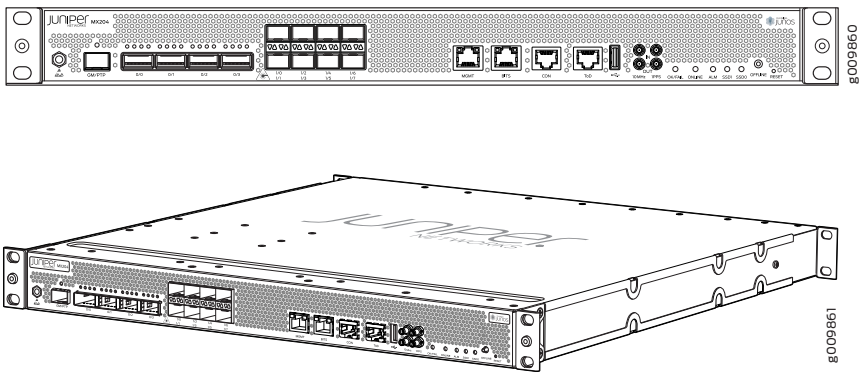
MX204 3D Universal Edge Router Hardware Guide

Modified: 2018-06-11

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 4 shows the components supported on the router.

Table 3: MX204 Router Components

Component	Description
Power supply module	2
Fan module	3

Related Documentation

- MX204 Chassis Description on page 5
- MX204 Cooling System Description on page 11
- MX204 Front and Rear Panel Components on page 8
- MX204 Power System Description on page 21
- MX204 Router Physical Specifications on page 29

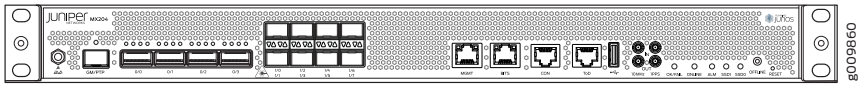
CHAPTER 2

Chassis Components and Descriptions

MX204 Chassis Description

The router chassis is a rigid sheet metal structure that houses all the other router components. Figure 2 on page 5 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 29.

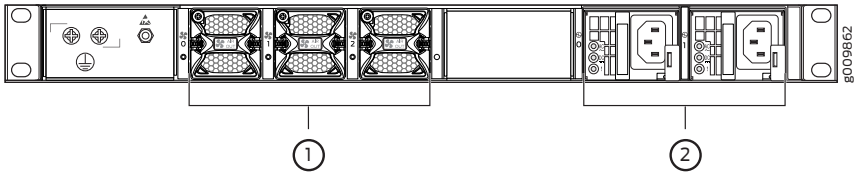
Figure 2: Front View of the MX204 Router



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.

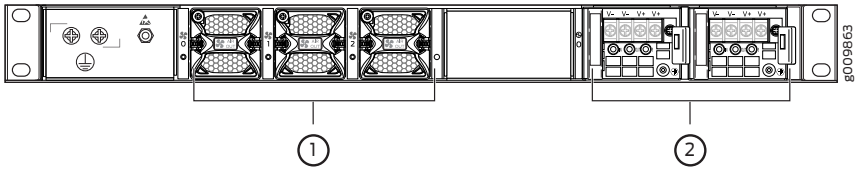
The router comes in two variants–AC-powered and DC-powered. Figure 3 on page 6 and Figure 4 on page 6 shows the rear of the fully configured chassis.

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

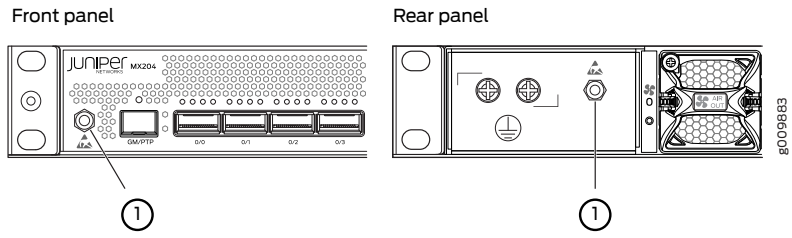


1—Fan modules	2—Power supply modules (DC)

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 6 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	

Related Documentation

- MX204 Router Overview on page 3
- MX204 Router Physical Specifications on page 29

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.**

Related Documentation

- MX204 Router Overview on page 3
- Locating the Serial Number on an MX204 Router or Component on page 125
- Guidelines for Packing Hardware Components for Shipment on page 122
- Returning a Hardware Component to Juniper Networks, Inc. on page 123

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

Related Documentation

- MX204 Hardware Components and CLI Terminology on page 8
- Replacing an MX204 AC Power Supply on page 97
- Replacing an MX204 DC Power Supply on page 99
- Replacing an MX204 Fan Module on page 95

MX204 Hardware Components and CLI Terminology

The MX204 router support the components in Table 4 on page 8, 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 5
Cooling system			"MX204 Cooling System Description" on page 11
Fan module	JNP-FAN-1RU	**Fan Tray, Front to Back Airflow - AFO**	
Power system components			"MX204 Power System Description" on page 21
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 8 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

Related Documentation

- MX204 Router Overview on page 3
- MX204 Chassis Description on page 5

MX204 Front and Rear Panel Components

- Front Panel Components on page 9
- Rear Panel Components on page 9

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. Figure 2 on page 5 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. Figure 3 on page 6 and Figure 4 on page 6 shows the rear of the fully configured chassis.

Table 6 on page 9 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

Related Documentation

- MX204 Routing Engine Description on page 15
- MX204 Chassis Description on page 5

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 9 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.

Related Documentation

- Routine Maintenance Procedures for MX204 Routers on page 113

CHAPTER 3

Cooling System

MX204 Cooling System Description

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

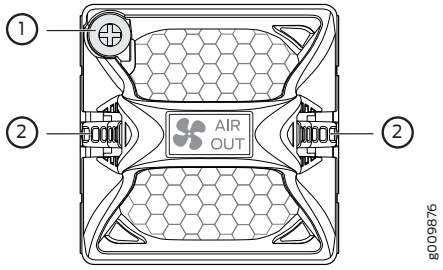
The cooling system consists of the following features and components:

Fan Trays

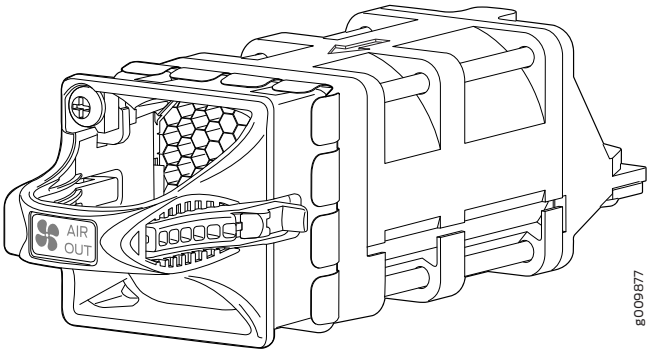
The chassis monitors the temperature of the router components. When the router is operating normally, the fans function at lower than full speed. If a fan fails or the ambient temperature rises above a threshold, the speed of the remaining fans is automatically adjusted to keep the temperature within 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 12).

Figure 6: Fan Module



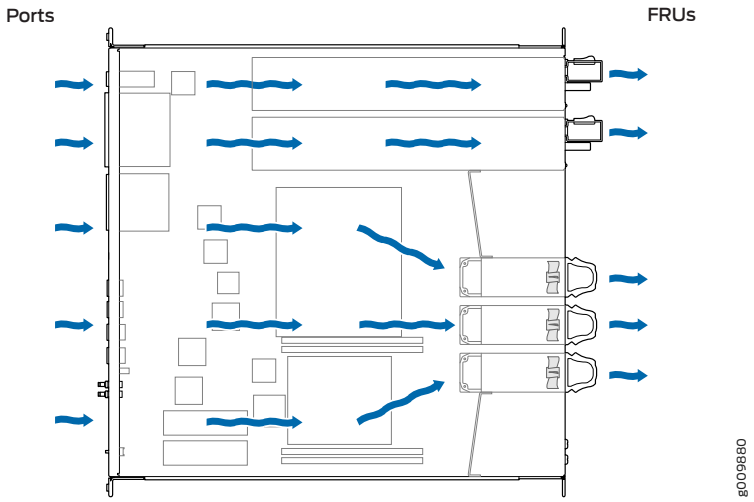
1—Captive screw	2—Latch



Airflow

The router has front-to-back (AIR OUT) cooling system (see Figure 7 on page 12). 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.

Related Documentation

- Maintaining the MX204 Fan Module on page 115
- Maintaining the MX204 Power Supplies on page 116
- Maintaining the MX204 Routing Engine on page 117
- Replacing an MX204 AC Power Supply on page 97
- Replacing an MX204 DC Power Supply on page 99
- Replacing an MX204 Fan Module on page 95
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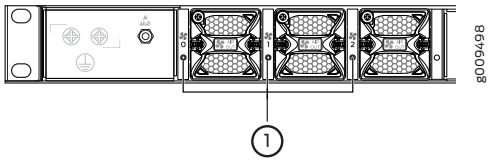
MX204 Fan Status LED

The MX204 fan module does not have any LED—the fan status LEDs are located on the MX204 chassis. Figure 8 on page 13 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 13 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

CHAPTER 4

Host Subsystem Components

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

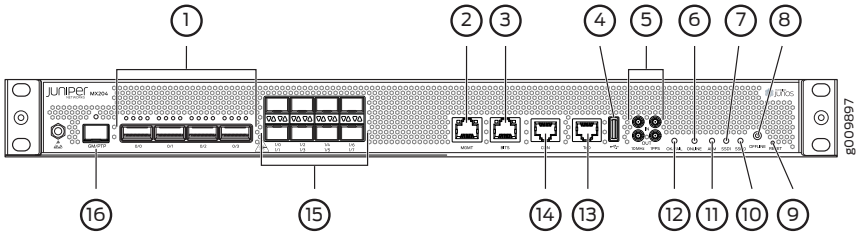
The Routing Engine consists of the following internal components:

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

Routing Engine Front Panel

Figure 9 on page 16 shows the front panel of the MX204 chassis.

Figure 9: 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 9 on page 16):

- **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.

Related Documentation

- 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 56
- MX204 Chassis Description on page 5

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 9 on page 18 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 9: 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.
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.

Table 9: MX204 LEDs (continued)

Label	Color	State	Description
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).

Related Documentation

- MX204 Routing Engine Description on page 15

CHAPTER 5

Power System Components and Descriptions

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 10 on page 22 and Figure 11 on page 23 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.

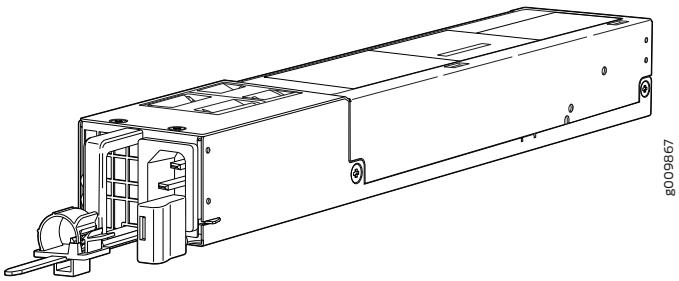
AC Power Supply Description

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 10 on page 22 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 10: AC Power Supply

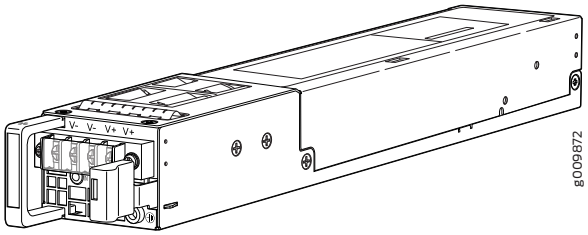


DC Power Supply Description

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 11 on page 23 shows the DC power supply.

Figure 11: DC Power Supply



Related Documentation

- MX204 Power Supply Module LEDs on page 23
- Maintaining the MX204 Power Supplies on page 116
- MX204 Router AC Power Specifications on page 43
- MX204 Router DC Power Specifications on page 49

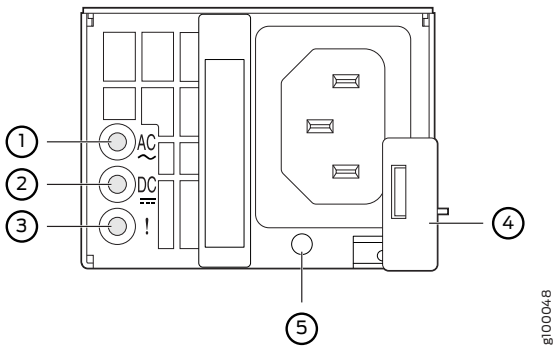
MX204 Power Supply Module LEDs

- AC Power Supply Module LEDs on page 23
- DC Power Supply Module LEDs on page 24

AC Power Supply Module LEDs

Figure 12 on page 23 shows the AC power supply module components along with the status LEDs.

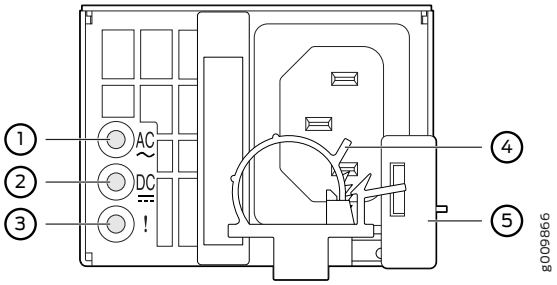
Figure 12: AC Power Supply Module LEDs and Components



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

Figure 13 on page 24 shows the AC power supply module components with the AC power cord retainer along with the status LEDs.

Figure 13: 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 10 on page 24 describes the LEDs on the AC power supply modules.

Table 10: AC Power Supply Module LEDs

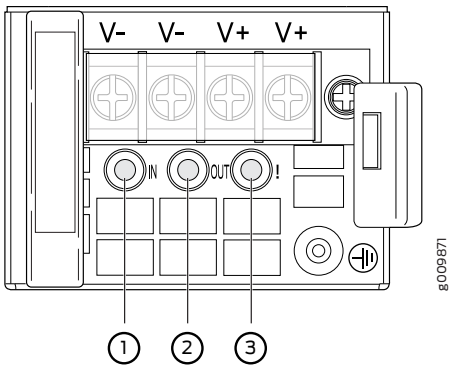
Label	Color	State	Description
AC OK	Unlit	Off	The power supply is disconnected from power source, or the power supply is not receiving power.
	Green	On steadily	Power supply is receiving power.
DC OK	Unlit	Off	Power supply output is off.
	Green	On steadily	The power supply is sending out power correctly.
! (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 14 on page 25 shows the DC power supply modules status LEDs.

Figure 14: 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 11 on page 25 describes the LEDs on the DC power supply modules.

Table 11: 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.

Related Documentation

- Routine Maintenance Procedures for MX204 Routers on page 113
- MX204 Power System Description on page 21
- Maintaining the MX204 Power Supplies on page 116

PART 2

Site Planning, Preparation, and Specifications

CHAPTER 6

Preparation Overview

MX204 Router Physical Specifications

Table 12 on page 29 summarizes the physical specifications for the router.

Table 12: 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)

Related Documentation

- MX204 Router Overview on page 3
- MX204 Chassis Description on page 5

MX204 Router Environmental Specifications

Table 13 on page 30 specifies the environmental specifications required for normal router operation. In addition, the site should be as dust-free as possible.

Table 13: 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.

Related Documentation

- Routine Maintenance Procedures for MX204 Routers on page 113
- *General Safety Guidelines for Juniper Networks Devices*
- General Safety Warnings for Juniper Networks Devices on page 134

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.

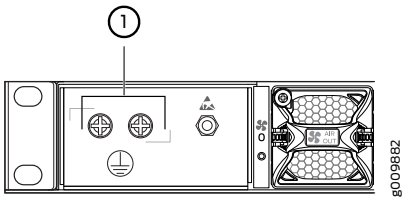
Figure 15 on page 31 shows the grounding point location on the router.

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 15: Grounding Points on the Router



Rear panel

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.

Related Documentation

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Prevention of Electrostatic Discharge Damage on page 156
- MX204 Router AC Power Specifications on page 43
- MX204 Router DC Power Specifications on page 49

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 14 on page 32 summarizes rack requirements and specifications for the router.

Table 14: 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 29). 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.

Related Documentation

- MX204 Site Preparation Checklist on page 35
- MX204 Installation Summary on page 63
- MX204 Router Physical Specifications on page 29

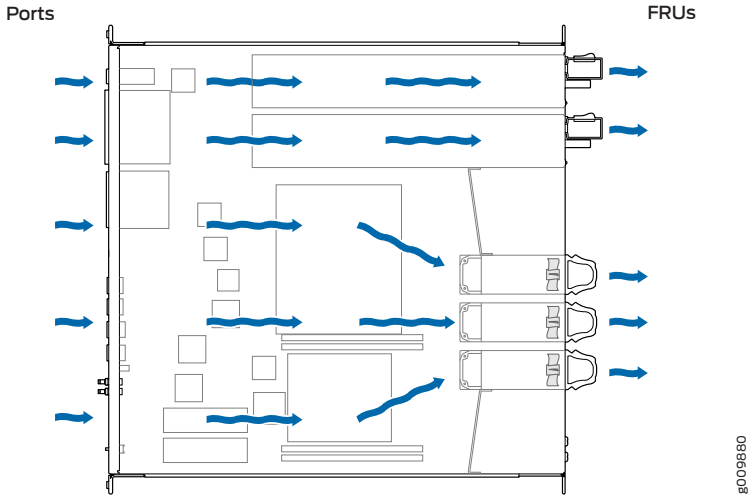
MX204 Router Cabinet Requirements and Specifications

Table 15 on page 33 summarizes cabinet requirements and specifications for the MX204 router.

Table 15: 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.
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 16 on page 34. • 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 34. • 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 16: Airflow Through MX204 Chassis



Related Documentation

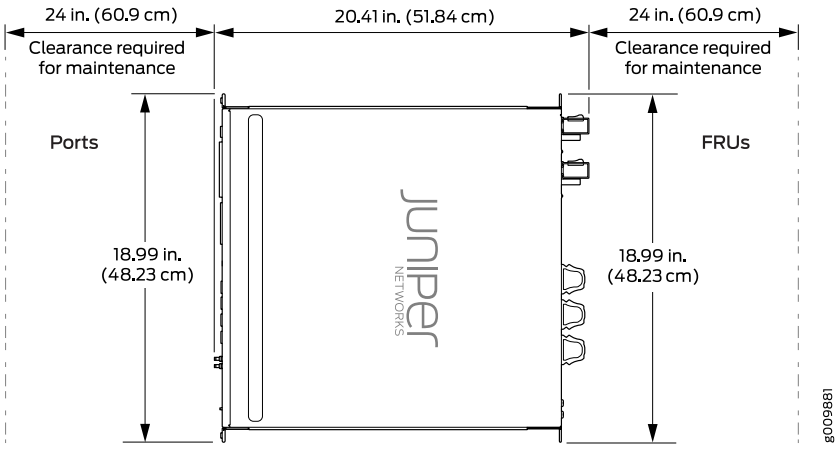
- MX204 Router Physical Specifications on page 29
- MX204 Site Preparation Checklist on page 35
- MX204 Installation Summary on page 63
- MX204 Cooling System Description on page 11

MX204 Router Clearance Requirements for Airflow and Hardware Maintenance

When planning the installation site, allow sufficient clearance around the rack (see Figure 17 on page 35):

- 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 17: MX204 Chassis Dimensions and Clearance Requirements



Related Documentation

- MX204 Site Preparation Checklist on page 35
- MX204 Router Rack Requirements on page 32
- MX204 Router Physical Specifications on page 29

MX204 Site Preparation Checklist

The checklist in Table 16 on page 35 summarizes the tasks you must perform when preparing a site for router installation.

Table 16: 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 30		
Power			
Locate sites for connection of system grounding.	"MX204 Router Grounding Specifications" on page 30		
Measure distance between external power sources and router installation site.	"MX204 Router DC Power Specifications" on page 49 "MX204 Router AC Power Specifications" on page 43		

Table 16: MX204 Site Preparation Checklist (continued)

Item or Task	For More Information	Performed by	Date
Calculate the power consumption and requirements.	"Power Consumption for a DC-Powered MX204 Router" on page 50 "Power Consumption for an AC-Powered MX204 Router" on page 44		
Rack			
Select the type of rack or cabinet.	"MX204 Router Rack Requirements" on page 32 "MX204 Router Cabinet Requirements and Specifications" on page 33		
Plan rack or cabinet location, including required space clearances.	"MX204 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 34		
If a rack is used, secure rack to floor and building structure.	"MX204 Router Rack Requirements" on page 32		
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 37		

Related Documentation

- MX204 Installation Summary on page 63
- Tools Required to Install the MX204 Chassis in Rack on page 64
- Installing the MX204 Chassis in a Rack on page 65

CHAPTER 7

Transceiver and Cable Specifications

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 37
2. Calculating Power Margin for Fiber-Optic Cable on page 38

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 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 17 on page 38 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 17: 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 17 on page 38 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 17 on page 38 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 18 on page 39 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 18: 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

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.

CHAPTER 8

AC Power Requirements, Specifications, and Guidelines

MX204 Router AC Power Specifications

Table 19 on page 43 lists the AC power system electrical specifications.

Table 19: 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 20 on page 43 lists the AC power supply electrical specifications.

Table 20: AC Power Supply Electrical Specifications

Item	Specification
Maximum output power	650 W
AC input voltage	Operating range: 100 through 127 VAC 200 through 240 VAC

Table 20: AC Power Supply Electrical Specifications (continued)

Item	Specification
AC input line frequency	50 to 60 Hz (nominal)
AC input current rating	7.8 A @ 100 VAC 3.8 A @ 240 VAC

Related Documentation

- MX204 Power System Description on page 21
- Maintaining the MX204 Power Supplies on page 116
- AC Power Circuit Breaker Requirements for the MX204 Router on page 45

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 on page 44
- Calculating System Thermal Output on page 45

Power Requirements for MX204 Components

Table 21 on page 44 lists the power requirements for various hardware components when the router is operating under typical and maximum voltage conditions.

Table 21: 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 22 on page 44 lists the power requirements for the fully configured AC-powered routers operating under typical voltage conditions.

Table 22: 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 23 on page 45 lists the power requirements for the fully configured AC-powered routers operating under maximum voltage conditions.

Table 23: 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 22 on page 44 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

Related Documentation

- MX204 Power System Description on page 21
- Replacing an MX204 AC Power Supply on page 97
- AC Power Cord Specifications for MX204 Routers on page 46
- AC Power Circuit Breaker Requirements for the MX204 Router on page 45
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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.

Related Documentation

- MX204 Power System Description on page 21
- Replacing an MX204 AC Power Supply on page 97
- Power Consumption for an AC-Powered MX204 Router on page 44
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155

- Prevention of Electrostatic Discharge Damage on page 156

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 24 on page 46 gives the AC power cord specifications for the countries and regions listed in the table.

Table 24: AC Power Cord Specifications

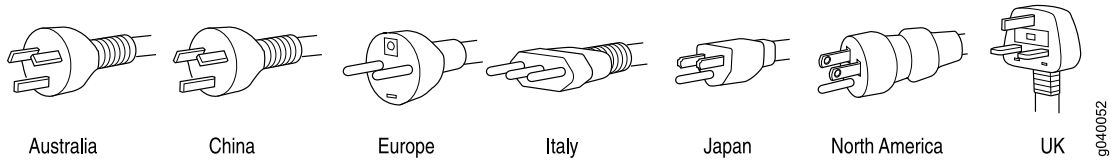
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR
China	250 VAC, 10 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

Table 24: AC Power Cord Specifications (continued)

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
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 18 on page 47 illustrates the plug on the power cord for some of the countries or regions listed in Table 24 on page 46.

Figure 18: AC Plug Types



Related Documentation

- MX204 Router AC Power Specifications on page 43
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

CHAPTER 9

DC Power Requirements, Specifications, and Guidelines

MX204 Router DC Power Specifications

Table 25 on page 49 lists the DC power system electrical specifications.

Table 25: 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 26 on page 49 lists the DC power supply electrical specifications.

Table 26: 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

Table 26: DC Power Supply Electrical Specifications (continued)

Item	Specification
DC input current rating	20 A @ –44 VDC

Related Documentation

- MX204 Power System Description on page 21
- Maintaining the MX204 Power Supplies on page 116
- Replacing an MX204 DC Power Supply on page 99
- DC Power Circuit Breaker Requirements for the MX204 Router on page 51

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 44
- Calculating System Thermal Output on page 45

Power Requirements for MX204 Components

Table 27 on page 50 lists the power requirements for various hardware components when the router is operating under typical and maximum voltage conditions.

Table 27: 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 28 on page 50 lists the power requirements for the fully configured DC-powered routers operating under typical voltage conditions.

Table 28: 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 29 on page 51 lists the power requirements for the fully configured DC-powered routers operating under maximum voltage conditions.

Table 29: 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 28 on page 50 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

Related Documentation

- MX204 Power System Description on page 21
- Replacing an MX204 DC Power Supply on page 99
- DC Power Circuit Breaker Requirements for the MX204 Router on page 51
- DC Power Source Cabling for MX204 Router on page 52
- DC Power Cable Specifications for MX204 Router on page 53
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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.

Related Documentation

- MX204 Power System Description on page 21
- Replacing an MX204 DC Power Supply on page 99
- Power Consumption for a DC-Powered MX204 Router on page 50

- DC Power Source Cabling for MX204 Router on page 52
- DC Power Cable Specifications for MX204 Router on page 53
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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.

Related Documentation

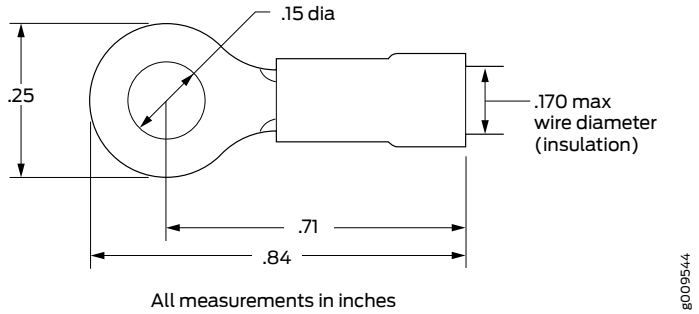
- MX204 Power System Description on page 21
- Replacing an MX204 DC Power Supply on page 99
- Power Consumption for a DC-Powered MX204 Router on page 50
- DC Power Circuit Breaker Requirements for the MX204 Router on page 51
- DC Power Cable Specifications for MX204 Router on page 53
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

DC Power Cable Specifications for MX204 Router

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 19: 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.

Related Documentation

- MX204 Power System Description on page 21
- Replacing an MX204 DC Power Supply on page 99
- MX204 Router DC Power Specifications on page 49
- Power Consumption for a DC-Powered MX204 Router on page 50
- DC Power Circuit Breaker Requirements for the MX204 Router on page 51
- DC Power Source Cabling for MX204 Router on page 52

CHAPTER 10

Pinout Specifications

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 30 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 30: 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

Related Documentation

- CB-RE and RCB Interface Cable and Wire Specifications for MX Series Routers on page 39

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 31 on page 56 describes the RJ-45 connector pinout.

Table 31: 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

Related Documentation

- CB-RE and RCB Interface Cable and Wire Specifications for MX Series Routers on page 39

PART 3

Initial Installation and Configuration

CHAPTER 11

Unpacking the Router

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

Related Documentation

- MX204 Chassis Description on page 5
- MX204 Field-Replaceable Units on page 7
- Unpacking MX204 Router on page 59

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.

Related Documentation

- MX204 Site Preparation Checklist on page 35
- MX204 Installation Summary on page 63
- Tools and Parts Required to Unpack the MX204 Router on page 59
- Verifying the MX204 Router Parts Received on page 60

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 60, and an accessory box, which contains the parts listed in Table 33 on page 61. 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
Quick start installation instructions	1
Blank panels for slots without components installed	One blank panel for each slot not occupied by a component

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

Related Documentation

- MX204 Site Preparation Checklist on page 35
- MX204 Installation Summary on page 63
- Tools and Parts Required to Unpack the MX204 Router on page 59
- Unpacking MX204 Router on page 59

CHAPTER 12

Installing the Router

MX204 Installation Summary

To install the router:

1. Prepare your installation site.

   See "MX204 Site Preparation Checklist" on page 35.

2. Review the safety guidelines and warnings:

   - See "General Safety Guidelines and Warnings" on page 133.
   - See "General Safety Warnings for Juniper Networks Devices" on page 134.

3. Unpack the router and verify the parts:

   a. See "Unpacking MX204 Router" on page 59.

   b. See "Verifying the MX204 Router Parts Received" on page 60.

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 83.

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 80.
11. Perform the initial system configuration.

    See "Performing the Initial Software Configuration for the MX204 Router" on page 89.

Related Documentation

- MX204 Router Rack Requirements on page 32
- MX204 Router Clearance Requirements for Airflow and Hardware Maintenance on page 34
- MX204 Router Cabinet Requirements and Specifications on page 33

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

Related Documentation

- MX204 Site Preparation Checklist on page 35
- MX204 Installation Summary on page 63
- Installing the MX204 Chassis in a Rack on page 65

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:

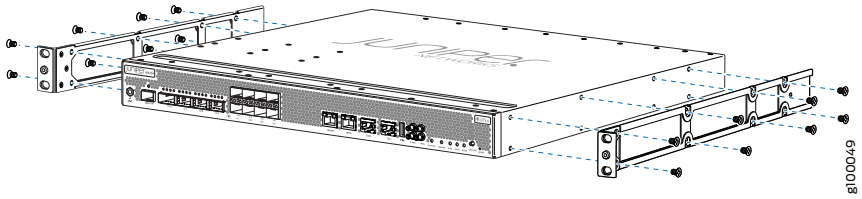
- Installing the MX204 Chassis in a 19-in. Rack on page 65
- Installing the MX204 in a 21-in. ETSI Rack on page 67

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

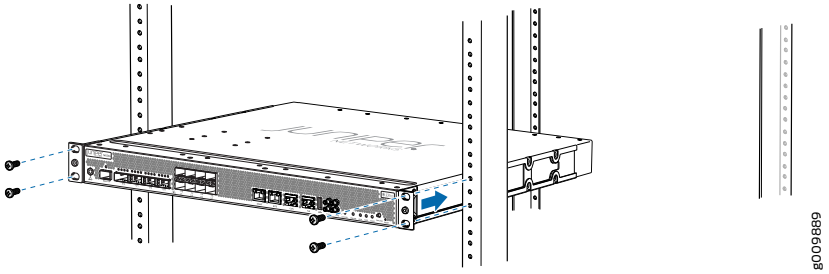


4. Using a Phillips (+) number 2 screwdriver, secure the mounting brackets to the router using the mounting screws.

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.

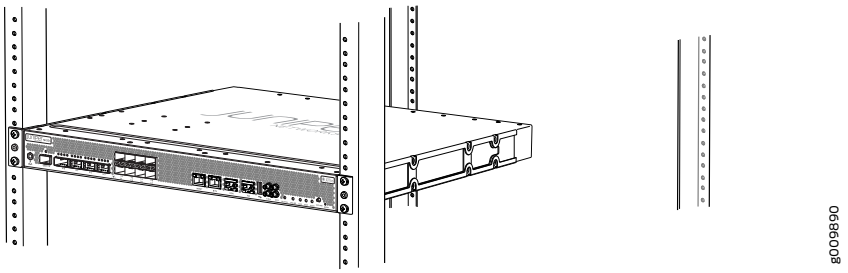
6. Carefully slide the router onto the mounting brackets until the front-mounting brackets attached to the chassis contact the rack rails (see Figure 21 on page 66).

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 66 shows the router fully secured to the front rails of the four-post rack.

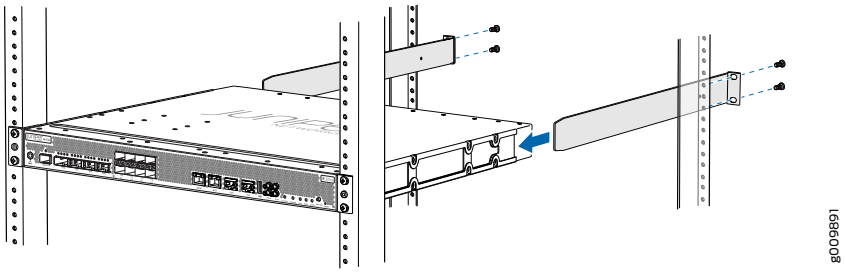
Figure 22: Router Secured by Front-Mounting Brackets



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.

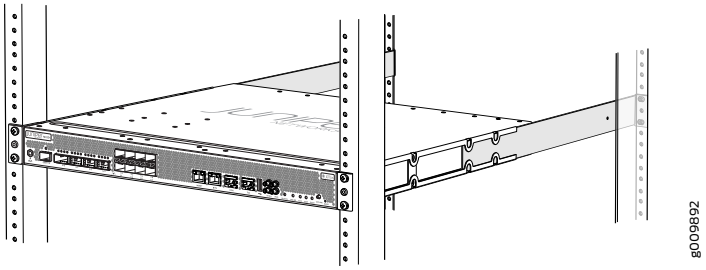
Figure 23: Installing the Rear-Mounting Brackets



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 67 shows the router fully secured and installed in a four-post rack.

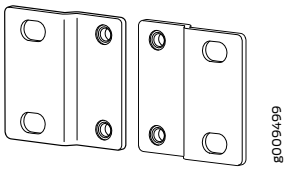
Figure 24: Router Installed in the Rack



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 67 shows the ETSI brackets supported by MX204 router.

Figure 25: ETSI Brackets



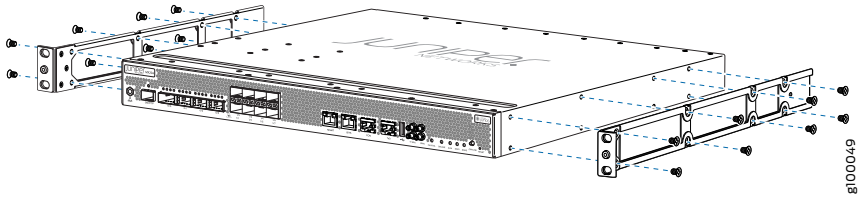
To install the router in a 21-in. ETSI rack or cabinet:

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.

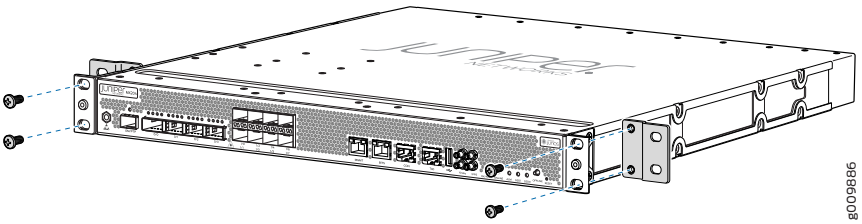
3. Align the holes in the front mounting brackets with the holes on the side of the chassis (see Figure 26 on page 68).

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 68).

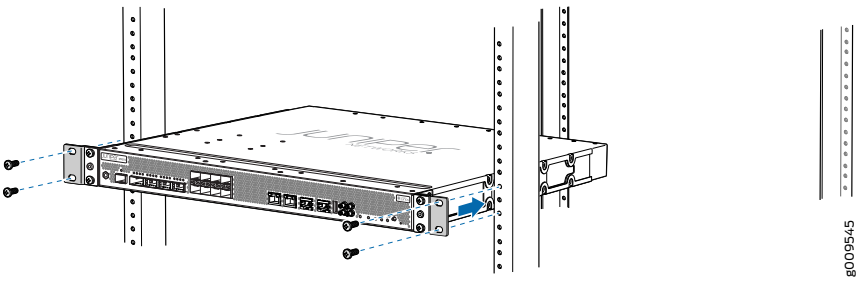
Figure 27: Installing the Front ETSI Brackets



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.

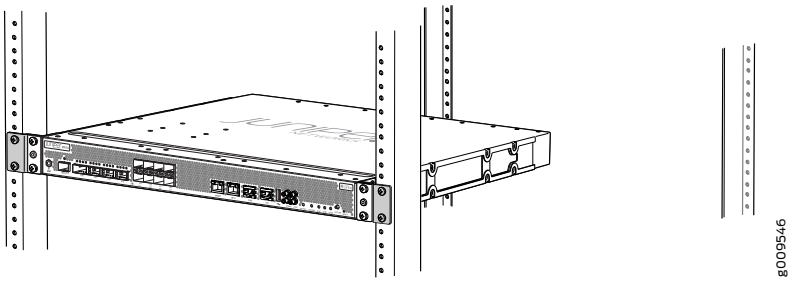
6. Carefully slide the router onto the mounting brackets until the front-mounting brackets attached to the chassis contact the rack rails (see Figure 28 on page 68).

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 69 shows the router fully secured to the front rails of the four-post rack.

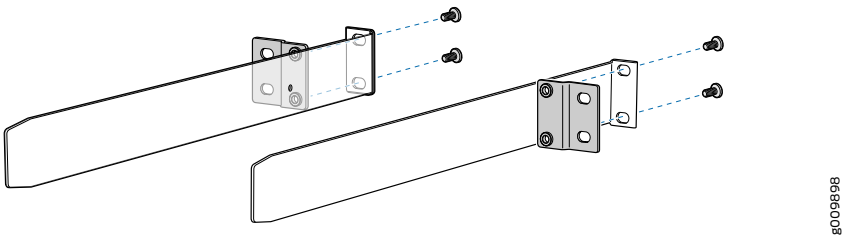
Figure 29: Router Secured by Front-Mounting Brackets with ETSI Brackets



8. Install the two rear ETSI brackets on the rear-mounting brackets (see Figure 30 on page 69).

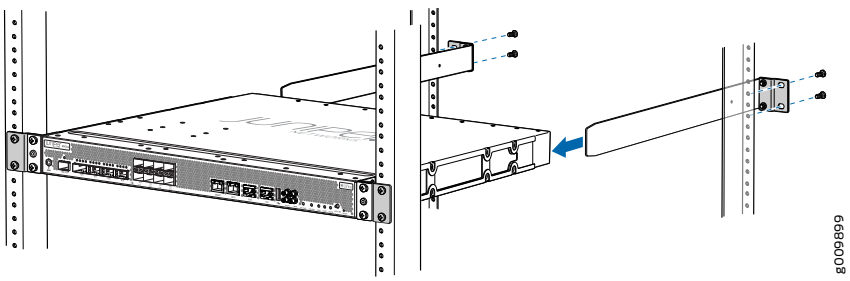
   The rear-mounting brackets on each side of the chassis are movable. You can adjust the brackets according to the depth of the rack.

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 69).

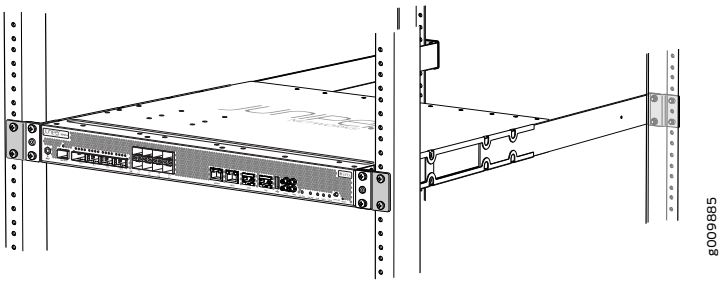
Figure 31: Installing the Rear-Mounting Brackets with ETSI Brackets



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 70 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



Related Documentation

- MX204 Site Preparation Checklist on page 35
- MX204 Router Grounding Specifications on page 30
- MX204 Router Clearance Requirements for Airflow and Hardware Maintenance on page 34
- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Tools Required to Install the MX204 Chassis in Rack on page 64

CHAPTER 13

Connecting the Router to Power

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

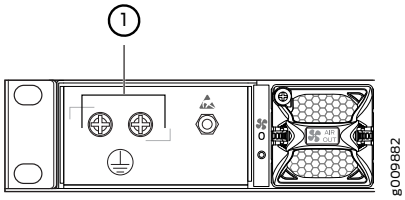
Related Documentation

- Grounding the MX204 Router on page 72
- MX204 Router Grounding Specifications on page 30
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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 30.

Figure 33: Grounding Point on the MX204 Router



Rear panel

1— Grounding point	

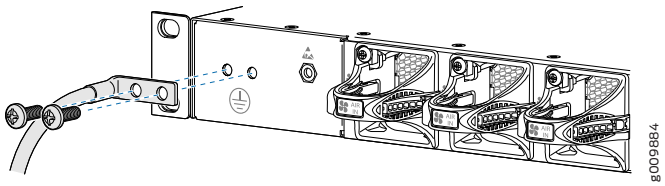
To ground the router:

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



Related Documentation

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Connecting Power to an AC-Powered MX204 Router on page 73
- Connecting Power to a DC-Powered MX204 Router on page 77
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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 46.

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.

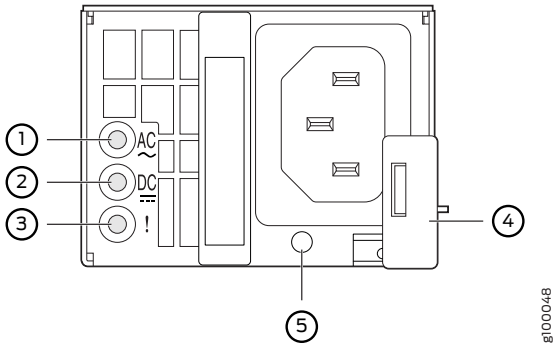
4. Connect the power cord to the power supply source.

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.

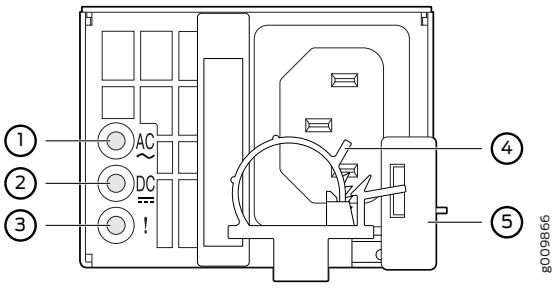
Figure 35: Power Cord Retainer Port on the AC Power Supply Module



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.

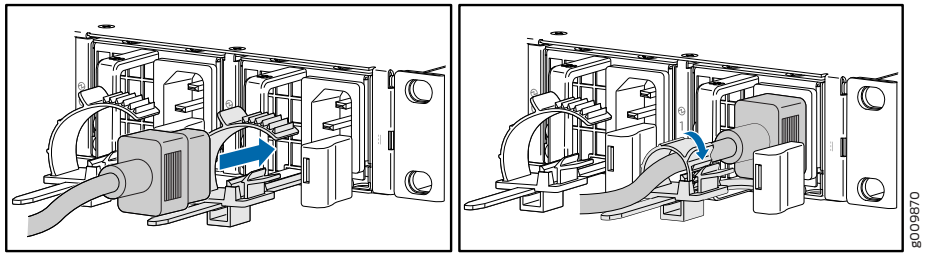
9. Press the tab on the loop and draw out the loop into a tight circle (see Figure 37 on page 75).

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



Related Documentation

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71

- Powering On an AC-Powered MX204 Router on page 76
- MX204 Router Grounding Specifications on page 30
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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.

Related Documentation

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Connecting Power to an AC-Powered MX204 Router on page 73
- MX204 Router Grounding Specifications on page 30
- *request system halt*
- *show chassis power*
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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 53.

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.

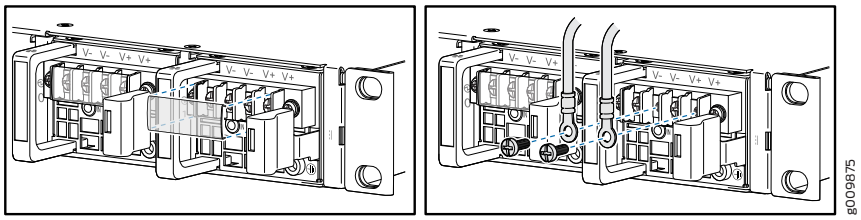
CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color 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 49.

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



Related Documentation

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Powering On a DC-Powered MX204 Router on page 80
- MX204 Router Grounding Specifications on page 30
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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.

Related Documentation

- Tools and Parts Required for MX204 Router Grounding and Power Connections on page 71
- Connecting Power to a DC-Powered MX204 Router on page 77
- MX204 Router Grounding Specifications on page 30
- *request system halt*
- *show chassis power*
- General Safety Guidelines and Warnings on page 133
- General Electrical Safety Guidelines and Warnings on page 155
- Prevention of Electrostatic Discharge Damage on page 156

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 156.
- 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 83).

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.

Related Documentation

- Powering On an AC-Powered MX204 Router on page 76
- Powering On a DC-Powered MX204 Router on page 80
- *request vmhost halt*

CHAPTER 14

Connecting the Router 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)

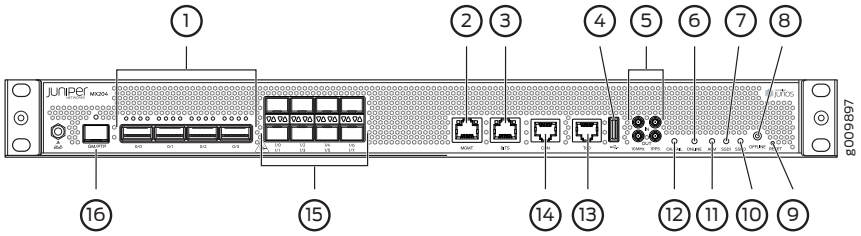
Related Documentation

- Verifying the MX204 Router Parts Received on page 60
- Connecting the MX204 Router to External Devices and Cables on page 83
- Prevention of Electrostatic Discharge Damage on page 156

Connecting the MX204 Router to External Devices and Cables

Figure 39 on page 84 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 84
- Connecting the Router to a Console Device on page 85
- Connecting the Router to External Clocking and Timing Devices on page 86

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 84 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

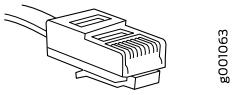


Table 34: Out-of-Band Management Port on the MX204 Router

Callout	Label	Description
2 (See Figure 39 on page 84)	**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 86 and Figure 43 on page 86). 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 85) 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

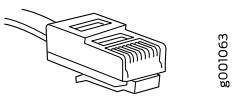


Figure 42: Connecting the MX204 Router to a Management Console Through a Console Server

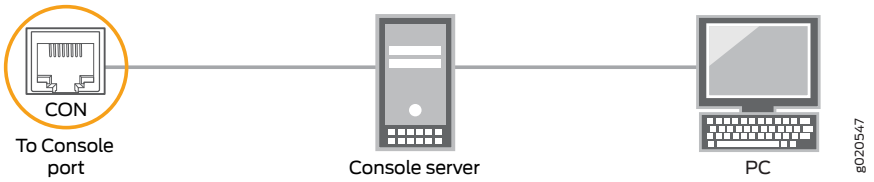


Figure 43: Connecting the MX204 Router Directly to a Management Console

Table 35: Console Port on the MX204 Router

Callout	Label	Description
14 (See Figure 39 on page 84)	**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 86
- Connecting a Time-of-Day Device to the Router on page 87
- Connecting a BITS External Clocking Device to the Router on page 87

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 84)	**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 84)	**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 84)	**BITS**	Building-Integrated Timing Supply (BITS) clock interface port with LED.

Related Documentation

- MX204 Routing Engine Description on page 15
- Prevention of Electrostatic Discharge Damage on page 156

CHAPTER 15

Configuring Junos OS on the Router

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 156

PART 4

Removing, Installing, and Upgrading Components

CHAPTER 16

Replacing Cooling System Components

Replacing an MX204 Fan Module

Removing an MX204 Fan Module

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

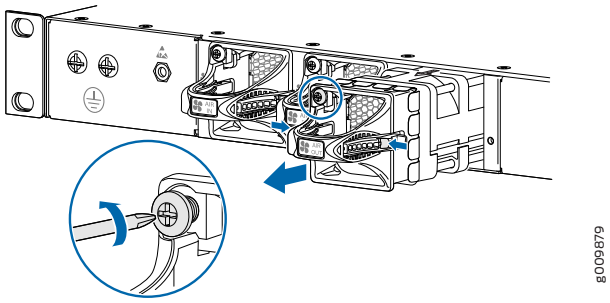
To remove the fan module (see Figure 44 on page 96):

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 44: Removing the Fan Module



Installing an MX204 Fan Module

To install the fan module (see Figure 45 on page 96):

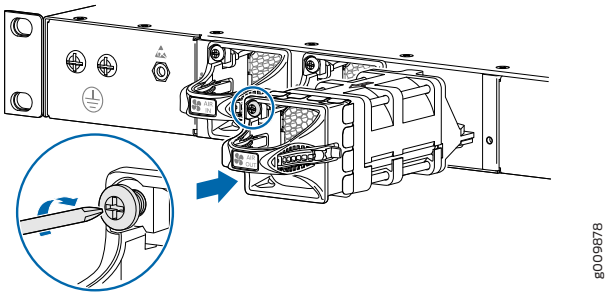
1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

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 45: Installing the Fan Module



Related Documentation

- MX204 Cooling System Description on page 11
- Maintaining the MX204 Fan Module on page 115
- Prevention of Electrostatic Discharge Damage on page 156

CHAPTER 17

Replacing Power System Components

Replacing an MX204 AC Power Supply

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 46 on page 98):

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.

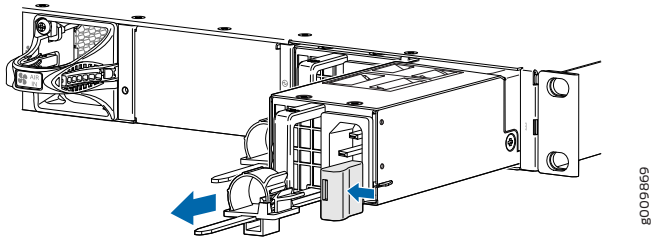
2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

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 46 on page 98).

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

Figure 46: Removing an AC Power Supply



Installing an MX204 AC Power Supply

To install an AC power supply (see Figure 47 on page 99):

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.

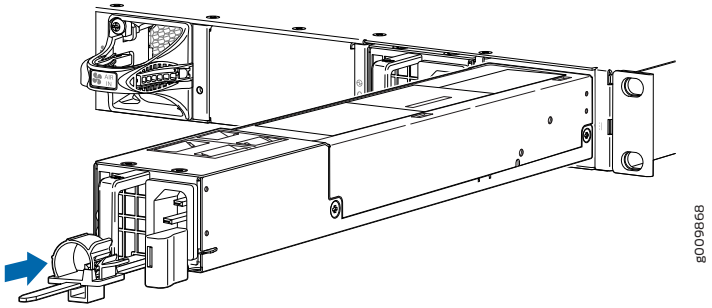
3. Press the latch located on the side of the power supply to slide it into the chassis.

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 47: Installing an AC Power Supply



Related Documentation

- MX204 Power System Description on page 21
- MX204 Router AC Power Specifications on page 43
- AC Power Circuit Breaker Requirements for the MX204 Router on page 45
- Prevention of Electrostatic Discharge Damage on page 156

Replacing an MX204 DC Power Supply

- Removing an MX204 DC Power Supply on page 99
- Installing an MX204 DC Power Supply on page 101

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 48 on page 101).
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 49 on page 101).

Figure 48: Disconnecting the DC Power Cables

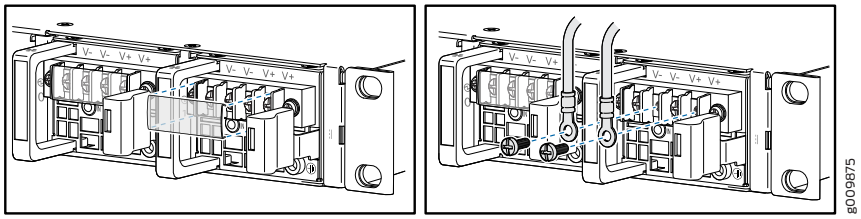
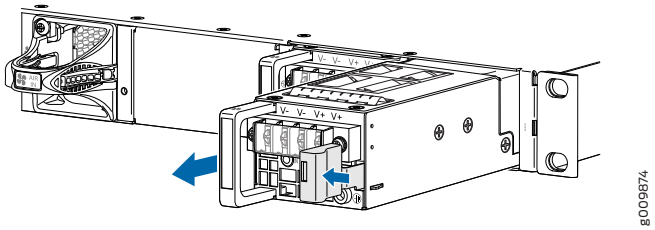


Figure 49: Removing a DC Power Supply



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 50 on page 103):

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 51 on page 103). 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 50: Installing a DC Power Supply

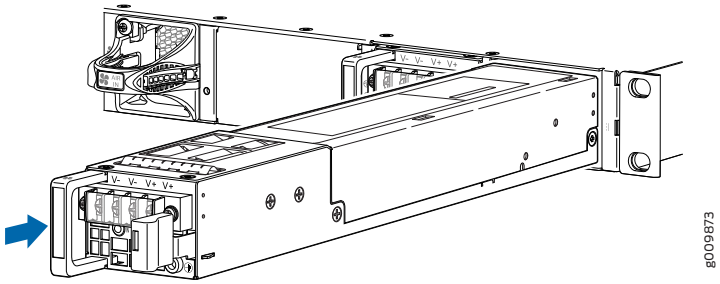
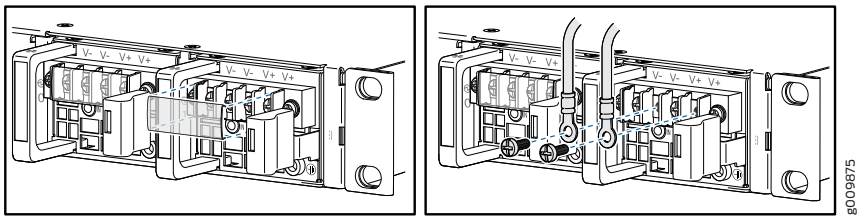


Figure 51: Connecting the DC Power Cables



Related Documentation

- MX204 Power System Description on page 21
- MX204 Router DC Power Specifications on page 49
- DC Power Circuit Breaker Requirements for the MX204 Router on page 51
- DC Power Source Cabling for MX204 Router on page 52
- DC Power Cable Specifications for MX204 Router on page 53
- Prevention of Electrostatic Discharge Damage on page 156

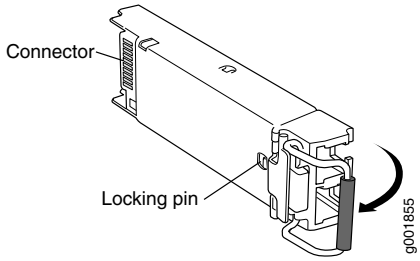
CHAPTER 18

Replacing Transceivers

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 52: Small Form-Factor Pluggable (SFP) Transceiver



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*.

Related Documentation

- Connecting the MX204 Router to External Devices and Cables on page 83
- MX204 Router Overview on page 3

Replacing a QSFP28 Transceiver

28-Gbps quad small form-factor pluggable (QSFP28) transceivers are optical transceivers that are 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 107
- Installing a QSFP28 Transceiver on page 108

Removing a QSFP28 Transceiver

To remove a QSFP28 transceiver (see Figure 53 on page 108):

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.

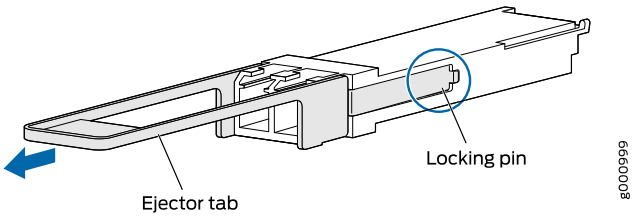
   CAUTION: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.

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 53: 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.

Related Documentation

- *Configuring Rate Selectability on MX204 to Enable Different Port Speeds*
- MX204 Router Overview on page 3

PART 5

Maintaining the Chassis and Components

CHAPTER 19

Maintaining the Router

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.

Related Documentation
- Alarm LEDs on the MX204 Front Panel on page 9

CHAPTER 20

Maintaining the Router 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
```

Related Documentation

- MX204 Cooling System Description on page 11
- Replacing an MX204 Fan Module on page 95
- *show chassis environment*

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.

Related Documentation

- MX204 Power System Description on page 21
- MX204 Power Supply Module LEDs on page 23

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
```

Related Documentation

- MX204 Routing Engine Description on page 15
- MX204 Routing Engine LEDs on page 17
- *show chassis routing-engine*

PART 6

Contacting Customer Support and Returning the Chassis or Components

CHAPTER 21

Contacting Customer Support

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.

Related Documentation

- Prevention of Electrostatic Discharge Damage on page 156

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.

Returning a Hardware Component to Juniper Networks, Inc.

In the event of a hardware failure, please contact Juniper Networks, Inc. to obtain a Return Material Authorization (RMA) number. This number is used to track the returned material at the factory and to return repaired or new components to the customer as needed.

NOTE: Do not return any component to Juniper Networks, Inc. unless you have first obtained an RMA number. Juniper Networks, Inc. reserves the right to refuse shipments that do not have an RMA. Refused shipments are returned to the customer by collect freight.

For more information about return and repair policies, see the customer support Web page at https://www.juniper.net/support/guidelines.html.

For product problems or technical support issues, contact the Juniper Networks Technical Assistance Center (JTAC) by using the Case Manager link at https://www.juniper.net/support/ or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

To return a defective hardware component:

1. Determine the part number and serial number of the defective component.
2. Obtain an RMA number from the Juniper Networks Technical Assistance Center (JTAC). You can send e-mail or telephone as described above.
3. Provide the following information in your e-mail message or during the telephone call:
   - Part number and serial number of component
   - Your name, organization name, telephone number, and fax number
   - Description of the failure
4. The support representative validates your request and issues an RMA number for return of the component.
5. Pack the component for shipment.

CHAPTER 22

Locating Component Serial Numbers

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 121.

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.

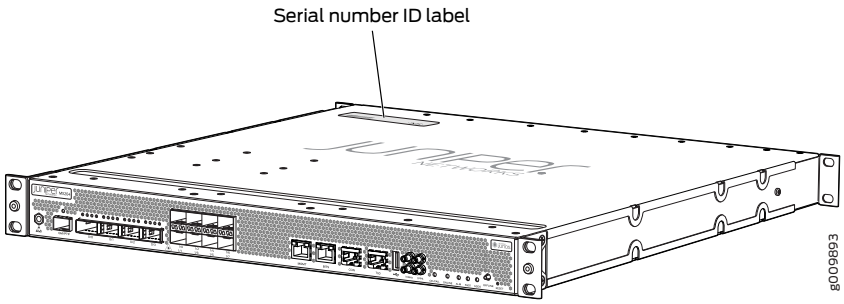
```
user@device> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                BB768             JNP204 [MX204]
Routing Engine 0          BUILTIN      BUILTIN           RE-S-2X00x6
CB 0             REV 11   750-069579   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 126 for the location on an MX204.

Figure 54: MX204 Chassis Serial Number Label

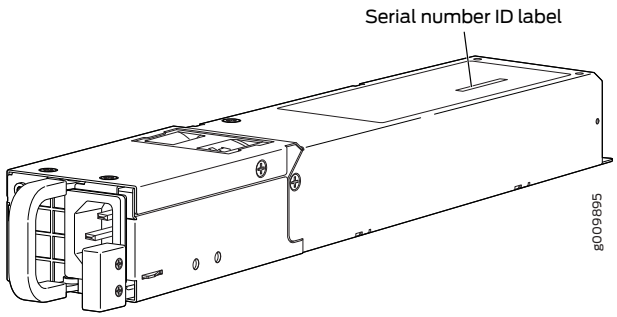


Locating the Serial Number ID Labels on MX204 Power Supplies

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.

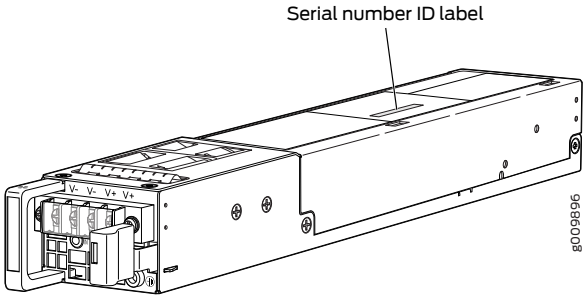
- AC power supply—The serial number ID label is on the top of the AC power supply. See Figure 55 on page 126.

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 127.

Figure 56: MX204 DC Power Supply Serial Number Location

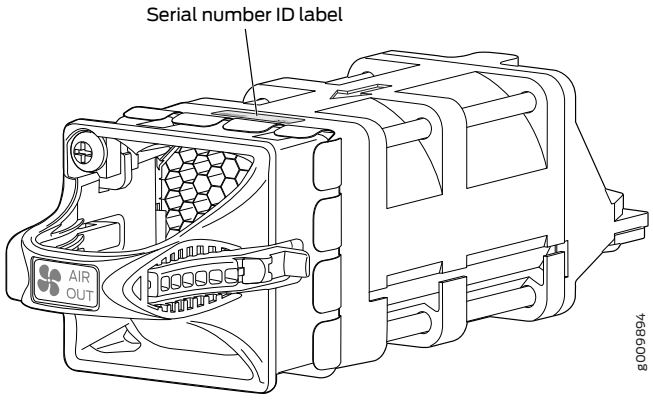


Locating the Serial Number ID Label on an MX204 Fan Module

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 127.

Figure 57: MX204 Fan Module Serial Number Location



Related Documentation

- MX204 Hardware Components and CLI Terminology on page 8