MX10003 Universal Routing Platform Hardware Guide



Modified: 2019-07-01

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MX10003 Universal Routing Platform Hardware Guide
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Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

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Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   system {
     scripts {
       commit {
         file ex-script.xsl;
       }
     }
   }
   interfaces {
     fxp0 {
       disable;
       unit 0 {
         family inet {
           address 10.0.0.1/24;
         }
       }
     }
   }
   ```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

   ```
   [edit]
   user@host# load merge /var/tmp/ex-script.conf
   load complete
   ```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   commit {
     file ex-script-snippet.xsl; }
   ```


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2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see CLI Explorer.

Documentation Conventions

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

Table 1: Notice Icons

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

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

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Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric** *metric***>;**
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	**broadcast | multicast** **(***string1* **|** *string2* **|** *string3***)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [** *community-ids* **]**

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

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

GUI Conventions

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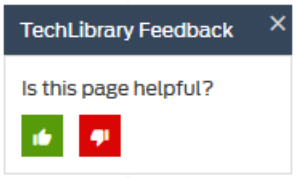
Table 2: Text and Syntax Conventions (continued)

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

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit https://www.juniper.net/support/warranty/.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: https://www.juniper.net/customers/support/
- Search for known bugs: https://prsearch.juniper.net/
- Find product documentation: https://www.juniper.net/documentation/
- Find solutions and answer questions using our Knowledge Base: https://kb.juniper.net/
- Download the latest versions of software and review release notes: https://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: https://www.juniper.net/company/communities/
- Create a service request online: https://myjuniper.juniper.net

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

Creating a Service Request with JTAC

You can create a service request with JTAC on the Web or by telephone.

- Visit https://myjuniper.juniper.net.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

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

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CHAPTER 1

Overview

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MX10003 System Overview

The Juniper Networks MX10003 Universal Routing Platform is an Ethernet-optimized edge router with 2.4Tb capacity that provide both switching and carrier-class Ethernet routing. The MX10003 router runs Junos operating system (Junos OS), enabling a wide range of business and residential applications and services, including high-speed transport and virtual private network (VPN) services, next-generation broadband multiplay services, and high-volume Internet data center internetworking. Each router provides full duplex, high-density Ethernet interfaces and high- capacity switching throughput and uses the Junos Trio chipset for increased scalability of Layer 2/Layer 3 packet forwarding, buffering, and queuing.

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- MX10003 Field-Replaceable Units on page 24

Benefits of the MX10003 Router

- **Space-optimized, power-efficient cloud-era routing platform—**The MX10003 caters to the edge and Metro Ethernet needs of service providers, mobile operators, multiple-service operators in space- and power-constrained environments. Delivering 2.4 Tbps of throughput in just three rack units (3 U), the MX10003 delivers industry-leading port density and performance while consuming just 0.9 watts per gigabit of throughput.

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- **Integrated high-precision timing—**The MX10003 router eliminates the need for external clocks by supporting highly scalable and reliable hardware-based timing including Synchronous Ethernet for frequency, and Precision Time Protocol (PTP) for frequency and phase synchronization. The router uses a hybrid mode, combining Synchronous Ethernet and PTP, to achieve a high level of frequency (10 ppb) and phase (<1.5 uS) accuracy.
- **Simplified management through Junos Fusion—**You can use the MX10003 as aggregation devices in a Junos Fusion Provider Edge deployment, where EX Series and QFX Series switches function as satellite devices.

MX10003 Router Hardware Overview

The MX10003 router contains modular Routing Engines and multiple Packet Forwarding Engines. The Packet Forwarding Engine has two “pseudo” Flexible PIC Concentrators (FPC 0 and FPC1). The single Packet Forwarding Engine takes care of both ingress and egress packet forwarding.

The MX10003 is a compact router, three rack units (3U) tall. Several routers can be stacked in a single floor-to-ceiling rack for increased port density per unit of floor space.

The router provides two dedicated line card slots for Modular Port Concentrators (MPCs). MPCs install into the line-card slots. The router supports two redundant Routing and Control Board (RCB). The RCB houses the Routing Engine and Control Board. The router is powered by six dedicated AC/DC power supply modules. Cooling is handled by four fan modules.

See Table 3 on page 20 for components supported on the router.

Table 3: MX10003 Router Components

Component	Description
MPC	2
Routing and Control Board (RCB)	2
Power supply module	6
Fan module	4

Starting in Junos OS Release 18.3R1, you can use the Mellanox 10-Gbps pluggable adapter (QSFP+ to SFP+ adapter or QSA; model number: MAM1Q00A-QSA) to convert four lane-based ports to a single lane-based SFP+ port. The QSA adapter has the QSFP+ form factor with a receptacle for the SFP+ module. Use the QSA adapter to convert a 40-Gbps port to a 10-Gbps or a 1-Gbps port. You can configure the 4x10 Gbps ports on the fixed pic (6XQSFPP) and the QSFP28 ports on the non-MACSEC MIC (JNP-MIC1) in the 1-Gbps mode, when the SFP is plugged in through the QSA adapter.

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NOTE:

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

NOTE: For a complete list of supported optics on MX10003, see MX10003 Transceivers.

See Also

- MX10003 Cooling System Description on page 29
- MX10003 Power System Description on page 32
- MX10003 Router Physical Specifications on page 59

MX10003 Hardware Components and CLI Terminology

The MX10003 router support the components in Table 4 on page 21, listed in alphabetic order.

Table 4: MX10003 Router Hardware Components and CLI Terminology

Component	Hardware Model Number	CLI Name	Description
Chassis	MX10003-Base	**JNP10003 [MX10003]**	"MX10003 Chassis Description" on page 25
Cooling system, including fan modules and air filters			"MX10003 Cooling System Description" on page 29
Air filter kit	JNP-AIRFLTR-3RU	N/A	
Fan module	JNP-FAN-3RU	**Fan Tray**	
Power system components			"MX10003 Power System Description" on page 32
Power supply module	• JNP-PWR1600-AC • JNP-PWR1100-DC	• **JNP-PWR1600-AC** • **JNP-PWR1100-DC**	
MIC	• Without MACsec support: JNP-MIC1 • With MACsec support: JNP-MIC1-MACSEC	• **MIC1** • **MIC1-MACSEC**	"Multi-Rate Ethernet MIC" on page 46
MPC	MX10003-LC2103.	**LC2103**	"MX10003 MPC (Multi-Rate)" on page 50

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Table 4: MX10003 Router Hardware Components and CLI Terminology (continued)

Component	Hardware Model Number	CLI Name	Description
Routing and Control Board (RCB)	• JNP10003-RE1 • JNP10003-RE1-LT	• RE: **RE-S-1600x8** • CB: **Control Board**	"MX10003 Routing and Control Board (RCB) Description" on page 41
Transceiver	See *MX Series Interface Module Reference*.	**Xcvr**	Hardware Compatibility Tool

Table 5 on page 22 lists the spare parts and blank panels available for the router.

Table 5: MX10003 Spare Parts and Blank Panels

Model Number	Description
JNP10003-CHAS	MX10003 chassis, spare
JNP-FAN-3RU	MX10003 fan module, spare
JNP10003-RE1	MX10003 RE, spare
JNP10003-RE1-R	JNP10003 RE, redundant
JNP10003-LC2103	MX10003 MPC, 6 quad small form-factor pluggable plus transceivers (QSFP+), 1 MIC slot
JNP-PWR1600-AC	MX10003 AC power supply module
JNP-PWR1600-AC-R	MX10003 AC power supply, 1600 W, redundant
JNP-PWR1100-DC	MX10003 DC power supply, 1100 W
JNP-PWR1100-DC-R	MX10003 DC power supply, 1100 W, redundant
JNP-FLTRDR-3RU	MX10003 air filter assembly
JNP-AIRFLTR-3RU	MX10003 air filter
JNP-RE-BLNK-3	MX10003 RE blank cover panel
JNP-PWR-BLNK-3	MX10003 power blank cover panel
JNP-LC-BLNK-3	MX10003 LC2103 blank cover panel
JNP-MIC-BLNK-3	MX10003 MIC1 blank cover panel

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MX10003 Component Redundancy

A fully configured router is designed so that 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:

- Host subsystem—The host subsystem consists of two Routing and Control Boards (RCBs). The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality. The router can have one or two host subsystems. If two host subsystems are installed, one functions as the master and the other functions as the backup. If the master host subsystem (or either of its components) fails, the backup can take over as the master. The RCB installed in slot **0** functions as the default master.
- Power supplies—The router supports six power supplies. Table 6 on page 23 shows the power redundancy supported on the AC and DC powered router for minimum operation. Minimum power supplies required for non-redundant operation is 2 for AC (high), 3 for DC, and 4 for AC (low). With additional power supplies, it provides *N*+1 and *N*+*N* redundancy for the system. Both AC and DC systems can withstand the failure of a single power supply without system interruption in *N*+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.

Table 6: Power Supply Redundancy

Power Supply	PSM Redundancy	Feed Redundancy
AC (250 V; high)	2+1	2+2
AC (110 V; low)	4+1	Not allowed
DC	3+1	3+3

- Cooling system—The cooling system has a total of four fan modules, which are controlled and monitored by the host subsystem. A fully configured router needs all the four 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 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 four fan modules must be operational, and in the event of any fan module failure the failed fan module must be replaced immediately.**

See Also

- Locating the Serial Number on a MX10003 Router or Component on page 144
- Guidelines for Packing Hardware Components for Shipment on page 149

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- *Returning a Hardware Component to Juniper Networks, Inc.*

MX10003 Field-Replaceable Units

Field-replaceable units (FRUs) are router components that can be replaced at the customer site (see Table 7 on page 24). Replacing most FRUs requires minimal router downtime. The router uses the following types of FRUs:

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

Table 7 on page 24 lists the FRUs for the router.

Table 7: Field-Replaceable Units

Hot-Removable and Hot-Insertable FRUs	Hot-Pluggable FRUs
• Backup RCB (if redundant) • Master RCB (if nonstop active routing is configured) • Modular Port Concentrators (MPCs) • Modular Interface Cards (MICs) NOTE: MIC installed in MPC slot 1. • Power supply modules (if redundant) • Fan modules (if redundant) • Air filter unit	• Routing and Control Boards (RCB) (nonredundant) • Master RCB (if nonstop active routing is not configured)

See Also

- Replacing an MX10003 DC Power Supply on page 114
- Replacing an MX10003 AC Power Supply on page 112
- Replacing the MX10003 Air Filter Unit on page 104
- Replacing an MX10003 Fan Module on page 109
- Replacing an MX10003 MIC on page 124
- Replacing an MX10003 MPC on page 129

MX10003 Chassis

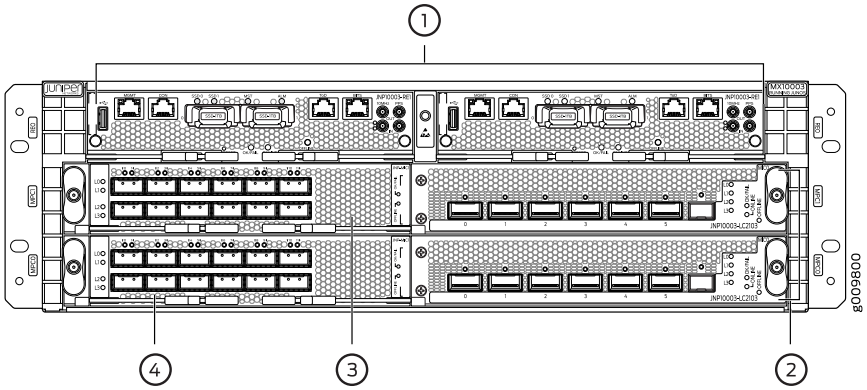
- MX10003 Chassis Description on page 25
- MX10003 Front and Rear Panel Components on page 26
- MX10003 Cable Management Bracket Description on page 27
- Alarm LEDs on the MX10003 Front Panel on page 28

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MX10003 Chassis Description

The router chassis is a rigid sheet metal structure that houses all the other router components. Figure 1 on page 25 shows the front of the fully configured chassis. The chassis measures 5.21 in. (13.23 cm) high, 17.6 in. (44.7 cm) wide, and 30 in. (76.2 cm) deep. The chassis installs in standard 800-mm or 900-mm deep open rack, 19-in. equipment racks, or telco open-frame racks. The total weight of a fully loaded router: up to 157.4 lb (71.4 kg) for an AC-powered chassis, and up to 163.4 lb (74.1 kg) for a DC-powered chassis. For more information, see "MX10003 Router Physical Specifications" on page 59.

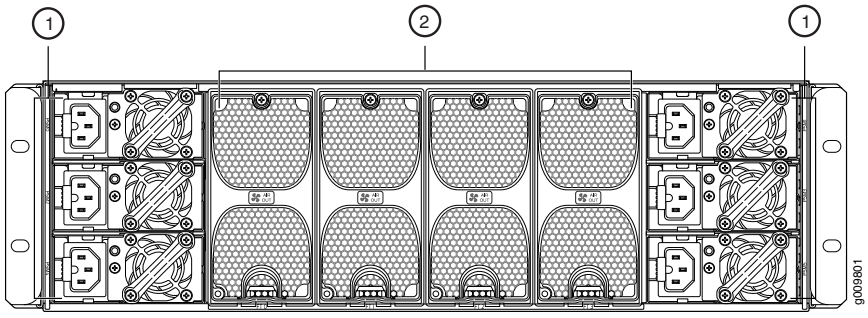
Figure 1: Front View of the MX10003 Router



1—Routing and Control Boards (RCBs)	3—MIC installed in MIC1 slot of **MPC1**
2—MPCs	4—MIC installed in MIC1 slot of **MPC0**

The router comes in two variants–AC-powered and DC-powered. Figure 2 on page 25 and Figure 3 on page 26 shows the rear of the fully configured chassis.

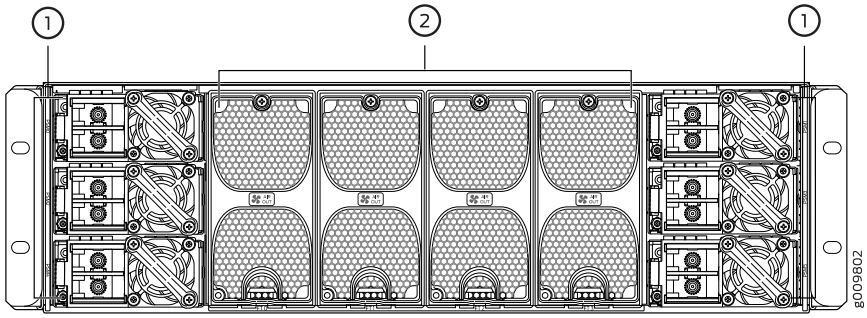
Figure 2: Rear View of the AC-Powered MX10003 Router



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

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Figure 3: Rear View of the DC-Powered MX10003 Router

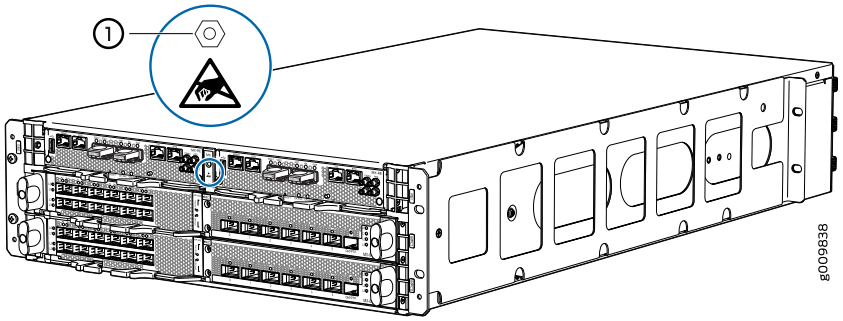


1—Power supply modules (DC)	2—Fan modules

Figure 4 on page 26 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 4: ESD Point on the MX10003 Router



1—ESD point	

MX10003 Front and Rear 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 ports for the 10-Gigabit Ethernet MIC.

Front Panel Components

Table 8 on page 27 lists the components on the front panel of the MX10003 router.

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Table 8: Front Panel Components in a Fully Configured MX10003 Router

Component	Slots	Number of FRUs
RCB	0 and 1	2
MPC	0 and 1	2
MIC (installed in MPC)	1 per MPC NOTE: MIC installs in slot 1 of the MPC.	1
Cable management brackets	-	2
Air filter unit	-	1

Rear Panel Components

Table 9 on page 27 lists the components on the rear panel of the MX10003 router.

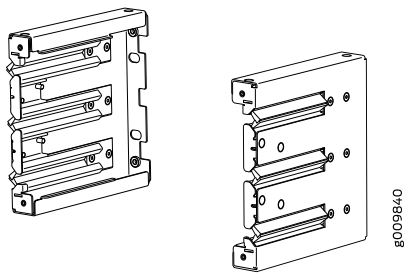
Table 9: Rear Panel Components in a Fully Configured MX10003 Router

Component	Slots	Number of FRUs
Power supply module	0 through 5	6
Fan module	0 through 3	4

MX10003 Cable Management Bracket Description

The cable management bracket (see Figure 5 on page 27) consists of dividers and installs on the front of the chassis. The cable management bracket enables you to route the cables outside the router and away from the RCBs, MICs, and MPCs.

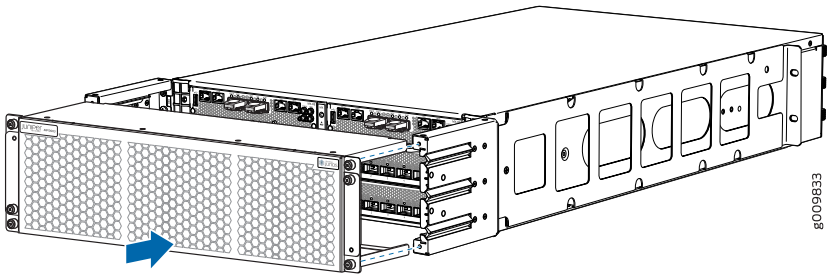
Figure 5: Cable Management Bracket



The air filter unit is installed on the cable management brackets. Before installing the air filter unit, ensure that the cable management brackets are already installed on the front of the router. Figure 6 on page 28 shows the air filter unit along with the cable management brackets installed on the router.

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Figure 6: Cable Management Brackets and Air Filter Unit Installed on the Router



See Also

- Replacing the MX10003 Air Filter Unit on page 104
- Installing the MX10003 Router in a Rack on page 80

Alarm LEDs on the MX10003 Front Panel

One alarm LED located on the front panel of the RCB. 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 10 on page 28 describes the alarm LED in more detail.

NOTE: Only the master RCB drives the LED to show the status of the chassis.

Table 10: Alarm LEDs on the MX10003 Front Panel

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

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103

MX10003 Cooling System

- MX10003 Cooling System Description on page 29
- MX10003 Fan Module LED on page 32

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MX10003 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 components:

- Fan Modules on page 29
- Airflow on page 30
- Air Filter Unit on page 31
- Power Supply Cooling System on page 31

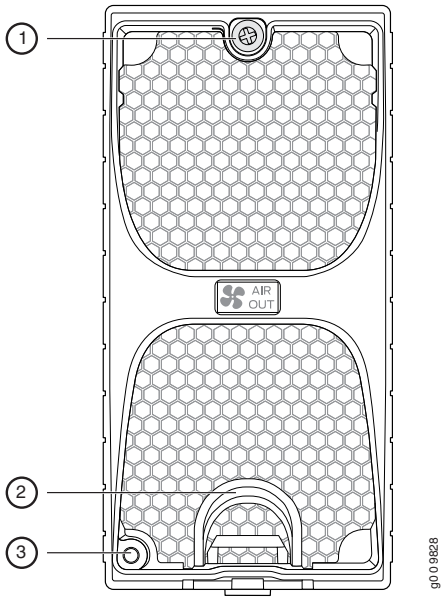
Fan Modules

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 router by disabling output power from each power supply.

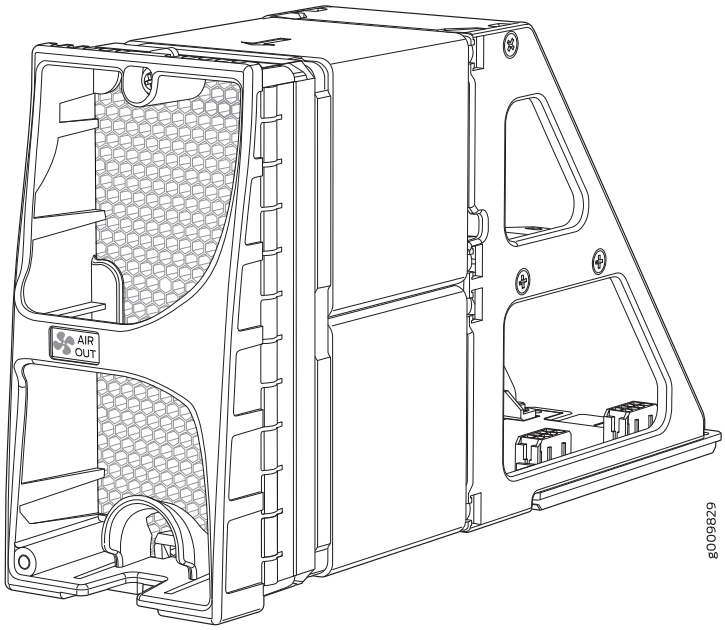
The router has four fan modules that install vertically at the rear of the router. Each fan module contains two counter-rotating fans. The fan modules are hot-insertable and hot-removable field-replaceable units (FRUs) (see Figure 7 on page 30).

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Figure 7: Fan Module



1—Captive screw	3—Status LED
2—Latch	

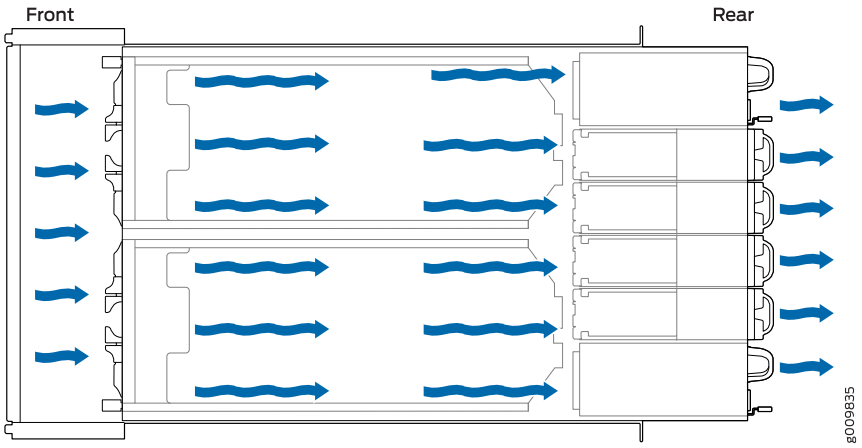


Airflow

The router has front-to-back (**AIR OUT**) cooling system (see Figure 8 on page 31). Air is pulled through the front the chassis toward the fan module, which exhausts the air out of the router.

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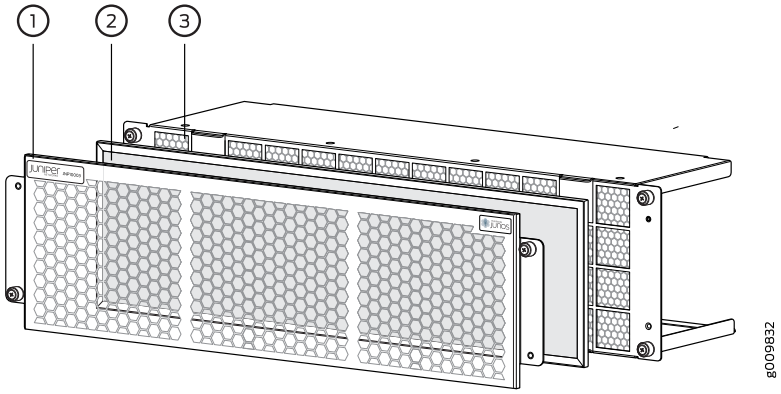
Figure 8: Airflow Through the Router



Air Filter Unit

The air filter unit consists of three parts–the outer filter cover, the air filter, and the inner cage that form the body, and the air filter (see Figure 9 on page 31). The air filter sits right inside the outer filter cover and the inner cage. The air filter unit is installed into the cable management brackets, and are held tightly by captive screws.

Figure 9: Air Filter Unit



1—Outer filter cover	3—Inner cage
2—Air filter	

Power Supply Cooling System

The power supplies are self-cooling and are located in the rear of the router (to the left and the right of the rear of the chassis). The exhaust for the power supplies are also located on the rear of the chassis.

See Also

- Replacing the MX10003 Air Filter Unit on page 104
- Replacing the MX10003 Air Filter on page 106

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MX10003 Fan Module LED

Each fan module contains one bicolor LED. "MX10003 Cooling System Description" on page 29 shows the fan module LED.

Table 11 on page 32 describes the behavior of the fan module LEDs.

Table 11: Fan Module LEDs

Label	Color	State	Description
STATUS	Green	Blinking	Fan module hardware initialization complete and software initialization pending.
		On steadily	Software initialization complete and the fan is functioning normally.
	Red	On steadily	Faulty and not functioning normally

See Also

- Replacing an MX10003 Fan Module on page 109

MX10003 AC Power System

- MX10003 Power System Description on page 32
- MX10003 Power Supply Module LEDs on page 34
- MX10003 Router AC Power Specifications on page 35
- AC Power Circuit Breaker Requirements for the MX10003 Router on page 36
- AC Power Cord Specifications for MX10003 Routers on page 36

MX10003 Power System Description

The MX10003 uses either AC or DC power supply modules (see Figure 10 on page 33 and Figure 11 on page 34). The router contain six power supplies located at the rear of the chassis in slots **PSM0** through **PSM5**. The AC or DC power supplies directly plug into the midplane and are placed symmetrically on both sides of the chassis for better thermal management. Each power supply has a handle, an ejection lever, and a status LED. The power supplies connect to the baseboard, which distributes the different output voltages produced by the power supplies to the router components, depending on their voltage requirements. A minimum of 3 power supplies are required for non-redundant operation. If one power supply in a redundant configuration fails or is removed, the remaining power supplies assume the entire electrical load without interruption. See "MX10003 Component Redundancy" on page 23 for more information on power redundancy supported on the AC and DC powered router. Each power supply is cooled by its own internal cooling system. The chassis is designed to support *N+N* mode with feed redundancy, and *N*+1 mode without feed redundancy.

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Redundant power supplies are hot-removable and hot-insertable. When you remove a power supply from a router that uses only one power supply, the router might shut down depending on your configuration.

CAUTION: Do not mix AC and DC power supplies 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.

- AC Power Supply Description on page 33
- DC Power Supply Description on page 33

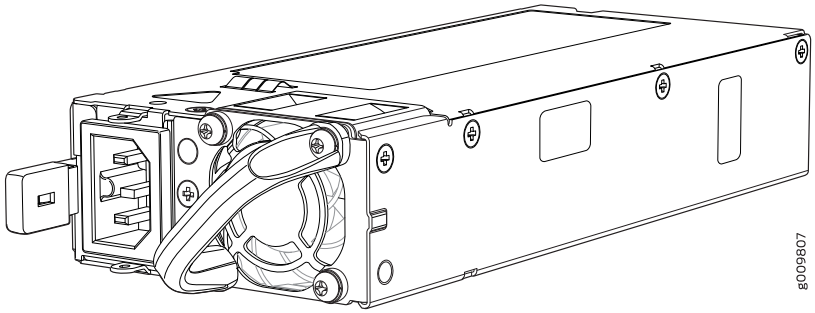
AC Power Supply Description

Each AC power supply weighs approximately 3.4 lb (1.54 kg) and consists of a handle, an ejector lever, an AC appliance inlet, a fan, and an LED to monitor the status of the power supply. Figure 10 on page 33 shows the power supply.

Each inlet requires a dedicated AC power feed and a dedicated customer-site circuit breaker. We recommend that you use a minimum 15-A (110 VAC) customer-site circuit breaker, or as required by local code.

WARNING: The router is a pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal (sized for M4 hex 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

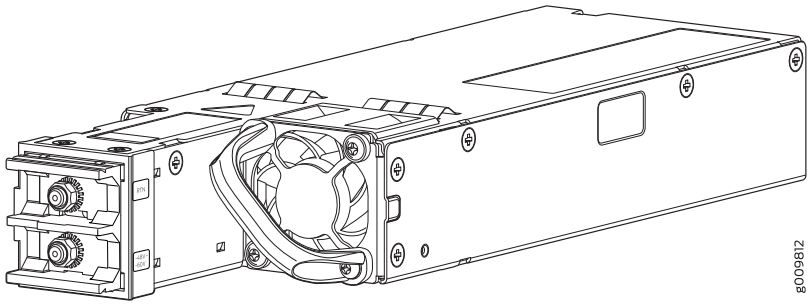
Each DC power supply weighs approximately 4.4 lb (1.99 kg) and consists of a handle, an ejector lever, a status LED, and a terminal block that provides a single DC input (–48

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VDC and return) that requires a dedicated customer-site circuit breaker. We recommend that you use a dedicated customer-site circuit breaker rated for 40 A (–48 VDC) minimum, or as required by local code.

Figure 11 on page 34 shows the power supply.

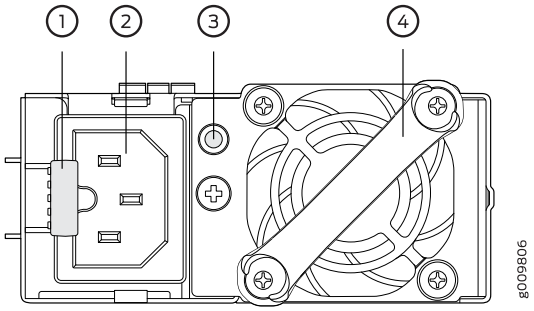
Figure 11: DC Power Supply



MX10003 Power Supply Module LEDs

Figure 12 on page 34 shows the AC power supplies components along with the status LED.

Figure 12: AC Power Supplies Components

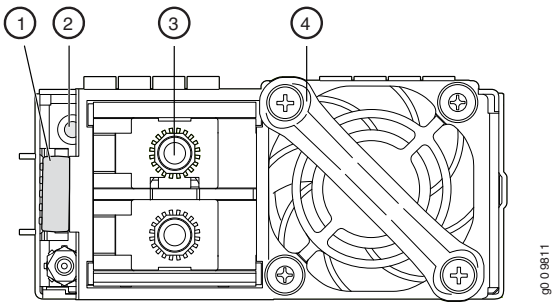


1—Ejector lever	3—Status LED
2—AC inlet plug	4—Handle

Figure 13 on page 35 shows the DC power supplies components along with the status LED.

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Figure 13: DC Power Supplies Components



1—Ejector lever	3—DC inlet cable lug point
2—Status LED	4—Handle

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103

MX10003 Router AC Power Specifications

Table 12 on page 35 lists the AC power system electrical specifications.

Table 12: AC Power System Electrical Specifications

Item	Specification
AC input voltage	Operating range: AC low: 90 through 140 VAC AC high: 180 through 264 VAC
AC input line frequency	50 through 60 Hz (nominal)
AC system current rating	25 A
AC system input power	2500 W

Table 13 on page 35 lists the AC power supply electrical specifications.

Table 13: AC Power Supply Electrical Specifications

Item	Specification
Maximum output power	AC high: 1600 W AC low: 800 W
AC input voltage	Operating range: 90 through 140 VAC: 800 W 180 through 264 VAC: 1600 W

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Table 13: AC Power Supply Electrical Specifications (continued)

Item	Specification
AC input line frequency	50 through 60 Hz (nominal)
AC input current rating	10 A @ 100 VAC through 240 VAC

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 AC Power Supply on page 112
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

AC Power Circuit Breaker Requirements for the MX10003 Router

We recommend that you use a dedicated customer-site circuit breaker rated for 15 A (110 VAC) minimum or 10 A (220 VAC) minimum for each AC power feed, or as required by local code. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure.

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 AC Power Supply on page 112
- Calculating AC Power Requirements for MX10003 Router on page 63
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

AC Power Cord Specifications for MX10003 Routers

A detachable AC power cord is supplied with the AC power supplies. 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.

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NOTE: In North America, AC power cords must not exceed 4.5 meters 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 14 on page 37 gives the AC power cord specifications for the countries and regions listed in the table.

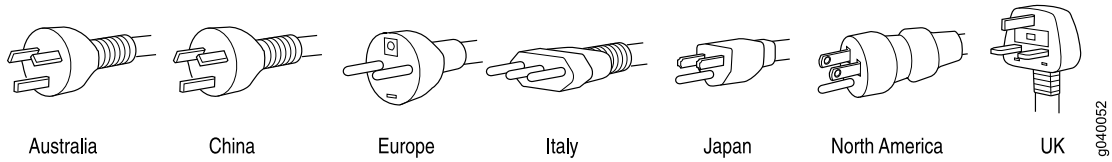
Table 14: AC Power Cord Specifications

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

Figure 14 on page 38 illustrates the plug on the power cord for some of the countries or regions listed in Table 14 on page 37.

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Figure 14: AC Plug Types



See Also

- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

MX10003 DC Power System

- MX10003 Router DC Power Specifications on page 38
- DC Power Circuit Breaker Requirements for the MX10003 Router on page 39
- DC Power Source Cabling for MX10003 Router on page 39
- DC Power Cable Specifications for MX10003 Router on page 40

MX10003 Router DC Power Specifications

Table 15 on page 38 lists the DC power system electrical specifications.

Table 15: DC Power System Electrical Specifications

Item	Specification
DC input voltage	Operating range: –40 through –72 VDC
DC system input current rating	54 A @ –48 VDC (maximum)
DC system input power	2500 W

Table 16 on page 38 lists the DC power supply electrical specifications.

Table 16: DC Power Supply Electrical Specifications

Item	Specification
Maximum output power	1100 W
DC input voltage	Minimum: –40 VDC Nominal: –48 VDC, –60 VDC Operating range: –40 through –72 VDC
DC input current rating	32 A @ –48 VDC

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See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 DC Power Supply on page 114
- Calculating DC Power Requirements for MX10003 Router on page 66
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

DC Power Circuit Breaker Requirements for the MX10003 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 40 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 40 A (–48 VDC) circuit breaker, we recommend that you provision a dedicated customer-site circuit breaker for each DC power supply rated for at least 125 percent of the continuous current that the system draws at –48 VDC.

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 DC Power Supply on page 114
- Calculating DC Power Requirements for MX10003 Router on page 66
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

DC Power Source Cabling for MX10003 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.

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

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

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 DC Power Supply on page 114
- Calculating DC Power Requirements for MX10003 Router on page 66
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

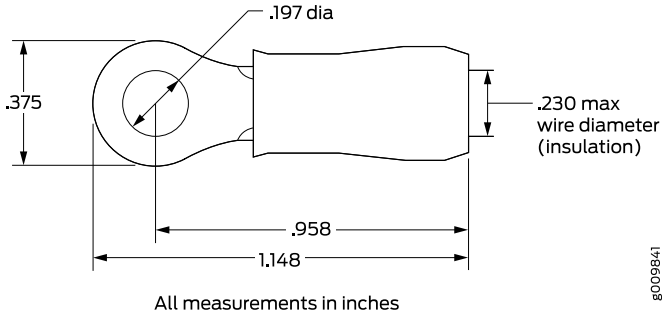
DC Power Cable Specifications for MX10003 Router

- DC Power Cable Lug Specifications on page 40
- DC Power Cable Specifications on page 41

DC Power Cable Lug Specifications

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

Figure 15: DC Power Cable Lug



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

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DC Power Cable Specifications

You must supply four DC power cables that meet the following specifications: 10-AWG (1.3 mm^2), minimum 60° C wire, or as required by the local code.

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 DC Power Supply on page 114
- Calculating DC Power Requirements for MX10003 Router on page 66
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

MX10003 Routing and Control Board

- MX10003 Routing and Control Board (RCB) Description on page 41
- MX10003 RCB LEDs on page 45

MX10003 Routing and Control Board (RCB) 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 MX10003 host subsystem consists of two Routing and Control Boards, or RCBs. The RCB is an integrated board and a single FRU that provides Routing Engine (RE) and Control Board (CB) functionality. The RE performs all route-processing functions, whereas the CB performs chassis control and management plane functionality. The RCB provides control plane functions. You can install one or two RCBs on the router. Each RCB functions as a unit.

NOTE: Install two RCBs for redundant protection. If you install only one RCB, you can install it in slot 0 or slot 1. By default, slot 0 functions as the master.

CAUTION: If one of the RCBs fails, do not remove the failed RCB until you have a replacement or blank panel to install.

The MX10003 router supports the following RCBs:

- JNP10003-RE1
- JNP10003-RE1-LT

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This topic covers:

- Routing and Control Board Functions on page 42
- Routing and Control Board Components on page 42
- RCB Front Panel on page 42
- RCB Interface Ports on page 44

Routing and Control Board Functions

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

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

Routing and Control Board Components

Each RCB consists of the following internal components:

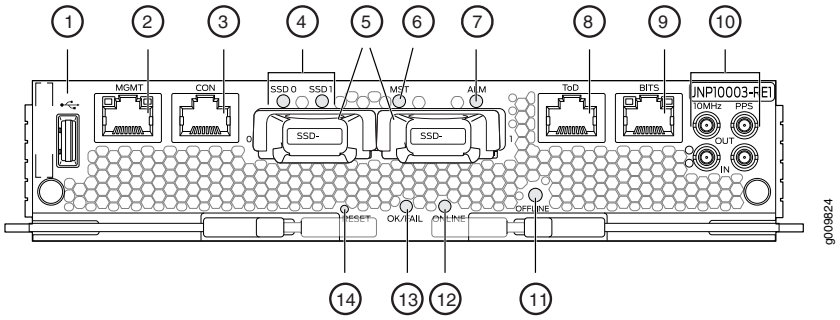
- High-performance 1.6-GHz Intel 8 Core X86 CPU
- 64-GB DDR4 RAM
- 100-GB SATA SSD

RCB Front Panel

Figure 16 on page 43 shows the front panel of the MX10003 RCB (model number: JNP10003-RE1).

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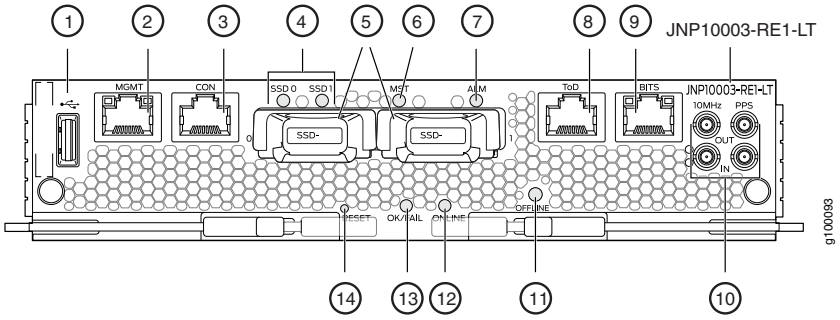
Figure 16: JNP10003-RE1 RCB Ports



1—USB port	8—Time of day (**ToD**) port with LEDs (This port is reserved for future use)
2—Management (**MGMT**) port	9—**BITS** port with LEDs
3—Console (**CON**) port	10—Clocking ports
4—SSD LEDs	11—**OFFLINE** button
5—SSD slots (**0** and **1**)	12—**ONLINE** LED
6—Master (**MST**) LED	13—**OK/FAIL** LED
7—Alarm (**ALM**) LED	14—**RESET** button

Figure 17 on page 43 shows the front panel of the MX10003 RCB with limited encryption support (model number: JNP10003-RE1-LT).

Figure 17: JNP10003-RE1-LT RCB Ports



1—USB port	8—Time of day (**ToD**) port with LEDs (This port is reserved for future use)
2—Management (**MGMT**) port	9—**BITS** port with LEDs
3—Console (**CON**) port	10—Clocking ports
4—SSD LEDs	11—**OFFLINE** button
5—SSD slots (**0** and **1**)	12—**ONLINE** LED
6—Master (**MST**) LED	13—**OK/FAIL** LED
7—Alarm (**ALM**) LED	14—**RESET** button

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The MX10003 router with JNP10003-RE1-LT RCB supports only Junos Limited image. The Junos Limited image does not have data-plane encryption and is intended only for countries in the Eurasian Customs Union because these countries have import restrictions on software containing data-plane encryption. Unlike the Junos Worldwide image, the Junos Limited image supports control plane encryption through Secure Shell (SSH) and Secure Sockets Layer (SSL), thus allowing secure management of the system. The Limited Restriction RCB boots only the encryption free Junos software and fails to boot if the fully encrypted Junos software is used for booting. The Junos upgrade and VMHost upgrade using non-limited version of Junos software fails on the JNP10003-RE1-LT RCB.

The command **show chassis hardware [models | clei-models | extensive]** displays the model number and helps identifying the different SKUs. An alarm, **Mixed Master and Backup RE types** is displayed when dissimilar Routing Engines are present on the chassis (see *Chassis Alarms*).

RCB Interface Ports

The ports located on the RCB, connect the RCB 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 RCB.

The RCB interface ports with the indicated labels function are as follows (see Figure 16 on page 43):

- **CON**—Connects the RCB to a system console through a serial cable with an RJ-45 connector.
- **MGMT**—Connects the RCB 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 connection to external clocking devices.
- **ToD**—Time-of-day (TOD) port on the front panel of the router allows 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 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 connect to external clock signal sources. The clocking ports provide

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the synchronized output clocks from any one of the reference clock inputs based on the clock's priority.

- USB—Provides a removable media interface through which you can install Junos OS manually. Junos OS supports USB version 1.0 and later.

See Also

- Replacing an MX10003 RCB on page 120
- RJ-45 Connector Pinouts for MX Series CB-RE or RCB Auxillary and Console Ports on page 73
- RJ-45 Connector Pinouts for an MX Series CB-RE or RCB Management Port on page 74
- *Supported Routing Engines by Router*
- *Routing Engine Specifications*

MX10003 RCB LEDs

The Routing and Control Board (RCB) is an integrated board and a single FRU that provides Routing Engine and Control Board functionality.

The LEDs—labeled **ONLINE**, **MST**, **OK/FAIL**, **LINK**, **GPS**, **BITS**—are located directly on the faceplate of the RCB. Table 17 on page 45 describes the functions of the Routing Engine interface of the RCB.

NOTE: **The functioning of the MX10003 router is contolled by the RCB, and the LEDs present on the RCBs displays the status and functioning of the MX10003 chassis.**

Table 17: MX10003 RCB LEDs

Label	Color	State	Description
ONLINE	Green	Blinking	RCB is starting Junos OS.
	Yellow	Blinking	RCB is starting Linux.
		On steadily	Both Junos OS and Linux are successfully loaded on the RCB.
		Off	RCB is offline.
MST	Blue	On steadily	RCB is the master.
	–	Off	RCB is the backup.
OK/FAIL	Yellow	On steadily	RCB has failed.
	Green	On steadily	RCB is functioning normally.

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Table 17: MX10003 RCB LEDs (continued)

Label	Color	State	Description
SSD0	Green	Blinking	SSD0 is active.
SSD1	Green	Blinking	SSD1 is active.
BITS	Green	On steadily	Building-integrated timing supply (BITS) external clocking interface is active.
	Red	On steadily	BITS external clocking interface has failed.
	–	Off	BITS external clocking interface is offline.

See Also
- Replacing an MX10003 RCB on page 120

MX10003 Interface Modules

- Multi-Rate Ethernet MIC on page 46
- Multi Rate Ethernet MIC LEDs on page 50
- MX10003 MPC (Multi-Rate) on page 50
- MX10003 Port and Interface Numbering on page 52
- MX10003 MPC (Multi-Rate) LEDs on page 53

Multi-Rate Ethernet MIC

Figure 18: JNP-MIC

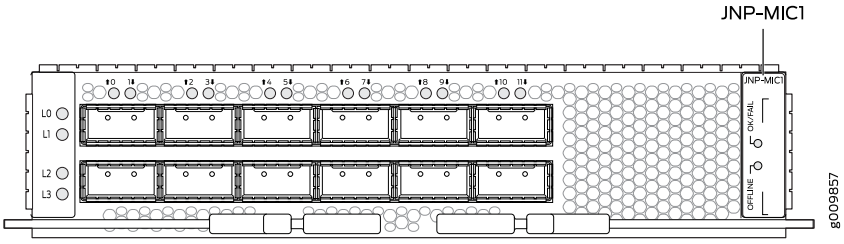
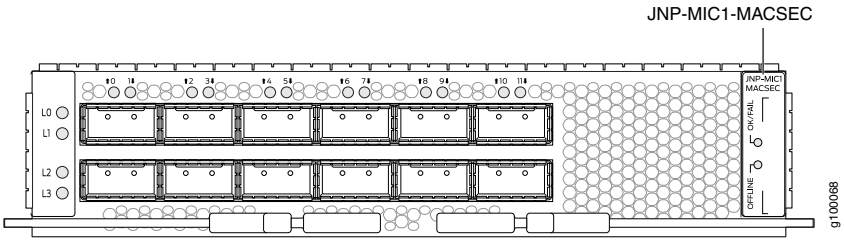
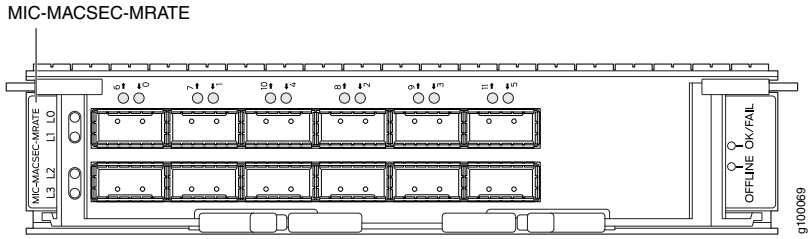


Figure 19: JNP-MIC1-MACSEC



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Figure 20: MIC-MACSEC-MRATE



Software release	• JNP-MIC1: Junos OS release 17.3R1 and later • JNP-MIC1-MACSEC: Junos OS release 17.3R2 and later • MIC-MACSEC-MRATE: Junos OS release 17.4R1 and later For information about which MPCs support this MIC, see *MIC/MPC Compatibility*. For information about which MICs are supported on MX Series routers, see *MICs Supported by MX Series Routers*.
Description	• Weight: 3 lb (1.36 kg) • Model numbers: Without MACsec support: JNP-MIC1 With MACsec support: JNP-MIC1-MACSEC With MACsec support: MIC-MACSEC-MRATE • Power requirement: ◦ JNP-MIC1: 85 W at 55º C 80 W at 25º C ◦ JNP-MIC1-MACSEC: 130 W at 55º C 125 W at 25º C ◦ MIC-MACSEC-MRATE: 110 W at 45º C 105 W at 25º C • Name in the CLI: JNP-MIC1: **MIC1** JNP-MIC1-MACSEC: **MIC1-MACSEC** MIC-MACSEC-MRATE: **MACSEC-12xQSFPP-XGE-XLGE-CGE**

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Hardware features	• JNP-MIC1 and JNP-MIC1-MACSEC:
	  • Twelve 100-Gigabit Ethernet ports that support quad small form-factor pluggable (QSFP28) transceivers
	  • The ports are numbered **0** through **11**.
	  • Each port can be configured as a 100-Gigabit Ethernet port, 40-Gigabit Ethernet port, or as four 10-Gigabit Ethernet ports (by using a breakout cable).
	  Table 18 on page 48 lists the configurable Gigabit Ethernet port speeds for each port.
	• MIC-MACSEC-MRATE:
	  • Twelve Gigabit Ethernet QSFP+ ports, each of which can be configured as a 40-Gigabit Ethernet port or as four 10-Gigabit Ethernet ports (by using a breakout cable).
	  • The ports are numbered **0** through **11**.
	  • Eight out of the twelve ports can be configured as 100-Gigabit Ethernet ports. Port numbers **0** through **3**, and **6** through **9** are the eight 100-Gigabit Ethernet ports.
	  • When used in MP8CE:
	  • Four ports out of the total twelve ports support 100-Gigabit Ethernet speed
	  • Maximum aggregate port capacity across ports **0** through **5** should not exceed 240 Gbps
	  • Maximum aggregate port capacity across ports **6** through **11** should not exceed 240 Gbps
	  • When used in MPC9E:
	  • Eight ports out of the total twelve ports support 100-Gigabit Ethernet speed
	  • Maximum aggregate port capacity across ports **0** through **5** should not exceed 400 Gbps
	  • Maximum aggregate port capacity across ports **6** through **11** should not exceed 400 Gbp
	  Table 19 on page 49 lists the configurable Gigabit Ethernet port speeds for each port.

Software features	• Supports rate selectability at the port level. • By default, the ports are configured as 10-Gigabit Ethernet ports. • Supports remote port identification. • MICs with model numbers JNP-MIC1-MACSEC and MIC-MACSEC-MRATE support Media Access Control Security (MACsec)
Cables and connectors	TIP: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers supported on your Juniper Networks device. The list of supported transceivers for the MX Series is located at https://pathfinder.juniper.net/hct/category/#catKey=100001&modelType;=All&pf;=MX+Series.

LEDs	• **OK/FAIL** LED, one bicolor:
	  • OFF—MIC is offline or MIC has fault.
	  • Red—MIC is in power failure state.
	  • Green—MIC is online.
	• Link LED, one green per port:
	  • Steady green—Link is up.
	  • Off—Link is down or disabled.
	• Like port status LED, each individual lane LED support four states as: OFF, AMBER, GREEN, RED. See *MPC and MIC Lane LED Scheme Overview* for more details.

Table 18: Multi Rate Ethernet MIC Port Speed Capabilities for JNP-MIC1 and JNP-MIC1-MACSEC

Port #	4x10-Gigabit Ethernet	40-Gigabit Ethernet	100-Gigabit Ethernet
0	yes	yes	yes

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Table 18: Multi Rate Ethernet MIC Port Speed Capabilities for JNP-MIC1 and JNP-MIC1-MACSEC (continued)

Port #	4x10-Gigabit Ethernet	40-Gigabit Ethernet	100-Gigabit Ethernet
1	yes	yes	yes
2	yes	yes	yes
3	yes	yes	yes
4	yes	yes	yes
5	yes	yes	yes
6	yes	yes	yes
7	yes	yes	yes
8	yes	yes	yes
9	yes	yes	yes
10	yes	yes	yes
11	yes	yes	yes

Table 19: Multi Rate Ethernet MIC Port Speed Capabilities for MIC-MACSEC-MRATE

Port #	4x10-Gigabit Ethernet	40-Gigabit Ethernet	100-Gigabit Ethernet
0	yes	yes	yes
1	yes	yes	yes
2	yes	yes	yes
3	yes	yes	yes
4	yes	yes	no
5	yes	yes	no
6	yes	yes	yes
7	yes	yes	yes
8	yes	yes	yes
9	yes	yes	yes
10	yes	yes	no

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Table 19: Multi Rate Ethernet MIC Port Speed Capabilities for MIC-MACSEC-MRATE (continued)

Port #	4x10-Gigabit Ethernet	40-Gigabit Ethernet	100-Gigabit Ethernet
11	yes	yes	no

See Also

- *MPC and MIC Lane LED Scheme Overview*
- *Configuring Rate Selectability on MX10003 MPC to Enable Different Port Speeds*
- *MX10003 MPC Rate-Selectability Overview*
- *Understanding Rate Selectability*

Multi Rate Ethernet MIC LEDs

The Multi Rate Ethernet Modular Interface Card (MIC) has link LEDs located on the front panel.

Table 20 on page 50 describes the link LEDs in more detail.

Table 20: Multi Rate Ethernet MIC LEDs

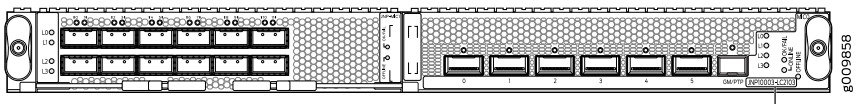
Color	State	Description
Green	On steadily	Link is up.
	Off	No link.

Like port status LED, each individual lane LED support four states: OFF, AMBER, GREEN, RED. See *MPC and MIC Lane LED Scheme Overview* for more details.

See Also

- *MPC and MIC Lane LED Scheme Overview*
- *Configuring Rate Selectability on MX10003 MPC to Enable Different Port Speeds*
- *MX10003 MPC Rate-Selectability Overview*
- *Understanding Rate Selectability*
- *MICs Supported by MX Series Routers*

MX10003 MPC (Multi-Rate)



JNP10003-LC2103

Software release	• Junos OS release 17.3R1 and later

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Description	• Weight: 30 lb (13.61 kg) (net weight without blank panel and without any MIC in slot 1) • Model number: MX10003-LC2103 • Power requirement: 715 W at 55º C 660 W at 25º C • Name in the CLI: **LC2103**
Hardware features	• The MX10003 MPC is a 1.2-Terabit capable MPC with three Packet Forwarding Engine complexes (that is, three EA ASICs). The EA ASIC operates in 400G mode. • The Packet Forwarding Engine is based on the third generation of the Trio chpiset architecture---namely, the EA (Eagle) ASIC. The Packet Forwarding Engine offers 400 Gbps of WAN and fabric bandwidth each. • MX10003 MPC has six built-in QSFP+ optics ports, and one MIC slot. • Supports Multi-Rate Ethernet Modular Interface Card (MIC) (model numbers: JNP-MIC1 and JNP-MIC1-MACSEC), and the fixed-port PIC (6xQSFPP). For information about which MICs are supported on this MPC, see *MIC/MPC Compatibility*. • Supports maximum transmission units (MTUs) from 256 bytes through 16,000 bytes for transit traffic, and from 256 bytes through 9,500 bytes for host bound packets.
Software features	• *Dynamic Power Management* for effective utilization of available power. • *Inline Active Flow Monitoring* for higher scalability and performance. • *Flexible Queuing Mode* to support 32,000 queues per line card, including queues on both ingress and egress interfaces. Supports up to 512,000 queues per slot or 768,000 queues per slot. • *Hyper Mode* to speed up packet processing. • Optical diagnostics and related alarms. For more information about features supported on MX10003 MPC, see *Protocols and Applications Supported by the MX10003 MPC (Multi-Rate) on the MX10003 Router*.
Cables and connectors	TIP: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers supported on your Juniper Networks device. The list of supported transceivers for the MX Series is located at https://pathfinder.juniper.net/hct/category/#catKey=100001&modelType;=All&pf;=MX+Series.
Power requirements (without MICs)	• At different temperatures: 55º C: 715 W 25º C: 660 W
LEDs	**OK/FAIL** LED, one bicolor: • Steady green—MPC is functioning normally and the link is up. • Off—MPC is plugged-in but not powered on. • Red—MPC has failed. For information on the lane LEDs (**Lo**, **L1**, **L2**, and **L3**), see *MPC and MIC Lane LED Scheme Overview*.

Table 21 on page 52 summarize the port speed capability of MX10003 MPCs.

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Table 21: MX10003 MPC (Multi-Rate) Port Speed

MIC	Port Number	Port Speed Supported
PIC 0	0-5	40 Gigabit Ethernet 4X10-Gigabit Ethernet
PIC 1	0-11	100 Gigabit Ethernet 40 Gigabit Ethernet 4X10-Gigabit Ethernet

See Also

- *MPC and MIC Lane LED Scheme Overview*
- *Configuring Rate Selectability on MX10003 MPC to Enable Different Port Speeds*
- *MX10003 MPC Rate-Selectability Overview*
- *Understanding Interface Naming Conventions for MX10003 MPC*
- *Understanding Rate Selectability*
- *MX Series MPC Overview*
- *MPCs Supported by MX Series Routers*
- Replacing an MX10003 MIC on page 124

MX10003 Port and Interface Numbering

In the physical part of the interface name, a hyphen (**-**) separates the media type from the MPC number (represented as an **FPC** in the CLI), and a slash (**/**) separates the logical PIC and port numbers:

type-fpc/pic/port

- *type*—Media type, which identifies the network device. For example:
  - xe—10-Gigabit Ethernet interface
  - et—100-Gigabit Ethernet interfaces (40 and 100-Gigabit Ethernet interface)

  For a complete list of media types, see *Interface Naming Overview* in the *MX Series 5G Universal Routing Platform Interface Module Reference* guide.
- *fpc*—Slot in which the MPC is installed, and are represented in the CLI as either **FPC 0** or **FPC 1**.
- *pic*—Logical PIC on the MIC. The number of logical PICs varies depending on the type of MIC.
- *port*—Port number.

See Also

- *Understanding Interface Naming Conventions for MX10003 MPC*

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MX10003 MPC (Multi-Rate) LEDs

The MX10003 MPC (Multi-Rate) has LEDs located on the front panel.

Table 22 on page 53 describes the link LEDs in more detail.

Table 22: MX10003 MPC (Multi-Rate) LEDs

LED Status	Color	State	Description
OK/FAIL	Green	On steadily	MPC is functioning normally and the link is up.
		Off	MPC is plugged-in but not powered on.
	Red	-	MPC has failed.
ONLINE	Green	-	MPC is online.

For information on the lane LEDs (**Lo**, **L1**, **L2**, and **L3**), see *MPC and MIC Lane LED Scheme Overview*.

See Also

- *MPC and MIC Lane LED Scheme Overview*
- *Configuring Rate Selectability on MX10003 MPC to Enable Different Port Speeds*
- *MX10003 MPC Rate-Selectability Overview*
- *Understanding Rate Selectability*
- *MICs Supported by MX Series Routers*
- *Understanding Interface Naming Conventions for MX10003 MPC*

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CHAPTER 2

Site Planning, Preparation, and Specifications

- MX10003 Site Preparation Checklist on page 55
- MX10003 Site Guidelines and Requirements on page 56
- MX10003 Power Planning on page 63
- MX10003 Network Cable and Transceiver Planning on page 69
- MX10003 Management and Console Port Specifications and Pinouts on page 73

MX10003 Site Preparation Checklist

The checklist in Table 23 on page 55 summarizes the tasks you must perform when preparing a site for router installation.

Table 23: MX10003 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.	"MX10003 Router Environmental Specifications" on page 56		
Power			
Locate sites for connection of system grounding.	"MX10003 Router Grounding Specifications" on page 57		
Measure distance between external power sources and router installation site.	"MX10003 Router DC Power Specifications" on page 38 "MX10003 Router AC Power Specifications" on page 35		
Calculate the power consumption and requirements.	"Calculating DC Power Requirements for MX10003 Router" on page 66 "Calculating AC Power Requirements for MX10003 Router" on page 63		

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Table 23: MX10003 Site Preparation Checklist (continued)

Item or Task	For More Information	Performed By	Date
Rack			
Select the type of rack or cabinet.	"MX10003 Router Rack Requirements" on page 61 "MX10003 Router Cabinet Requirements and Specifications" on page 62		
Plan rack or cabinet location, including required space clearances.	"MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 59		
If a rack is used, secure rack to floor and building structure.	"MX10003 Router Rack Requirements" on page 61		
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 69		

Related Documentation

- MX10003 Installation Overview on page 77
- Tools Required to the Install MX10003 Router in a Rack on page 79
- Installing the MX10003 Router in a Rack on page 80

MX10003 Site Guidelines and Requirements

- MX10003 Router Environmental Specifications on page 56
- MX10003 Router Grounding Specifications on page 57
- MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance on page 59
- MX10003 Router Physical Specifications on page 59
- MX10003 Router Rack Requirements on page 61
- MX10003 Router Cabinet Requirements and Specifications on page 62

MX10003 Router Environmental Specifications

Table 24 on page 57 specifies the environmental specifications required for normal router operation. In addition, the site should be as dust-free as possible.

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Table 24: 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) 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 (500 W)	1705 BTU/hour

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

See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- *General Safety Guidelines for Juniper Networks Devices*
- General Safety Warnings for Juniper Networks Devices on page 154

MX10003 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 21 on page 58 shows the grounding point location on the router.

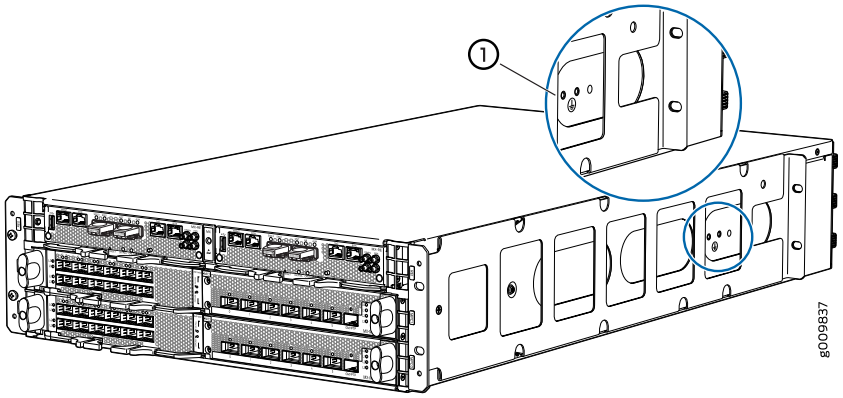
A protective earthing terminal bracket is required for connecting the chassis to earth ground. This two-holed bracket attaches on the side of the chassis through the mounting rail and provides a protective earthing terminal for the switch. The grounding points are studs sized for M4 hex screws. M4 hex screws with integrated washers are provided in the accessory kit. The grounding points are spaced at 0.75-in. (19.1-mm) centers.

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Two threaded holes are provided on the front right side of the chassis for connecting the router to earth ground. The grounding points fit M5 pan head screws.

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

Figure 21: Grounding Points on the Router



1— Grounding point	

Grounding Cable Lug Specifications

The accessory box shipped with the router includes one cable lug that attaches to the grounding cable and M4 hex 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 LCD10-14B-L or equivalent (not provided). The grounding lug accommodates 14–10 AWG (2–5.3 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. Minimum recommendations are 14–10 AWG (2–5.3 mm^2) stranded wire, 60° C wire, or as permitted by local code.

See Also

- Tools and Parts Required for MX10003 Router Grounding and Power Connections on page 83
- MX10003 Router AC Power Specifications on page 35
- MX10003 Router DC Power Specifications on page 38

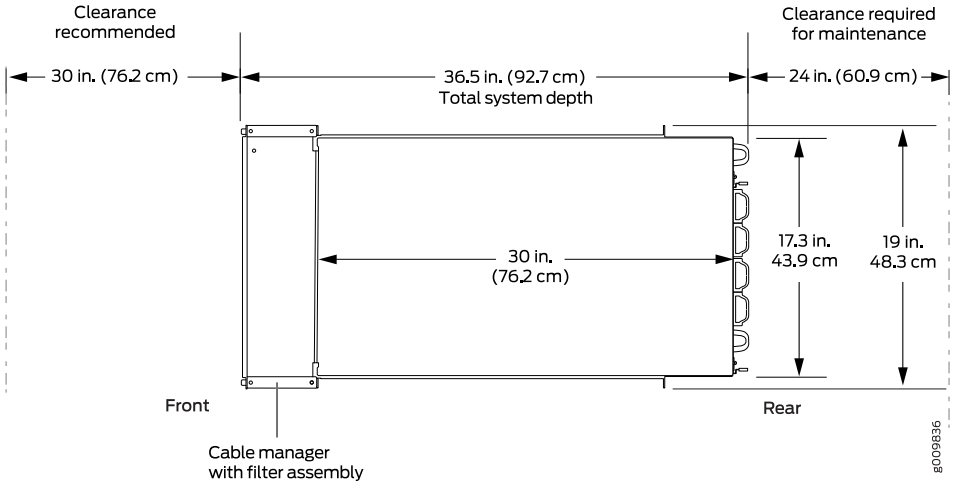
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MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance

When planning the installation site, allow sufficient clearance around the rack (see Figure 22 on page 59):

- 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 22: MX10003 Chassis Dimensions and Clearance Requirements



MX10003 Router Physical Specifications

Table 25 on page 60 summarizes the physical specifications for the router.

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Table 25: Router Physical Specifications

Description	Weight	Width	Depth	Height
Chassis fully loaded with all FRUs	AC-powered chassis: 157.4 lb (71.4 kg)	19 in. (48.26 cm)	36.5 in. (92.7 cm) with the cable management brackets, air filter unit, and handles for fans and power supplies	5.21 in. (13.23 cm; 3 U)
	DC-powered chassis: 163.4 lb (74.11 kg)	19 in. (48.26 cm)	38.5 in. (97.79 cm) with the cable management brackets, air filter unit, and handles for fans and power supplies	5.21 in. (13.23 cm; 3 U)
Chassis without any FRUs	50 lb (22.68 kg)	19 in. (48.26 cm)	30 in. (76.2 cm) without the cable management brackets, air filter unit, and handles for fans and power supplies	5.21 in. (13.23 cm; 3 U)
Air filter unit along with cable management brackets	5.51 lb (2.5 kg)	19 in. (48.26 cm)	5.43 in. (13.79 cm)	5.19 in. (13.18 cm)
MPC (model number: JNP10003-LC2103; without any MIC in MIC1 slot)	30 lb (13.61 kg)	16.5 in. (41.91 cm)	22.37 in. (56.82 cm)	1.65 in. (4.19 cm)
MIC (model number: JNP-MIC1)	3 lb (1.36 kg)	7.77 in. (19.73 cm)	8.97 in (22.78 cm)	1.65 in. (4.19 cm)
Routing and Control Board (RCB)	7.5 lb (3.4 kg)	7.98 in. (20.27 cm)	22.12 in. (56.18 cm)	1.66 in. (4.21 cm)
fan module	1.5 lb (0.68 kg)	2.46 in. (6.25 cm)	9.27 in. (23.54 cm)	4.99 in. (12.67 cm)
AC power supply	3.4 lb (1.54 kg)	3.53 in. (8.67 cm)	9.26 in. (23.52 cm)	1.63 in. (4.14 cm)
DC power supply	4.4 lb (1.99 kg)	3.53 in. (8.67 cm)	10.8 in. (27.43 cm)	1.63 in. (4.14 cm)

NOTE: For router maintenance and to accommodate power cable bend radius, allow at least 30 in. (76.2 cm) in front of the rack and 24 in. (61 cm) behind the router (see "MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 59).

See Also

- MX10003 Router Hardware Overview on page 20

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- MX10003 Chassis Description on page 25

MX10003 Router Rack Requirements

The 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 26 on page 61 summarizes rack requirements and specifications for the router.

Table 26: Router Rack Requirements and Specifications

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:
	  ◦ 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 "MX10003 Router Physical Specifications" on page 59). 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 that are specified in "MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 59.
	• 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 5.21 in. (13.23 cm) is approximately 3 U (rack unit).
	• The rack must be strong enough to support the weight of the fully configured router, up to 164 lb (74.2 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 28 in. (71.1 cm) and 36 in. (91.4 cm) front to back.
	• Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the router and rack as specified in "MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 59.

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

See Also

- MX10003 Installation Overview on page 77
- Installing the MX10003 Router in a Rack on page 80

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MX10003 Router Cabinet Requirements and Specifications

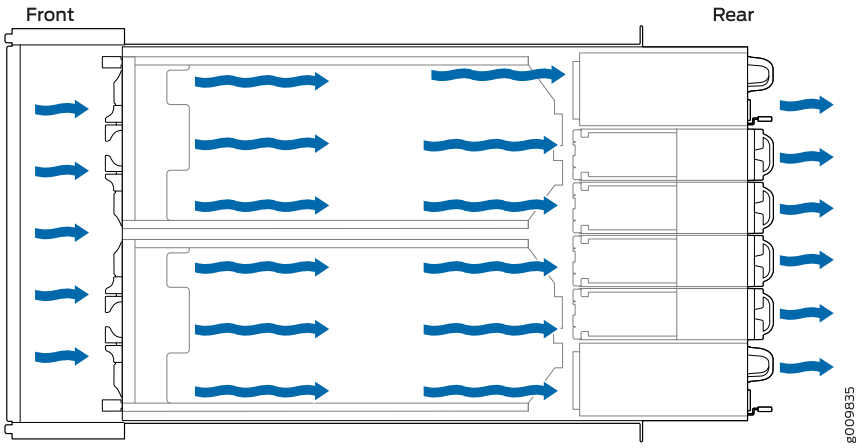
Table 27 on page 62 summarizes cabinet requirements and specifications for MX10003 router.

Table 27: Cabinet Requirements and Specifications for an MX10003 Router

Cabinet Requirement	Guidelines for the MX10003 Router
Cabinet size and clearance	• The minimum-sized cabinet that can accommodate the router is 19-in. (482-mm) wide, and 30.0-in. (762-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 3 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 MX10003 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 23 on page 63. • 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 "MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance" on page 59. • 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.

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Figure 23: Airflow Through Chassis



See Also

- MX10003 Cooling System Description on page 29
- MX10003 Installation Overview on page 77

MX10003 Power Planning

- Calculating AC Power Requirements for MX10003 Router on page 63
- Calculating DC Power Requirements for MX10003 Router on page 66

Calculating AC Power Requirements for MX10003 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 MX10003 Components on page 66
- Calculating Power Consumption for your Configuration on page 67
- Calculating System Thermal Output on page 69

Power Requirements for MX10003 Components

Table 28 on page 63 lists the power requirements for various hardware components when the router is operating under typical and maximum voltage conditions.

Table 28: Power Requirements for MX10003 Components

Component	Power Requirement at 25° C (Watts; Typical)	Power Requirement at 55° C (Watts; Maximum)
JNP-MIC1 (MIC)	80 W	85 W
JNP-MIC1-MACSEC (MIC)	110 W	120 W

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Table 28: Power Requirements for MX10003 Components (continued)

Component	Power Requirement at 25° C (Watts; Typical)	Power Requirement at 55° C (Watts; Maximum)
JNP10003-LC2103 (MPC)	660 W	715 W
JNP10003-RE1 (RCB)	58 W	65 W
JNP-FAN-3RU (Fan module)	20 W	95 W

Calculating Power Consumption for Your Configuration

These examples use generalized values per MIC. For exact MIC power requirements, see the *MX Series Interface Module Reference*.

The following calculations show the typical power consumption (at 25° C) for modular AC-powered routers @ 220 V:

- Fully loaded AC-powered router with four fan modules, two MPCs, two JNP-MIC1 MICs, and two RCBs :

  Router (idle at 25° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  80 W + 1320 W + 160 W + 116 W = 1676 W

  Output power in watts / power supply efficiency @90% = power consumption in watts
  1676 W / 0.9 = 1862 W

- Fully loaded AC-powered router with four fan modules, two MPCs, two JNP-MIC1-MACSEC MICs, and two RCBs:

  Router (idle at 25° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  90 W + 1320 W + 220 W + 116 W = 1736 W

  Output power in watts / power supply efficiency @90% = power consumption in watts
  1736 W / 0.9 = 1929 W

The following calculations show the maximum power consumption (at 55° C) for modular AC-powered routers @ 220 V:

- Fully loaded AC-powered router with four fan modules, two MPCs, two JNP-MIC1 MICs, and two RCBs:

  Router (idle at 55° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  380 W + 1430 W + 170 W + 130 W = 2110 W

  Output power in watts / power supply efficiency @90% = power consumption in watts

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2110 W / 0.9 = 2345 W

- Fully loaded AC-powered router with four fan modules, two MPC, two JNP-MIC1-MACSEC MICs, and two RCBs:

  Router (idle at 55° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  380 W + 1430 W + 240 W + 130 W = 2180 W

  Output power in watts / power supply efficiency @90% = power consumption in watts
  2180 W / 0.9 = 2422 W

Table 29 on page 65 lists the power requirements for the fully configured AC-powered routers operating under typical voltage conditions.

Table 29: MX10003 Router AC Router Power Requirements at Typical Temperature (25° C)

Fixed Chassis Configuration	Power Requirement at 25° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1	1676 W	1862 W
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1-MACSEC	1736 W	1929 W

Table 30 on page 65 lists the power requirements for the fully configured AC-powered routers operating under maximum voltage conditions.

Table 30: MX10003 Router AC Router Power Requirements at Maximum Temperature (55° C)

Fixed Chassis Configuration	Power Requirement at 55° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1	2110 W	2344 W
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1-MACSEC	2180 W	2422 W

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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 29 on page 65 we calculated the power consumption for a fully configured chassis running at high activity, with QSFP28 optics, and JNP-MIC1 at 25° C typical temperature to be 1676 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
1,676 W * 3.41 = 5,715.16 BTU/hr

See Also

- MX10003 Power System Description on page 32
- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 AC Power Supply on page 112
- AC Power Cord Specifications for MX10003 Routers on page 36
- AC Power Circuit Breaker Requirements for the MX10003 Router on page 36
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Calculating DC Power Requirements for MX10003 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 MX10003 Components on page 66
- Calculating Power Consumption for your Configuration on page 67
- Calculating System Thermal Output on page 69

Power Requirements for MX10003 Components

Table 31 on page 66 lists the power requirements for various hardware components when the router is operating under typical and maximum voltage conditions.

Table 31: Power Requirements for MX10003 Components

Component	Power Requirement at 25° C (Watts; Typical)	Power Requirement at 55° C (Watts; Maximum)
JNP-MIC1 (MIC)	80 W	85 W

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Table 31: Power Requirements for MX10003 Components (continued)

Component	Power Requirement at 25° C (Watts; Typical)	Power Requirement at 55° C (Watts; Maximum)
JNP-MIC1-MACSEC (MIC)	110 W	120 W
JNP10003-LC2103 (MPC)	660 W	715 W
JNP10003-RE1 (RCB)	58 W	65 W
JNP-FAN-3RU (Fan module)	20 W	95 W

Calculating Power Consumption for your Configuration

These examples use generalized values per MIC. For exact MIC power requirements, see the *MX Series Interface Module Reference*.

The following calculations show the typical power consumption (at 25° C) for modular DC-powered routers @ 220 V:

- Fully loaded DC-powered router with four fan modules, two MPCs, two JNP-MIC1 MICs, and two RCBs :

  Router (idle at 25° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  80 W + 1320 W + 160 W + 116 W = 1676 W

  Output power in watts / power supply efficiency @90% = power consumption in watts
  1676 W / 0.9 = 1862 W

- Fully loaded DC-powered router with four fan modules, two MPCs, two JNP-MIC1-MACSEC MICs, and two RCBs:

  Router (idle at 25° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  90 W + 1320 W + 220 W + 116 W = 1736 W

  Output power in watts / power supply efficiency @90% = power consumption in watts
  1736 W / 0.9 = 1929 W

The following calculations show the maximum power consumption (at 55° C) for modular DC-powered routers @ 220 V:

- Fully loaded DC-powered router with four fan modules, two MPCs, two JNP-MIC1 MICs, and two RCBs:

  Router (idle at 55° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  380 W + 1430 W + 170 W + 130 W = 2110 W

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Output power in watts / power supply efficiency @90% = power consumption in watts
2110 W / 0.9 = 2345 W

- Fully loaded DC-powered router with four fan modules, two MPCs, two JNP-MIC1-MACSEC MICs, and two RCBs:

  Router (idle at 55° C, with QSFP28 optics) with 4 fans (running at normal speed) + 2 MPC + 2 MIC + 2 RCBs=
  380 W + 1430 W + 240 W + 130 W = 2180 W

  Output power in watts / power supply efficiency @90% = power consumption in watts
  2180 W / 0.9 = 2422 W

Table 32 on page 68 lists the power requirements for the fully configured DC-powered routers operating under typical voltage conditions.

Table 32: MX10003 Router DC Router Power Requirements at Typical Temperature (25° C)

Fixed Chassis Configuration	Power Requirement at 25° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1	1676 W	1862 W
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1-MACSEC	1736 W	1929 W

Table 33 on page 68 lists the power requirements for the fully configured DC-powered routers operating under maximum voltage conditions.

Table 33: MX10003 Router DC Router Power Requirements at Maximum Temperature (55° C)

Fixed Chassis Configuration	Power Requirement at 55° C (Watts)	Power Requirement (Watts) with 90% Efficiency
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1	2110 W	2344 W
Fully configured chassis running at high activity, with QSFP28 optics and JNP-MIC1-MACSEC	2180 W	2422 W

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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 29 on page 65 we calculated the power consumption for a fully configured chassis running at high activity, with QSFP28 optics, and JNP-MIC1 at 25º C typical temperature to be 1676 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
1,676 W * 3.41 = 5,715.16 BTU/hr

See Also

- MX10003 Power System Description on page 32
- Routine Maintenance Procedures for MX10003 Routers on page 103
- Replacing an MX10003 DC Power Supply on page 114
- DC Power Circuit Breaker Requirements for the MX10003 Router on page 39
- DC Power Source Cabling for MX10003 Router on page 39
- DC Power Cable Specifications for MX10003 Router on page 40
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

MX10003 Network Cable and Transceiver Planning

- Calculating Power Budget and Power Margin for Fiber-Optic Cables on page 69
- CB-RE and RCB Interface Cable and Wire Specifications for MX Series Routers on page 71
- Understanding Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion on page 72

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 70
2. Calculating Power Margin for Fiber-Optic Cable on page 70

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Calculating Power Budget for Fiber-Optic Cable

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

$$P_B = P_T - P_R$$

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

$$P_B = P_T - P_R$$

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

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

Calculating Power Margin for Fiber-Optic Cable

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

$$P_M = P_B - LL$$

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

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. Table 34 on page 70 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 34: 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

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Table 34: Estimated Values for Factors Causing Link Loss (continued)

Link-Loss Factor	Estimated Link-Loss Value
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 34 on page 70 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 34 on page 70 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 35 on page 72 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.

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Table 35: Cable and Wire Specifications for Routing Engine and RCB Management and Alarm Interfaces

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

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

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

- Signal Loss in Multimode and Single-Mode Fiber-Optic Cable on page 72
- Attenuation and Dispersion in Fiber-Optic Cable on page 72

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

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power of the light signal as it is transmitted. Attenuation is caused by passive media components, such as cables, cable splices, and connectors. Although attenuation is significantly lower for optical fiber than for other media, it still occurs in both multimode and single-mode transmission. An efficient optical data link must have enough light available to overcome attenuation.

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

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

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

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

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

MX10003 Management and Console Port Specifications and Pinouts

- RJ-45 Connector Pinouts for MX Series CB-RE or RCB Auxillary and Console Ports on page 73
- RJ-45 Connector Pinouts for an MX Series CB-RE or RCB Management Port on page 74

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 36 on page 74 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.

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Table 36: RJ-45 Connector Pinout for the AUX and CONSOLE Ports

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

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

The port on the Control Board and Routing Engine (CB-RE; Routing and Control Board (RCB)) labeled **MGMT** is an autosensing 10/100/1000-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 37 on page 74 describes the RJ-45 connector pinout.

Table 37: RJ-45 Management Port Connector Pinouts for the CB-RE or RCB MGMT Port

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

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Table 37: RJ-45 Management Port Connector Pinouts for the CB-RE or RCB MGMT Port (continued)

Pin	Signal	Description
7	TRP4+	Transmit/receive data pair 4
8	TRP4–	Transmit/receive data pair 4

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CHAPTER 3

Initial Installation and Configuration

- MX10003 Installation Overview on page 77
- Unpacking the MX10003 Router on page 78
- Installing the MX10003 on page 79
- Connecting the MX10003 to Power on page 82
- Connecting the MX10003 to the Network on page 89
- Powering On and Off the MX10003 on page 94
- Initially Configuring the MX10003 Router on page 98

MX10003 Installation Overview

To install the router:

1. Prepare your installation site.

   See "MX10003 Site Preparation Checklist" on page 55.

2. Review the safety guidelines and warnings:
   - See "General Safety Guidelines and Warnings" on page 153.
   - See "General Safety Warnings for Juniper Networks Devices" on page 154.
3. Unpack the router and verify the parts:
   a. See "Unpacking the MX10003 Router" on page 78.

   b. See *Verifying the MX10003 Router Parts Received*.

4. (*Optional*) Remove components from the MX10003 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 onto the rack.

   See "Installing the MX10003 Router in a Rack" on page 80.

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6. (*Optional*; Required only if you have removed the components from the router in step 4) Reinstall components in the MX10003 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 MX10003 Router to External Devices and Cables" on page 89.

8. Connect the grounding cable.

   See "Grounding the MX10003 Router" on page 84.

9. Connect the AC power cord or DC power cables:
   - See "Connecting Power to an AC-Powered MX10003 Router" on page 85.
   - See "Connecting Power to a DC-Powered MX10003 Router" on page 87.
10. Power on the router:
    - See "Powering On an AC-Powered MX10003 Router" on page 95.
    - See "Powering On a DC-Powered MX10003 Router" on page 96.
11. Install the air filter unit.

    See "Replacing the MX10003 Air Filter Unit" on page 104.

12. Perform the initial system configuration.

    See "Initially Configuring the MX10003 Router" on page 98.

Related Documentation

- MX10003 Router Rack Requirements on page 61
- MX10003 Router Clearance Requirements for Airflow and Hardware Maintenance on page 59
- MX10003 Router Cabinet Requirements and Specifications on page 62

Unpacking the MX10003 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.**

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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

- MX10003 Site Preparation Checklist on page 55
- *Tools and Parts Required to Unpack the MX10003 Router*
- *Verifying the MX10003 Router Parts Received*

Installing the MX10003

- Tools Required to the Install MX10003 Router in a Rack on page 79
- Installing the MX10003 Router in a Rack on page 80

Tools Required to the Install MX10003 Router in a Rack

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

- Phillips (+) screwdriver, number 2
- ESD grounding wrist strap

See Also

- MX10003 Site Preparation Checklist on page 55

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Installing the MX10003 Router in a Rack

To install the router in a four-post rack or a cabinet:

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.

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

CAUTION: Lifting the chassis and mounting it in a rack requires two people (one person to guide the router in place and a second person to install the screws). A fully loaded AC-powered router weighs up to 157.4 lb (71.4 kg), while a fully loaded DC-powered router weighs up to 163.4 lb (74.1 kg).

Material handling systems (such as levers, slings, lifts, and so on) must be used to lift any equipment weighs above 121.2 lb (55 kg). When this is not practical, specially trained persons or systems must be used (riggers or movers).

1. Position the router in front of the four-post rack or the cabinet.

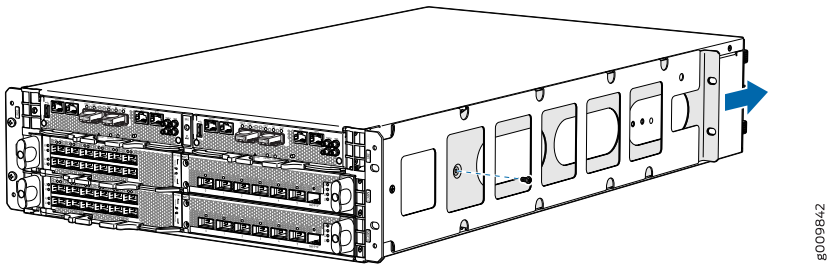
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and to a site ESD point.

3. Using a Phillips (+) number 2 screwdriver, remove the screw on each side of the chassis that holds the rear-mounting brackets, and slide the brackets out of the chassis (see Figure 24 on page 81). Keep the brackets safely to be used in later stage.

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

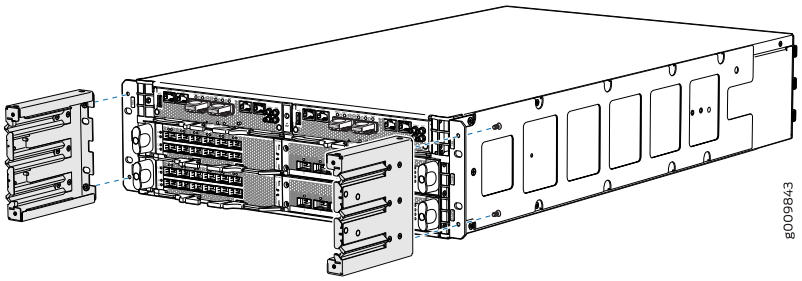
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Figure 24: Removing the Rear-Mounting Brackets



4. Install the cable management brackets on each side of the front of the chassis, and secure each bracket with screws at the bottom and top of the bracket (see Figure 25 on page 81).

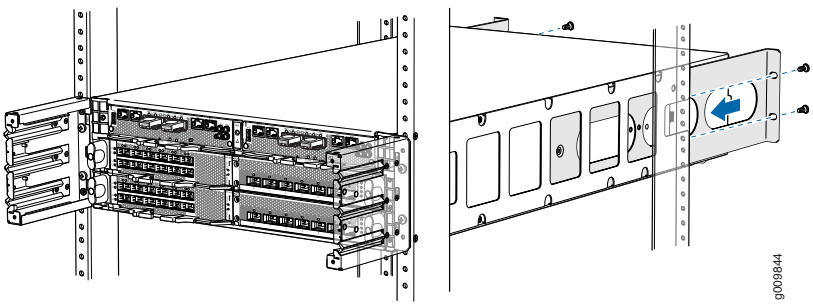
Figure 25: Installing the Cable Management Brackets



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 26 on page 81). The mounting brackets ensure that the holes in the front-mounting brackets attached to the chassis align with the holes in the rack rails.

Figure 26: Installing the Router in a Four-Post Rack



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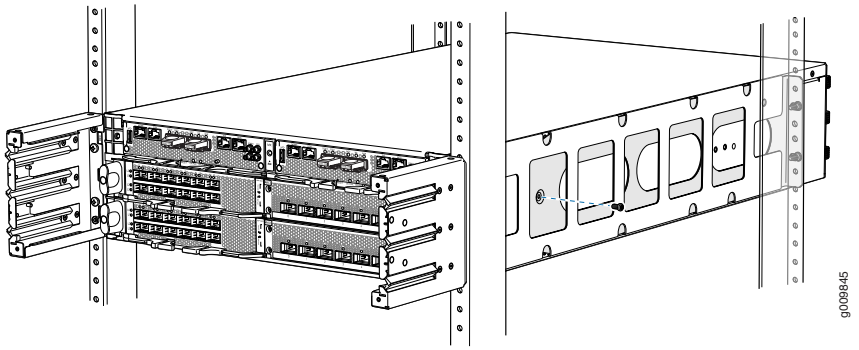
7. Install mounting screws into each of the open front-mounting holes aligned with the rack, starting from the bottom, and secure them tightly.

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.

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 27 on page 82 shows the router fully secured and installed in a four-post rack.

Figure 27: Router Installed in the Rack



11. Install the air filter unit. See "Replacing the MX10003 Air Filter Unit" on page 104.

See Also

- MX10003 Site Preparation Checklist on page 55
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Connecting the MX10003 to Power

- Tools and Parts Required for MX10003 Router Grounding and Power Connections on page 83
- Grounding the MX10003 Router on page 84
- Connecting Power to an AC-Powered MX10003 Router on page 85
- Connecting Power to a DC-Powered MX10003 Router on page 87

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Tools and Parts Required for MX10003 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 nutdriver
- 2.5-mm flat-blade (–) screwdriver
- Torque-controlled driver, with a maximum torque capacity of 6 lb-in. (0.68 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 may want to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

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

See Also

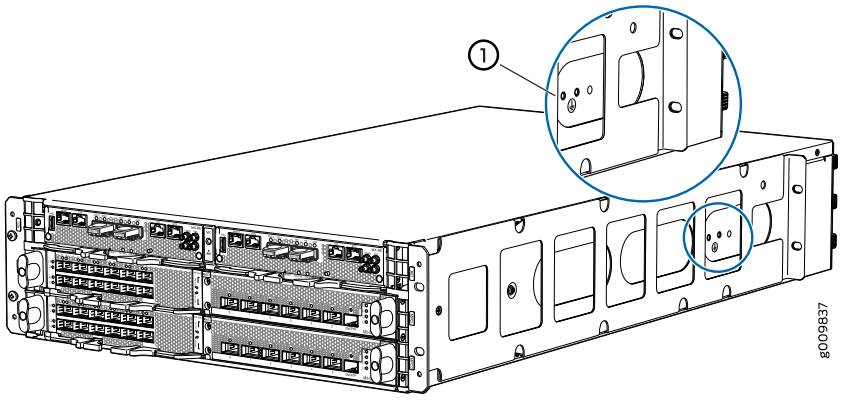
- MX10003 Router Grounding Specifications on page 57
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

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Grounding the MX10003 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 M5 pan head screws. Figure 28 on page 84 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 "MX10003 Router Grounding Specifications" on page 57.

Figure 28: Grounding Points on the MX10003 Router



1— Grounding point	

To ground the router:

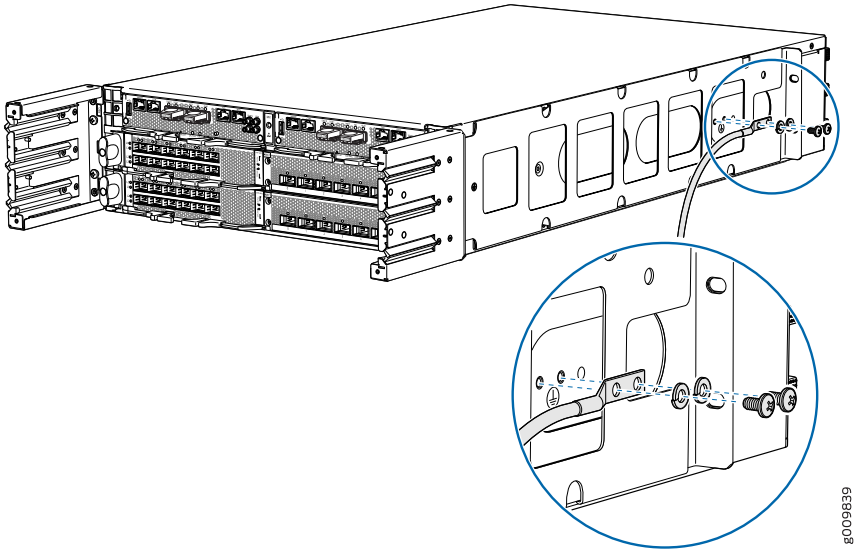
1. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.
3. Ensure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

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8. Secure the grounding cable lug with the screws. The holes are sized for M5 pan head screws (see Figure 29 on page 85).

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 29: Connecting Grounding lugs to the MX10003 Router



See Also

- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Connecting Power to an AC-Powered MX10003 Router

CAUTION: Do not mix AC and DC power supplies 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 supplies.

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

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1. Locate power cords that have a plug appropriate for your geographic location. For more information, see "AC Power Cord Specifications for MX10003 Routers" on page 36.

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 power supply.

4. Connect the power cord to the power supply.

5. Insert the power cord plug into an external AC power source receptacle (see Figure 30 on page 86).

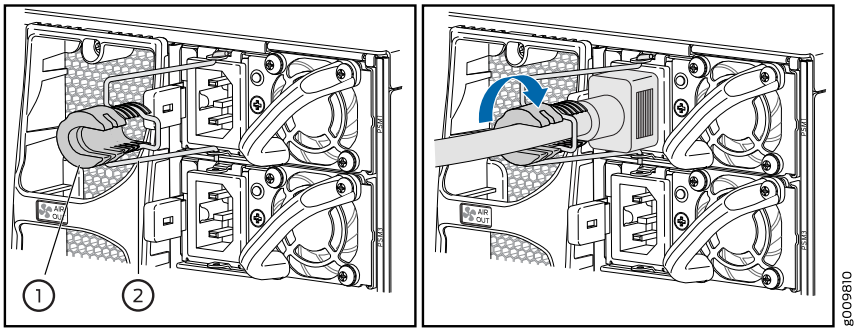
   NOTE: **Each power supply must be connected to a dedicated AC power feed and a dedicated customer-site circuit breaker. We recommend that you use a dedicated customer-site circuit breaker rated for 15 A (110 VAC) minimum, or as required by local code.**

6. 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.

7. Power on the power supply at source.

8. Repeat Step 1 through Step 7 for the installing the remaining power supply.

Figure 30: Connecting AC Power to the Router



See Also

- MX10003 Router Grounding Specifications on page 57
- General Safety Guidelines and Warnings on page 153

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- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Connecting Power to a DC-Powered MX10003 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 MX10003 Router" on page 40.

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

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the color coding for the leads on the power cables that attach to the terminal studs on each power supply.

4. Remove the nuts from the terminals.

5. Secure each power cable lug to the terminal with the nuts (see Figure 31 on page 89). Apply between 5 lb-in. (0.6 Nm) and 6 lb-in. (0.7 Nm) of torque to the nuts. Do not overtighten the nuts. (Use a socket nutdriver.)

   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 nuts. Ensure that each nut is properly threaded into the terminal. Applying installation torque to the nuts 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.



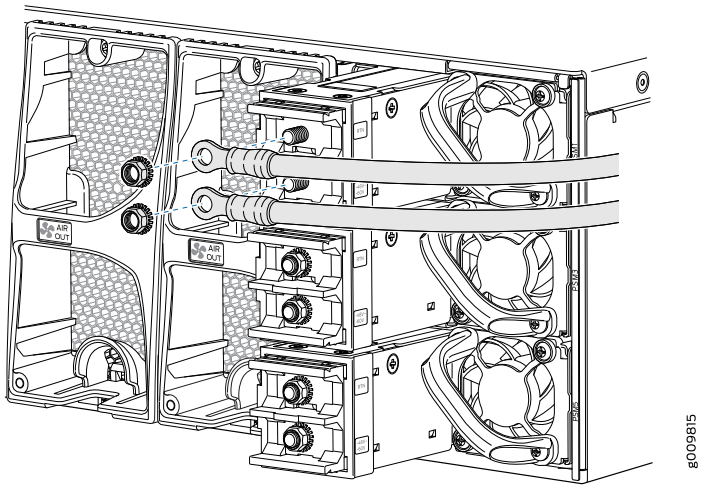
NOTE: For information about connecting to DC power sources, see "MX10003 Router DC Power Specifications" on page 38.

6. Verify that the power cables are connected correctly, that they are not touching or blocking 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 supplies.

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Figure 31: Connecting DC Power to the Router



See Also

- MX10003 Router Grounding Specifications on page 57
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Connecting the MX10003 to the Network

- Tools and Parts Required to Connect the MX10003 Router to External Devices on page 89
- Connecting the MX10003 Router to External Devices and Cables on page 89

Tools and Parts Required to Connect the MX10003 Router to External Devices

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

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

See Also

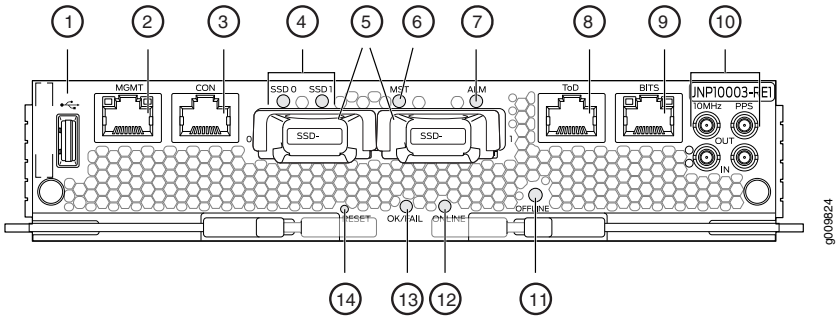
- *Verifying the MX10003 Router Parts Received*
- Prevention of Electrostatic Discharge Damage on page 156

Connecting the MX10003 Router to External Devices and Cables

Figure 32 on page 90 shows the front panel of the MX10003 RCB. All the connections to the router are made through the RCBs. The external devices are connected through the RCBs.

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Figure 32: Routing and Control Board (RCB) Ports



1—USB port	8—Time of day (**ToD**) port with LEDs
2—Management (**MGMT**) port	9—**BITS** port with LEDs
3—Console (**CON**) port	10—Clocking ports
4—SSD LEDs	11—**OFFLINE** button
5—SSD slots (**0** and **1**)	12—**ONLINE** LED
6—Master (**MST**) LED	13—**OK/FAIL** LED
7—Alarm (**ALM**) LED	14—**RESET** button

- Connecting the Router to a Network for Out-of-Band Management on page 90
- Connecting the Router to a Console Device on page 91
- Connecting the Router to External Clocking and Timing Devices on page 92

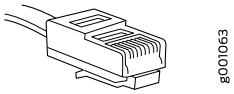
Connecting the Router to a Network for Out-of-Band Management

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

NOTE: Use shielded CAT5e cable for connecting the CON and MGMT ports in RCB.

1. Turn off power to the management device.
2. Plug one end of the Ethernet cable (Figure 33 on page 90 shows the connector) into the **MGMT** port on the RCB interface.
3. Plug the other end of the cable into the network device.

Figure 33: Out-of-Band Management Cable Connector



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Table 38: Out-of-Band Management Port on the RCB

Callout (see Figure 32 on page 90)	Label	Description
2	**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 Routing Engine, connect it to the appropriate **CON** port on the RCB interface. The console port is used to connect a laptop or console terminal to configure the router (see Figure 35 on page 92 and Figure 36 on page 92). 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 in RCB.**

To connect a management console:

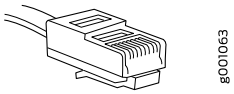
1. Turn off power to the console device.
2. Plug the RJ-45 end of the serial cable (see Figure 34 on page 91) into the **CON** port on the RCB interface.
3. Plug the female DB-9 end into the device's serial port.

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 34: Console and Auxiliary Cable Connector



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Figure 35: Connecting a router to a Management Console Through a Console Server

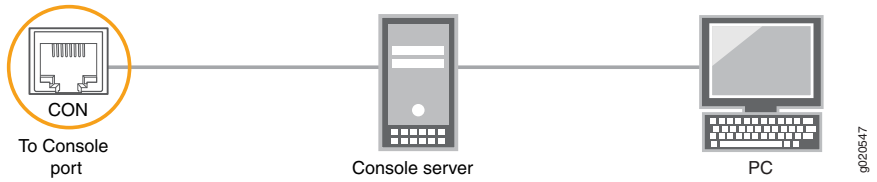


Figure 36: Connecting a router Directly to a Management Console



Table 39: Console Port on the RCB

Callout (see Figure 32 on page 90)	Label	Description
3	**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 92
- Connecting a Time-of-Day Device to the Router on page 93
- Connecting a BITS External Clocking Device to the Router on page 94

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

The router has two 2x1 DIN 1.0/2.3 right angle connectors that support 1-PPS-IN, 1-PPS-OUT, 10-MHz-IN, and 10-MHz-OUT timing ports.

NOTE: MX10003 can be configured as a timing master or a slave device. If the MX10003 is configured as a timing master device, the router gets 1-PPS-IN and 10-MHz-IN input (connected to the ports marked IN) from the timing source and sends 1-PPS-OUT and 10-MHz-OUT to a slave device. If the MX10003 is configured as a timing slave device, it receives 1-PPS-IN and 10-MHz-IN (connected to ports marked IN) as input from the timing source.

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

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To connect the DIN cable to the external clocking input port:

1. Connect one end of the DIN cable connectors to the 1-PPS-IN and the 10-MHz-IN ports marked **IN** on the router.

   If the MX10003 is a timing master device, use the 1-PPS-OUT and the 10-MHz-OUT ports marked **OUT** to connect to a slave router or device.

2. Connect the other end of the DIN cable to the 10-MHz or 1-PPS source network equipment.

NOTE: Ensure that the 10-MHz or 1-PPS source network equipment contains a low voltage complementary metal oxide semiconductor (LVCMOS) of 50 ohms or is compatible with low-voltage transistor-transistor logic (LVTTL) (3.3v).

Table 40: Clocking Port on the RCB

Callout (see Figure 32 on page 90)	Label	Description
10	**10MHz- IN**	1 PPS input port
	1PPS-IN	10 MHz input port
	10MHz-OUT	1 PPS output port
	1PPS-OUT	10 MHz output port

Connecting a Time-of-Day Device to the Router

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

To connect the router to a ToD external timing device:

1. Attach an electrostatic discharge (ESD) grounding strap 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 RCB.

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*.

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Table 41: Time-of-Day Port on the RCB

Callout (see Figure 32 on page 90)	Label	Description
8	**ToD**	ToD RJ-45 port.

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 RCB.

To connect the router to a BITS external clocking device:

1. Attach an electrostatic discharge (ESD) grounding strap 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 RCB.
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 42: BITS Port on the RCB

Callout (see Figure 32 on page 90)	Label	Description
9	**BITS**	Building-Integrated Timing Supply (BITS) clock interface port.

See Also

- MX10003 Routing and Control Board (RCB) Description on page 41
- Prevention of Electrostatic Discharge Damage on page 156

Powering On and Off the MX10003

- Powering On an AC-Powered MX10003 Router on page 95
- Powering On a DC-Powered MX10003 Router on page 96
- Powering Off the MX10003 Router on page 97

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Powering On an AC-Powered MX10003 Router

To power on an AC-powered router:

1. Verify that the power supplies 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 one of the RCB ports (**CON**).
4. Turn on power to the external management device.
5. Switch on the dedicated customer-site circuit breakers for the power supplies. 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 above each AC input switch 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.

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See Also

- MX10003 Router Grounding Specifications on page 57
- *request system halt*
- *show chassis power*
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Powering On a DC-Powered MX10003 Router

To power on a DC-powered router:

1. Verify that an external management device is connected to one of the RCB ports (**CON**).
2. Turn on power to the external management device.
3. Verify that the power supplies 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 blue 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 blue steadily.

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

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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 RCB, monitor the startup process to verify that the system has booted properly.

See Also

- MX10003 Router Grounding Specifications on page 57
- *request system halt*
- *show chassis power*
- General Safety Guidelines and Warnings on page 153
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 156

Powering Off the MX10003 Router

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

To power off the router:

1. On the external management device connected to the RCB, issue the **request system halt** command.

   ```
   user@host> request vmhost halt
   ```

2. 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.

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

4. Switch off the power supply source.

See Also
- *request vmhost halt*

Initially Configuring the MX10003 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 slot in the RCB panel faceplate. The system also supports two M.2-based solid-state drive (SSD) slots. These two SSD devices act as the primary boot devices (**sda** and **sdb**). When the router boots, it first attempts to start the Junos OS image on the USB Flash memory 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 RCB **CON** 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.

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


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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
    ```

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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 {
    ```


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```
        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

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CHAPTER 4

Maintaining Components

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Maintaining MX10003 Cooling System Components on page 103
- Maintaining MX10003 Power System Components on page 111
- Maintaining MX10003 Routing and Control Board on page 118
- Maintaining MX10003 Interface Modules on page 123

Routine Maintenance Procedures for MX10003 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 MX10003 Front Panel on page 28

Maintaining MX10003 Cooling System Components

- Maintaining the MX10003 Air Filter on page 103
- Replacing the MX10003 Air Filter Unit on page 104
- Replacing the MX10003 Air Filter on page 106
- Maintaining the MX10003 Fan Module on page 108
- Replacing an MX10003 Fan Module on page 109

Maintaining the MX10003 Air Filter

Purpose For optimum cooling, verify the condition of the air filter.

Action
- Regularly inspect the air filter. A dirty air filter restricts airflow in the unit, producing a negative effect on the ventilation of the chassis. The filter degrades over time. You must replace the filter every 6 months.

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CAUTION: Always keep the air filter in place while the device is operating. Because the fans are very powerful, they could pull small bits of wire or other materials into the through the unfiltered air intake. This could damage the components.

- The shelf life of polyurethane filter varies from two years to five years depending on the storage conditions. Store in a cool, dry, and dark environment. Wrap the media in plastic and store in an environment with relative humidity between 40%- 80% and temperature between 40° F (4° C) to 90° F (32° C). Note that if the material flakes, or becomes brittle when rubbed or deformed, it is no longer usable.

See Also
- MX10003 Cooling System Description on page 29

Replacing the MX10003 Air Filter Unit

The air filter unit consists of three parts—the outer filter cover, the air filter, and the inner cage which forms the body, and the air filter. The air filter sits right inside the outer filter cover and the inner cage. The air filter unit is installed into the cable management brackets, and are held tightly by captive screws.

- Removing the MX10003 Air Filter Unit on page 104
- Installing the MX10003 Air Filter Unit on page 105

Removing the MX10003 Air Filter Unit

NOTE: Air filter assembly is designed to prevent dust from being drawn into the chassis. This filter assembly must be installed for the product to be NEBS GR 63 compliant.

To remove the air filter unit:

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.

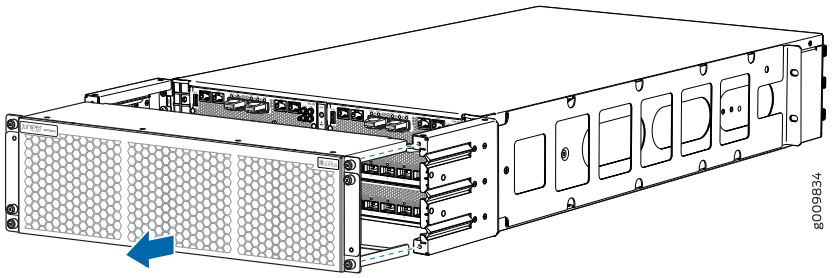
2. Loosen the captive screws located on either side of the air filter unit attached at the front of the router.

   NOTE: Removing the cables from the cable manager is not necessary to access the air filter.

3. Grasp the air filter unit and gently pull the air filter unit out of the cable management brackets. See Figure 37 on page 105.

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Figure 37: Removing the Air Filter from the Chassis



Installing the MX10003 Air Filter Unit

NOTE: The air filter unit is installed on the cable management brackets. Before installing the air filter unit, ensure that the cable management brackets are already installed on the front of the router.

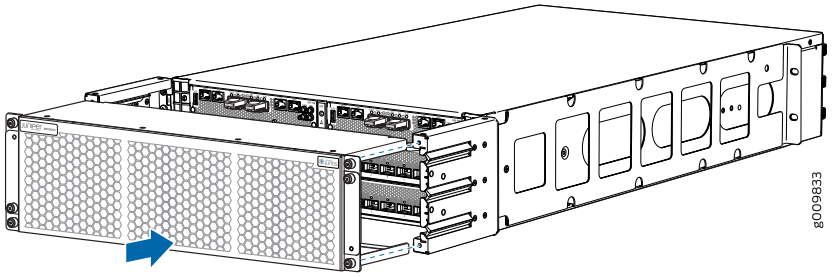
To install the air filter unit:

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. Ensure that the air filter unit is right side up.

3. Grasp the air filter unit and slide into the rails on the cable management brackets until it stops (see Figure 38 on page 105). The air filter unit fits snugly on the cable management brackets.

Figure 38: Installing the Air Filter



4. Tighten the captive screws to secure the air filter unit.

See Also
- MX10003 Cooling System Description on page 29

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- Prevention of Electrostatic Discharge Damage on page 156

Replacing the MX10003 Air Filter

The air filter unit consists of three parts—the outer and inner metal cage unit which forms the body, and the air filter. The air filter sits right inside the outer and inner cage unit. The air filter unit is installed into the cable management brackets, and are held tightly by captive screws.

Regularly inspect the air filter. A dirty air filter restricts airflow in the unit, producing a negative effect on the ventilation of the chassis.

- Removing the MX10003 Air Filter on page 106
- Installing the MX10003 Air Filter on page 107

Removing the MX10003 Air Filter

CAUTION: Do not run the router for more than a few minutes without the air filter in place.

CAUTION: Always keep the air filter unit in place while the router is operating, except during replacement. Because the fans are very powerful, they could pull small bits of wire or other materials into the router through the unfiltered air intake. This could damage the router components.

To remove the air filter:

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. Loosen the captive screws located on either side of the air filter unit attached on the front of the router.

   NOTE: Removing the cables from the cable manager is not necessary to access the air filter.

   CAUTION: Do not run the router for more than 2 minutes without the air filter unit in place.

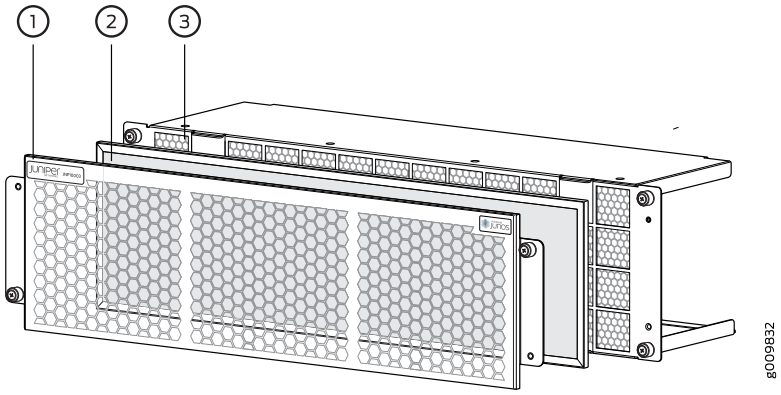
3. Grasp the head of the loosened screws, and pull to remove the outer air filter cover.

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The air filter is located at the center of the air filter unit, and just behind the outer filter cover. See Figure 39 on page 107.

4. Grasp the air filter, and pull the air filter straight out from the air filter unit.

Figure 39: Removing the Air Filter from the Air Filter Unit



1—Outer filter cover	3—Inner filter cage
2—Air filter	

Installing the MX10003 Air Filter

NOTE: The air filter unit is installed on the cable management brackets. Before installing the air filter unit, ensure that the cable management brackets are already installed on the front of the router.

To install the air filter:

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. Loosen the captive screws located on either side of the air filter unit attached on the front of the router.

NOTE: Removing the cables from the cable manager is not necessary to access the air filter.

CAUTION: Do not run the router for more than 2 minutes without the air filter unit in place.

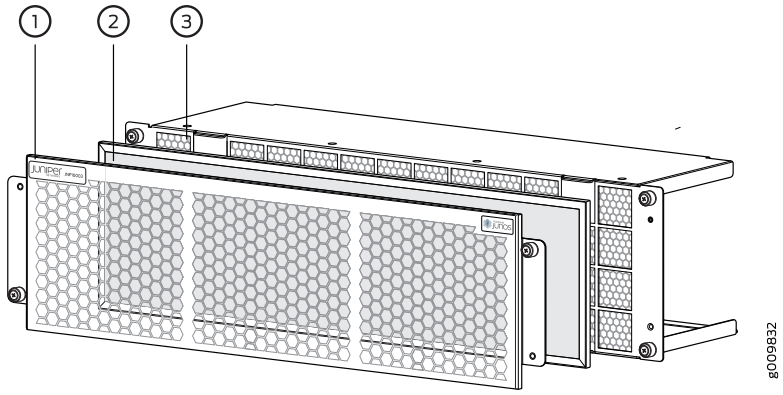
3. Grasp the head of the loosened screws, and pull to remove the outer air filter cover.

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The air filter is located at the center of the air filter unit, and just behind the outer filter cover. See Figure 40 on page 108.

4. Grasp the air filter, and place the air filter straight onto inner filter cage.

Figure 40: Installing the Air Filter into the Air Filter Unit



1—Outer filter cover	3—Inner filter cage
2—Air filter	

5. Place the outer air filter cover back into it's place, and tighten the captive screws to secure the air filter unit.

Maintaining the MX10003 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 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         39 degrees C / 102 degrees F
      CB 0 Top Right Exhaust Sensor  OK         46 degrees C / 114 degrees F
      CB 0 Top Left Exhaust Sensor   OK         66 degrees C / 150 degrees F
      CB 0 CPU Core-0 Temp           OK         50 degrees C / 122 degrees F
      CB 0 CPU Core-1 Temp           OK         50 degrees C / 122 degrees F
      CB 0 CPU Core-2 Temp           OK         49 degrees C / 120 degrees F
      CB 0 CPU Core-3 Temp           OK         50 degrees C / 122 degrees F
      CB 0 CPU Core-4 Temp           OK         49 degrees C / 120 degrees F
      CB 0 CPU Core-5 Temp           OK         49 degrees C / 120 degrees F
      CB 0 CPU Core-6 Temp           OK         49 degrees C / 120 degrees F
```


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```
      CB 0 CPU Core-7 Temp           OK          49 degrees C / 120 degrees F
      FPC 0 EA0_HMC0 Logic die       OK          82 degrees C / 179 degrees F
      FPC 0 EA0_HMC0 DRAM botm       OK          79 degrees C / 174 degrees F
      FPC 0 EA0_HMC1 Logic die       OK          86 degrees C / 186 degrees F
      FPC 0 EA0_HMC1 DRAM botm       OK          83 degrees C / 181 degrees F
      FPC 0 EA0 Chip                 OK          94 degrees C / 201 degrees F
      FPC 0 EA0-XR0 Chip             OK          70 degrees C / 158 degrees F
      FPC 0 EA0-XR1 Chip             OK          74 degrees C / 165 degrees F
Power PEM 0                          Check
      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
```

Replacing an MX10003 Fan Module

- Removing an MX10003 Fan Module on page 109
- Installing an MX10003 Fan Module on page 110

Removing an MX10003 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 41 on page 110):

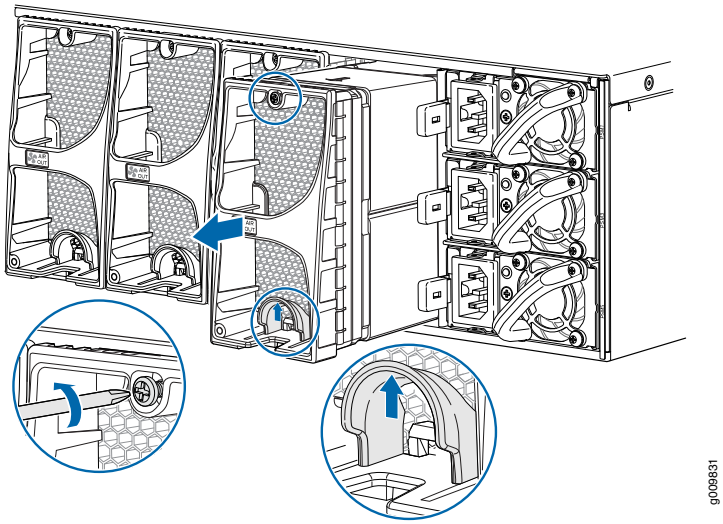
1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Loosen the captive screw on the fan module faceplate (use a number-2 Phillips screwdriver).
3. Hold and lift the latch located on the inside of the fan module to release it from the chassis.

   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.

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Figure 41: Removing the Fan Module



Installing an MX10003 Fan Module

To install the fan module (see Figure 42 on page 111):

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

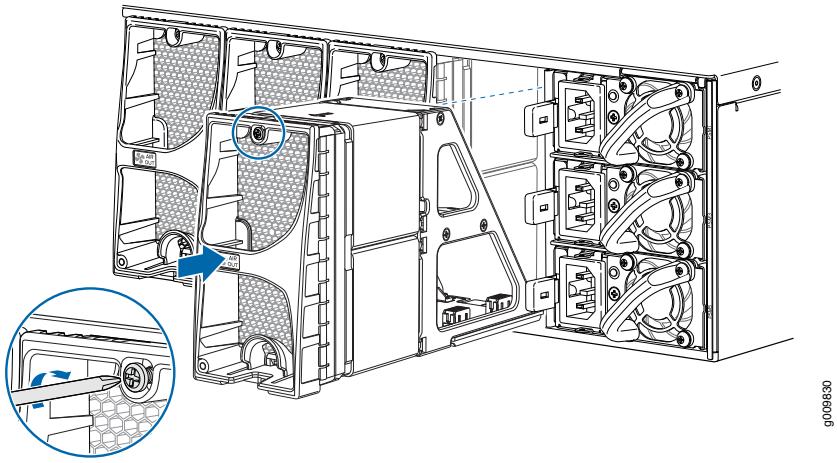
2. Grasp the fan module by the handle, and place one hand under the fan module for support.

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.

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Figure 42: Installing the Fan Module



See Also

- MX10003 Cooling System Description on page 29
- Prevention of Electrostatic Discharge Damage on page 156

Maintaining MX10003 Power System Components

- Maintaining the Power Supplies on page 111
- Replacing an MX10003 AC Power Supply on page 112
- Replacing an MX10003 DC Power Supply on page 114

Maintaining the Power Supplies

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

Action On a regular basis check the power supply status:

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

```
user@host> show chassis power
PEM 0:
  State:     Online
  Capacity:  1600 W (maximum 1600 W)
  AC input:  OK (1 feed expected, 1 feed connected)
  DC output: 24 W (zone 0, 2 A at 12 V, 1% of capacity)

PEM 1:
  State:     Online
  Capacity:  1600 W (maximum 1600 W)
  AC input:  OK (1 feed expected, 1 feed connected)
  DC output: 300 W (zone 0, 25 A at 12 V, 18% of capacity)
...
```

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- Make sure that the power and grounding cables are arranged so that they do not obstruct access to other router components.
- Routinely check the status LEDs on the power supply faceplates and the craft interface to determine if the power supplies are functioning normally.
- Check the red and yellow alarm LEDs on the craft interface. Power supply failure or removal triggers an alarm that causes one or both of the LEDs to light. You can display the associated error messages by issuing the following command:

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

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



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

See Also

- MX10003 Power System Description on page 32
- MX10003 Power Supply Module LEDs on page 34

Replacing an MX10003 AC Power Supply

- Removing an MX10003 AC Power Supply on page 112
- Installing an MX10003 AC Power Supply on page 113

Removing an MX10003 AC Power Supply

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



NOTE: The minimum required number of power supplies 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.

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To remove an AC power supply (see Figure 43 on page 113):

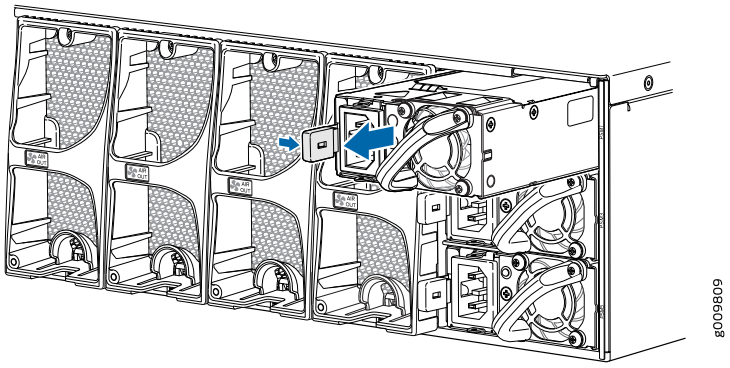
1. Switch off the dedicated customer-site circuit breaker for the power supply, and remove the power cord from the AC power source. Follow the instructions for your site.

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

3. Press the release latch on the left side of the AC power supply to disconnect the power supply from the chassis (see Figure 43 on page 113).

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

Figure 43: Removing an AC Power Supply



Installing an MX10003 AC Power Supply

To install an AC power supply (see Figure 44 on page 114):

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 left side of the power supply to slide it into the chassis.

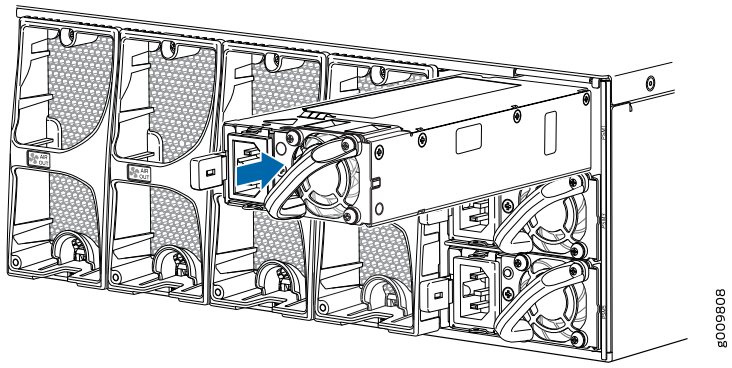
4. Attach the power cord to the power supply.

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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 44: Installing an AC Power Supply



See Also

- MX10003 Power System Description on page 32
- MX10003 Router AC Power Specifications on page 35
- AC Power Circuit Breaker Requirements for the MX10003 Router on page 36
- AC Power Cord Specifications for MX10003 Routers on page 36
- Prevention of Electrostatic Discharge Damage on page 156

Replacing an MX10003 DC Power Supply

- Removing an MX10003 DC Power Supply on page 114
- Installing an MX10003 DC Power Supply on page 116

Removing an MX10003 DC Power Supply

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

NOTE: The minimum required number of power supplies 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.

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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.

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. Using a socket nutdriver, remove the nut from each of the DC power terminals (see Figure 45 on page 116).
6. Remove the cable lugs from the terminals.
7. Carefully move the power cables out of the way.
8. Press the latch located on the left side of the DC power supply, to release it from the chassis.
9. Pull the power supply straight out of the chassis (see Figure 46 on page 116).

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Figure 45: Disconnecting the DC Power Cables

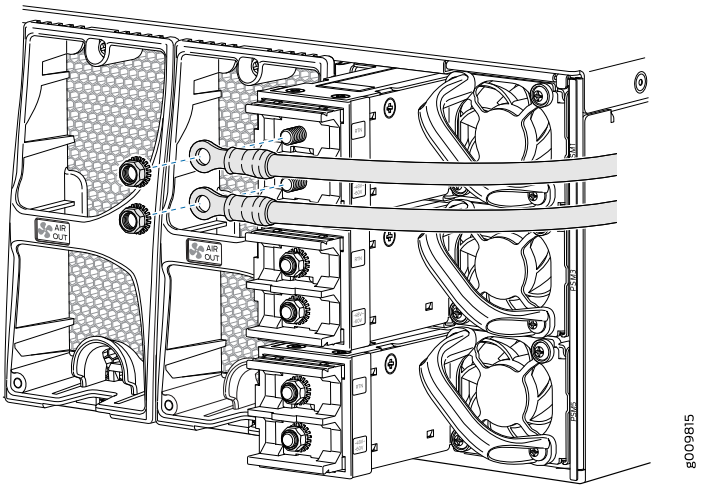
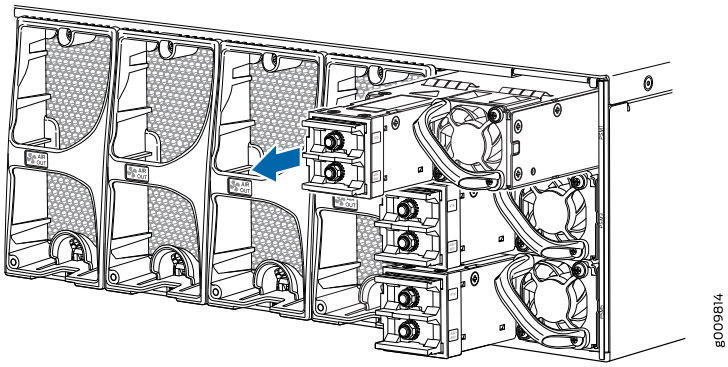


Figure 46: Removing a DC Power Supply



Installing an MX10003 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 47 on page 118):

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.

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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 nuts from the terminals.

5. Secure each power cable lug to the terminal with the nut (see Figure 48 on page 118). Apply between 5 lb-in. (0.6 Nm) and 6 lb-in. (0.7 Nm) of torque to the nut. Do not overtighten the nut (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.

6. Verify that the power cabling is correct, that the cables are not touching or blocking access to router components, and that they do not drape where people could trip on them.

7. 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 supplies at the same time.

8. 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.

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Figure 47: Installing a DC Power Supply

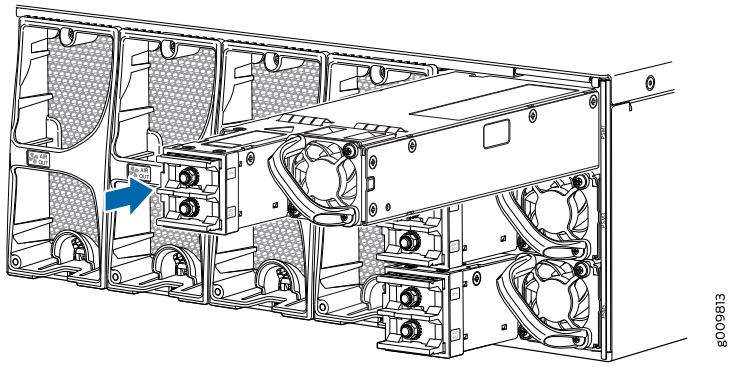
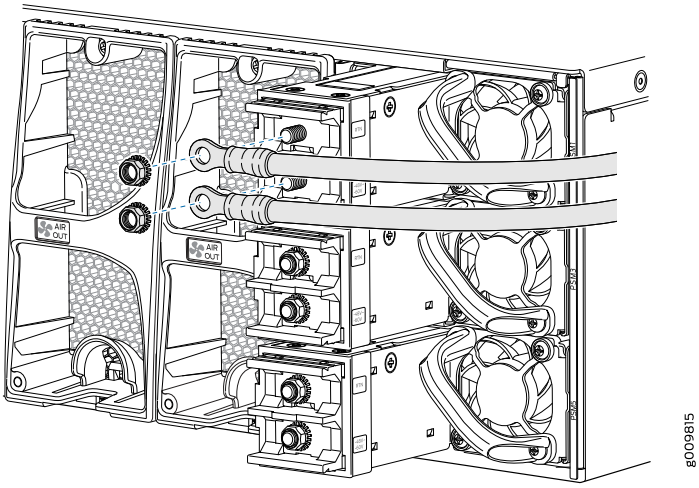


Figure 48: Connecting the DC Power Cables



See Also

- MX10003 Power System Description on page 32
- MX10003 Router DC Power Specifications on page 38
- DC Power Circuit Breaker Requirements for the MX10003 Router on page 39
- DC Power Source Cabling for MX10003 Router on page 39
- DC Power Cable Specifications for MX10003 Router on page 40
- Prevention of Electrostatic Discharge Damage on page 156

Maintaining MX10003 Routing and Control Board

- Maintaining the Routing and Control Board (RCB) on page 119
- Replacing an MX10003 RCB on page 120

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Maintaining the Routing and Control Board (RCB)

Purpose For optimum router performance, verify the condition of the RCB on regular basis.

Action On a regular basis:

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

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 44 degrees C / 111 degrees F
    CPU temperature             41 degrees C / 105 degrees F
    DRAM                      49110 MB (49152 MB installed)
    Memory utilization           4 percent
    5 sec CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      99 percent
    1 min CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      99 percent
    5 min CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      99 percent
    15 min CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     1 percent
      Interrupt                  0 percent
      Idle                      99 percent
    Start time                    2017-08-19 23:31:33 PDT
    Uptime                        7 hours, 33 minutes, 29 seconds
    Last reboot reason            0x2000:hypervisor reboot
    Load averages:                1 minute   5 minute  15 minute
                                      0.09       0.20       0.18
Routing Engine status:
  Slot 1:
    Current state                 Present
```

See Also
- MX10003 Routing and Control Board (RCB) Description on page 41

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- MX10003 RCB LEDs on page 45
- *show chassis routing-engine*

Replacing an MX10003 RCB

- Removing an MX10003 RCB on page 120
- Installing an MX10003 RCB on page 121

Removing an MX10003 RCB

The MX10003 host subsystem consists of two Routing and Control Boards (RCBs). The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality and supports virtualization.

To remove an RCB (see Figure 49 on page 121):

NOTE: You can remove the RCB as a unit.

CAUTION: Before removing an RCB, ensure that you know how to operate the ejector handles properly to avoid damage to the equipment.

CAUTION: Before you replace an RCB, you must take the host subsystem offline. If there is only one host subsystem, taking the host subsystem offline shuts down the router.

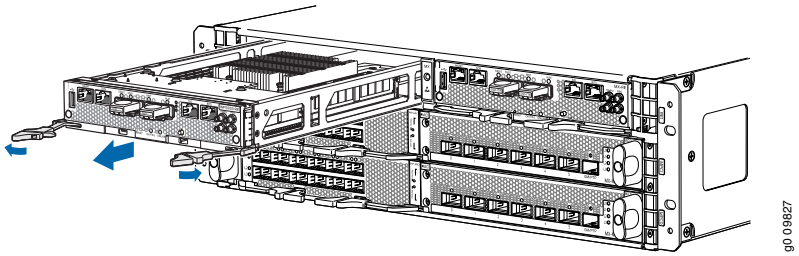
1. Take the host subsystem offline.
2. Place an electrostatic bag or antistatic mat on a flat, stable surface.
3. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
4. Open the ejector handle outward to unseat the RCB.
5. Grasp the ejector handle, and slide the RCB about halfway out of the chassis.
6. Place one hand underneath the RCB to support it, and slide it completely out of the chassis.

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7. Place the RCB on the antistatic mat or into an antistatic bag.

8. If you are not replacing the RCB immediately, install a blank panel over the empty slot.

Figure 49: Removing a RCB



Installing an MX10003 RCB

To install an MX10003 RCB (see Figure 50 on page 123):

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. Remove the RCB from the electrostatic bag.

3. Carefully align the sides of the RCB with the guides inside the chassis.

4. Slide the RCB into the chassis until you feel resistance, carefully ensuring that it is correctly aligned.

5. Grasp the ejector handle, and gently close it inward simultaneously until the RCB is fully seated.

6. Check the LEDs on the RCB faceplate to verify that it is functioning normally.
   - The green **OK/FAIL** LED should light steadily a few minutes after the RCB is installed.
   - If the **OK/FAIL** LED is red, remove and install the RCB again. If the **OK/FAIL** LED still lights steadily, the RCB is not functioning properly. Contact your customer support representative. See *Contacting Customer Support*.

7. Check the status of the RCB by using the **show chassis routing-engine** command:

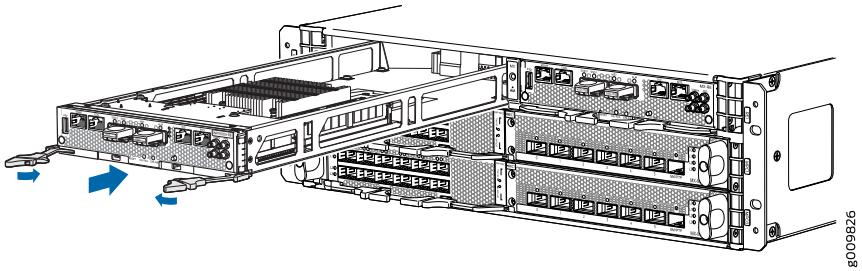
```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 41 degrees C / 105 degrees F
```

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```
    CPU temperature             43 degrees C / 109 degrees F
    DRAM                       49112 MB (49152 MB installed)
    Memory utilization             6 percent
    5 sec CPU utilization:
      User                         1 percent
      Background                   0 percent
      Kernel                       0 percent
      Interrupt                    0 percent
      Idle                        99 percent
    1 min CPU utilization:
      User                         2 percent
      Background                   0 percent
      Kernel                       1 percent
      Interrupt                    0 percent
      Idle                        97 percent
    5 min CPU utilization:
      User                         1 percent
      Background                   0 percent
      Kernel                       1 percent
      Interrupt                    0 percent
      Idle                        98 percent
    15 min CPU utilization:
      User                         1 percent
      Background                   0 percent
      Kernel                       1 percent
      Interrupt                    0 percent
      Idle                        97 percent
    Model                          RE-S-2X00x6
    Start time                     2017-11-06 22:55:43 PST
    Uptime                         1 hour, 7 minutes, 19 seconds
    Last reboot reason             0x2000:hypervisor reboot
    Load averages:                 1 minute   5 minute  15 minute
                                       0.54       0.45       0.42
Routing Engine status:
  Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    Temperature                 43 degrees C / 109 degrees F
    CPU temperature             42 degrees C / 107 degrees F
    DRAM                       49109 MB (49152 MB installed)
    Memory utilization             4 percent
    5 sec CPU utilization:
      User                         0 percent
      Background                   0 percent
      Kernel                       0 percent
      Interrupt                    0 percent
      Idle                       100 percent
    Model                          RE-S-2X00x6
    Start time                     2017-11-04 02:37:23 PDT
    Uptime                         2 days, 22 hours, 25 minutes, 41 seconds
    Last reboot reason             0x1:power cycle/failure
    Load averages:                 1 minute   5 minute  15 minute
                                       0.16       0.14       0.09
```


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Figure 50: Installing an MX10003 RCB



See Also

- MX10003 Routing and Control Board (RCB) Description on page 41
- MX10003 RCB LEDs on page 45

Maintaining MX10003 Interface Modules

- Maintaining MICs on page 123
- Replacing an MX10003 MIC on page 124
- Maintaining MPCs on page 128
- Replacing an MX10003 MPC on page 129
- Maintaining Cables That Connect to MPCs or MICs on page 133
- Replacing a Cable on an MX10003 MPC or MIC on page 134
- Replacing a SFP+ Transceiver on page 137
- Replacing a QSFP28 Transceiver on page 139

Maintaining MICs

Purpose For optimum router performance, verify the condition of the MICs.

Action On a regular basis:

- Check the LEDs on MIC faceplates. The meaning of the LED states differs for various MICs. For more information, see the *MX Series Interface Module Reference*. If the MPC that houses the MIC detects a MIC failure, the MPC generates an alarm message to be sent to the Routing Engine.
- Issue the **show chassis fpc pic-status** CLI command. The MIC slots in an MPC are numbered **PIC 0** and **PIC 1**, right to left:

```
user@host> show chassis fpc pic-status
Slot 0   Online       LC2103
  PIC 0  Online       6xQSFPP
  PIC 1  Online       MIC1
Slot 1   Online       LC2103
  PIC 0  Online       6xQSFPP
  PIC 1  Online       MIC1
```

For further description of the output from the command, see the CLI Explorer.

Replacing an MX10003 MIC

- Removing an MX10003 MIC on page 124
- Installing an MX10003 MIC on page 126

Removing an MX10003 MIC

MICs are hot-insertable and hot-removable. When you remove a MIC, the router continues to function, although the MIC interfaces being removed no longer function.

NOTE: On the MX10003 MPC (Multi-Rate), only the MIC in slot 1 is removable. The MIC in slot 0 is fixed to the MPC and cannot be removed.

The MICs are located in the MPCs installed at the front of the router. A typical MIC weighs around 3 lb (1.36 kg).

To remove a MIC (see Figure 52 on page 126):

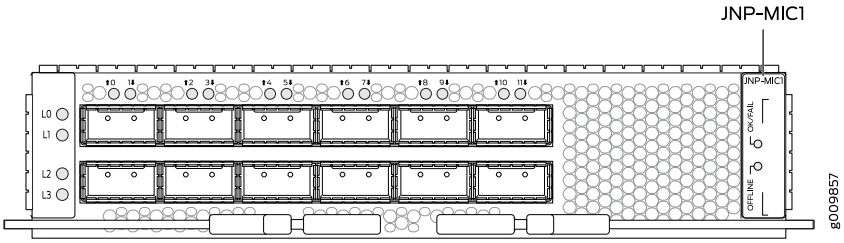
1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the MIC. If the MIC connects to fiber-optic cable, have ready a rubber safety cap for each transceiver and cable.

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

3. Use one of the following methods to take the MIC offline:

   - Press its **OFFLINE** button. Use a narrow-ended tool that fits inside the opening that leads to the button. Press and hold the button (for about 5 seconds) until the MIC's **OK/FAIL** LED goes off. Figure 51 on page 124 shows the location of the **OFFLINE** button on the MIC.

Figure 51: JNP-MIC



   - Issue the following CLI command:

     `user@host>` **request chassis pic fpc-slot** ***fpc-slot*** **pic-slot** ***pic-slot*** **offline**

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For more information about the command, see the *Junos OS System Basics and Services Command Reference*.

4. Label the cables connected to the MIC so that you can later reconnect each cable to the correct MIC.

5. Disconnect the cables from the MIC. If the MIC uses fiber-optic cable, immediately cover each transceiver and the end of each 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.**

6. Arrange the cable 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.



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.**

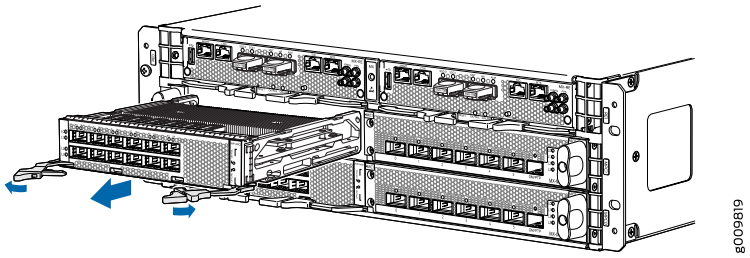
7. Pull both the ejector levers of the MIC you are removing away from the MPC faceplate. Doing this disconnects the MIC from the MPC.

8. Grasp the handles on the MIC faceplate, and slide the MIC out of the MPC card carrier. Place it in the electrostatic bag or on the antistatic mat.

9. If you are not reinstalling a MIC into the emptied MIC slot within a short time, install a blank MIC panel over the slot to maintain proper airflow in the MPC card cage.

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Figure 52: Removing a MIC



Installing an MX10003 MIC

To install a MIC (see Figure 53 on page 127):

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. If the MIC uses fiber-optic cable, verify that a rubber safety cap is over each transceiver on the faceplate. Install a cap if necessary.

3. Align the rear of the MIC with the guides located at the corners of the MIC slot.

4. Grasp and press both the MIC ejector handles inward, and slide the MIC until the ejectors latch into the MPC.

   CAUTION: Slide the MIC straight into the slot to avoid damaging the components on the MIC.

5. Verify that the ejector lever is engaged properly by pushing it toward the MIC faceplate.

6. If the MIC uses fiber-optic cable, remove the rubber safety cap from each transceiver and the end of each cable.

   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.

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7. Insert the appropriate cables into the cable connectors on the MIC.

8. Arrange each cable 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.

   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.

9. Use one of the following methods to bring the MIC online:

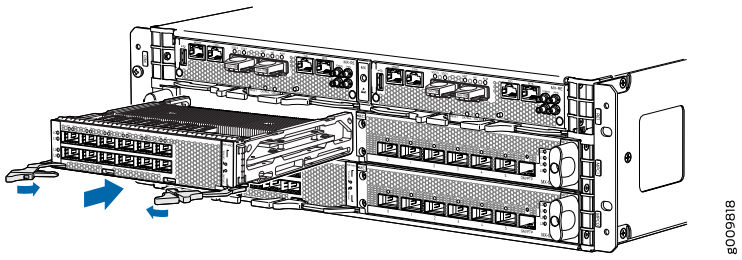
   - Press the MIC **OFFLINE** button until the MIC **OK/FAIL** LED lights green. Figure 51 on page 124 shows the location of the offline button on the MIC. Use a narrow-ended tool that fits inside the opening that leads to the button.
   - Issue the following CLI command:

     ```
     user@host> request chassis pic fpc-slot fpc-slot pic-slot pic-slot online
     ```

     For more information about the command, see the *Junos OS System Basics and Services Command Reference*.

   The normal functioning **OK/FAIL** LED confirms that the MIC is online. You can also verify correct MIC functioning by issuing the **show chassis fpc pic-status** command.

Figure 53: Installing a MIC



See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Prevention of Electrostatic Discharge Damage on page 156

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Maintaining MPCs

Purpose The router can have up to two MPCs mounted horizontally in the card cage at the front of the chassis. For optimum router performance, verify the condition of the MPCs.

Action On a regular basis:

- Check the **OK/FAIL** LED on the MPC. If the MPC detects a failure, the MPC sends an alarm message to the Routing Engine.
- Issue the **show chassis fpc** CLI command to check the status of installed MPCs. As shown in the sample output, the value **Online** in the column labeled **State** indicates that the MPC is functioning normally:

```
user@host> show chassis fpc
                     Temp  CPU Utilization (%)   CPU Utilization (%)  Memory
  Utilization (%)
Slot State            (C)  Total  Interrupt      1min   5min   15min  DRAM (MB)
 Heap     Buffer
  0  Online            57     24          0       21     23     23    3136
   12         11
  1  Online            58     20          0       21     23     23    3136
   12         11
```

For more detailed output, add the **detail** option. The following example does not specify a slot number, which is optional:

```
user@host> show chassis fpc detail
Slot 0 information:
  State                               Online
  Total CPU DRAM                  3136 MB
  Total RLDRAM                     771 MB
  Total DDR DRAM                 18432 MB
  Temperature                       57 degrees C / 134 degrees F
  Start time                           2017-08-20 01:40:14 PDT
  Uptime                               5 hours, 14 minutes, 5 seconds
  Max MPC base power consumption   910 Watts
  Max MIC1 power consumption         0 Watts
  Max MPC total power consumption  910 Watts
Slot 1 information:
  State                               Online
  Total CPU DRAM                  3136 MB
  Total RLDRAM                     771 MB
  Total DDR DRAM                 18432 MB
  Temperature                       58 degrees C / 136 degrees F
  Start time                           2017-08-20 01:40:14 PDT
  Uptime                               5 hours, 14 minutes, 5 seconds
  Max MPC base power consumption   910 Watts
  Max MIC1 power consumption         0 Watts
  Max MPC total power consumption  910 Watts
```

- Issue the **show chassis fpc pic-status** CLI command. The MPC slots are numbered **0** and **1**, bottom to top:

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```
user@host> show chassis fpc pic-status
Slot 0   Online       LC2103
  PIC 0  Online       6xQSFPP
  PIC 1  Online       MIC1
Slot 1   Online       LC2103
  PIC 0  Online       6xQSFPP
  PIC 1  Online       MIC1
```

For further description of the output from the command, see the CLI Explorer.

Replacing an MX10003 MPC

- Removing an MX10003 MPC on page 129
- Installing an MX10003 MPC on page 131

Removing an MX10003 MPC

When you remove an MPC, the router continues to function, although the MIC interfaces installed on the MPC being removed no longer function.

An MPC installs horizontally in the front of the router. The MPCs are hot-insertable and hot-removable. A fully configured MPC can weigh up to 33 lb (14.96 kg). Be prepared to accept its full weight.

To remove an MPC (see Figure 54 on page 131):

1. Have ready a replacement MPC blank panel and an antistatic mat for the MPC. Also have ready rubber safety caps for each MIC using an optical interface on the MPC that you are removing.

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 each MIC on the MPC so that you can later reconnect the cables to the correct MICs.

4. Use one of the following methods to take the MPC offline:

   - Press and hold the **OFFLINE** button on the MPC. The green **OK/FAIL** LED next to the button begins to blink. Hold the button down until the LED goes off. Use a narrow-ended tool that fits inside the opening that leads to the button.
   - Issue the following CLI command:

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

     For more information about the command, see the CLI Explorer.

5. Disconnect the cables from the MICs installed in the MPC.

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



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



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

6. If a MIC uses fiber-optic cable, immediately cover each transceiver and the end of each cable with a rubber safety cap.

7. Arrange the disconnected cables in the cable management brackets to prevent the cables from developing stress points.

8. Simultaneously turn both the ejector handles counterclockwise to unseat the MPC.

9. Grasp the handles, and slide the MPC straight out of the card cage halfway.

10. Place one hand around the front of the MPC and the other hand under it to support it. Slide the MPC completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.



CAUTION: The weight of the MPC is concentrated in the back end. Be prepared to accept the full weight as you slide the MPC out of the chassis.

When the MPC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.

Do not stack MPCs on top of one another after removal. Place each one individually in an electrostatic bag or on its own antistatic mat on a flat, stable surface.

11. If necessary, remove the installed MIC from the MPC.

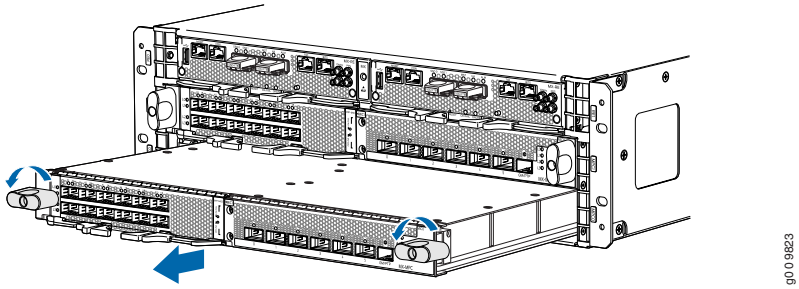
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12. After you remove each MIC, immediately place it on an antistatic mat or in an electrostatic bag.

13. If you are not reinstalling an MPC into the emptied line card slots within a short time, install a blank MPC panel over each slot to maintain proper airflow in the card cage.

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

Figure 54: Removing an MPC



Installing an MX10003 MPC

An MPC installs horizontally at the front of the router. The MPCs are hot-insertable and hot-removable. A fully configured MPC can weigh up to 18.35 lb (8.3 kg). Be prepared to accept its full weight.

To install an MPC (see Figure 55 on page 133):

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

2. Place the MPC on an antistatic mat.

3. Take the MIC to be installed in the replacement MPC out of its electrostatic bag.

4. Verify that each fiber-optic MIC has a rubber safety cap covering the MIC transceiver. If it does not, cover the transceiver with a safety cap.

5. Install the MIC into the appropriate slot on the MPC.

6. Locate the slot in the card cage in which you plan to install the MPC.

7. Orient the MPC so that the faceplate faces you.

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8. Lift the MPC into place, and carefully align the sides of the MPC with the guides inside the card cage.



CAUTION: When the MPC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.

9. Slide the MPC all the way into the card cage until you feel resistance.

10. Grasp both ejector handles, and rotate them clockwise simultaneously until the MPC is fully seated.

11. If any of the MICs on the MPC connect to fiber-optic cable, remove the rubber safety cap from each transceiver and cable.



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

12. Insert the appropriate cable into the cable connector ports on each MIC on the MPC. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop, using the cable management system. Placing fasteners on a loop helps to maintain its shape.



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



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

13. Use one of the following methods to bring the MPC online:

- Press and hold the MPC's **OFFLINE** button (for about 5 seconds) until the green **OK/FAIL** LED next to the button lights steadily. Use a narrow-ended tool that fits inside the opening that leads to the button.
- Issue the following CLI command:

  `user@host>` **request chassis fpc slot** *slot-number* **online**

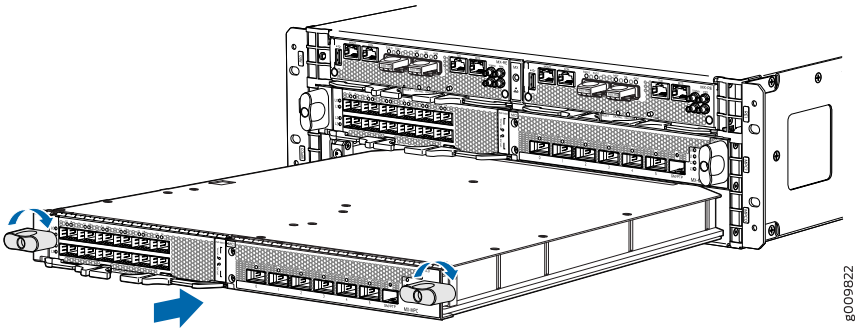
  For more information about the command, see the CLI Explorer.

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CAUTION: After the OK/FAIL LED lights steadily, wait at least 30 seconds before removing the MPC again, removing an MPC from a different slot, or inserting an MPC in a different slot.

You can also verify correct MPC and MIC functioning by issuing the **show chassis fpc** and **show chassis fpc pic-status** commands.

Figure 55: Installing an MPC



See Also

- Replacing a Cable on an MX10003 MPC or MIC on page 134
- Routine Maintenance Procedures for MX10003 Routers on page 103
- Prevention of Electrostatic Discharge Damage on page 156

Maintaining Cables That Connect to MPCs or MICs

Purpose For optimum router performance, verify the condition of the cables that connect to the MPCs or MICs.

Action On a regular basis:

- Use the cable management brackets to support cables and prevent cables from dislodging or developing stress points.
- Place excess cable out of the way in the cable management brackets. Do not allow fastened loops of cable to dangle from the connector or cable management brackets, because this stresses the cable at the fastening point. Putting fasteners on the loops helps to maintain their shape.
- Keep the cable connections clean and free of dust and other particles, which can cause drops in the received power level. Always inspect cables and clean them if necessary before connecting an interface.
- Label both ends of the cables to identify them.

The following guidelines apply specifically to fiber-optic cables:

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- When you unplug a fiber-optic cable, always place a rubber safety plug over the transceiver on the faceplate and on the end of the cable.
- Anchor fiber-optic cables to avoid stress on the connectors. Be sure to secure fiber-optic cables so that they do not support their own weight as they hang to the floor. Never let fiber-optic cable hang free from the connector.
- Avoid bending fiber-optic cable beyond its bend radius. An arc smaller than a few inches can damage the cable and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cable into and out of optical instruments can cause damage to the instruments that is expensive to repair. Instead, attach a short fiber extension to the optical equipment. Any wear and tear due to frequent plugging and unplugging is then absorbed by the short fiber extension, which is easy and inexpensive to replace.
- Keep fiber-optic cable connections clean. Small microdeposits of oil and dust in the canal of the transceiver or cable connector could cause loss of light, reducing signal power and possibly causing intermittent problems with the optical connection.

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

  After you clean an optical transceiver, make sure that the connector tip of the fiber-optic cable is clean. Use only an approved alcohol-free fiber-optic cable cleaning kit, such as the Opptex Cletop-S Fiber Cleaner. Follow the directions for the cleaning kit you use.

Replacing a Cable on an MX10003 MPC or MIC

- Removing a Cable on an MPC or MIC on page 134
- Installing a Cable on an MPC or MIC on page 135

Removing a Cable on an MPC or MIC

Removing and installing cables on an MPC or MIC does not affect router function.

To remove a cable:

1. Have ready a rubber safety cap for each fiber-optic cable and transceiver.

2. If removing all cables connected to the component, use one of the following methods to take the component offline:

   - To take an MPC offline:
     - Press and hold the corresponding **OFFLINE** button on the MPC. The green **OK/FAIL** LED next to the button begins to blink. Hold the button down until the LED goes off. Use a narrow-ended tool that fits inside the opening that leads to the button.
     - Issue the following CLI command:

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

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For more information about the command, see the CLI Explorer.

- To take a MIC offline:
  - Press the **OFFLINE** button on the MIC. Use a narrow-ended tool that fits inside the opening that leads to the button. Press and hold the button until the MIC's **OK/FAIL** LED goes off (about 5 seconds). Use a narrow-ended tool that fits inside the opening that leads to the button.
  - Issue the following CLI command:

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

    For more information about the command, see the CLI Explorer.

3. Disconnect the cable from the cable connector port. If the component uses fiber-optic cable, immediately cover each transceiver and the end of each 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 cables connected to a transceiver emit laser light that can damage your eyes.

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

4. Remove the cable from the cable management brackets.

5. Disconnect the cable from the destination port.

Installing a Cable on an MPC or MIC

To install a cable:

1. Have ready a length of the type of cable used by the MPC or MIC. For cable specifications, see the *MX Series Interface Module Reference*.

2. If the cable connector port is covered by a rubber safety plug, remove the plug.

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



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

3. Insert the cable connector into the cable connector port on the component faceplate.

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



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



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

5. Insert the other end of the cable into the destination port.

6. Repeat the previous steps for any additional cables.

7. If the component is offline (its failure indicator LED is lit), use one of the following methods to bring the it online:

   - To bring an MPC online:
     - Press and hold the **OFFLINE** button on the MPC until the green **OK** LED next to the button lights steadily, in about 5 seconds. Use a narrow-ended tool that fits inside the opening that leads to the button.
     - Issue the following CLI command:

       `user@host>` **request chassis fpc slot *slot-number* online**

       For more information about the command, see the CLI Explorer.
   - To bring a MIC online:
     - Press the MIC **OFFLINE** button until the **OK/FAIL** LED lights green. Use a narrow-ended tool that fits inside the opening that leads to the button.
     - Issue the following CLI command:

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```
user@host>request chassis pic fpc-slot fpc-slot pic-slot pic-slot online
```

For more information about the command, see the CLI Explorer.

The normal functioning indicator LED confirms that the component is online. You can also verify correct DPC or MPC functioning by issuing the **show chassis fpc** command or correct MIC or the PIC functioning by issuing the **show chassis fpc pic-status** command.

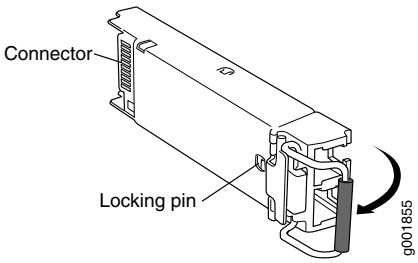
See Also

- Routine Maintenance Procedures for MX10003 Routers on page 103
- Prevention of Electrostatic Discharge Damage on page 156

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 56: Small Form-Factor Pluggable (SFP) Transceiver



- Removing an SFP+ Transceiver on page 137
- Installing a SFP+ Transceiver on page 138

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.

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

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.

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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 cables connected to a transceiver emit laser light that can damage your eyes.**

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

Replacing a QSFP28 Transceiver

28-Gbps quad small form-factor pluggable (QSFP28) transceivers are optical ACX5448 installed in an MPC, a MIC, or a router. QSFP28 transceivers are hot-insertable and hot-removable. Removing a QSFP28 transceiver does not interrupt router functioning, but the removed QSFP28 transceiver no longer receives or transmits data.

- Removing a QSFP28 Transceiver on page 139
- Installing a QSFP28 Transceiver on page 140

Removing a QSFP28 Transceiver

To remove a QSFP28 transceiver (see Figure 57 on page 140):

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.

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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.

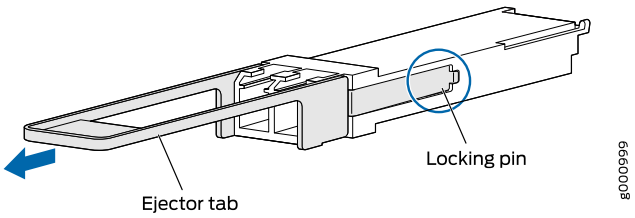
CAUTION: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.

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 57: 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.

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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.

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CHAPTER 5

Contacting Customer Support and Returning the Chassis or Components

- Contacting Customer Support and Returning the Chassis or Components on page 143

Contacting Customer Support and Returning the Chassis or Components

- Contacting Customer Support to Obtain Return Material Authorization on page 143
- Locating the Serial Number on a MX10003 Router or Component on page 144
- Guidelines for Packing Hardware Components for Shipment on page 149

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 service request 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 service request number, if you have one
- Serial number of the component
- Your name, organization name, telephone number, fax number, and shipping address
- Details of the failure or problem
- Type of activity being performed on the device when the problem occurred
- Configuration data displayed by one or more **show** commands

You can contact JTAC 24 hours a day, seven days a week on the Web or by telephone:

- Service Request Manager: https://support.juniper.net/support
- Telephone: +1-888-314-JTAC (+1-888-314-5822), toll free in U.S., Canada, and Mexico

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

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

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

Locating the Serial Number on a MX10003 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 143.

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 on page 144
- Locating the Chassis Serial Number ID Label on a MX10003 on page 145
- Locating the Serial Number ID Labels on MX10003 Power Supplies on page 145
- Locating the Serial Number ID Label on MX10003 Fan Module on page 146
- Locating the Serial Number ID Labels on MX10003 Line Cards on page 147
- Locating the Serial Number ID Labels on MX10003 Routing and Control Board (RCB) on page 148
- Locating the Serial Number ID Label on a MX10003 SATA SSD on page 148

Listing the Chassis and Component Details Using the CLI

To list the MX10003 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                                AF209             JNP10003 [MX10003]
```

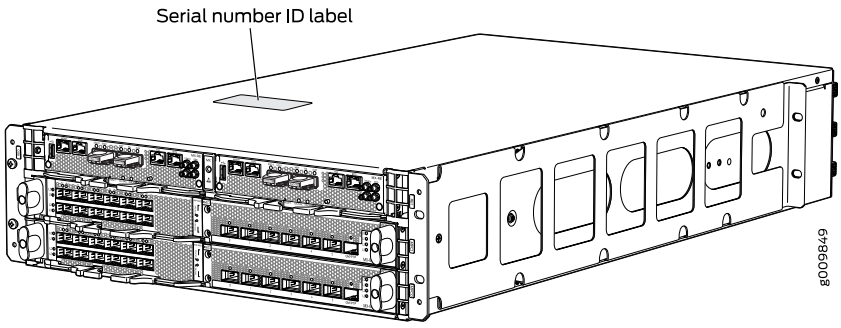

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```
Midplane          REV 01   750-066883   CAGZ6546          Midplane 2
Routing Engine 0           BUILTIN      BUILTIN           RE-S-2X00x6
CB 0              REV 10   750-067071   CAGZ9916          Control Board
  Mezz            REV 06   711-066896   CAGS1711          Control Mezz Board
FPC 0             REV 05   750-066879   CAGV0280          LC2103
  CPU                      BUILTIN      BUILTIN           SMPC PMB
  PIC 0                    BUILTIN      BUILTIN           6xQSFPP
    Xcvr 0        REV 01   740-054053   QF310124          QSFP+-4X10G-SR
    Xcvr 1        REV 01   740-032986   QD417082          QSFP+-40G-SR4
  PIC 1           REV 05   750-069305   CAGX1011          MIC1-MACSEC
    Xcvr 4        REV 01   740-067443   XW40EAK           QSFP+-40G-SR4
    Xcvr 10       REV 01   740-046565   XU70N7F           QSFP+-40G-SR4
    Xcvr 11       REV 01   740-046565   XU70N6B           QSFP+-40G-SR4
FPC 1             REV 05   750-066879   CAGV0284          LC2103
  CPU                      BUILTIN      BUILTIN           SMPC PMB
  PIC 0                    BUILTIN      BUILTIN           6xQSFPP
    Xcvr 0        REV 01   740-054053   XW30F2L           QSFP+-4X10G-SR
  PIC 1           REV 05   750-069305   CAGX1003          MIC1-MACSEC
PEM 0             REV 01   740-066937   1HS16500013       JNP-PWR1600-AC
PEM 1             REV 01   740-066937   1HS16500015       JNP-PWR1600-AC
PEM 2             REV 01   740-066937   1HS16500014       JNP-PWR1600-AC
PEM 3             REV 01   740-066937   1HS16500018       JNP-PWR1600-AC
Fan Tray 0        REV 02   760-069329   CAGS7662          JNP FAN 3RU
Fan Tray 1        REV 02   760-069329   CAHA9105          JNP FAN 3RU
Fan Tray 2        REV 02   760-069329   CAHA9144          JNP FAN 3RU
Fan Tray 3        REV 02   760-069329   CAGS7759          JNP FAN 3RU
```

Locating the Chassis Serial Number ID Label on a MX10003

The serial number ID label is located on a label on the top of the chassis. See Figure 58 on page 145 for the location on a MX10003.

Figure 58: MX10003 Serial Number Label



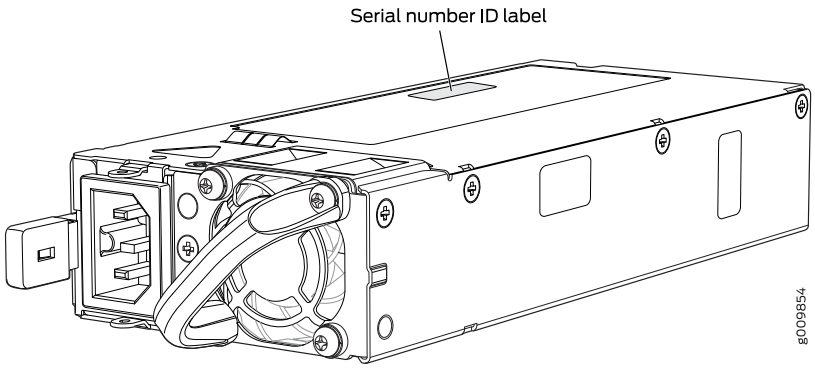
Locating the Serial Number ID Labels on MX10003 Power Supplies

The power supplies installed in a MX10003 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 59 on page 146.

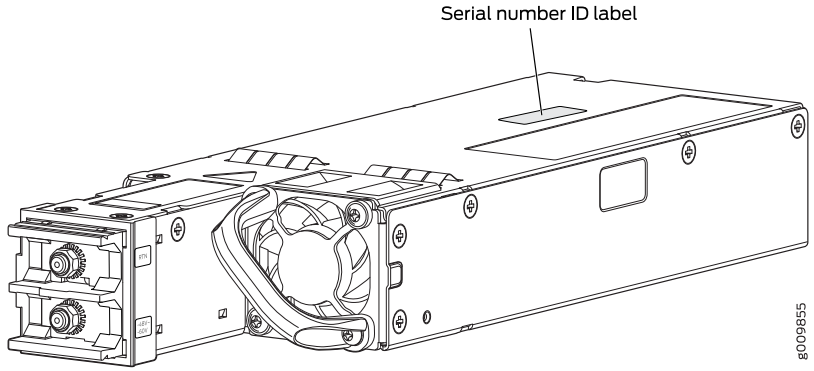
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Figure 59: MX10003 AC Power Supply Serial Number Location



- DC power supply—The serial number ID label is on the top of the DC power supply. See Figure 60 on page 146.

Figure 60: MX10003 DC Power Supply Serial Number Location



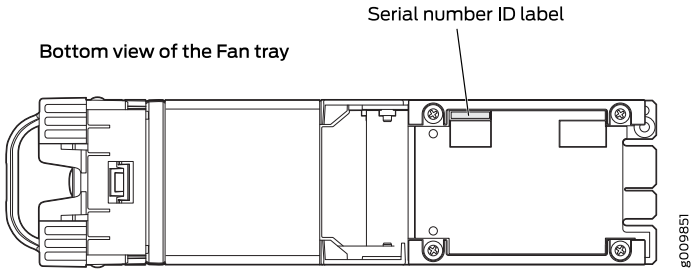
Locating the Serial Number ID Label on MX10003 Fan Module

The four fan modules installed in a MX10003 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 61 on page 147.

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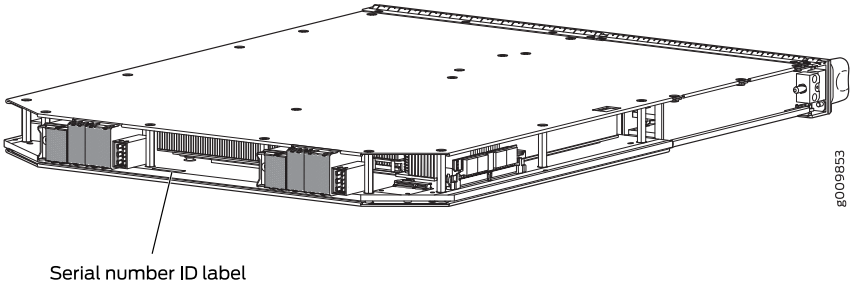
Figure 61: MX10003 Fan Module Serial Number Location



Locating the Serial Number ID Labels on MX10003 Line Cards

The serial number ID label for an MX10003 MPC is located on the connector end of the card. See Figure 62 on page 147.

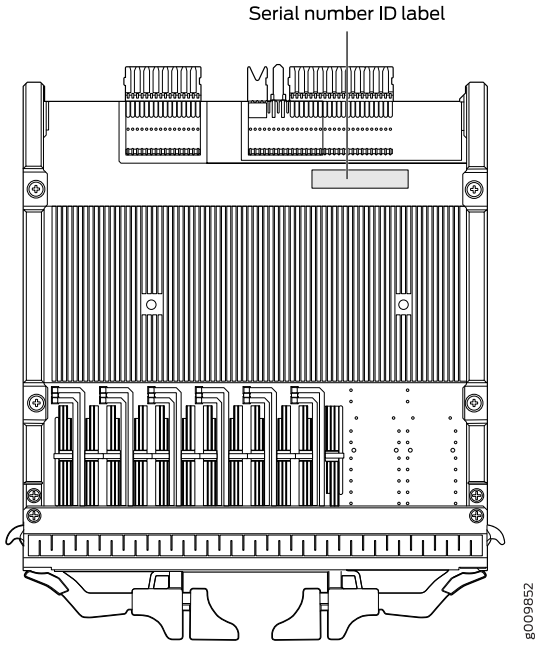
Figure 62: MX10003 MPC Serial Number Location



The serial number ID label for an MX10003 MIC is located on the connector end of the card. See Figure 63 on page 148.

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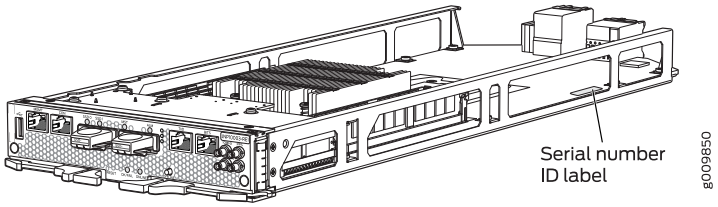
Figure 63: MX10003 MIC Serial Number Location



Locating the Serial Number ID Labels on MX10003 Routing and Control Board (RCB)

The serial number ID label for an MX10003 RCB is located on the connector end of the card. See Figure 64 on page 148.

Figure 64: MX10003 RCB Serial Number Location

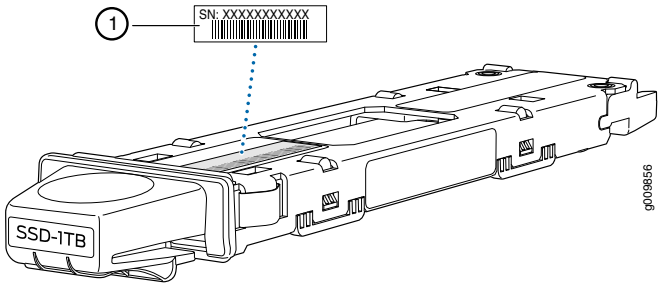


Locating the Serial Number ID Label on a MX10003 SATA SSD

The serial number for a SATA SSD is located on top of the drive. See Figure 65 on page 149.

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Figure 65: MX10003 SATA SSD Serial Number Location



See Also
- MX10003 Hardware Components and CLI Terminology on page 21

Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

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

CAUTION: Do not stack any of the hardware components.

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CHAPTER 6

Safety and Compliance Information

- Definitions of Safety Warning Levels on page 152
- General Safety Guidelines and Warnings on page 153
- General Safety Warnings for Juniper Networks Devices on page 154
- Prevention of Electrostatic Discharge Damage on page 156
- Fire Safety Requirements on page 158
- Installation Instructions Warning on page 159
- Chassis and Component Lifting Guidelines on page 159
- Ramp Warning on page 160
- Rack-Mounting and Cabinet-Mounting Warnings on page 160
- Laser and LED Safety Guidelines and Warnings on page 164
- Radiation from Open Port Apertures Warning on page 166
- Maintenance and Operational Safety Guidelines and Warnings on page 167
- General Electrical Safety Guidelines and Warnings on page 172
- Prevention of Electrostatic Discharge Damage on page 173
- Site Electrical Wiring Guidelines on page 174
- AC Power Electrical Safety Guidelines on page 175
- AC Power Disconnection Warning on page 176
- DC Power Disconnection Warning on page 177
- DC Power Grounding Requirements and Warning on page 178
- DC Power Wiring Sequence Warning on page 179
- DC Power Wiring Terminations Warning on page 180
- Multiple Power Supplies Disconnection Warning on page 181
- TN Power Warning on page 182
- Action to Take After an Electrical Accident on page 183
- Agency Approvals for MX10003 Router on page 183
- Compliance Statements for NEBS on page 184
- Compliance Statements for EMC Requirements on page 185

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- Compliance Statements for Environmental Requirements on page 186
- Compliance Statements for Acoustic Noise for MX10003 Router on page 186

Definitions of Safety Warning Levels

The documentation uses the following levels of safety warnings (there are two *Warning* formats):



NOTE: You might find this information helpful in a particular situation, or you might overlook this important information if it was not highlighted in a Note.



CAUTION: You need to observe the specified guidelines to prevent minor injury or discomfort to you or severe damage to the device.



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



WARNING: This symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.

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

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

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Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

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

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

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

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

General Safety Guidelines and Warnings

The following guidelines help ensure your safety and protect the device from damage. The list of guidelines might not address all potentially hazardous situations in your working environment, so be alert and exercise good judgment at all times.

- Perform only the procedures explicitly described in the hardware documentation for this device. Make sure that only authorized service personnel perform other system services.
- Keep the area around the device clear and free from dust before, during, and after installation.
- Keep tools away from areas where people could trip over them while walking.
- Do not wear loose clothing or jewelry, such as rings, bracelets, or chains, which could become caught in the device.
- Wear safety glasses if you are working under any conditions that could be hazardous to your eyes.
- Do not perform any actions that create a potential hazard to people or make the equipment unsafe.
- Never attempt to lift an object that is too heavy for one person to handle.

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- Never install or manipulate wiring during electrical storms.
- Never install electrical jacks in wet locations unless the jacks are specifically designed for wet environments.
- Operate the device only when it is properly grounded.
- Ensure that the separate protective earthing terminal provided on this device is permanently connected to earth.
- Replace fuses only with fuses of the same type and rating.
- Do not open or remove chassis covers or sheet-metal parts unless instructions are provided in the hardware documentation for this device. Such an action could cause severe electrical shock.
- Do not push or force any objects through any opening in the chassis frame. Such an action could result in electrical shock or fire.
- Avoid spilling liquid onto the chassis or onto any device component. Such an action could cause electrical shock or damage the device.
- Avoid touching uninsulated electrical wires or terminals that have not been disconnected from their power source. Such an action could cause electrical shock.
- Some parts of the chassis, including AC and DC power supply surfaces, power supply unit handles, SFB card handles, and fan tray handles might become hot. The following label provides the warning of the hot surfaces on the chassis:



- Always ensure that all modules, power supplies, and cover panels are fully inserted and that the installation screws are fully tightened.

General Safety Warnings for Juniper Networks Devices

- Qualified Personnel Warning on page 154
- Restricted-Access Area Warning on page 155

Qualified Personnel Warning



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

Waarschuwing Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.

Varoitus Ainoastaan koulutettu ja pätevä henkilökunta saa asentaa tai vaihtaa tämän laitteen.

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Attention Tout installation ou remplacement de l'appareil doit être réalisé par du personnel qualifié et compétent.

Warnung Gerät nur von geschultem, qualifiziertem Personal installieren oder auswechseln lassen.

Avvertenza Solo personale addestrato e qualificato deve essere autorizzato ad installare o sostituire questo apparecchio.

Advarsel Kun kvalifisert personell med riktig opplæring bør montere eller bytte ut dette utstyret.

Aviso Este equipamento deverá ser instalado ou substituído apenas por pessoal devidamente treinado e qualificado.

¡Atención! Estos equipos deben ser instalados y reemplazados exclusivamente por personal técnico adecuadamente preparado y capacitado.

Varning! Denna utrustning ska endast installeras och bytas ut av utbildad och kvalificerad personal.

Restricted-Access Area Warning



WARNING: The hardware equipment is intended for installation in restricted-access areas. A restricted-access area is an area to which access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and which is controlled by the authority responsible for the location.

Waarschuwing Dit toestel is bedoeld voor installatie op plaatsen met beperkte toegang. Een plaats met beperkte toegang is een plaats waar toegang slechts door servicepersoneel verkregen kan worden door middel van een speciaal instrument, een slot en sleutel, of een ander veiligheidsmiddel, en welke beheerd wordt door de overheidsinstantie die verantwoordelijk is voor de locatie.

Varoitus Tämä laite on tarkoitettu asennettavaksi paikkaan, johon pääsy on rajoitettua. Paikka, johon pääsy on rajoitettua, tarkoittaa paikkaa, johon vain huoltohenkilöstö pääsee jonkin erikoistyökalun, lukkoon sopivan avaimen tai jonkin muun turvalaitteen avulla ja joka on paikasta vastuussa olevien toimivaltaisten henkilöiden valvoma.

Attention Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité. L'accès aux zones de sécurité est sous le contrôle de l'autorité responsable de l'emplacement.

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Warnung Diese Einheit ist zur Installation in Bereichen mit beschränktem Zutritt vorgesehen. Ein Bereich mit beschränktem Zutritt ist ein Bereich, zu dem nur Wartungspersonal mit einem Spezialwerkzeugs, Schloß und Schlüssel oder anderer Sicherheitsvorkehrungen Zugang hat, und der von dem für die Anlage zuständigen Gremium kontrolliert wird.

Avvertenza Questa unità deve essere installata in un'area ad accesso limitato. Un'area ad accesso limitato è un'area accessibile solo a personale di assistenza tramite un'attrezzo speciale, lucchetto, o altri dispositivi di sicurezza, ed è controllata dall'autorità responsabile della zona.

Advarsel Denne enheten er laget for installasjon i områder med begrenset adgang. Et område med begrenset adgang gir kun adgang til servicepersonale som bruker et spesielt verktøy, lås og nøkkel, eller en annen sikkerhetsanordning, og det kontrolleres av den autoriteten som er ansvarlig for området.

Aviso Esta unidade foi concebida para instalação em áreas de acesso restrito. Uma área de acesso restrito é uma área à qual apenas tem acesso o pessoal de serviço autorizado, que possua uma ferramenta, chave e fechadura especial, ou qualquer outra forma de segurança. Esta área é controlada pela autoridade responsável pelo local.

¡Atención! Esta unidad ha sido diseñada para instalarse en áreas de acceso restringido. Área de acceso restringido significa un área a la que solamente tiene acceso el personal de servicio mediante la utilización de una herramienta especial, cerradura con llave, o algún otro medio de seguridad, y que está bajo el control de la autoridad responsable del local.

Varning! Denna enhet är avsedd för installation i områden med begränsat tillträde. Ett område med begränsat tillträde får endast tillträdas av servicepersonal med ett speciellt verktyg, lås och nyckel, eller annan säkerhetsanordning, och kontrolleras av den auktoritet som ansvarar för området.

Related Documentation

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

Prevention of Electrostatic Discharge Damage

Device components that are shipped in antistatic bags are sensitive to damage from static electricity. Some components can be impaired by voltages as low as 30 V. You can easily generate potentially damaging static voltages whenever you handle plastic or foam packing material or if you move components across plastic or carpets. Observe

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the following guidelines to minimize the potential for electrostatic discharge (ESD) damage, which can cause intermittent or complete component failures:

- Always use an ESD wrist strap when you are handling components that are subject to ESD damage, and make sure that it is in direct contact with your skin.

  If a grounding strap is not available, hold the component in its antistatic bag (see Figure 66 on page 157) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.

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

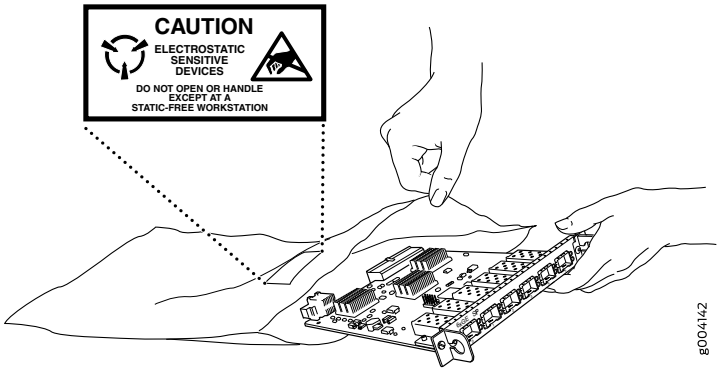
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  If no grounding strap is available, touch the exposed, bare metal of the device to ground yourself before handling the component.

- Avoid contact between the component that is subject to ESD damage and your clothing. ESD voltages emitted from clothing can damage components.

- When removing or installing a component that is subject to ESD damage, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an antistatic bag (see Figure 66 on page 157). If you are returning a component, place it in an antistatic bag before packing it.

Figure 66: Placing a Component into an Antistatic Bag



CAUTION: **ANSI/TIA/EIA-568 cables such as Category 5e and Category 6 can get electrostatically charged. To dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.**

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Fire Safety Requirements

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

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

Fire Suppression

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

Fire Suppression Equipment

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

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

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



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

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

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Installation Instructions Warning



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

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

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

Attention Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.

Warnung Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.

Avvertenza Consultare le istruzioni di installazione prima di collegare il sistema all'alimentatore.

Advarsel Les installasjonsinstruksjonene før systemet kobles til strømkilden.

Aviso Leia as instruções de instalação antes de ligar o sistema à sua fonte de energia.

¡Atención! Ver las instrucciones de instalación antes de conectar el sistema a la red de alimentación.

Varning! Läs installationsanvisningarna innan du kopplar systemet till dess strömförsörjningsenhet.

Chassis and Component Lifting Guidelines

- Before moving the device to a site, ensure that the site meets the power, environmental, and clearance requirements.
- Before lifting or moving the device, disconnect all external cables and wires.
- As when lifting any heavy object, ensure that most of the weight is borne by your legs rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
- Use the following lifting guidelines to lift devices and components:
  - Up to 39.7 lb (18 kg): One person.
  - 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
  - 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
  - Above 121.2 lbs (55 kg): Material handling systems (such as levers, slings, lifts and so on) must be used. When this is not practical, specially trained persons or systems must be used (riggers or movers).

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Ramp Warning



WARNING: When installing the device, do not use a ramp inclined at more than 10 degrees.

Waarschuwing Gebruik een oprijplaat niet onder een hoek van meer dan 10 graden.

Varoitus Älä käytä sellaista kaltevaa pintaa, jonka kaltevuus ylittää 10 astetta.

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

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

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

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

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

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

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

Rack-Mounting and Cabinet-Mounting Warnings

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



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

- The device must be installed in a rack that is secured to the building structure.
- The device should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

Waarschuwing Om lichamelijk letsel te voorkomen wanneer u dit toestel in een rek monteert of het daar een servicebeurt geeft, moet u speciale voorzorgsmaatregelen nemen om ervoor te zorgen dat het toestel stabiel

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blijft. De onderstaande richtlijnen worden verstrekt om uw veiligheid te verzekeren:

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

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

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

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

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

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

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

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

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

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

- Juniper Networks switch må installeres i et stativ som er forankret til bygningsstrukturen.
- Denne enheten bør monteres nederst i kabinettet hvis dette er den eneste enheten i kabinettet.
- Ved montering av denne enheten i et kabinett som er delvis fylt, skal kabinettet lastes fra bunnen og opp med den tyngste komponenten nederst i kabinettet.
- Hvis kabinettet er utstyrt med stabiliseringsutstyr, skal stabilisatorene installeres før montering eller utføring av reparasjonsarbeid på enheten i kabinettet.

Aviso Para se prevenir contra danos corporais ao montar ou reparar esta unidade numa estante, deverá tomar precauções especiais para se certificar

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de que o sistema possui um suporte estável. As seguintes directrizes ajudá-lo-ão a efectuar o seu trabalho com segurança:

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

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

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

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

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

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Laser and LED Safety Guidelines and Warnings

Juniper Networks devices are equipped with laser transmitters, which are considered a Class 1 Laser Product by the U.S. Food and Drug Administration and are evaluated as a Class 1 Laser Product per EN 60825-1 requirements.

Observe the following guidelines and warnings:

- General Laser Safety Guidelines on page 164
- Class 1 Laser Product Warning on page 164
- Class 1 LED Product Warning on page 165
- Laser Beam Warning on page 165

General Laser Safety Guidelines

When working around ports that support optical transceivers, observe the following safety guidelines to prevent eye injury:

- Do not look into unterminated ports or at fibers that connect to unknown sources.
- Do not examine unterminated optical ports with optical instruments.
- Avoid direct exposure to the beam.



WARNING: **Unterminated optical connectors can emit invisible laser radiation. The lens in the human eye focuses all the laser power on the retina, so focusing the eye directly on a laser source—even a low-power laser—could permanently damage the eye.**

Class 1 Laser Product Warning



WARNING: **Class 1 laser product.**

Waarschuwing Klasse-1 laser produkt.

Varoitus Luokan 1 lasertuote.

Attention Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

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Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning



WARNING: Class 1 LED product.

Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Attention Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning



WARNING: Do not stare into the laser beam or view it directly with optical instruments.

Waarschuwing Niet in de straal staren of hem rechtstreeks bekijken met optische instrumenten.

Varoitus Älä katso säteeseen äläkä tarkastele sitä suoraan optisen laitteen avulla.

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

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

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

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

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

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

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

Radiation from Open Port Apertures Warning



WARNING: Because invisible radiation might be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.

Waarschuwing Aangezien onzichtbare straling vanuit de opening van de poort kan komen als er geen fiberkabel aangesloten is, dient blootstelling aan straling en het kijken in open openingen vermeden te worden.

Varoitus Koska portin aukosta voi emittoitua näkymätöntä säteilyä, kun kuitukaapelia ei ole kytkettynä, vältä säteilylle altistumista äläkä katso avoimiin aukkoihin.

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

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

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

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

Aviso Dada a possibilidade de emissão de radiação invisível através do orifício da via de acesso, quando esta não tiver nenhum cabo de fibra conectado, deverá evitar a exposição à radiação e não deverá olhar fixamente para orifícios que se encontrarem a descoberto.

¡Atención! Debido a que la apertura del puerto puede emitir radiación invisible cuando no existe un cable de fibra conectado, evite mirar directamente a las aperturas para no exponerse a la radiación.

Varning! Osynlig strålning kan avges från en portöppning utan ansluten fiberkabel och du bör därför undvika att bli utsatt för strålning genom att inte stirra in i oskyddade öppningar.

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Maintenance and Operational Safety Guidelines and Warnings

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

- Battery Handling Warning on page 167
- Jewelry Removal Warning on page 168
- Lightning Activity Warning on page 169
- Operating Temperature Warning on page 170
- Product Disposal Warning on page 171

Battery Handling Warning



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

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

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

Attention Danger d'explosion si la pile n'est pas remplacée correctement. Ne la remplacer que par une pile de type semblable ou équivalent, recommandée par le fabricant. Jeter les piles usagées conformément aux instructions du fabricant.

Warnung Bei Einsetzen einer falschen Batterie besteht Explosionsgefahr. Ersetzen Sie die Batterie nur durch den gleichen oder vom Hersteller empfohlenen Batterietyp. Entsorgen Sie die benutzten Batterien nach den Anweisungen des Herstellers.

Advarsel Det kan være fare for eksplosjon hvis batteriet skiftes på feil måte. Skift kun med samme eller tilsvarende type som er anbefalt av produsenten. Kasser brukte batterier i henhold til produsentens instruksjoner.

Avvertenza Pericolo di esplosione se la batteria non è installata correttamente. Sostituire solo con una di tipo uguale o equivalente, consigliata dal produttore. Eliminare le batterie usate secondo le istruzioni del produttore.

Aviso Existe perigo de explosão se a bateria for substituída incorrectamente. Substitua a bateria por uma bateria igual ou de um tipo equivalente

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recomendado pelo fabricante. Destrua as baterias usadas conforme as instruções do fabricante.

¡Atención! Existe peligro de explosión si la batería se reemplaza de manera incorrecta. Reemplazar la batería exclusivamente con el mismo tipo o el equivalente recomendado por el fabricante. Desechar las baterías gastadas según las instrucciones del fabricante.

Varning! Explosionsfara vid felaktigt batteribyte. Ersätt endast batteriet med samma batterityp som rekommenderas av tillverkaren eller motsvarande. Följ tillverkarens anvisningar vid kassering av använda batterier.

Jewelry Removal Warning



WARNING: Before working on equipment that is connected to power lines, remove jewelry, including rings, necklaces, and watches. Metal objects heat up when connected to power and ground and can cause serious burns or can be welded to the terminals.

Waarschuwing Alvorens aan apparatuur te werken die met elektrische leidingen is verbonden, sieraden (inclusief ringen, kettingen en horloges) verwijderen. Metalen voorwerpen worden warm wanneer ze met stroom en aarde zijn verbonden, en kunnen ernstige brandwonden veroorzaken of het metalen voorwerp aan de aansluitklemmen lassen.

Varoitus Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.

Attention Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

Warnung Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

Avvertenza Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

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Advarsel Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

Aviso Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

¡Atención! Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.

Varning! Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.

Lightning Activity Warning



WARNING: Do not work on the system or connect or disconnect cables during periods of lightning activity.

Waarschuwing Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.

Varoitus Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.

Attention Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.

Warnung Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.

Avvertenza Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.

Advarsel Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.

Aviso Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).

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¡Atención! No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.

Varning! Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.

Operating Temperature Warning



WARNING: To prevent the device from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature. To prevent airflow restriction, allow at least 6 in. (15.2 cm) of clearance around the ventilation openings.

Waarschuwing Om te voorkomen dat welke switch van de Juniper Networks router dan ook oververhit raakt, dient u deze niet te bedienen op een plaats waar de maximale aanbevolen omgevingstemperatuur van 40° C wordt overschreden. Om te voorkomen dat de luchtstroom wordt beperkt, dient er minstens 15,2 cm speling rond de ventilatie-openingen te zijn.

Varoitus Ettei Juniper Networks switch-sarjan reititin ylikuumentuisi, sitä ei saa käyttää tilassa, jonka lämpötila ylittää korkeimman suositellun ympäristölämpötilan 40° C. Ettei ilmanvaihto estyisi, tuuletusaukkojen ympärille on jätettävä ainakin 15,2 cm tilaa.

Attention Pour éviter toute surchauffe des routeurs de la gamme Juniper Networks switch, ne l'utilisez pas dans une zone où la température ambiante est supérieure à 40° C. Pour permettre un flot d'air constant, dégagez un espace d'au moins 15,2 cm autour des ouvertures de ventilations.

Warnung Um einen Router der switch vor Überhitzung zu schützen, darf dieser nicht in einer Gegend betrieben werden, in der die Umgebungstemperatur das empfohlene Maximum von 40° C überschreitet. Um Lüftungsverschluß zu verhindern, achten Sie darauf, daß mindestens 15,2 cm lichter Raum um die Lüftungsöffnungen herum frei bleibt.

Avvertenza Per evitare il surriscaldamento dei switch, non adoperateli in un locale che ecceda la temperatura ambientale massima di 40° C. Per evitare che la circolazione dell'aria sia impedita, lasciate uno spazio di almeno 15.2 cm di fronte alle aperture delle ventole.

Advarsel Unngå overoppheting av eventuelle rutere i Juniper Networks switch Disse skal ikke brukes på steder der den anbefalte maksimale omgivelsestemperaturen overstiger 40° C (104° F). Sørg for at klaringen rundt lufteåpningene er minst 15,2 cm (6 tommer) for å forhindre nedsatt luftsirkulasjon.

Aviso Para evitar o sobreaquecimento do encaminhador Juniper Networks switch, não utilize este equipamento numa área que exceda a temperatura

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máxima recomendada de 40° C. Para evitar a restrição à circulação de ar, deixe pelo menos um espaço de 15,2 cm à volta das aberturas de ventilação.

¡Atención! Para impedir que un encaminador de la serie Juniper Networks switch se recaliente, no lo haga funcionar en un área en la que se supere la temperatura ambiente máxima recomendada de 40° C. Para impedir la restricción de la entrada de aire, deje un espacio mínimo de 15,2 cm alrededor de las aperturas para ventilación.

Varning! Förhindra att en Juniper Networks switch överhettas genom att inte använda den i ett område där den maximalt rekommenderade omgivningstemperaturen på 40° C överskrids. Förhindra att luftcirkulationen inskränks genom att se till att det finns fritt utrymme på minst 15,2 cm omkring ventilationsöppningarna.

Product Disposal Warning



WARNING: Disposal of this device must be handled according to all national laws and regulations.

Waarschuwing Dit produkt dient volgens alle landelijke wetten en voorschriften te worden afgedankt.

Varoitus Tämän tuotteen lopullisesta hävittämisestä tulee huolehtia kaikkia valtakunnallisia lakeja ja säännöksiä noudattaen.

Attention La mise au rebut définitive de ce produit doit être effectuée conformément à toutes les lois et réglementations en vigueur.

Warnung Dieses Produkt muß den geltenden Gesetzen und Vorschriften entsprechend entsorgt werden.

Avvertenza L'eliminazione finale di questo prodotto deve essere eseguita osservando le normative italiane vigenti in materia

Advarsel Endelig disponering av dette produktet må skje i henhold til nasjonale lover og forskrifter.

Aviso A descartagem final deste produto deverá ser efectuada de acordo com os regulamentos e a legislação nacional.

¡Atención! El desecho final de este producto debe realizarse según todas las leyes y regulaciones nacionales

Varning! Slutlig kassering av denna produkt bör skötas i enlighet med landets alla lagar och föreskrifter.

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General Electrical Safety Guidelines and Warnings



WARNING: Certain ports on the device are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in *GR-1089-CORE*) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the device are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.



CAUTION: Before removing or installing components of a device, connect an electrostatic discharge (ESD) grounding strap to an ESD point and wrap and fasten the other end of the strap around your bare wrist. Failure to use an ESD grounding strap could result in damage to the device.

- Install the device in compliance with the following local, national, and international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.
  - Canada—Canadian Electrical Code, Part 1, CSA C22.1.
- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.
- Make sure that grounding surfaces are cleaned and brought to a bright finish before grounding connections are made.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the device within marked electrical ratings and product usage instructions.
- To ensure that the device and peripheral equipment function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

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You can remove and replace many device components without powering off or disconnecting power to the device, as detailed elsewhere in the hardware documentation for this device. Never install equipment that appears to be damaged.

Prevention of Electrostatic Discharge Damage

Device components that are shipped in antistatic bags are sensitive to damage from static electricity. Some components can be impaired by voltages as low as 30 V. You can easily generate potentially damaging static voltages whenever you handle plastic or foam packing material or if you move components across plastic or carpets. Observe the following guidelines to minimize the potential for electrostatic discharge (ESD) damage, which can cause intermittent or complete component failures:

- Always use an ESD wrist strap when you are handling components that are subject to ESD damage, and make sure that it is in direct contact with your skin.

  If a grounding strap is not available, hold the component in its antistatic bag (see Figure 66 on page 157) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.

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

- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

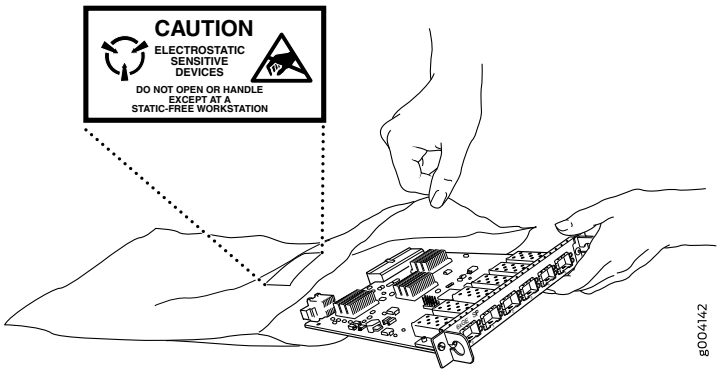
  If no grounding strap is available, touch the exposed, bare metal of the device to ground yourself before handling the component.

- Avoid contact between the component that is subject to ESD damage and your clothing. ESD voltages emitted from clothing can damage components.

- When removing or installing a component that is subject to ESD damage, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an antistatic bag (see Figure 66 on page 157). If you are returning a component, place it in an antistatic bag before packing it.

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Figure 67: Placing a Component into an Antistatic Bag



CAUTION: ANSI/TIA/EIA-568 cables such as Category 5e and Category 6 can get electrostatically charged. To dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.

Site Electrical Wiring Guidelines

Table 43 on page 174 describes the factors you must consider while planning the electrical wiring at your site.

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

Table 43: Site Electrical Wiring Guidelines

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

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Table 43: Site Electrical Wiring Guidelines (continued)

Site Wiring Factor	Guidelines
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Some of the problems caused by strong sources of electromagnetic interference (EMI) are: • Destruction of the signal drivers and receivers in the device • Electrical hazards as a result of power surges conducted over the lines into the equipment

AC Power Electrical Safety Guidelines



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

The following electrical safety guidelines apply to AC-powered devices:

- Note the following warnings printed on the device:

  "**CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK."

  "**ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE."

- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.
- You must provide an external certified circuit breaker (2-pole circuit breaker or 4-pole circuit breaker based on your device) rated minimum 20 A in the building installation.
- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.
- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely

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removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

Power Cable Warning (Japanese)

WARNING: The attached power cable is only for this product. Do not use the cable for another product.

注意

附属の電源コードセットはこの製品専用です。
他の電気機器には使用しないでください。

g017253

AC Power Disconnection Warning



WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

Waarschuwing Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

Attention Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut på vekselstrømsenheter.

Aviso Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada.

¡Atención! Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA).

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Varning! Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden.

DC Power Disconnection Warning



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

Waarschuwing Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

Varoitus Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

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

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

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

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

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

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

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

DC Power Grounding Requirements and Warning

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



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

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

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

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

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

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

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

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

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

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

DC Power Wiring Sequence Warning



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

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

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

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

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

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

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

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

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

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

DC Power Wiring Terminations Warning



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

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

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

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

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

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

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

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

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

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

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

Multiple Power Supplies Disconnection Warning



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

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

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

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

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

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

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

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

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

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

TN Power Warning



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

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

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

Attention Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

Warnung Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

Avvertenza Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

Advarsel Utstyret er utfomet til bruk med TN-strømsystemer.

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Aviso O dispositivo foi criado para operar com sistemas de corrente TN.

¡Atención! El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.

Varning! Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.

Action to Take After an Electrical Accident

If an electrical accident results in an injury, take the following actions in this order:

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.
2. Disconnect power from the device.
3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, then call for help.

Agency Approvals for MX10003 Router

The router comply with the following standards:

- Safety
  - CAN/CSA-22.2 No. 60950-00/UL 1950 Third Edition, Safety of Information Technology Equipment
  - UL 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements
  - EN 60950-1 European Norm, Safety of Information Technology Equipment
  - IEC 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements (with country deviations)
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC
  - EN 300 386 V2.1.1 Telecom Network Equipment - EMC Requirements
  - KN35 Korea Immunity Characteristics
  - EN 55024 Information Technology Equipment Immunity Characteristics
  - CISPR 24:2010 IT Equipment Immunity Characteristics

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- EMI
  - FCC Part 15 Class A USA Radiated Emissions
  - EN 55022 Class A European Radiated Emissions
  - CISPR 22 Class A European Radiated Emissions
  - EN 55032:Electromagnetic compatibility of multimedia equipment - Emission requirements
  - CISPR 32 Electromagnetic compatibility of multimedia equipment - Emission requirements
  - VCCI Class A Japanese Radiated Emissions
  - BSMI CNS 13438 Taiwan Radiated Emissions (at 10 Meter)
  - KN32/KN35 Korea Radiated Emission and Immunity Characteristics (at 10 Meter)
  - AS/NZS CISPR32 Australia/New Zealand Radiated Emissions
  - ICES-003 Canada Radiated Emissions
- Immunity
  - EN-61000-3-2 Power Line Harmonics
  - EN-61000-3-3 Voltage Fluctuations and Flicker
  - EN-61000-4-2 ESD
  - EN-61000-4-3 Radiated Immunity
  - EN-61000-4-4 EFT
  - EN-61000-4-5 Surge
  - EN-61000-4-6 Conducted Disturbances Immunity
  - EN-61000-4-11 Voltage Dips and Sags

The router is designed to comply with the following standards:

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

Compliance Statements for NEBS

- The equipment is suitable for installation as part of the Common Bonding Network (CBN).
- The equipment is suitable for installation in locations where the National Electrical Code (NEC) applies.

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- The battery return connection is to be treated as an isolated DC return (that is, DC-I), as defined in GR-1089-CORE.
- You must provision a readily accessible device outside of the equipment to disconnect power. The device must also be rated based on local electrical code practice.

Compliance Statements for EMC Requirements

- Canada on page 185
- European Community on page 185
- Israel on page 185
- Japan on page 185
- United States on page 186

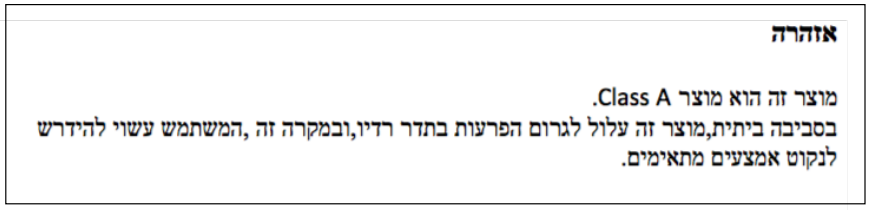
Canada

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

European Community

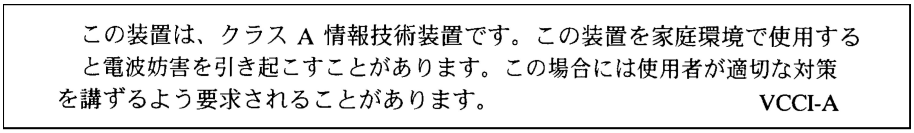
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

Israel



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

Japan



The preceding translates as follows:

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

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United States

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

Compliance Statements for Environmental Requirements

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

Compliance Statements for Acoustic Noise for MX10003 Router

The router complies with NEBS Level 3 requirements:

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

Related Documentation

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