 : 2008-09 Class A
  - FCC 47CFR , Part 15 Class A (2012) USA Radiated Emissions Class A
  - ICES-003 Issue 6, Jan 2016 Canada Radiated Emissions Class A
  - VCCI-V-3/2013.04 and V-4/2012.04 Japanese Radiated Emissions Class A
  - VCCI-CISPR 32:2016 Japanese Radiated and Conducted Emissions Class A
  - BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions Class A
  - AS/NZS CISPR22:2009/A1:2010 Class A
  - AS/NZS CISPR 32:2015 Electromagnetic compatibility of multimedia equipment - Emission requirements Class A
  - KN32 Korea Radiated Emission (at 10 Meter) Class A
  - TEC/EMI/TEL-001/01/FEB-09,Class A
  - EN-61000-3-2 Power Line Harmonics
  - EN-61000-3-3 Voltage Fluctuations and Flicker
- Immunity
  - EN 55024:2010 Information Technology Equipment Immunity Characteristics
  - CISPR 24:edition 2b: 2010 COREC 2011 IT Equipment Immunity Characteristics
  - EN 300 386 V1.6.1 Telecom Network Equipment - EMC requirements
  - EN 300 386 V2.1.1 Telecom Network Equipment - EMC requirements
  - KN35 Immunity Characteristics
  - TEC/EMI/TEL-001/01/FEB-09,Class A
  - EN-61000-4-2 ESD
  - EN-61000-4-3 Radiated Immunity
  - EN-61000-4-4 EFT
  - EN-61000-4-5 Surge
  - EN-61000-4-6 Low Frequency Common Immunity
  - EN-61000-4-11 Voltage Dips and Sags

The router is designed to comply with the following standards:

- GR-63-Core: NEBS, Physical Protection
- GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment
- SR-3580 NEBS Criteria Levels (Level 3 Compliance)

Related Documentation

- MX204 Router Overview on page 19

Compliance Statements for NEBS

- The equipment is suitable for installation as part of the Common Bonding Network (CBN).
- The equipment is suitable for installation in locations where the National Electrical Code (NEC) applies.
- The battery return connection is to be treated as an isolated DC return (that is, DC-I), as defined in GR-1089-CORE.
- You must provision a readily accessible device outside of the equipment to disconnect power. The device must also be rated based on local electrical code practice.

Compliance Statements for EMC Requirements

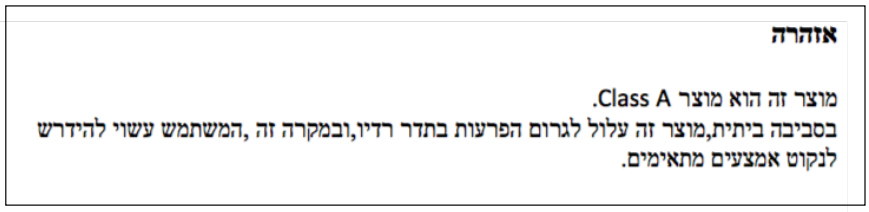
Canada

CAN ICES-3 (A)/NMB-3(A)

European Community

This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

Israel



Translation from Hebrew—Warning: This product is Class A. In residential environments, the product might cause radio interference, and in such a situation, the user might be required to take adequate measures.

Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

The preceding translates as follows:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it might cause radio interference. Install and use the equipment according to the instruction manual. VCCI-A.

United States

The hardware equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Compliance Statements for Environmental Requirements

Batteries in this product are not based on mercury, lead, or cadmium substances. The batteries used in this product are in compliance with EU Directives 91/157/EEC, 93/86/EEC, and 98/101/EEC. The product documentation includes instructional information about the proper method of reclamation and recycling.

Compliance Statements for Acoustic Noise for MX204 Router

The router complies with NEBS Level 3 requirements:

- GR-63-CORE: NEBS, Physical Protection
- GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment