



M10i Multiservice Edge Router Hardware Guide



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M10i Multiservice Edge Router Hardware Guide
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Documentation and Release Notes

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Documentation Conventions

Table 1 on page xx 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 xx defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies guide names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS CLI User Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	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 <i>domain-name</i>

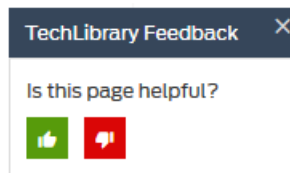
Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none">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 <i>metric</i>>;
(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 (<i>string1</i> <i>string2</i> <i>string3</i>)
# (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 [<i>community-ids</i>]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	<pre>[edit] routing-options { static { route default { nexthop <i>address</i>; retain; } } }</pre>
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none">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 .

Documentation Feedback

We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the [Juniper Networks TechLibrary](#) site, and do one of the following:



- Click the thumbs-up icon if the information on the page was helpful to you.
- Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.
- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or Partner Support Service support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- 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.

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/>.

PART 1

Overview

- [System Overview and Architecture on page 3](#)
- [M10i Router Release Notes on page 9](#)
- [Chassis Components and Descriptions on page 11](#)
- [Cooling System Components and Descriptions on page 19](#)
- [Host Subsystem Components and Descriptions on page 21](#)
- [Line Card Components and Descriptions on page 51](#)
- [Power System Components and Descriptions on page 63](#)
- [Switch Fabric Components and Descriptions on page 67](#)

CHAPTER 1

System Overview and Architecture

- [M10i Router Description on page 3](#)
- [M10i System Redundancy on page 4](#)
- [M10i System Architecture Overview on page 4](#)
- [M10i Packet Forwarding Engine Architecture Overview on page 5](#)
- [M10i Routing Engine Architecture Overview on page 7](#)

M10i Router Description

The M10i Multiservice Edge Router provides high-speed interfaces for medium and large networks and network applications, such as those supported by Internet service providers (ISPs). Application-specific integrated circuits (ASICs), a definitive part of the router design, enable the router to forward data at the high speeds demanded by current network media.

The M10i router supports up to eight Physical Interface Cards (PICs). The router height of 8.7 in. (22.1 cm) enables stacked installation of five M10i routers in a single floor-to-ceiling rack, for increased port density per unit of floor space.

The router's maximum aggregate throughput is 12.8 gigabits per second (Gbps) simplex or 6.4 Gbps full duplex. Inserting a combination of PICs with an aggregate higher than the maximum throughput per FPC is supported, but constitutes oversubscription of the FPC.

The router architecture cleanly separates control operations from packet forwarding operations, which helps to eliminate processing and traffic bottlenecks. Control operations in the router are performed by the Routing Engine, which runs Junos OS to handle routing protocols, traffic engineering, policy, policing, monitoring, and configuration management. Forwarding operations in the router are performed by the Packet Forwarding Engine, which consists of hardware, including ASICs, designed by Juniper Networks.

Related Documentation

- [M10i System Redundancy on page 4](#)
- [M10i Chassis Description on page 11](#)
- [M10i Router Physical Specifications on page 76](#)
- [Overview of M10i Router Installation on page 105](#)

M10i System Redundancy

You can configure the router for system redundancy by using three AC or four DC load-sharing, fully-redundant power supplies to distribute power to the other components.

AC System Redundancy

AC system redundancy requires three independent AC power outlets. If one power supply fails, the other two power supplies provide full power to the router's components indefinitely.

You can set up increased AC system redundancy by using four AC power supplies. In this case, two power supplies are powered from two AC outlets, and the other two power supplies use two AC outlets from a UPS battery-backed power source. This lets the router run during AC power outages for the amount of time that the UPS allows.

DC System Redundancy

DC system redundancy requires two power sources from feed A and two power sources from feed B. If one feed fails or is shut down for service, the other feed powers two DC power supplies and can provide full power to the router's components indefinitely.

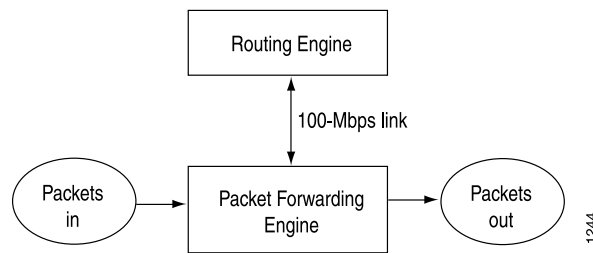
- Related Documentation**
- [M10i Chassis Description on page 11](#)
 - [M10i Router Physical Specifications on page 76](#)
 - [Overview of M10i Router Installation on page 105](#)

M10i System Architecture Overview

The router architecture consists of two major components:

- Packet Forwarding Engine—Performs Layer 2 and Layer 3 packet switching, route lookups, and packet forwarding.
- Routing Engine—Provides Layer 3 routing services and network management.

The Packet Forwarding Engine and the Routing Engine perform independently but communicate constantly through a 100-Mbps internal link. This arrangement provides streamlined forwarding and routing control and the ability to run Internet-scale networks at high speeds. [Figure 1 on page 5](#) illustrates the relationship between the Packet Forwarding Engine and the Routing Engine.

Figure 1: System Architecture**Related Documentation**

- [M10i Chassis Description on page 11](#)
- [M10i Midplane Description on page 12](#)
- [M10i Power System Description on page 63](#)

M10i Packet Forwarding Engine Architecture Overview

The Packet Forwarding Engine performs Layer 2 and Layer 3 packet switching. It can forward up to 15 million packets per second (Mpps) for all packet sizes. The aggregate throughput is 4 gigabits per second (Gbps) full duplex per FPC (8 Gbps full-duplex total throughput rate). The Packet Forwarding Engine is implemented in application-specific integrated circuits (ASICs). It uses a centralized route lookup engine and shared memory.

The Packet Forwarding Engine architecture includes the following components:

- Midplane—Transports packets, notifications, and other signals between the PICs and the Packet Forwarding Engine (as well as other system components).
- Physical Interface Card (PIC)—Physically connects the router to fiber-optic or digital network media. A controller ASIC in each PIC performs control functions specific to the PIC media type.
- Compact Forwarding Engine Board (CFEB) or Enhanced Compact Forwarding Engine Board (CFEB-E)—Hosts an integrated ASIC, which makes forwarding decisions, distributes data cells to the shared memory, and directs data packets when they are ready for transmission.

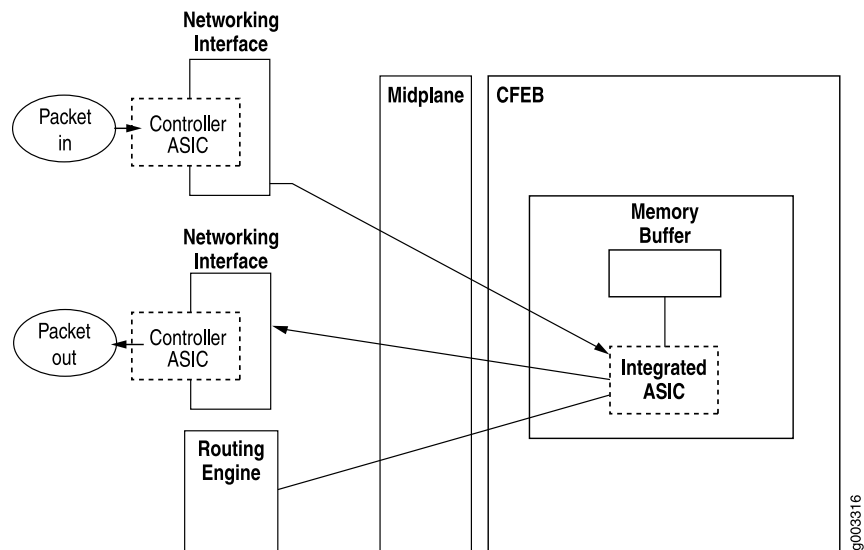
Data Flow Through the Packet Forwarding Engine

Use of ASICs promotes efficient movement of data packets through the system. Packets flow through the Packet Forwarding Engine in the following sequence (see [Figure 2 on page 6](#)):

1. Packets arrive at an incoming networking interface.
2. The networking interface passes the packets to the CFEB or CFEB-E, where the integrated ASIC processes the packet headers, divides the packets into 64-byte data cells, and distributes the data cells throughout the memory buffer.

3. The integrated ASIC on the CFEB or CFEB-E performs a route lookup for each packet and decides how to forward it.
 - a. If services are configured for the packet, the integrated ASIC reassembles the packet and passes them to the services interface.
 - b. The services interface passes the packet to the CFEB or CFEB-E, where the integrated ASIC processes the packet, divides the packet into 64-byte cells, and distributes the data cells throughout the memory buffer.
 - c. The integrated ASIC performs a second route lookup for each packet and decides how to forward it.
4. The integrated ASIC notifies the outbound networking interface.
5. The integrated ASIC reassembles data cells stored in shared memory into data packets as they are ready for transmission and passes them to the outbound networking interface.
6. The outbound networking interface transmits the data packets.

Figure 2: Packet Forwarding Engine Components and Data Flow



Related Documentation

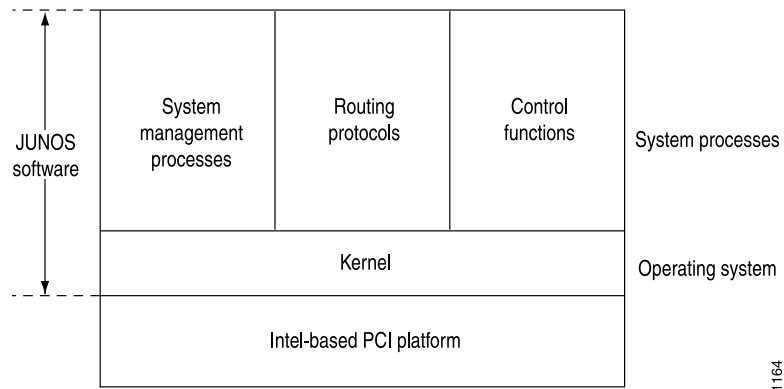
- [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
- [M10i Router Description on page 3](#)
- [M10i Router Physical Specifications on page 76](#)

M10i Routing Engine Architecture Overview

The Routing Engine is an Intel-based PCI platform running the Junos OS, which Juniper Networks has developed and optimized to handle large numbers of network interfaces and routes. The software consists of a set of system processes running in protected memory modules on top of an independent operating system. The Junos kernel supports Junos system processes, which handle system management processes, routing protocols, and control functions (see [Figure 3 on page 7](#)).

The Routing Engine has a dedicated 100-Mbps internal connection to the Packet Forwarding Engine.

Figure 3: Routing Engine Architecture



Routing Engine Functions

The Routing Engine handles all routing protocol processes, as well as the software processes that control the router's interfaces, the chassis components, system management, and user access to the router. These routing and software processes run on top of a kernel that interacts with the Packet Forwarding Engine. For more information about the processes, see the [CLI Explorer](#).

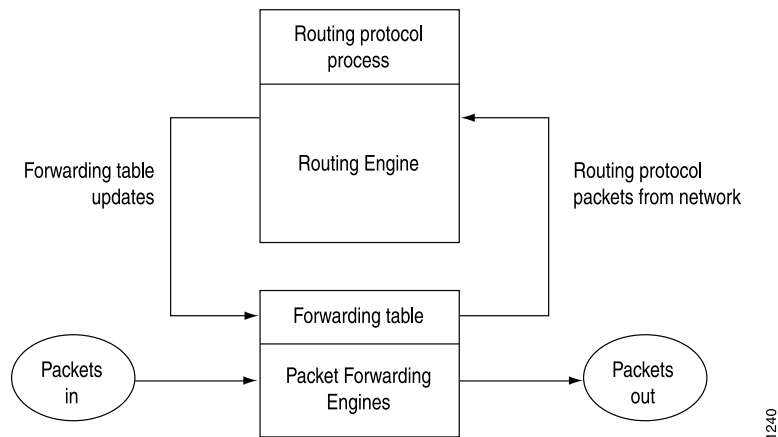
The Routing Engine includes the following functions and features:

- **Processing of routing protocol packets**—The Routing Engine handles all packets that concern routing protocols, freeing the Packet Forwarding Engine to handle only packets that represent Internet traffic.
- **Software modularity**—Because each software process is devoted to a different function and uses a separate process space, the failure of one process has little or no effect on the others.
- **In-depth Internet functionality**—Each routing protocol is implemented with a complete set of Internet features and provides full flexibility for advertising, filtering, and modifying routes. Routing policies are set according to route parameters (for example, prefix, prefix lengths, and Border Gateway Protocol [BGP] attributes).

- **Scalability**—The Junos routing tables have been designed to hold all the routes in current networks with ample capacity for expansion. Additionally, the Junos OS can efficiently support large numbers of interfaces and virtual circuits.
- **Management interface**—Different levels of system management tools are provided, including the Junos OS command-line interface (CLI), the Junos XML management protocol, the craft interface, and SNMP.
- **Storage and change management**—Configuration files, system images, and microcode can be held and maintained in primary and secondary storage systems, permitting local or remote upgrades.
- **Monitoring efficiency and flexibility**—The router supports functions such as alarm handling and packet counting on every port, without degrading packet-forwarding performance.

The Routing Engine constructs and maintains one or more routing tables (see [Figure 4 on page 8](#)). From the routing tables, the Routing Engine derives a table of active routes, called the forwarding table, which is then copied into the Packet Forwarding Engine. The design of the ASICs allow the forwarding table in the Packet Forwarding Engine to be updated without interrupting forwarding performance.

Figure 4: Control Packet Handling for Routing and Forwarding Table Updates



Related Documentation

- [M10i Routing Engine Description on page 21](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Replacing the M10i Routing Engine on page 158](#)

CHAPTER 2

M10i Router Release Notes

- [Outstanding Issues with the M10i Router on page 9](#)
- [Errata with the M10i Router Documentation on page 9](#)

Outstanding Issues with the M10i Router

This section lists outstanding issues with the documentation.

- The default configuration of the Routing Engine does not include an CompactFlash card, which affects which media are available to the Routing Engine as it accesses the Junos operating system (Junos OS) at boot time. For more information about the Routing Engine's use of boot media, see "Installation Overview" in the *Junos OS Administration Library*.
- The long haul (LH) small form-factor pluggable transceiver (SFP) conforms to Class A emissions standards on the M10i router when it is installed in the 1-port Gigabit Ethernet SFP Physical Interface Card (PIC).

Related Documentation

- [Errata with the M10i Router Documentation on page 9](#)
- [M10i Routing Engine Description on page 21](#)

Errata with the M10i Router Documentation

There are currently no outstanding issues for the M10i router documentation.

Related Documentation

- [Outstanding Issues with the M10i Router on page 9](#)

CHAPTER 3

Chassis Components and Descriptions

- [M10i Chassis Description on page 11](#)
- [M10i Midplane Description on page 12](#)
- [M10i Cable Management System Description on page 13](#)
- [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
- [M10i HCM LEDs on page 16](#)
- [M10i HCM Alarm LEDs on page 16](#)

M10i Chassis Description

The router chassis is a rigid sheet metal structure that houses the other hardware components. The chassis is 17.5 in. (44.5 cm) wide and 18 in. (45.7 cm) deep. The chassis height of 8.7 in. (22.1 cm) enables stacked installation of eight M10i routers in a single floor-to-ceiling rack. For more information, see [“Installation Safety Warnings for Juniper Networks Devices” on page 269](#).

The two mounting brackets (one on each side) extend the chassis width to 19 in. (48.3 cm).

[Figure 5 on page 11](#) and [Figure 6 on page 12](#) show front and rear views of the router chassis.

Figure 5: Front of Chassis

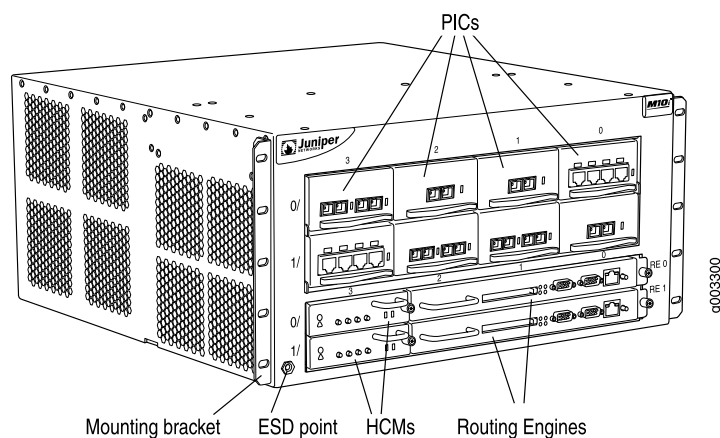
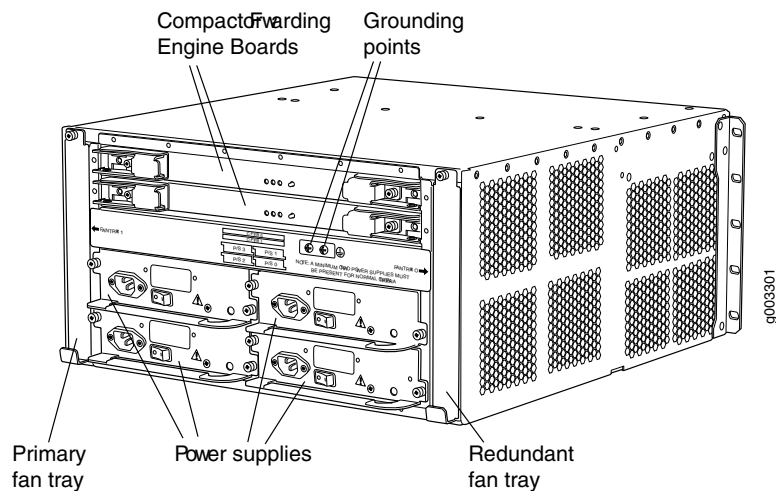


Figure 6: Rear of Chassis

The chassis includes an electrostatic discharge (ESD) point (banana plug receptacle) to protect electronic components from damage due to static electricity, at the front of the chassis, as shown in [Figure 5 on page 11](#).



WARNING: Before removing or installing components of a functioning router, 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 router.

The router must be connected to earth ground during normal operation.

For chassis serial number information, see [“Displaying M10i Router Components and Serial Numbers” on page 247](#).

Related Documentation

- [M10i System Redundancy on page 4](#)
- [M10i Router Physical Specifications on page 76](#)
- [Overview of M10i Router Installation on page 105](#)

M10i Midplane Description

The midplane is a panel located in the center of the chassis, running from side to side and forming the rear of the PIC card cage (see [Figure 7 on page 13](#)). All router components plug directly into the midplane. The midplane contains an EEPROM that stores the serial number and revision level of the midplane.

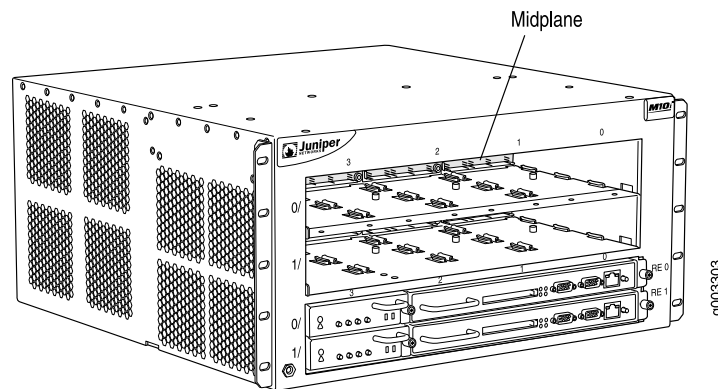
The midplane performs the following functions:

- Transfer of packets—After being processed by a PIC, an incoming data packet crosses the midplane to the CFEB or the CFEB-E. The CFEB or CFEB-E performs switching and

forwarding functions and transfers outgoing packets back across the midplane to the PICs for transmission to the network.

- Power distribution—The midplane distributes power to all router components from the power supplies attached to it. It also provides hot-plug protection for the PIC and HCM slots.
- Signal connectivity—The midplane transports the signals exchanged by system components for monitoring and control purposes.

Figure 7: Midplane



For chassis serial number information, see [“Displaying M10i Router Components and Serial Numbers”](#) on page 247.

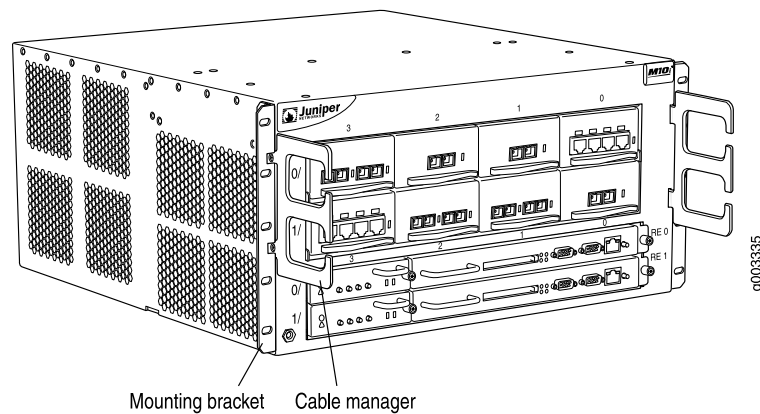
Related Documentation

- [M10i Chassis Description on page 11](#)
- [M10i Router Description on page 3](#)
- [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)

M10i Cable Management System Description

The cable management system consists of racks that attach vertically to each side of the chassis at the front, as shown in [Figure 8 on page 14](#). Pass PIC cables through the slots in the racks to keep the cables organized and securely in place, and to avoid bending optical cables beyond the proper bend radius. The cable management system evenly distributes the weight of a cable, so that it is not subjected to undue stress at the connector.

Figure 8: Cable Management System



- Related Documentation**
- [Installing the M10i Cable Management System on page 141](#)
 - [M10i Chassis Description on page 11](#)
 - [M10i Router Physical Specifications on page 76](#)

M10i High-Availability Chassis Manager (HCM) Description

The High-Availability Chassis Manager (HCM) works with its companion Routing Engine to provide control and monitoring functions for router components. The HCM also displays alarm status and takes PICs online and offline.

Two HCMs are installed into the midplane from the front of the chassis, as shown in [Figure 5 on page 11](#). The master HCM performs all functions and provides PIC removal buttons for the first FPC. The backup HCM provides PIC removal buttons for the second FPC. The HCM in the slot labeled **HCM0** is paired with the Routing Engine in the slot labeled **RE0**. Likewise, the HCM in the slot labeled **HCM1** is paired with the Routing Engine in the slot labeled **RE1**. By default, the HCM in the slot labeled **HCM0** is the master.



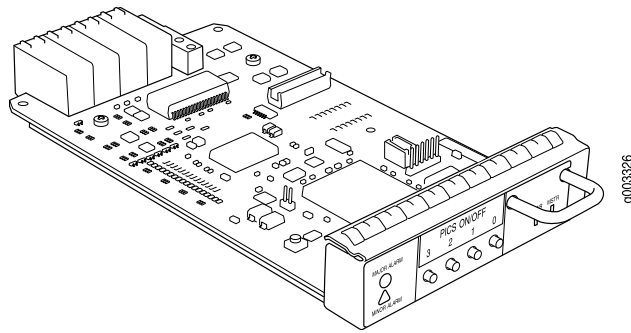
NOTE: When HCM mastership changes because of failure, Routing Engine mastership will change as well. For a description of Routing Engine mastership, see [“M10i Routing Engine Description” on page 21](#).

The HCM performs the following functions:

- **Monitoring and control of router components**—The HCM collects statistics from all sensors in the system. When it detects a failure or alarm condition, it sends a signal to the Routing Engine, which generates control messages or sets an alarm. The HCM also relays control messages from the Routing Engine to the router components.
- **Controlling component power-up and power-down**—The HCM controls the power-up sequence of router components as they start and powers down components when their offline buttons are pressed.

- Signaling of mastership—In a router with more than one Routing Engine, the HCM signals to all router components which Routing Engine is the master and which is the standby.
- Alarm display—If an alarm exists, the HCM displays the alarm condition. For more information, see [“M10i HCM Alarm LEDs” on page 16](#).
- PIC removal—If a PIC offline button is pressed, the HCM relays the request to the CFEB or CFEB-E, which takes the PIC offline and informs the Routing Engine. Other PICs are unaffected, and system operation continues. For more information, see [“M10i HCM LEDs” on page 16](#).

Figure 9: M10i High-Availability Chassis Manager



Each HCM (shown in [Figure 9 on page 15](#)) has the following components:

- 100-Mbps Fast Ethernet switch—Carries signals and monitoring data between router components.
- Two LEDs—Indicate HCM status. There is a green one labeled **PWR** and an blue one labeled **MSTR**. [“M10i HCM LEDs” on page 16](#) describes the LED states.
- Alarm LEDs—Display alarm conditions, if any exist.
- PIC offline buttons—Relays a request to the CFEB or CFEB-E, which prepares a PIC for removal from the router, or brings the PIC online when it is replaced.

Offline buttons for one row of PICs are located on each HCM (see [Figure 9 on page 15](#)). Pressing the button relays a request to the CFEB or CFEB-E, which prepares the PIC for removal from the router, or brings it online when it is replaced. The HCM in slot **0** controls PICs on FPC **0**. The HCM in slot **1** controls PICs on FPC **1**. The buttons are labeled with the PIC slot numbers. The PIC slots on the upper FPC are numbered from **0/0** (zero/zero) through **0/3**, right to left. The PIC slots in the lower FPC are numbered from **1/0** (one/zero) through **1/3**, right to left.

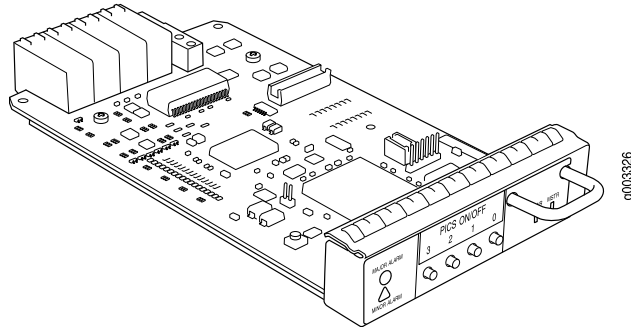
For PIC replacement instructions, see [“Replacing an M10i PIC” on page 179](#).

Related Documentation

- [M10i HCM Serial Number ID Label on page 248](#)
- [M10i Router Physical Specifications on page 76](#)
- [M10i Routing Engine Interface Ports on page 29](#)

M10i HCM LEDs

Figure 10: M10i High-Availability Chassis Manager



Two LEDs indicate HCM status. There is a green LED labeled **PWR** and an blue LED labeled **MSTR**. [Table 3 on page 16](#) describes the LED states.

Table 3: States for HCM LEDs

Label	Color	State	Description
PWR	Green	On steadily	HCM is functioning normally.
		Blinking	HCM is starting up.
MSTR	Blue	On steadily	HCM is master.

- Related Documentation**
- [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
 - [M10i HCM Alarm LEDs on page 16](#)
 - [M10i Chassis Description on page 11](#)



M10i HCM Alarm LEDs

Two alarm LEDs are located on the right of the HCM (see [Figure 10 on page 16](#)). The circular red LED lights to indicate a critical condition that can result in a system shutdown. The triangular yellow LED lights to indicate a less severe condition that requires monitoring or maintenance. Both LEDs can be lit simultaneously.

To deactivate red and yellow alarms, you must clear the condition that caused the alarm.

[Table 4 on page 17](#) describes the alarm LEDs in more detail.

Table 4: Alarm LEDs

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

**Related
Documentation**

- [M10i Chassis Description on page 11](#)
- [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
- [M10i HCM Serial Number ID Label on page 248](#)

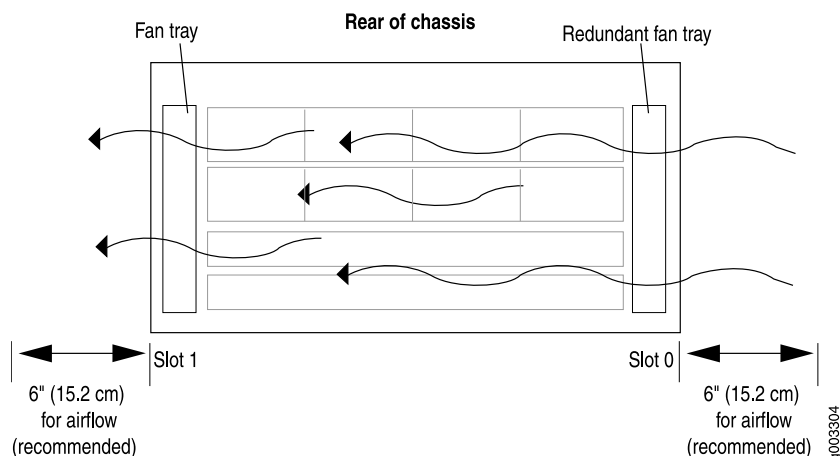
Cooling System Components and Descriptions

- [M10i Fan Tray Description on page 19](#)

M10i Fan Tray Description

The fan trays installed along each side of the chassis draw room air into the chassis to maintain an acceptable operating temperature for the Routing Engine, PICs, CFEB or CFEB-E, and other components. The router's cooling system consists of two fan trays, located along the left and right side of the chassis, that provide side-to-side cooling (see [Figure 11 on page 19](#)). They connect directly to the router midplane. Each fan tray is a single unit containing eight individually fault-tolerant fans. If a single fan fails, the remaining fans continue to function indefinitely. For proper airflow, the primary fan tray should be installed in slot 1 (the left slot looking at the chassis from the rear) and must be installed for proper cooling at all times. The redundant fan tray, if present, should be installed in slot 0 on the right. This fan tray provides additional cooling and redundancy.

Figure 11: Airflow Through the Chassis



The fan tray is hot-removable and hot-insertable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on page 139. For instructions on replacing it, see “[Replacing an M10i Fan Tray](#)” on page 150.



.....

CAUTION: Do not remove both fan trays for more than one minute while the router is operating. The fans are the sole source of cooling, and the router can overheat when they are absent.

.....

**Related
Documentation**

- [Installing an M10i Fan Tray on page 149](#)
- [M10i Router Description on page 3](#)
- [Maintaining the M10i Cooling System on page 221](#)
- [Troubleshooting the M10i Fan Tray on page 230](#)

CHAPTER 5

Host Subsystem Components and Descriptions

- [M10i Routing Engine Description on page 21](#)
- [M10i Routing Engine 400 Description on page 23](#)
- [M10i Routing Engine 400 LEDs on page 24](#)
- [M10i Routing Engine 850 Description on page 25](#)
- [M10i Routing Engine 850 LEDs on page 26](#)
- [M10i Routing Engine RE-B-1800 Description on page 27](#)
- [M10i Routing Engine 1800 LEDs on page 28](#)
- [M10i Routing Engine Interface Ports on page 29](#)
- [Routing Engine Specifications on page 29](#)
- [Supported Routing Engines by Router on page 34](#)

M10i Routing Engine Description

The Routing Engine runs Junos OS. The software processes that run on the Routing Engine maintain the routing tables, manage the routing protocols used on the router, control the router's interfaces, control some chassis components, and provide the interface for system management and user access to the router.

For a description of the Routing Engine's role in router architecture, see "[M10i Routing Engine Architecture Overview](#)" on page 7.



NOTE: The M10i router supports the Routing Engine 400, Routing Engine 850, and Routing Engine 1800.

One or two Routing Engines can be installed into the midplane from the front of the chassis, as shown in [Figure 5 on page 11](#). If two Routing Engines are installed, the High-Availability Chassis Manager (HCM) determines which is the master and which is backup (in standby mode and so performs no functions). By default, the Routing Engine in the slot labeled **RE0** is the master. To change the default master Routing Engine, include the appropriate **[edit chassis redundancy routing-engine]** statement in the

configuration, as described in the section about Routing Engine redundancy in the *Junos OS Administration Library*.



NOTE: If two Routing Engines are installed, they must both be the same hardware model.

The Routing Engine is hot-pluggable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on [page 139](#). If two Routing Engines are installed, removal or failure of the backup Routing Engine does not affect router function. Removal or failure of the master Routing Engine affects forwarding and routing based on the high availability configuration:

- Dual Routing Engines without any high availability features enabled—Traffic is interrupted while the Packet Forwarding Engine is reinitialized. All kernel and forwarding processes are restarted. When the switchover to the new master Routing Engine is complete, routing convergence takes place and traffic is resumed.
- Graceful Routing Engine switchover (GRES) is enabled—Graceful Routing Engine switchover preserves interface and kernel information. Traffic is not interrupted. However, graceful Routing Engine switchover does not preserve the control plane. Neighboring routers detect that the router has restarted and react to the event in a manner prescribed by individual routing protocol specifications. To preserve routing without interruption during a switchover, graceful Routing Engine switchover must be combined with nonstop active routing.
- Nonstop active routing is enabled (graceful Routing Engine switchover must be configured for nonstop active routing to be enabled)—Nonstop active routing supports Routing Engine switchover without alerting peer nodes that a change has occurred. Nonstop active routing uses the same infrastructure as graceful Routing Engine switchover to preserve interface and kernel information. However, nonstop active routing also preserves routing information and protocol sessions by running the routing protocol process (rpd) on both Routing Engines. In addition, nonstop active routing preserves TCP connections maintained in the kernel.
- Graceful restart is configured—Graceful restart provides extensions to routing protocols so that neighboring helper routers restore routing information to a restarting router. These extensions signal neighboring routers about the graceful restart and prevent the neighbors from reacting to the router restart and from propagating the change in state to the network during the graceful restart period. Neighbors provide the routing information that enables the restarting router to stop and restart routing protocols without causing network reconvergence. Neighbors are required to support graceful restart. The routing protocol process (rpd) restarts. A graceful restart interval is required. For certain protocols, a significant change in the network can cause graceful restart to stop.

If you do not configure graceful Routing Engine switchover, graceful restart, or nonstop active routing, you can configure automatic Routing Engine mastership failover. For information about configuring automatic mastership failover, see the *Junos OS Administration Library*.



NOTE: Router performance might change if the backup Routing Engine's configuration differs from the former master's configuration. For the most predictable performance, configure the two Routing Engines identically, except for parameters unique to each Routing Engine.



NOTE: For information about configuring graceful Routing Engine switchover, graceful restart, and nonstop active routing, see the *High Availability Feature Guide*.



NOTE: The first supported release for graceful Routing Engine switchover and nonstop active routing on the M10i router is Junos OS Release 6.1 and Junos OS Release 8.4, respectively. However, for graceful Routing Engine switchover we recommend Junos OS Release 7.0 or later. Graceful restart software requirements are dependent on the routing protocols configured on the router. For the minimum software requirements for graceful restart, see the *High Availability Feature Guide*.

For replacement instructions, see [“Replacing the M10i Routing Engine” on page 158](#).

**Related
Documentation**

- [M10i Router Description on page 3](#)
- [M10i Router Physical Specifications on page 76](#)
- [M10i Router Power Requirements on page 82](#)

M10i Routing Engine 400 Description

The Routing Engine 400 has the following major components:

- **CPU**—Runs Junos OS to maintain the router's routing tables and routing protocols. It has a Pentium-class processor.
- **SDRAM**—Provides storage for the routing and forwarding tables and for other Routing Engine processes.
- **CompactFlash card**—This drive is optional. If installed, it provides primary storage. It holds software images, configuration files, and microcode.
- **Hard disk**—If no CompactFlash card is installed, provides primary storage for software images, configuration files, and microcode. If a CompactFlash card is installed, the hard disk provides secondary storage for log files and memory dumps, and can reboot the system if the CompactFlash card fails.
- **I2C/EEPROM**—Stores the serial number of the Routing Engine.

The faceplate of the Routing Engine 400 contains the following:

- PC card slot—Accepts a removable PC card, which stores software images for system upgrades.
- Interfaces for out-of-band management access—Provide information about Routing Engine status to devices (console, laptop, or terminal server) that can be attached to access ports located on the Routing Engine.
- Reset button—Reboots the Routing Engine when pressed.
- Offline button—Powers down the Routing Engine when pressed.
- Thumbscrews—Secure the Routing Engine in the chassis.
- Four LEDs—A green LED labeled **HDD**, a blue LED labeled **MASTER**, a red LED labeled **FAIL**, and a green LED labeled **ONLINE** indicate Routing Engine status.

The disk from which the router boots is called the *primary boot device*, and the other disk is the *alternate boot device*.

The boot sequence for the router:

- PC Card
- CompactFlash card
- Hard disk



NOTE: If the router boots from an alternate boot device, a yellow alarm lights the LED on the router's craft interface.

M10i Routing Engine 400 LEDs

Four LEDs—A green LED labeled **HDD**, a blue LED labeled **MASTER**, a red LED labeled **FAIL**, and a green LED labeled **ONLINE** indicate Routing Engine status. [Table 5 on page 24](#) describes the LED states.

Table 5: States for Routing Engine LEDs

Label	Color	State	Description
HDD	Green	Blinking	There is read/write activity on the PC card.
MASTER	Blue	On steadily	Routing Engine is functioning as master.
FAIL	Red	On steadily	Routing Engine is not operational.
ONLINE	Green	On steadily	Routing Engine is running normally.

Related Documentation

- [Displaying M10i Router Components and Serial Numbers on page 247](#)

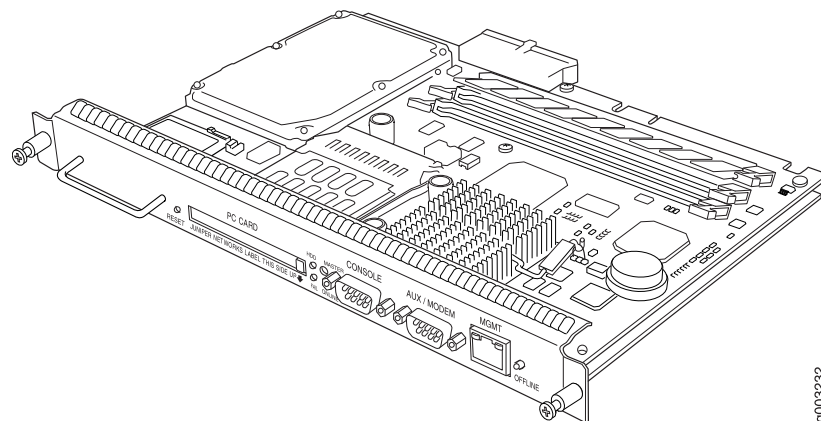
- M10i PIC LEDs on page 53
- M10i Router Physical Specifications on page 76

M10i Routing Engine 850 Description



NOTE: RE-850 routing engine is being replaced with RE-B-1800 from Junos OS release 12.1. See the End-of-life (EOL) and End-of-sale (EOS) Notification Policy and Procedures for the M10i products at <https://www.juniper.net/support/eol/>. End of life (EOL) indicates that the product has been removed from the price list and is no longer available for purchase. End of support (EOS) indicates that no new support contracts are available on these products and the last contract will expire on the EOS date associated with each product. For more information about EOS or EOL products, see the product support notification (PSN) hardware end-of-life announcements. For PSN details for RE-850, see PSN-2011-09-369.

Figure 12: Routing Engine



The Routing Engine 850 has the following major components (see [Figure 12 on page 25](#)):

- CPU—Runs Junos OS to maintain the router's routing tables and routing protocols. It has a Pentium-class processor.
- SDRAM—Provides storage for the routing and forwarding tables and for other Routing Engine processes.
- CompactFlash card—Provides primary storage. It holds software images, configuration files, and microcode.
- Hard disk—Provides secondary storage for log files and memory dumps, and can reboot the system if the CompactFlash card fails.
- I2C/EEPROM—Stores the serial number of the Routing Engine.



NOTE: For specific information about Routing Engine components (for example, the capacity of the hard drive), issue the `show chassis routing-engine` command.

The faceplate of the Routing Engine 850 contains the following:

- PC card slot—Accepts a removable PC card, which stores software images for system upgrades.
- Interfaces for out-of-band management access—Provide information about Routing Engine status to devices (console, laptop, or terminal server) that can be attached to access ports located on the Routing Engine.
- Reset button—Reboots the Routing Engine when pressed.
- Offline button—Powers down the Routing Engine when pressed.
- Thumbscrews—Secure the Routing Engine in the chassis.
- Four LEDs—A green LED labeled **HDD**, a blue LED labeled **MASTER**, a red LED labeled **FAIL**, and a green LED labeled **ONLINE** indicate Routing Engine status.

The disk from which the router boots is called the *primary boot device*, and the other disk is the *alternate boot device*.

The boot sequence for the router:

- PC Card
- CompactFlash card
- Hard disk



NOTE: If the router boots from an alternate boot device, a yellow alarm lights the LED on the router's craft interface.

Related Documentation

- [M10i PIC LEDs on page 53](#)

M10i Routing Engine 850 LEDs

Four LEDs—A green LED labeled **HDD**, a blue LED labeled **MASTER**, a red LED labeled **FAIL**, and a green LED labeled **ONLINE** indicate Routing Engine status. [Table 6 on page 26](#) describes the LED states.

Table 6: States for Routing Engine LEDs

Label	Color	State	Description
HDD	Green	Blinking	There is read/write activity on the PC card.

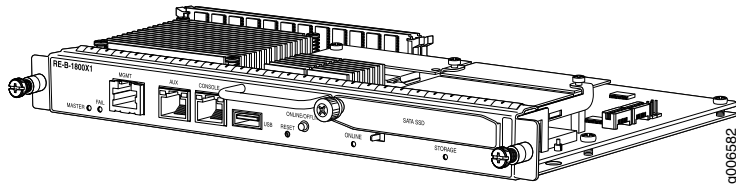
Table 6: States for Routing Engine LEDs (continued)

Label	Color	State	Description
MASTER	Blue	On steadily	Routing Engine is functioning as master.
FAIL	Red	On steadily	Routing Engine is not operational.
ONLINE	Green	On steadily	Routing Engine is running normally.

- Related Documentation**
- [Displaying M10i Router Components and Serial Numbers on page 247](#)
 - [M10i Router Physical Specifications on page 76](#)

M10i Routing Engine RE-B-1800 Description

Figure 13: Routing Engine RE-B-1800



The Routing Engine RE-B-1800 has the following major components:

- **CPU**—Runs Junos OS to maintain the router's routing tables and routing protocols. It has Intel's single core Jasper Forest processor.
- **USB port**—Provides a removable media interface through which you can install the Junos OS manually. Junos OS supports USB version 2.0.
- **DRAM**—Provides storage for the routing and forwarding tables and for other Routing Engine processes.
- **CompactFlash card**—Provides primary storage for software images, configuration files, and microcode. The CompactFlash card is field-replaceable.
- **Solid-state Disk (SSD)**—Provides secondary storage for log files and memory dumps, and can reboot the system if the CompactFlash card fails. SSD is front-pluggable and hot-swappable.
- **Interface ports**—The **AUX**, **CONSOLE**, and **MGMT** ports provide access to management devices. Each Routing Engine has one 10/100/1000-Mbps Ethernet port for connecting to a management network, and two asynchronous serial ports—one for connecting to a console and one for connecting to a modem or other auxiliary device.
- **EEPROM**—Stores the serial number of the Routing Engine.
- **Reset button**—Reboots the Routing Engine when pressed.
- **Online/Offline button**—Takes the Routing Engine online or offline when pressed.

- Real-time clock—Provides real-time integrated clock with batter backup for data retention.
- Extractor handle—Used for inserting and extracting the Routing Engine.
- Captive screws—Secure the Routing Engine in place.
- Four LEDs—A green LED labeled **STORAGE**, a blue LED labeled **MASTER**, a red LED labeled **FAIL**, and a green LED labeled **ONLINE** indicate Routing Engine status.



NOTE: For specific information about Routing Engine components (for example, the capacity of the SSD), issue the `show chassis routing-engine` command.

The router is shipped with the Junos OS preinstalled on the Routing Engine. There are three copies of software:

- One copy on the CompactFlash card in the Routing Engine.
- One copy on the SSD in the Routing Engine.
- One copy on a USB flash drive that can be inserted into the slot on the Routing Engine faceplate.

The Routing Engine boots from the storage media in this order: the USB device (if present), then the CompactFlash card, then the SSD, then the LAN. Normally, the router boots from the copy of the software on the CompactFlash card.

Related Documentation

- [M10i Routing Engine 1800 LEDs on page 28](#)
- [M10i Routing Engine Description on page 21](#)
- [Replacing the M10i Routing Engine on page 158](#)
- [Replacing the SSD on an RE-B-1800 Routing Engine on page 169](#)

M10i Routing Engine 1800 LEDs

Four LEDs—a blue LED labeled **MASTER**, a red LED labeled **FAIL**, a green LED labeled **STORAGE**, and a green LED labeled **ONLINE**—located on the faceplate, indicate Routing Engine status. [Table 7 on page 28](#) describes the LED states.

Table 7: States for Routing Engine LEDs

Label	Color	State	Description
MASTER	Blue	On steadily	Routing Engine is functioning as master.
FAIL	Red	On steadily	Routing Engine is not operational.
STORAGE	Green	Blinking	Indicates activity on the SSD or Compact Flash.

Table 7: States for Routing Engine LEDs (continued)

Label	Color	State	Description
ONLINE	Green	On steadily	Routing Engine is running normally.

- Related Documentation**
- [Displaying M10i Router Components and Serial Numbers on page 247](#)
 - [M10i Router Physical Specifications on page 76](#)

M10i Routing Engine Interface Ports

Each Routing Engine has a set of ports for connecting to one or more external devices on which system administrators can issue Junos OS command-line interface (CLI) commands to manage the router (see [“M10i Routing Engine 850 LEDs” on page 25](#)).

The ports with the indicated label in each set function as follows:

- **AUX/MODEM**—Connects the Routing Engine to a laptop, modem, or other auxiliary device through an RS-232 (EIA-232) serial cable.
- **MGMT**—Connects the Routing Engine through an Ethernet connection to a management LAN (or any other device that plugs into an Ethernet connection) for out-of-band management. The port uses an autosensing RJ-45 connector to support both 10- and 100-Mbps connections.

To the left of each **MGMT** port is a link status indicator, which lights to show that a link has been established over the Ethernet connection. To the right of each **MGMT** port is an activity indicator, which flashes when data is being transferred.

- **CONSOLE**—Connects the Routing Engine to a system console through an RS-232 (EIA-232) serial cable.

For information about the pinouts for the connectors, see [“RJ-45 Connector Pinouts for the M10i Routing Engine MGMT Port” on page 100](#).

- Related Documentation**
- [M10i Routing Engine Description on page 21](#)
 - [M10i Router Physical Specifications on page 76](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)

Routing Engine Specifications

[Table 8 on page 30](#) lists the current specifications for Routing Engines supported on M Series, MX Series, and T Series routers. [Table 9 on page 33](#) lists the specifications for end-of-life Routing Engines.



NOTE: For a list of the routing engines that are supported on the M Series, MX Series, T Series, and PTX routers, see [“Supported Routing Engines by Router” on page 34](#).



NOTE: For information about PTX Series Routing Engine specifications, see *Routing Engines Supported on PTX Series Routers*. For information about

Table 8: Routing Engine Specifications

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
RE-400-768	400-MHz Celeron	768 MB	Fast Ethernet	40 GB hard disk	1 GB CompactFlash card	9.0	—
RE-A1000-2048	1.0-GHz Pentium	2048 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.1	—
RE-A2000-4096	2.0-GHz Pentium	4096 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.1	—
RE-S1000-2048	1.3-GHz Pentium	2048 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.2	SCB, SCBE
RE-S2000-4096	2.0-GHz Pentium	4096 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.2	SCB, SCBE

Table 8: Routing Engine Specifications (continued)

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
RE-C1800	1.8-GHz	8 GB	Gigabit Ethernet	SSD	4 GB CompactFlash card	T1600 router in a routing matrix: 9.6R2 Standalone T640 or T1600 router: 11.2	CB-T for a standalone router. CB-LCC for a router in a routing matrix.
	1.8 GHz	16 GB	Gigabit Ethernet	SSD	4 GB CompactFlash card	32-bit Junos OS on a standalone T1600 router: 11.4R2 32-bit Junos OS on a T1600 router in a routing matrix: 11.4R2 64-bit Junos OS on a standalone T1600 router: 11.4R2 64-bit Junos OS on a T1600 router in a routing matrix: 11.4R2	CB-T for a standalone router. CB-LCC for a router in a routing matrix.
RE-C2600	2.6-GHz	16 GB	Gigabit Ethernet	SSD	4 GB CompactFlash card	TX Matrix Plus router: 9.6R2	—
RE-A-1800x2	1800-MHz	8 GB or 16 GB	Gigabit Ethernet	32 GB SSD	4 GB CompactFlash card	10.4	—
RE-S-1800x2	1800-MHz	8 GB or 16 GB	Gigabit Ethernet	32 GB SSD	4 GB CompactFlash card	10.4	SCB, SCBE
RE-S-1800x4	1800-MHz	8GB or 16 GB	Gigabit Ethernet	32 GB SSD	4 GB CompactFlash card	10.4	SCB, SCBE, SCBE2
RE-S-MX104	1.8-GHz	4 GB	Gigabit Ethernet	—	8 GB NAND Flash	13.2	—
RE-B-1800x1-4G	1.73-GHz	4 GB	Gigabit Ethernet	64 GB SSD	4 GB CompactFlash card	12.1R2, 11.4R4, and 12.2R1	—

Table 8: Routing Engine Specifications (continued)

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
RE-M1000-4	1.8- GHz	16 GB	Gigabit Ethernet	32 GB SSD	4 GB Fixed Internal CompactFlash card	12.3R2	SCB, SCBE
RE-S1000-4CS	1.8- Ghz	32 GB	Gigabit Ethernet	32 GB SSD	4 GB Fixed Internal CompactFlash card	<ul style="list-style-type: none"> 12.3R4 13.2R1 	SCB, SCBE SCBE2
RE-M1000-3CS	1.8- Ghz	32 GB	Gigabit Ethernet	32 GB SSD	4GB Fixed Internal CompactFlash card	<ul style="list-style-type: none"> 12.3R4 13.2R1 	—
RE-S-X6-64G, RE-S-X6-64GLT	2 Ghz	64 GB	Gigabit Ethernet	Two 50-GB SSDs	—	15.1F4, 16.1	SCBE2
RE-M-X6-64G	2.3 Ghz	64 GB	Gigabit Ethernet	Two 100-GB SSDs	—	15.1F5-S1, 16.1R2, and 16.2R1	—
RE-M-X6-64GLT	2.3 Ghz	64 GB	Gigabit Ethernet	Two 100-GB SSDs	—	17.2R1	—
RE-M1000-86G	2.3 Ghz	64 GB	Gigabit Ethernet	Two 50-GB SSDs	—	15.1F7	—
RE-S-1600x8	1.6 Ghz	64 GB	Gigabit Ethernet	Two 50-GB SSDs	—	17.3R1	—
RE-M1000-66GLT	2.1 Ghz	64 GB	Gigabit Ethernet	Two 100-GB SSDs	—	17.2R1	—
RE-M1000-812G	2.3 Ghz	128 GB	Gigabit Ethernet	Two 200-GB SSDs	—	18.2R1	—
RE-S-X6-128G	2.1 Ghz	128 GB	Gigabit Ethernet	Two 200-GB SSDs	—	18.1R1	—
RE-M-X6-128G	2.1 Ghz	128 GB	Gigabit Ethernet	Two 200-GB SSDs	—	18.1R1	—
JNP10003-RE1	1.6-GHz	64 GB	Gigabit Ethernet	Two 100 GB SSDs	—	17.3R1	—

Table 8: Routing Engine Specifications (continued)

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
JNP1003-RE1T	1.6-GHz	64 GB	Gigabit Ethernet	Two 100 GB SSDs	-	18.1R1	-
JNP10K-RE0	2.5 GHz	32 GB	Gigabit Ethernet	Two 50 GB SSDs	-	17.2R1	-
JNP10K-RE1	2.3 GHz	64 GB	Gigabit Ethernet	Two 200 GB SSDs	-	18.2R1	-
JNP10K-RE1LT	2.3 GHz	64 GB	Gigabit Ethernet	Two 200 GB SSDs	-	18.3R1	-
JNP10K-RE128	2.3 GHz	128 GB	Gigabit Ethernet	Two 200 GB SSDs	-	18.3R1	-



NOTE: Use shielded CAT5e cable for connecting the AUX, CONSOLE, and MGMT ports in RE-S-X6-64G, REMX2K-X8-64G, and REMX2008-X8-64G Routing Engines.

Table 9: End-of-Life Routing Engine Specifications

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	EOL Details
RE-333-256	333-MHz Pentium II	256 MB	Fast Ethernet	6.4 GB hard disk	80 MB CompactFlash card	3.4	PSN-2003-01-063
RE-333-768	333-MHz Pentium II	768 MB	Fast Ethernet	6.4 GB hard disk	80 MB CompactFlash card	3.4	PSN-2003-01-063
RE-600-512	600-MHz Pentium III	512 MB	Fast Ethernet	30 GB hard disk	256 MB CompactFlash card	5.4	PSN-2004-07-019
RE-600-2048	600-MHz Pentium III	2048 MB	Fast Ethernet	40 GB hard disk	1 GB CompactFlash card	5.3	PSN-2008-02-018
RE-850-1536	850-MHz Pentium III	1536 MB	Fast Ethernet	40 GB hard disk	1 GB CompactFlash card	7.2	PSN-2011-04-226
RE-M40	200-MHz Pentium	256 MB	Fast Ethernet	6.4 GB hard disk	80 MB CompactFlash card	3.2	FA-HW-0101-001

Table 9: End-of-Life Routing Engine Specifications (continued)

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	EOL Details
RE-M40-333-768	333-MHz Pentium II	768 MB	Fast Ethernet	10 GB hard disk	80 MB CompactFlash card	4.2	PSN-2003-01-063
RE-M600-2048	600-MHz Pentium III	2048 MB	Fast Ethernet	30 GB hard disk	128 MB CompactFlash card	5.4	PSN-2004-TI-020
RE-1600-2048	1.6-GHz Pentium M	2048 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	6.2	PSN-2008-02-019



NOTE: The memory in [Table 8 on page 30](#) indicates the amount of total memory. To determine the amount of available memory, issue the `show chassis routing-engine` CLI command.

On routers that accept two Routing Engines, you cannot mix Routing Engine types except for a brief period (one minute or so) during an upgrade or downgrade to two Routing Engines of the same type.

Related Documentation

- [Supported Routing Engines by Router on page 34](#)

Supported Routing Engines by Router

The following tables list the Routing Engines that each router supports, the first supported release for the Routing Engine in the specified router, the management Ethernet interface, and the internal Ethernet interfaces for each Routing Engine.

- [M7i Routing Engines on page 35](#)
- [M10i Routing Engines on page 35](#)
- [M40e Routing Engines on page 36](#)
- [M120 Routing Engines on page 36](#)
- [M320 Routing Engines on page 37](#)
- [MX5, MX10, MX40, and MX80 Routing Engine on page 37](#)
- [MX104 Routing Engines on page 38](#)
- [MX240 Routing Engines on page 38](#)
- [MX480 Routing Engines on page 39](#)
- [MX960 Routing Engines on page 40](#)
- [MX2008 Routing Engines on page 41](#)
- [MX2010 Routing Engines on page 42](#)

- [MX2020 Supported Routing Engines on page 42](#)
- [MX10003 Routing Engines on page 43](#)
- [MX10008 Routing Engines on page 43](#)
- [PTX1000 Routing Engines on page 44](#)
- [PTX3000 Routing Engines on page 44](#)
- [PTX5000 Routing Engines on page 45](#)
- [PTX10008 and PTX10016 Routing Engines on page 45](#)
- [T320 Routing Engines on page 46](#)
- [T640 Routing Engines on page 46](#)
- [T1600 Routing Engines on page 47](#)
- [T4000 Routing Engines on page 48](#)
- [TX Matrix Routing Engines on page 49](#)
- [TX Matrix Plus Routing Engines on page 49](#)
- [TX Matrix Plus \(with 3D SIBs\) Routing Engines on page 50](#)

M7i Routing Engines

[Table 10 on page 35](#) lists the Routing Engines supported by the M7i router. The M7i router supports 32-bit Junos OS only.

Table 10: M7i Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-400-768 (EOL details: TSB16445)	RE-5.0	9.0	fxp0	fxp1
RE-850-1536 (EOL details: TSB15553)	RE-850	7.2	fxp0	fxp1
RE-B-1800X1-4G	RE-B-1800x1	11.4R4 12.1R2	fxp0	em0

M10i Routing Engines

[Table 11 on page 35](#) lists the Routing Engines supported by the M10i router. The M10i router supports 32-bit Junos OS only.

Table 11: M10i Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-400-768 (EOL details: TSB16445)	RE-5.0	9.0	fxp0	fxp1 fxp2

Table 11: M10i Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-850-1536 (EOL details: TSB15553)	RE-850	7.2	fxp0	fxp1 fxp2
RE-B-1800X1-4G	RE-B-1800x1	11.4R4 12.1R2	fxp0	em0

M40e Routing Engines

Table 12 on page 36 lists the Routing Engines supported by the M40e router.

Table 12: M40e Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-600-2048 (EOL details: TSB14373)	RE-3.0 or RE-3.0 (RE-600)	5.3	fxp0	fxp1 fxp2
RE-A-1000-2048	RE-A-1000	8.1	fxp0	fxp1 fxp2

M120 Routing Engines

Table 13 on page 36 lists the Routing Engines supported by the M120 router.

Table 13: M120 Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-A-1000-2048	RE-A-1000	8.0R2	–	fxp0	fxp1 fxp2
RE-A-2000-4096	RE-A-2000	8.0R2	–	fxp0	em0 bcm0
RE-A-1800X2-8G	RE-A-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	fxp1 fxp2

Table 13: M120 Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-A-1800X2-16G	RE-A-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	fxp1 fxp2
RE-A-1800X4-16G	RE-A-1800x4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1

M320 Routing Engines

Table 14 on page 37 lists the Routing Engines supported by the M320 router.

Table 14: M320 Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-1600-2048 (EOL details: TSB14374)	RE-4.0	6.2	—	fxp0	fxp1 fxp2
RE-A-2000-4096	RE-A-2000	8.1	—	fxp0	em0 bcm0
RE-A-1800X2-8G	RE-A-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 bcm0
RE-A-1800X2-16G	RE-A-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 bcm0
RE-A-1800X4-8G	RE-A-1800x4	<ul style="list-style-type: none"> 11.4R5 12.1R3 12.2 	10.4	fxp0	em0 em1

MX5, MX10, MX40, and MX80 Routing Engine

Table 15 on page 38 lists the Routing Engines supported by the MX5, MX10, MX40, and MX80 routers.

Table 15: MX5, MX10, MX40, and MX80 Routing Engine

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
Built-in Routing Engine	Routing Engine RE-MX80	12.3	-	fxp0	em0 em1 <i>NOTE:</i> em1 is used to communicate with the MS-MIC when it is inserted.

MX104 Routing Engines

Table 16 on page 38 lists the Routing Engines supported by MX104 routers.

Table 16: MX104 Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-MX104	Routing Engine	13.2	—	fxp0	fxp1 fxp2

MX240 Routing Engines

Table 17 on page 38 lists the Routing Engines supported by MX240 routers.

Table 17: MX240 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-1300-2048 (EOL details: TSB16556)	RE-S-1300	9.0	—	fxp0	fxp1 fxp2
RE-S-2000-4096 (EOL details: TSB16735)	RE-S-2000	9.0	—	fxp0	fxp1 fxp2
RE-S-1800X2-8G (EOL details: TSB16556)	RE-S-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800x2-16G (EOL details: TSB16556)	RE-S-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1

Table 17: MX240 Supported Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-1800X4-8G	RE-S-1800X4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X4-16G	RE-S-1800x4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X4-32G-S	RE-S-1800X4	<ul style="list-style-type: none"> 12.3R4 13.2R1 	<ul style="list-style-type: none"> 12.3R4 13.2R1 	fxp0	em0, em1
RE-S-X6-64G	RE-S-2X00x6	—	15.1F4 16.1R1	fxp0	ixlv0, igb0
RE-S-X6-64G-LT	RE-S-2X00x6-LT	—	17.2R1	fxp0	ixlv0, igb0 em0
RE-S-X6-128G	RE-S-2X00x6-128	—	18.1R1	fxp0	ixlv0, igb0 em0

MX480 Routing Engines

Table 18 on page 39 lists the Routing Engines supported by MX480 routers.

Table 18: MX480 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-1300-2048 (EOL details: TSB16556)	RE-S-1300	8.4	—	fxp0	fxp1 fxp2
RE-S-2000-4096 (EOL details: TSB16735)	RE-S-2000	8.4	—	fxp0	fxp1 fxp2
RE-S-1800X2-8G (EOL details: TSB16556)	RE-S-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X2-16G (EOL details: TSB16556)	RE-S-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1

Table 18: MX480 Supported Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-1800X4-8G	RE-S-1800X4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X4-16G	RE-S-1800x4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X4-32G-S	RE-S-1800X4	<ul style="list-style-type: none"> 12.3R4 13.2R1 	<ul style="list-style-type: none"> 12.3R4 13.2R1 	fxp0	em0 em1
RE-S-X6-64G	RE-S-2X00x6	—	15.1F4 16.1R1	fxp0	ixlv0, igb0
RE-S-X6-64G-LT	RE-S-2X00x6-LT	—	17.2R1	fxp0	ixlv0, igb0 em0
RE-S-X6-128G	RE-S-2X00x6-128	—	18.1R1	fxp0	ixlv0, igb0 em0

MX960 Routing Engines

Table 19 on page 40 lists the Routing Engines supported by MX960 routers.

Table 19: MX960 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-1300-2048 (EOL details: TSB16556)	RE-S-1300	8.2	—	fxp0	fxp1 fxp2
RE-S-2000-4096 (EOL details: TSB16735)	RE-S-2000	8.2	—	fxp0	fxp1 fxp2
RE-S-1800X2-8G (EOL details: TSB16556)	RE-S-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X2-16G (EOL details: TSB16556)	RE-S-1800x2	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1

Table 19: MX960 Supported Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-S-1800X4-8G	RE-S-1800x4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X4-16G	RE-S-1800x4	<ul style="list-style-type: none"> 11.4R5 12.1R3 	10.4	fxp0	em0 em1
RE-S-1800X4-32G-S	RE-S-1800x4	<ul style="list-style-type: none"> 12.3R4 13.2R1 	<ul style="list-style-type: none"> 12.3R4 13.2R1 	fxp0	em0 em1
RE-S-X6-64G	RE-S-2X00x6	—	15.1F4 16.1R1	fxp0	ixlv0, igb0
RE-S-X6-64G (For MX960-VC)	RE-S-2X00x6	—	17.1R2	fxp0	ixlv0, igb0
RE-S-X6-64G-LT	RE-S-2X00x6-LT	—	17.2R1	fxp0	ixlv0, igb0 em0
RE-S-X6-128G	RE-S-2X00x6-128	—	18.1R1	fxp0	ixlv0, igb0 em0

MX2008 Routing Engines

Table 20 on page 41 lists the Routing Engines supported by MX2008 routers.

Table 20: MX2008 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
REMX2008-X8-64G	RE-MX2008-X8-64G	15.1F7	fxp0	ixlv0 ixlv1
REMX2008-X8-64G-LT	RE-MX2008-X8-64G-LT	17.2R1	fxp0	ixlv0 ixlv1
REMX2008-X8-128G	RE-MX2008-X8-128G	18.2R1	fxp0	ixlv0 ixlv1

MX2010 Routing Engines

Table 21 on page 42 lists the Routing Engines supported by MX2010 routers.

Table 21: MX2010 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-MX2000-1800X4	RE-S-1800x4	12.3R2	fxp0	em0 em1
REMX2K-1800-32G-S	RE-S-1800x4	<ul style="list-style-type: none"> 12.3R4 13.2R1 	fxp0	em0 em1
REMX2K-X8-64G	RE-S-2X00x8	<ul style="list-style-type: none"> 15.1F5-S1 16.1R2 16.2R1 	fxp0	ixlv0 ixlv1 em0
REMX2K-X8-64G-LT	RE-S-2X00x8	17.2R1	fxp0	ixlv0 ixlv1 em0
REMX2K-X8-128G	RE-MX200X8-128G	18.1R1	fxp0	ixlv0 ixlv1

MX2020 Supported Routing Engines

Table 22 on page 42 lists the Routing Engines supported by MX2020 routers.

Table 22: MX2020 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-MX2000-1800X4	RE-S-1800x4	12.3R2	fxp0	em0 em1
REMX2K-1800-32G-S	RE-S-1800x4	<ul style="list-style-type: none"> 12.3R4 13.2R1 	fxp0	em0 em1

Table 22: MX2020 Supported Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
REMX2K-X8-64G	RE-S-2X00x8	• 15.1F5-S1	fxp0	ixlv0
		• 16.1R2		ixlv1
		• 16.2R1		em0
REMX2K-X8-64G-LT	RE-S-2X00x8	17.2R1	fxp0	ixlv0
				ixlv1
				em0
REMX2K-X8-128G	RE-MX200X8-128G	18.1R1	fxp0	ixlv0
				ixlv1
				em0

MX10003 Routing Engines

Table 23 on page 43 lists the Routing Engines supported by MX10003 routers.

Table 23: MX10003 Supported Routing Engines

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
JNP10003-RE1	RE-S-2X00x6	17.3R1	fxp0	em3
				em4
JNP10003-RE1-LT	RE-S-1600x8	18.1R1	fxp0	em3
				em4

MX10008 Routing Engines

Table 24 on page 43 lists the Routing Engines supported on the MX10008 router.

Table 24: MX10008 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
JNP10K-RE1	RE X10	18.2R1	em0	bme0
				bme1

Table 24: MX10008 Routing Engines (continued)

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
JNP10K-RE1-LT	RE X10 LT	18.3R1	em0	bme0 bme1
JNP10K-RE1-128	RE X10 128G	18.3R1	em0	bme0 bme1

PTX1000 Routing Engines

Table 25 on page 44 lists the Routing Engine supported on the PTX1000.



NOTE: The PTX1000 supports 64-bit Junos OS only.

Table 25: PTX1000 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
Built-in Routing Engine	RE-PTX1000	<ul style="list-style-type: none"> 16.1X65-D30 17.2R1 	em0	bme0 em1

PTX3000 Routing Engines

Table 26 on page 44 lists the Routing Engines supported on the PTX3000.



NOTE: The PTX3000 supports 64-bit Junos OS only.

Table 26: PTX3000 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C2600-16G	RE-DUO-2600	13.2R2	em0	ixgbe0 ixgbe1
RCB-PTX-X6-32G	RE-PTX-2X00x6	16.1R4 17.1R1 This Routing Engine does not support Junos OS Release 16.2.	em0	ixlv0 ixlv1

PTX5000 Routing Engines

Table 27 on page 45 lists the Routing Engines supported on the PTX5000.



NOTE:

- PTX5000 supports 64-bit Junos OS only.
- The PTX5000 router supports two midplanes. The midplane identified as **Midplane-8S** in the CLI output is supported in Junos OS releases, 12.1X48, 12.3, and 13.2. The enhanced midplane, identified as **Midplane-8SeP** is supported from Junos OS release 14.1 onwards.

The RE-DUO-2600 routing engine with Junos OS 13.2 or earlier is not supported on the PTX5000BASE2 midplane.

Table 27: PTX5000 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C2600-16G	RE-DUO-2600	12.1X48	em0	ixgbe0
		12.3		ixgbe1
		13.2		
		NOTE: The PTX5000 does not support Junos OS Releases 12.1, 12.2, or 13.1.		
RE-PTX-X8-64G	RE-PTX-2X00x8	15.1F4	em0	ixlv0
		16.1R1		ixlv1
				em1
RE-PTX-X8-128G	RE-PTX-2X00x8-128G	18.1R1	em0	ixlv0
				ixlv1
				em1

PTX10008 and PTX10016 Routing Engines

Table 28 on page 46 lists the Routing Engines supported on the PTX10008 and PTX10016 routers.

Table 28: PTX10008 and PTX10016 Routing Engines

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
JNP10K-RE0	RE-PTX-2X00x4	17.2R1	em0, em1	bme0 bme1
JNP10K-RE1	RE X10	18.2R1	em0	bme0 bme1
JNP10K-RE1-LT	RE X10 LT	18.3R1	em0	bme0 bme1
JNP10K-RE1-128	RE X10 128G	18.3R1	em0	bme0 bme1

T320 Routing Engines

Table 29 on page 46 lists the Routing Engines supported by the T320 router.

Table 29: T320 Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-600-2048 (EOL details: TSB14373)	RE-3.0 or RE-3.0 (RE-600)	5.3	fxp0	fxp1 fxp2
RE-1600-2048 (EOL details: TSB14374)	RE-4.0	6.2	fxp0	fxp1 fxp2
RE-A-2000-4096	RE-A-2000	8.1	fxp0	fxp1 fxp2

The T320 router supports the CB-T control board.

T640 Routing Engines

Table 30 on page 47 lists the Routing Engines supported by the T640 router.

Table 30: T640 Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-600-2048 (EOL details: TSB14373)	RE-3.0 or RE-3.0 (RE-600)	5.3	–	fxp0	fxp1 fxp2
RE-1600-2048 (EOL details: TSB14374)	RE-4.0	6.2	–	fxp0	fxp1 fxp2
RE-A-2000-4096	RE-A-2000	8.1	–	fxp0	em0 bcm0
RE-DUO-C1800-8G	RE-DUO-1800	32-bit Junos OS on a standalone T640 router: 11.2 32-bit Junos OS on a T640 router in a routing matrix: 11.4R9	64-bit Junos OS on a standalone T640 router: 11.3 64-bit Junos OS on a T640 router in a routing matrix: 11.4R9	em0	bcm0 em1
RE-DUO-C1800-16G	RE-DUO-1800	32-bit Junos OS on a standalone T640 router: 11.4R2 32-bit Junos OS on a T640 router in a routing matrix: 11.4R9	64-bit Junos OS on a standalone T640 router: 11.4R2 64-bit Junos OS on a T640 router in a routing matrix: 11.4R9	em0	bcm0 em1

The T640 standalone router supports CB-T control board and CB-LCC in a T640 routing matrix.

T1600 Routing Engines

Table 31 on page 47 lists the Routing Engines supported by the T1600 router.



NOTE: (Two RE-DUO-C1800-8G or two RE-DUO-C1800-16G are required to connect to a Routing Matrix)

Table 31: T1600 Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-600-2048 (EOL details: TSB14373)	RE-3.0 or RE-3.0 (RE-600)	8.5	–	fxp0	fxp1 fxp2

Table 31: T1600 Routing Engines (continued)

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-1600-2048 (EOL details: TSB14374)	RE-4.0 (RE-1600)	8.5	—	fxp0	fxp1 fxp2
RE-A-2000-4096	RE-A-2000	8.5	—	fxp0	em0 bcm0
RE-DUO-C1800-8G	RE-TXP-LCC or RE-DUO-1800	32-bit Junos OS on a T1600 router in a routing matrix: 9.6 NOTE: Junos OS Releases 9.6 through 10.4 support RE-DUO-C1800-8G only during upgrade to a line-card chassis (LCC) in a routing matrix. 32-bit Junos OS on a standalone T1600 router: 11.1	64-bit Junos OS on a T1600 router in a routing matrix: 9.6 64-bit Junos OS on a standalone T1600 router: 11.1	em0	bcm0 em1
RE-DUO-C1800-16G	RE-DUO-1800	32-bit Junos OS on a standalone T1600 router: 11.4R2 32-bit Junos OS on a T1600 router in a routing matrix: 11.4R2	64-bit Junos OS on a standalone T1600 router: 11.4R2 64-bit Junos OS on a T1600 router in a routing matrix: 11.4R2	em0	bcm0 em1

T4000 Routing Engines

Table 32 on page 48 lists the Routing Engines supported by the T4000 router.



NOTE: The T4000 router supports 64-bit Junos OS only.

Table 32: T4000 Routing Engines

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C1800-8G	RE-DUO-1800	Standalone T4000 router: 12.1 T4000 router in a routing matrix: 13.1	em0	bcm0 em1
RE-DUO-C1800-16G	RE-DUO-1800	Standalone T4000 router: 12.1R2 T4000 router in a routing matrix: 13.1	em0	bcm0 em1

The T4000 router supports the CB-LCC control board.

TX Matrix Routing Engines

Table 33 on page 49 lists the Routing Engines supported by the TX Matrix router.

Table 33: TX Matrix Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-600-2048 (EOL details: TSB14373)	RE-3.0 or RE-3.0 (RE-600)	7.0	–	fxp0	fxp1 fxp2
RE-1600-2048 (EOL details: TSB14374)	RE-4.0 (RE-1600)	7.0	–	fxp0	fxp1 fxp2
RE-A-2000-4096	RE-A-2000	8.5	–	fxp0	em0 bcm0
RE-DUO-C1800-8G	RE-DUO-1800	11.4R9	11.4R9	em0	bcm0 em1
RE-DUO-C1800-16G	RE-DUO-1800	11.4R9	11.4R9	em0	bcm0 em1

The TXP router supports two control boards, CB-TX and CB-LCC. The CB-LCC is required for both RE-DUO-C1800-8G and RE-DUO-C1800-16G Routing Engines.

TX Matrix Plus Routing Engines

Table 34 on page 49 lists the Routing Engines supported by the TX Matrix Plus router.

Table 34: TX Matrix Plus Routing Engines

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C2600-16G	RE-TXP-SFC or RE-DUO-2600	32-bit Junos OS: 9.6	64-bit Junos OS: 11.4	em0	ixgbe0 ixgbe1

The TX Matrix Plus router supports the CB-TXP control board.

TX Matrix Plus (with 3D SIBs) Routing Engines

Table 35 on page 50 lists the Routing Engines supported by the TX Matrix Plus router with 3D SIBs.

Table 35: Routing Engines on TX Matrix Plus with 3D SIBs

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-DUO-C2600-16G	RE-TXP-SFC or RE-DUO-2600	-	64-bit Junos OS: 11.4	em0	ixgbe0 ixgbe1

- Related Documentation**
- [Routing Engine Specifications on page 29](#)
 - *Understanding Internal Ethernet Interfaces*
 - *Understanding Management Ethernet Interfaces*

CHAPTER 6

Line Card Components and Descriptions

- [M10i Flexible PIC Concentrators \(FPCs\) Description on page 51](#)
- [M10i PICs Description on page 51](#)
- [M10i PIC LEDs on page 53](#)
- [M10i PICs Supported on page 53](#)
- [M10i End-of-Life PICs Supported on page 56](#)
- [M10i PIC/CFEB Compatibility on page 58](#)

M10i Flexible PIC Concentrators (FPCs) Description

Flexible PIC Concentrators (FPCs) house the PICs that connect the router to network media (for information about PICs, see “[M10i PICs Description](#)” on page 51). On the M10i router, each FPC is built in (it cannot be removed from the chassis as on other M Series platforms) and corresponds to a horizontal row of PIC slots. The two FPCs on the M10i router are numbered 0 and 1, top to bottom. Each FPC accommodates up to four PICs.

Related Documentation

- [Connecting M10i PIC Cables on page 121](#)
- [M10i Midplane Description on page 12](#)
- [M10i Chassis Description on page 11](#)

M10i PICs Description

PICs provide the physical connection to various network media types. PICs receive incoming packets from the network and transmit outgoing packets to the network, performing framing and line-speed signaling for their media type as required. PICs also encapsulate outgoing packets received from the Compact Forwarding Engine Board (CFEB) or Enhanced CFEB (CFEB-E) before transmitting them. The controller ASIC on each PIC performs additional control functions specific to the PIC media type.

The router supports various PICs, including ATM, Channelized, Gigabit Ethernet, IP Services, and SONET/SDH interfaces. You can install PICs of different media types on the same router as long as the router supports those PICs.

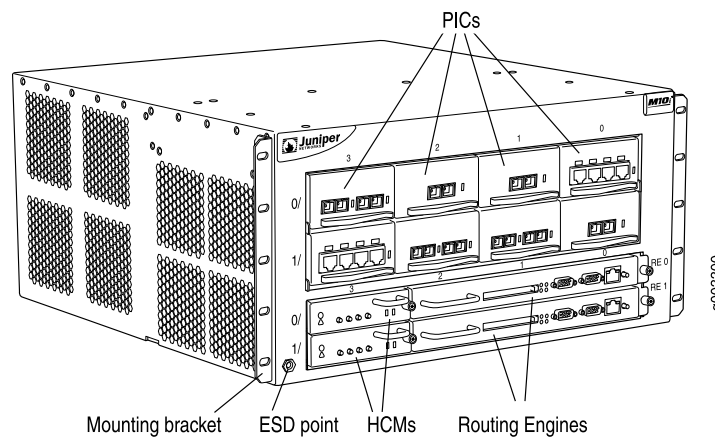
PICs are inserted into a slot in Flexible PIC Concentrators (FPCs), **FPC0** and **FPC1**, which are built in to the chassis. Up to eight PICs install into an M10i router, as shown in

[Figure 14 on page 52](#). Four PIC slots are located in each Flexible PIC Concentrator (FPC). The PIC slots on the upper FPC are numbered from **0/0** (zero/zero) through **0/3**, right to left. The PIC slots in the lower FPC are numbered from **1/0** (one/zero) through **1/3**, right to left. The PIC slot numbers are located above **FPC0**, and below **FPC1**. The number of ports on a PIC depends on the type of PIC.

Blank PICs resemble other PICs but do not provide any physical connection or activity. When a slot is not occupied by a PIC, you must insert a blank PIC to fill the empty slot and ensure proper cooling of the system.

The M10i router has a maximum throughput of 3.2 Gbps full duplex for each FPC. Inserting a combination of PICs with an aggregate higher than the maximum throughput is supported, but constitutes oversubscription of the FPC.

Figure 14: M10i PIC Location



PICs are hot-removable and hot-insertable. A removed PIC no longer receives or transmits data, and removing or inserting a PIC briefly interrupts forwarding of traffic through the remaining PICs.

Most PICs supported on the M10i router have the following components.

- One or more cable connector ports—Accept a network media connector.
- LEDs—Indicate PIC and port status. Most PICs have an LED labeled **STATUS** on the PIC faceplate. Some PICs have additional LEDs, often one per port. The meaning of the LED states differs for various PICs. For more information, see the description for each PIC.
- Ejector lever—Controls the locking system that secures the PIC in the card cage.

Some PICs accept small form-factor pluggables (SFPs), which are fiber-optic transceivers that can be removed from the PIC. Various SFPs have different reach characteristics. You can mix them in a single PIC and change the combination dynamically. SFPs are hot-removable and hot-insertable, as described in [“M10i Field-Replaceable Units \(FRUs\)” on page 139](#). For information about PICs that use SFPs, see the “Cables and connectors” section for each PIC.

- Related Documentation**
- [M10i PICs Supported on page 53](#)
 - [M10i Flexible PIC Concentrators \(FPCs\) Description on page 51](#)
 - [Installing an M10i PIC on page 173](#)
 - [M10i PIC Serial Number ID Label on page 250](#)
 - [Replacing an M10i PIC on page 179](#)
 - [Troubleshooting the M10i PICs on page 235](#)
 - [Replacing an M10i SFP on page 187](#)

M10i PIC LEDs

LEDs indicate PIC and port status. Most PICs have an LED labeled **STATUS** on the PIC faceplate. Some PICs have additional LEDs, often one per port. The meaning of the LED states differs for various PICs. For more information, see the *M10i Multiservice Edge Router Interface Module Reference*.

- Related Documentation**
- [M10i PICs Description on page 51](#)
 - [Displaying M10i Router Components and Serial Numbers on page 247](#)
 - [M10i Chassis Description on page 11](#)

M10i PICs Supported

[Table 36 on page 53](#) lists the PICs supported in the M10i router. The PICs are listed alphabetically by PIC family.



NOTE: The M10i router is now end-of-life. See the JTAC support bulletin TSB16809 for additional information about the PICs and other associated FRUs that moved to end-of-life with the router. The [“M10i End-of-Life PICs Supported” on page 56](#) topic lists PICs that moved to end-of-life before the M10i router itself moved to end-of-life.

Table 36: PICs Supported in the M10i Router

PIC Family and Type	Ports	Model Number	Connector	First Junos OS Release Support
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ATM2 IQ

Table 36: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	Connector	First Junos OS Release Support
ATM2 DS3 IQ PIC (M10i Router)	4	PE-4DS3-ATM2	Coaxial: <ul style="list-style-type: none"> 10 ft (3.05-m) posilock SMB to BNC (provided) Four pairs of Rx and Tx coaxial cables 	6.1
ATM2 OC3/STM1 IQ PIC (M10i Router)	2	PE-2OC3-ATM2-MM PE-2OC3-ATM2-SMIR	• SC/PC	6.0
ATM2 OC12/STM4 IQ PIC (M10i Router)	1	PE-1OC12-ATM2-MM PE-1OC12-ATM2-SMIR	• SC/PC	6.0
Channelized Enhanced IQ (IQE)				
Channelized DS3 and E3 Enhanced IQ (IQE) PIC (M10i Router)	4	PE-4CHDS3-E3-IQE-BNC	• Standard DS3 BNC coaxial cable interfaces	10.2
NOTE: Only the DS3 interface is channelized.				
Channelized E1/T1 Enhanced IQ (IQE) PIC (M10i Router)	10	PE-10CHE1-T1-IQE-RJ48	• 120-ohm RJ-48C connector (female)	10.2
Channelized OC3/STM1 Enhanced IQ (IQE) with SFP (M10i Router)	2	PE-2CHOC3-STM1-IQE-SFP	• LC/PC	10.2
Channelized OC12/STM4 Enhanced IQ (IQE) PIC with SFP (M10i Router)	1	PE-1CHOC12STM4-IQE-SFP	• LC/PC	10.2
Circuit Emulation				
Channelized OC3/STM1 Circuit Emulation PIC with SFP (M10i Router)	4	PE-4CHOC3-CE-SFP	• LC/PC	9.3
E1/T1 Circuit Emulation PIC (M10i Router)	12	PE-12T1E1-CE-TELCO	• RJ-21 NOTE: Cables are rated for intra-building connections only.	9.3
DS3, E1, E3, and T1				
DS3/E3 Enhanced IQ (IQE) PIC (M10i Router)	4	PE-4DS3-E3-IQE-BNC	• Standard DS3 BNC coaxial cable interfaces	10.2
E1 PIC (M10i Router)	4	PE-4E1-RJ48	• Four RJ-48 connectors (one per port)	6.0

Table 36: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	Connector	First Junos OS Release Support
<i>E3 IQ PIC (M10i Router)</i>	4	PE-4E3-QPP	<ul style="list-style-type: none"> Standard E3 BNC coaxial cable interfaces 	6.1
Ethernet				
<i>Fast Ethernet PICs (M10i Router)</i>	4	PE-4FE-TX	<ul style="list-style-type: none"> Two-pair, Category 5 unshielded twisted-pair connectivity through an RJ-45 connector Pinout: MDI noncrossover 	6.0
<i>Gigabit Ethernet PIC with SFP (M10i Router)</i>	1	PE-1GE-SFP	<ul style="list-style-type: none"> LC/PC 	6.3
Ethernet Enhanced IQ2 (IQ2E)				
<i>Gigabit Ethernet Enhanced IQ2 (IQ2E) PIC with SFP (M10i Router)</i>	4	PE-4GE-TYPE1-SFP-IQ2E	<ul style="list-style-type: none"> Duplex LC/PC connector (Rx and Tx) 	9.4
Services				
<i>Multiservices 100 PIC (M10i Router)</i>	0	PE-MS-100-1	<ul style="list-style-type: none"> None 	8.1
<i>Tunnel Services PIC (M10i Router)</i>	0	PE-TUNNEL	<ul style="list-style-type: none"> None 	6.0
Serial				
<i>EIA-530 PIC (M10i Router)</i>	2	PE-2EIA530	<ul style="list-style-type: none"> Two DB-25 male connectors (one per port, included with PIC) V.35 requires an EIA-530 to V.35 cable and connects to a V.35 DTE 34-pin Winchester type male cable (one per port) X.21 requires an EIA-530 to X.21 cable and connects to a X.21 DTE DB-15 male cable 	6.0
SONET/SDH				
<i>SONET/SDH OC3/STM1 PIC with SFP (M10i Router)</i>	2	PE-2OC3-SON-SFP	<ul style="list-style-type: none"> LC/PC 	8.4
<i>SONET/SDH OC3/STM1 Enhanced IQ (IQE) PIC with SFP (M10i Router)</i>	4	PE-4OC3-STM1-IQE-SFP	<ul style="list-style-type: none"> LC/PC 	10.2
<i>SONET/SDH OC3/STM1 (Multi-Rate) PIC with SFP (M10i Router)</i>	4	PE-4OC3-IOC12-SON-SFP	<ul style="list-style-type: none"> LC/PC 	8.4

Table 36: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	Connector	First Junos OS Release Support
SONET/SDH OC12/STM4 (Multi-Rate) PIC with SFP (M10i Router)	1	PE-1OC12-SON-SFP	• LC/PC	8.4

- Related Documentation**
- [M10i PICs Description on page 51](#)
 - [M10i End-of-Life PICs Supported on page 56](#)
 - [M10i PIC/CFEB Compatibility on page 58](#)

M10i End-of-Life PICs Supported

Table 37 on page 56 lists the end-of-life PICs supported in the M10i router. The PICs are listed alphabetically by PIC family.



NOTE: The M10i router is now end-of-life. See the JTAC support bulletin TSB16809 for additional information about the PICs and other associated FRUs that moved to end-of-life with the router. The “[M10i PICs Supported](#)” on page 53 topic lists PICs that had not moved to end-of-life before the M10i router itself moved to end-of-life.

Table 37: End-of-Life PICs Supported in the M10i Router

PIC Family and Type	Ports	Model Number	First Junos OS Release Support
ATM			
ATM DS3 EOL PIC (M10i Router)	4	PE-4DS3-ATM	6.1
ATM E3 EOL PIC (M10i Router)	4	PE-4E3-ATM	6.1
ATM2 IQ			
ATM2 E3 IQ EOL PIC (M10i Router)	2	PE-2E3-ATM2	6.1
Channelized			
Multichannel DS3 EOL PIC (M10i Router)	2	PE-2CHDS3	6.1
Channelized IQ			
Channelized DS3 IQ EOL PIC (M10i Router)	4	PE-4CHDS3-QPP	6.0

Table 37: End-of-Life PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	First Junos OS Release Support
Channelized E1 IQ EOL PIC (M10i Router)	10	PE-10CHE1-RJ48-QPP	6.0
	10	PE-10CHE1-RJ48-QPP-N	9.1R4 9.2R3 9.3
Channelized OC3 IQ EOL PIC (M10i Router)	1	PE-1CHOC3-SMIR-QPP	7.6
Channelized OC12 IQ EOL PIC (M10i Router)	1	PE-1CHOC12SMIR-QPP	6.1
Channelized STM1 IQ EOL PIC (M10i Router)	1	PE-1CHSTM1-SMIR-QPP	6.0
Channelized T1 IQ EOL PIC (M10i Router)	10	PE-10CHT1-RJ48-QPP	7.4
DS3, E1, E3, T1			
DS3 EOL PIC (M10i Router)	2	PE-2DS3	6.0
	4	PE-4DS3	6.0
E1 PIC (M10i Router)	4	PE-4E1-COAX	6.0
E3 PIC (M10i Router)	2	PE-2E3	6.0
T1 EOL PIC (M10i Router)	4	PE-4T1-RJ48	6.0
Ethernet			
Fast Ethernet PICs (M10i Router)	8	PE-8FE-FX	6.1
	12	PE-12FE-TX-MDI	6.0
		PE-12FE-TX-MDIX	
Gigabit Ethernet EOL PIC (M10i Router)	1	PE-1GE-LH PE-1GE-LX PE-1GE-SX	6.1
Ethernet IQ			
Gigabit Ethernet IQ EOL PIC with SFP (M10i Router)	1	PE-1GE-SFP-QPP	6.0
Ethernet IQ2			
Gigabit Ethernet IQ2 EOL PIC with SFP (M10i Router)	4	PE-4GE-TYPE1-SFP-IQ2	7.6R3
Services			
Adaptive Services EOL PIC (M10i Router)	0	PE-AS	6.1

Table 37: End-of-Life PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	First Junos OS Release Support
<i>Adaptive Services II EOL PIC (M10i Router)</i>	0	PE-AS2	6.4
<i>Adaptive Services II Layer 2 Services EOL PIC (M10i Router)</i>	0	PB-AS2-LAYER2SERVICES	8.0R2
<i>Adaptive Services II FIPS EOL PIC (M10i Router)</i>	0	PE-AS2-FIPS	7.2
<i>ES EOL PIC (M10i Router)</i>	0	PE-ES-800	6.1
<i>Link Services EOL PIC (M10i Router)</i>	0	PE-LS-4 PE-LS-32 PE-LS-128	6.1
<i>Monitoring Services EOL PIC (M10i Router)</i>	0	PE-PM	6.1
SONET/SDH			
<i>SONET/SDH OC3c/STM1 EOL PIC (M10i Router)</i>	2	PE-2OC3-SON-MM PE-2OC3-SON-SMIR	6.0
	4	PE-4OC3-SON-MM PE-4OC3-SON-SMIR	6.0
<i>SONET/SDH OC12c/STM4 EOL PIC (M10i Router)</i>	1	PE-1OC12-SON-MM PE-1OC12-SON-SMIR	6.0
<i>SONET/SDH OC12/STM4 Enhanced IQ (IQE) EOL PIC with SFP (M10i Router)</i>	1	PE-1OC12-STM4-IQE-SFP	10.2
<i>SONET/SDH OC48c/STM16 EOL PIC with SFP</i>	1	PE-1OC48-SON-SFP	6.4

- Related Documentation**
- [M10i PICs Description on page 51](#)
 - [M10i PICs Supported on page 53](#)
 - [M10i PIC/CFEB Compatibility on page 58](#)

M10i PIC/CFEB Compatibility

Table 38 on page 58 lists the PICs and CFEBs supported on the M10i router.

Table 38: PICs Supported in the M10i Router

PIC Family and Type	Ports	Model Number	CFEB	CFEB-E
ATM				

Table 38: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	CFEB	CFEB-E
ATM DS3 EOL PIC (M10i Router)	4	PE-4DS3-ATM EOL (see notification PSN-2003-10-018)	6.1	
ATM E3 EOL PIC (M10i Router)	4	PE-4E3-ATM EOL (see notification PSN-2003-10-018)	6.1	
ATM2 IQ				
ATM2 DS3 IQ	4	PE-4DS3-ATM2	6.1	9.4
ATM2 E3 IQ	2	PE-2E3-ATM2	6.1	9.4
ATM2 OC3/STM1 IQ	2	PE-2OC3-ATM2-MM PE-2OC3-ATM2-SMIR	6.1	9.4
ATM2 OC12/STM4 IQ	1	PE-1OC12-ATM2-MM PE-1OC12-ATM2-SMIR	6.1	9.4
Channelized				
Multichannel DS3 EOL PIC (M10i Router)	2	PE-2CHDS3 EOL (see notification PSN-2004-10-026)		
Channelized IQ				
Channelized DS3 IQ	4	PE-4CHDS3-QPP	6.1	9.4
Channelized E1 IQ	10	PE-10CHE1-RJ48-QPP-N	9.1R4 9.2R3 9.3	9.4
Channelized OC12 IQ	1	PE-1CHOC12SMIR-QPP	6.1	9.4
Channelized OC3 IQ	1	PE-1CHOC3-SMIR-QPP	7.1	9.4
Channelized STM1 IQ	1	PE-1CHSTM1-SMIR-QPP	6.1	9.4
Channelized T1 IQ	10	PE-10CHT1-RJ48-QPP	7.4	9.4
Channelized IQE				
Channelized DS3 and E3 Enhanced IQ (IQE)	4	PE-4CHDS3-E3-IQE-BNC	—	10.2
Channelized E1/T1 Enhanced IQ (IQE)	10	PE-10CHE-T1-IQE-RJ48	—	10.2
Channelized OC3/STM1 Enhanced IQ (IQE) with SFP	2	PE-2CHOC3-STM1-IQE-SFP	—	10.2
Channelized OC12/STM4 Enhanced IQ (IQE) PIC with SFP	1	PE-1CHOC12STM4-IQE-SFP	—	10.2

Table 38: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	CFEB	CFEB-E
Circuit Emulation				
Channelized OC3/STM1 Circuit Emulation	4	PE-4CHOC3-CE-SFP	9.3	9.5
E1/T1 Circuit Emulation	12	PE-12T1E1-CE-TELCO	9.3	9.5
DS3, E1, E3, and T1				
DS3	2	PE-2DS3	6.1	9.4
	4	PE-4DS3	6.1	9.4
DS3/E3 Enhanced IQ (IQE)	4	PE-4DS3-E3-IQE-BNC	—	10.2
E1	4	PE-4E1-COAX PE-4E1-RJ48	6.1	9.4
E3	2	PE-2E3	6.0	9.4
E3 IQ	4	PE-4E3-QPP	6.1	9.4
T1	4	PE-4T1-RJ48	6.1	9.4
E3				
<i>E3 PIC (M10i Router)</i>	4	PE-4E3 EOL (see notification PSN-2003-10-018)	6.1	
Ethernet				
Fast Ethernet	4	PE-4FE-TX	6.1	9.4
	8	PE-8FE-FX	6.1	9.4
	12	PE-12FE-TX-MDI PE-12FE-TX-MDIX	6.1	9.4
<i>Gigabit Ethernet EOL PIC (M10i Router)</i>	1	PE-1GE-LH EOL (see notification PSN-2004-06-014) PE-1GE-LX EOL (see notification PF-HW-0103-001) PE-1GE-SX EOL (see notification PF-HW-0103-001)	6.1	

Table 38: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	CFEB	CFEB-E
Gigabit Ethernet with SFP	1	PE-1GE-SFP	6.3	9.4
Ethernet IQ				
Gigabit Ethernet IQ	1	PE-1GE-SFP-QPP	6.1	9.4
Ethernet IQ2				
Gigabit Ethernet IQ2	4	PE-4GE-TYPE1-SFP-IQ2	7.6R3	9.4
Ethernet Enhanced IQ2 (IQ2E)				
Gigabit Ethernet IQ2E	4	PE-4GE-TYPE1-SFP-IQ2E	9.4	9.5R2
Services				
Link Services	0	PE-LS-4 PE-LS-32 PE-LS-128	6.1	—
Multiservices 100 PIC (M10i Router)	0	PE-MS-100-1	8.1	9.4
Tunnel Services PIC (M10i Router)	0	PE-TUNNEL	6.1	9.4
Adaptive Services EOL PIC (M10i Router)	0	PE-AS EOL (see notification PSN-2005-06-007)	6.1	
Adaptive Services II EOL PIC (M10i Router)	0	PE-AS2 EOL (see notification PSN-2007-12-036)	6.4	9.4
Adaptive Services II Layer 2 Services EOL PIC (M10i Router)	0	PB-AS2-LAYER2SERVICES EOL (see notification PSN-2008-11-080)	8.0R2	
Adaptive Services II FIPS EOL PIC (M10i Router)	0	PE-AS2-FIPS EOL (see notification PSN-20011-09-381)		
ES EOL PIC (M10i Router)	0	PE-ES-800 EOL (see notification PSN-2010-04-734)	6.0	
Link Services EOL PIC (M10i Router)	0	PE-LS-4 EOL (see notification PSN-2008-11-080) PE-LS-32 EOL (see notification PSN-2008-11-080) PE-LS-128 EOL (see notification PSN-2008-11-080)	6.0	
Monitoring Services EOL PIC (M10i Router)	0	PE-PM EOL (see notification PSN-2005-06-007)	6.1	
Serial				

Table 38: PICs Supported in the M10i Router (continued)

PIC Family and Type	Ports	Model Number	CFEB	CFEB-E
EIA-530	2	PE-2EIA530	6.1	9.4
SONET/SDH				
SONET/SDH OC3/STM1 PIC with SFP (M10i Router)	2	PE-2OC3-SON-SFP	8.4	9.6
SONET/SDH OC3/STM1 Enhanced IQ (IQE) PIC with SFP (M10i Router)	4	PE-4OC3-STM1-IQE-SFP	—	10.2
SONET/SDH OC3/STM1 (Multi-Rate) PIC with SFP (M10i Router)	4	PE-4OC3-1OC12-SON-SFP	8.4	9.4
SONET/SDH OC12/STM4 Enhanced IQ (IQE) EOL PIC with SFP (M10i Router)	1	PE-1OC12-STM4-IQE-SFP	—	10.2
SONET/SDH OC12/STM4 (Multi-Rate) PIC with SFP (M10i Router)	1	PE-1OC12-SON-SFP	8.4	9.4
SONET/SDH OC48c/STM16 EOL PIC with SFP	1	PE-1OC48-SON-SFP	6.4	—
SONET/SDH OC3c/STM1 EOL PIC (M10i Router)	2	PE-2OC3-SON EOL (see notification PSN-2007-12-037)	6.0	9.4
• SONET/SDH OC3c/STM1 PIC	2	PE-2OC3-SON-MM PE-2OC3-SON-SMIR		
• SONET/SDH OC3c/STM1 PIC	4	PE-4OC3-SON-MM PE-4OC3-SON-SMIR		
SONET/SDH OC12c/STM4 EOL PIC (M10i Router)	1	PE-1OC12-SON-MM EOL (see notification PSN-2007-12-037) PE-1OC12-SON-SMIR EOL (see notification PSN-2007-12-037)	6.0	9.4

Related Documentation

- [M10i PICs Description on page 51](#)
- [M10i PICs Supported on page 53](#)

CHAPTER 7

Power System Components and Descriptions

- [M10i Power System Description on page 63](#)
- [M10i AC Power Supply Description on page 64](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Power Supply LEDs on page 66](#)

M10i Power System Description

The router uses either AC or DC power. You can install up to three AC power supplies or four DC load-sharing power supplies at the bottom rear of the chassis, as shown in [Figure 6 on page 12](#). The power supplies connect to the midplane, which distributes power to router components according to their individual voltage requirements. When the power supplies are installed and operational, they automatically share the electrical load.

An enable control pin on the output connector of each power supply ensures that the supply is fully seated into the router midplane before the supply can be turned on. The enable pin prevents a user-accessible energy hazard, so there is no interlocking mechanism. The enable pin disables the voltage at the output connector if the power supply is not turned off before removal.

Redundant power supplies are hot-removable and hot-insertable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on page 139.

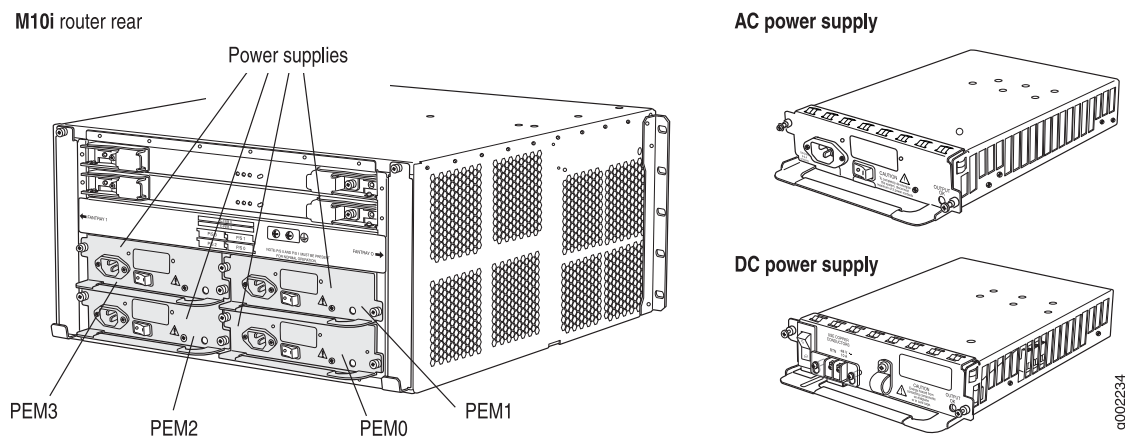


NOTE: After powering off a power supply, wait at least 60 seconds before turning it back on. After powering on a power supply, wait at least 60 seconds before turning it off.

If the router is completely powered off when you power on the power supply, the Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#).

After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the output status LED on the power supply, the command display output, and messages on the LED display on the craft interface—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Figure 15: M10i Router Power Supplies



Related Documentation

- [M10i AC Power Supply Description on page 64](#)
- [M10i DC Power Supply Description on page 65](#)
- [Troubleshooting the M10i Power System on page 237](#)
- [Replacing an M10i AC Power Supply on page 195](#)
- [Replacing an M10i DC Power Supply on page 201](#)

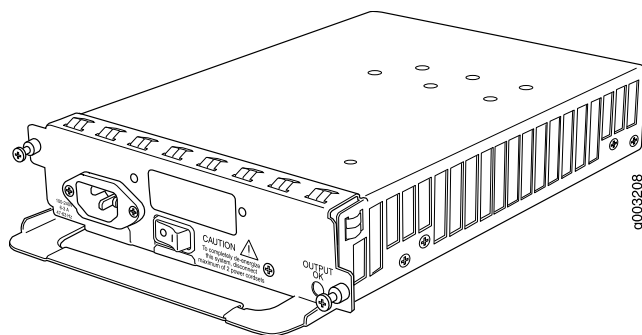
M10i AC Power Supply Description

An AC-powered router has up to three load-sharing AC power supplies, located at the bottom rear of the chassis, as shown in [Figure 6 on page 12](#). For information about power supply redundancy and replaceability, see [“M10i Power System Description” on page 63](#).

The router must have at least two AC power supplies, and any two AC power supplies can provide full power to the router. Three power supplies are required for redundancy.

Figure 16 on page 65 shows the power supply and Table 45 on page 85 lists electrical specifications. For information about the LED, see “M10i Power Supply LEDs” on page 66.

Figure 16: AC Power Supply



Related Documentation

- [Replacing an M10i AC Power Supply on page 195](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)

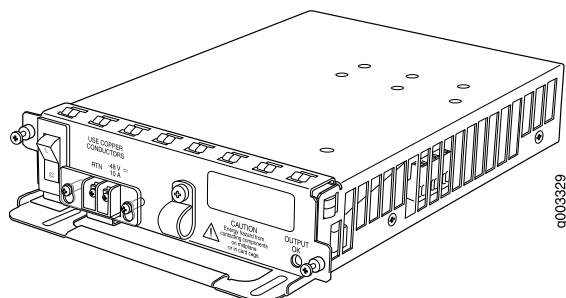
M10i DC Power Supply Description

A DC-powered router has up to four load-sharing DC power supplies, located at the bottom rear of the chassis, as shown in Figure 6 on page 12. For information about power supply redundancy and replaceability, see “M10i Power System Description” on page 63.

The router must have at least two DC power supplies, and any two DC power supplies can provide full power to the router. DC system redundancy requires two power sources from feed A and two power sources from feed B. If one feed fails or is shut down for service, the other feed powers two DC power supplies and can provide full power to the router's components indefinitely.

Figure 17 on page 65 shows the power supply and Table 47 on page 89 lists electrical specifications. For information about the LED, see “M10i Power Supply LEDs” on page 66.

Figure 17: DC Power Supply



Related Documentation

- [Replacing an M10i DC Power Supply on page 201](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)

M10i Power Supply LEDs

Table 39 on page 66 describes the LED on both AC and DC power supplies.

Table 39: States for Power Supply LED

Label	Color	State	Description
OUTPUT OK	Green	On steadily	Power supply is functioning normally, input is occurring, outputs are within range, and the temperature is within range.
		Blinking	Power supply is not functioning, is starting up, is not properly inserted, or airflow is not sufficient.

- Related Documentation**
- [Installing an M10i AC Power Supply on page 191](#)
 - [M10i Power System Description on page 63](#)
 - [Replacing an M10i AC Power Supply on page 195](#)
 - [Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off on page 237](#)

CHAPTER 8

Switch Fabric Components and Descriptions

- M10i Compact Forwarding Engine Board (CFEB) and Enhanced Compact Forwarding Engine Board (CFEB-E) Description on page 67
- M10i CFEB and CFEB-E LEDs on page 71

M10i Compact Forwarding Engine Board (CFEB) and Enhanced Compact Forwarding Engine Board (CFEB-E) Description

The Compact Forwarding Engine Board (CFEB) or Enhanced Compact Forwarding Engine Board (CFEB-E) performs route lookup, filtering, and switching on incoming data packets, then directs outbound packets to the appropriate FPC for transmission to the network. It can process 15 million packets per second (Mpps).

One or two CFEBs or CFEB-Es can be installed into the midplane from the rear of the chassis, as shown in [Figure 6 on page 12](#).



CAUTION: The M10i Internet router does not support a mixture of CFEB and CFEB-E hardware. If you install two devices, they must both be CFEBs or they must both be CFEB-Es.

Only one CFEB or CFEB-E is active at a time; the optional second CFEB or CFEB-E is in standby mode. By default, the CFEB or CFEB-E in slot **CFEB 0** is active. To modify the default, include the appropriate **cfeb** statement at the **[edit chassis redundancy]** hierarchy level of the configuration, as described in the section about CFEB or CFEB-E redundancy in the *Junos OS Administration Library*.



NOTE: For specific information about CFEB or CFEB-E components (for example, the amount of SDRAM), issue the **show chassis cfeb** command.

CFEBs or CFEB-Es are hot-pluggable when you replace a CFEB with a CFEB or a CFEB-E with a CFEB-E, as described in [“M10i Field-Replaceable Units \(FRUs\)” on page 139](#). To upgrade from a CFEB to a CFEB-E or to downgrade from a CFEB-E to a CFEB requires a

system reboot as described in [“Upgrading or Downgrading an M10i CFEB or CFEB-E” on page 215](#).

Removing the standby CFEB or CFEB-E has no effect on router function. If the active CFEB or CFEB-E fails or is removed from the chassis, the effect depends on how many CFEBs or CFEB-Es are installed:

- If there is one CFEB or CFEB-E, forwarding halts until the CFEB or CFEB-E is replaced and functioning again. For a minimum configuration, it takes approximately 2 minutes for the replaced CFEB or CFEB-E to boot and become active; reading in router configuration information can take additional time, depending on the complexity of the configuration.
- If there are two CFEBs or CFEB-Es, forwarding halts while the standby CFEB or CFEB-E boots and becomes active, which takes approximately 1 minute; synchronizing router configuration information can take additional time, depending on the complexity of the configuration.

For CFEB or CFEB-E replacement instructions, see [“Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E” on page 212](#).

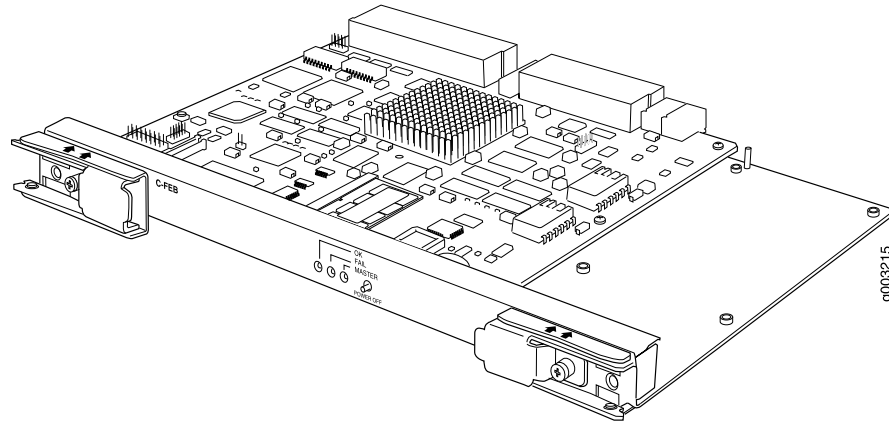
The CFEB or CFEB-E communicates with the Routing Engine using a dedicated 100-Mbps Fast Ethernet link that transfers routing table data from the Routing Engine to the forwarding table in the integrated ASIC. The link is also used to transfer from the CFEB or CFEB-E to the Routing Engine routing link-state updates and other packets destined for the router that have been received through the router interfaces.

The CFEB or CFEB-E provides the following functions:

- Route lookups—Performs route lookups using the forwarding table stored in the synchronous SRAM (SSRAM) on CFEBs or stored in the RLDRAM on CFEB-Es.
- Management of shared memory —Uniformly allocates incoming data packets throughout the router's shared memory.
- Transfer of outgoing data packets—Passes data packets to the destination FIC or PIC when the data is ready to be transmitted.
- Transfer of exception and control packets—Passes exception packets to the microprocessor on the CFEB or CFEB-E, which processes almost all of them. The remainder are sent to the Routing Engine for further processing. Any errors originating in the Packet Forwarding Engine and detected by the CFEB or CFEB-E are sent to the Routing Engine using system log messages.

CFEB

Figure 18: CFEB



The CFEB has the following major components:

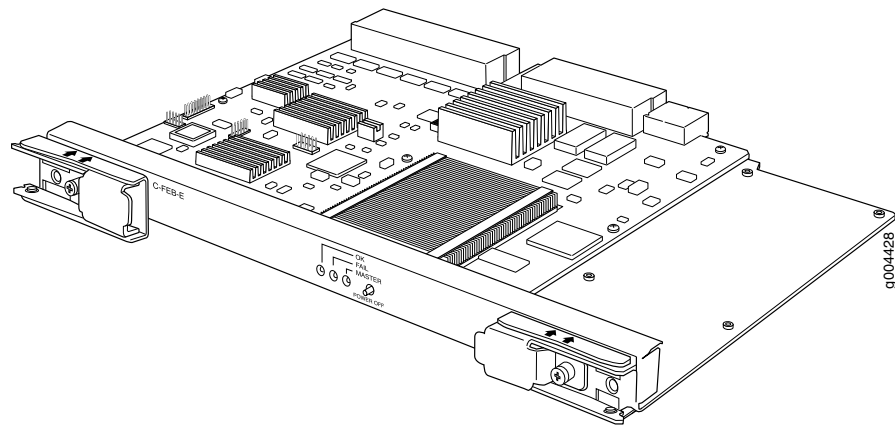
- Processing components:
 - 266-MHz CPU and supporting circuitry
 - Integrated ASIC
 - 33-MHz PCI bus
- Storage components:
 - 128-MB SDRAM for packet memory
 - 128-MB SDRAM for the microkernel
 - 8-MB SSRAM for route lookup
 - 4-MB SSRAM for control memory
- System interfaces:
 - 100-Mbps Ethernet link for internal interface to the Routing Engine
 - 19.44-MHz reference clock that generates clock signal for SONET/SDH PICs
 - I2C controller to read the I2C/EEPROMs in the PICs and temperature sensors
 - I2C/EEPROM containing the serial number and revision level
 - Two 512-KB boot flash EPROMs (programmable on the board)
- One PowerPC 8245 integrated processor
- Three LEDs—A green LED labeled **OK**, a red LED labeled **FAIL**, and a blue LED labeled **MASTER** indicate CFEB status. See “[M10i CFEB and CFEB-E LEDs](#)” on page 71.
- Online/Offline button—Prepares the CFEB for removal from the router when pressed.
- Ejector levers—Control the locking system that secures the CFEB in the chassis.

CFEB-E

The CFEB-E provides the following enhanced features:

- Increased number of logical interfaces.
- Increased route, nexthop, and interface lookup memory.
- Increased FPC throughput.
- Enhanced class of service features, including:
 - More queues and priority levels
 - Increased drop precedence per queue
 - Excess bandwidth allocation in proportion to weights
 - Hierarchical policing
 - Increased number of WRED profiles
 - Independent EXP and DSCP rewrite
 - Independent Layer 2 and Layer 3 classification on same port

Figure 19: CFEB-E



The CFEB-E has the following major components:

- Processing components:
 - 1-GHz CPU and supporting circuitry
 - Integrated ASIC
 - 33-MHz PCI bus
- Storage components:
 - Three 256-MB SDRAMs for packet memory
 - 1-GB SDRAM for the microkernel

- Two 64-MB RLDRAMs for route lookup
- Two 64-MB RLDRAMs for control memory
- System interfaces:
 - 100-Mbps link for internal interface to the Routing Engine
 - 19.44-MHz reference clock—Generates clock signal for SONET/SDH PICs
 - I2C controller to read the I2C/EEPROMs in the PICs and temperature sensors
 - I2C/EEPROM containing the serial number and revision level
 - Two 512-KB boot flash EPROMs (programmable on the board)
- One MPC8545 integrated processor with 1-GB DDR2 SDRAM
- Three LEDs—A green LED labeled **OK**, a red LED labeled **FAIL**, and a blue LED labeled **MASTER** indicate CFEB-E status.
- Offline button—Prepares the CFEB-E for removal from the router when pressed.
- Ejector levers—Control the locking system that secures the CFEB-E in the chassis.

Related Documentation

- [M10i Packet Forwarding Engine Architecture Overview on page 5](#)
- [M10i Routing Engine Description on page 21](#)
- [Configuring CFEB Redundancy on the M10i Router](#)
- [Installing an M10i CFEB or CFEB-E on page 211](#)
- [M10i Router Physical Specifications on page 76](#)

M10i CFEB and CFEB-E LEDs

Three LEDs—A green LED labeled **OK**, a red LED labeled **FAIL**, and a blue LED labeled **MASTER** indicate CFEB-E status.

Table 40: States for CFEB or CFEB-E LEDs

Label	Color	State	Description
OK	Green	On steadily	CFEB/CFEB-E is running normally.
		Blinking	CFEB/CFEB-E is starting up.
		Off	CFEB/CFEB-E is offline or is functioning as the backup CFEB/CFEB-E.
FAIL	Red	On steadily	CFEB/CFEB-E is not operational or is in reset mode.
		Off	CFEB/CFEB-E is functioning properly

Table 40: States for CFEB or CFEB-E LEDs (continued)

Label	Color	State	Description
MASTER	Blue	On steadily	CFEB/CFEB-E is functioning as master.
		Off	CFEB/CFEB-E is not functioning as master.

Related Documentation

- [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)

PART 2

Site Planning, Preparation, and Specifications

- [Preparation Overview on page 75](#)
- [AC Power Requirements and Specifications on page 85](#)
- [DC Power Requirements and Specifications on page 89](#)
- [Network Cable and Transceiver Planning on page 93](#)
- [Management Cable and Transceiver Specifications and Pinouts on page 99](#)

CHAPTER 9

Preparation Overview

- [M10i Router Site Preparation Checklist on page 75](#)
- [M10i Router Physical Specifications on page 76](#)
- [M10i Rack Size and Strength on page 77](#)
- [Spacing of Mounting Holes on page 78](#)
- [Connection to Building Structure on page 79](#)
- [Clearance Requirements for Airflow and Hardware Maintenance on page 79](#)
- [M10i Router Environmental Specifications on page 80](#)
- [M10i Chassis Grounding Cable and Lug Specifications on page 81](#)
- [M10i Router Power Requirements on page 82](#)

M10i Router Site Preparation Checklist

The checklist in [Table 41 on page 75](#) summarizes the tasks you need to perform when preparing a site for router installation.

Table 41: 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.	"M10i Router Environmental Specifications" on page 80		
Power			
Measure distance between external power sources and router installation site.	"M10i Router DC Power Supply Specifications" on page 89 "M10i Router AC Power Supply Specifications" on page 85		
Locate sites for connection of system grounding.	"M10i Chassis Grounding Cable and Lug Specifications" on page 81		
Calculate the power consumption and requirements.	"M10i Router Power Requirements" on page 82		

Table 41: Site Preparation Checklist (continued)

Item or Task	For More Information	Performed By	Date
Hardware Configuration			
Choose the configuration.			
Rack			
Verify that your rack meets the minimum requirements for the installation of the router.	"Installation Safety Warnings for Juniper Networks Devices" on page 269		
Plan rack location, including required space clearances.	"Clearance Requirements for Airflow and Hardware Maintenance" on page 79 "M10i Rack Size and Strength" on page 77		
If a rack is used, secure rack to floor and building structure.	"Connection to Building Structure" on page 79		
Cables			
Acquire cables and connectors:	"Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers" on page 95		
<ul style="list-style-type: none"> 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 Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers" on page 95		
Plan the cable routing and management.	"Maintaining the M10i PICs and PIC Cables" on page 223		

- Related Documentation**
- [M10i Router Description on page 3](#)
 - [M10i Router Physical Specifications on page 76](#)
 - [M10i Router Power Requirements on page 82](#)

M10i Router Physical Specifications

Table 42 on page 77 summarizes physical specifications for the router chassis.

Table 42: M10i Chassis Physical Specifications

Description	Weight	Width	Depth	Height
Chassis dimensions	79 lb (35.8 kg) maximum configuration 57 lb (25.9 kg) minimum configuration	<ul style="list-style-type: none"> 17.5 in. (44.5 cm) for sides of chassis 19 in. (48.3 cm) with mounting brackets 	18 in. (45.7 cm)	8.7 in. (22.1 cm)

- Related Documentation**
- [M10i Router Environmental Specifications on page 80](#)
 - [M10i Router Power Requirements on page 82](#)
 - [M10i Router Description on page 3](#)

M10i Rack Size and Strength

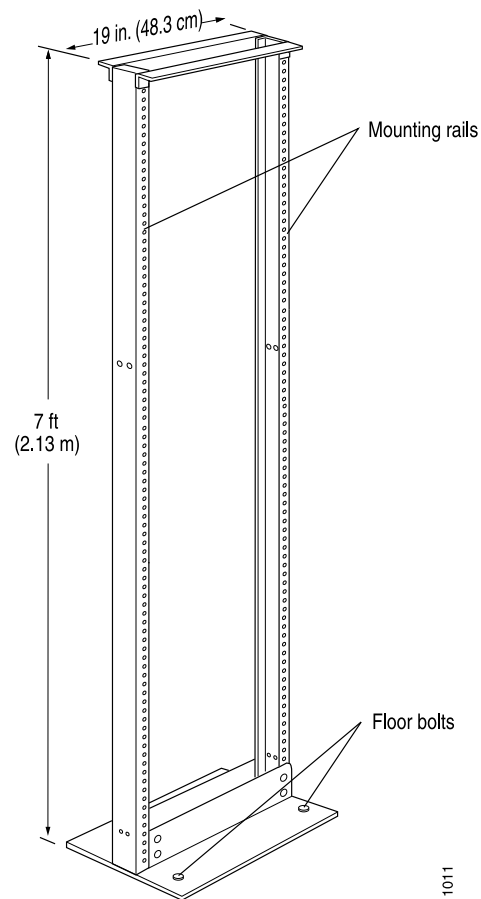
The router is designed for installation in a 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Components Industry Association (<http://www.ecianow.org/>).

With the use of adapters, the router is designed to fit into a 600-mm-wide and 600-mm-deep rack, as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (<http://www.etsi.org>). Use approved wing devices to narrow the opening between the rails.

The rack rails must be spaced widely enough to accommodate the router chassis's external dimensions: 8.7 in. (22.1 cm) high, 18 in. (45.7 cm) deep, and 17.5 in. (44.5 cm) wide. 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 “[Clearance Requirements for Airflow and Hardware Maintenance](#)” on page 79.

The chassis height of 8.7 in. (22.1 cm) is approximately 5 U. 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. You can stack eight router in a rack that has at least 40 U (70 in. or 1.78 m) of usable vertical space.

The rack must be strong enough to support the weight of the fully configured router, up to approximately 79 lb (35.8 kg). If you stack eight fully configured routers in one rack, it must be capable of supporting about 632 lb (286.7 kg).

Figure 20: Typical Open-Frame Rack**Related Documentation**

- [M10i Router Site Preparation Checklist on page 75](#)
- [Installing the M10i Router into a Rack on page 113](#)
- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
- [Spacing of Mounting Holes on page 78](#)

Spacing of Mounting Holes

The holes in the mounting brackets are spaced at 1 U (1.75 in. or 4.45 cm), so the router can be mounted in any rack that provides holes spaced at that distance.

Related Documentation

- [M10i Router Site Preparation Checklist on page 75](#)
- [Installing the M10i Router into a Rack on page 113](#)
- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
- [M10i Rack Size and Strength on page 77](#)

Connection to Building Structure

Always secure the rack to the structure of the building. If your geographical area is subject to earthquakes, bolt the rack to the floor. For maximum stability, also secure the rack to ceiling brackets. For more information, see [“Installation Safety Warnings for Juniper Networks Devices”](#) on page 269.

- Related Documentation**
- [M10i Router Site Preparation Checklist](#) on page 75
 - [Installing the M10i Router into a Rack](#) on page 113
 - [M10i Rack Size and Strength](#) on page 77

Clearance Requirements for Airflow and Hardware Maintenance

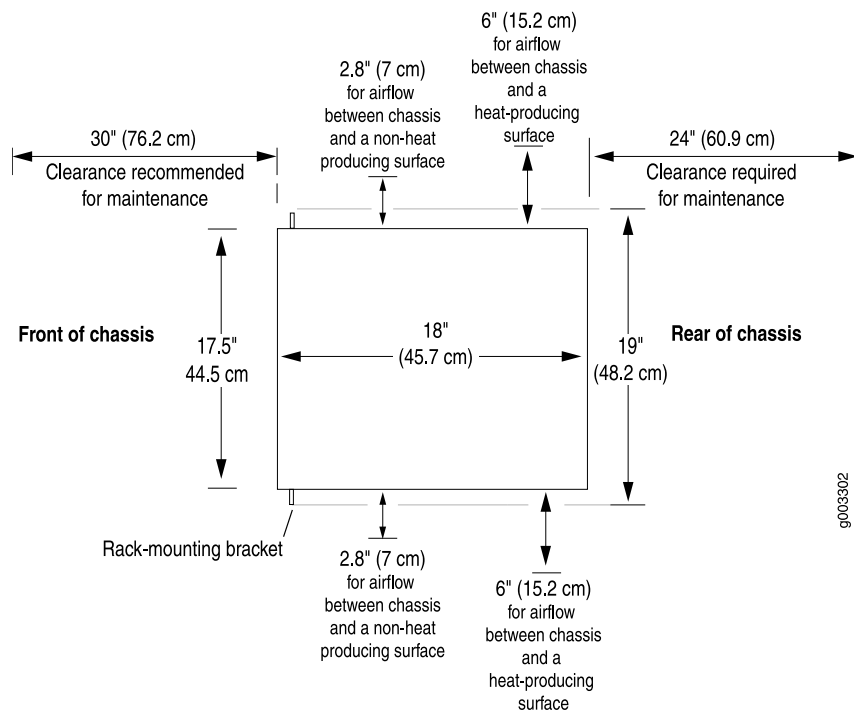
When planning the installation site, you must allow sufficient clearance around the rack (see [Figure 21](#) on page 80):

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. [Figure 11](#) on page 19 depicts the airflow in the router. 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.



NOTE: We recommend that you do not install the router in a cabinet. If you mount the router in a cabinet, be sure that ventilation is sufficient to prevent overheating.

- 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) is 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 rack.

Figure 21: Chassis Dimensions and Clearance Requirements

- Related Documentation**
- [M10i Router Site Preparation Checklist on page 75](#)
 - [Installing the M10i Router into a Rack on page 113](#)
 - [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
 - [M10i Rack Size and Strength on page 77](#)

M10i Router Environmental Specifications

Table 43 on page 80 specifies the environmental specifications required for normal router operation. In addition, the site should be as dust-free as possible.

Table 43: M10i Router Environmental Specifications

Description	Value
Altitude	No performance degradation to 10,000 ft (3048 m)
Relative humidity	Normal operation ensured in relative humidity range of 5% to 90%, noncondensing
Temperature	<p>Normal operation ensured in temperature range of 32°F (0°C) to 104°F (40°C)</p> <p>Nonoperating storage temperature in shipping crate: –40°F (–40°C) to 158°F (70°C)</p>

Table 43: M10i Router Environmental Specifications (continued)

Description	Value
Seismic	Tested to meet Telcordia Technologies Zone 4 earthquake requirements
Maximum thermal output	<ul style="list-style-type: none"> AC: 3276 BTU/hour (960 W) DC: 1965 BTU/hour (576 W)



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.

Related Documentation

- [M10i Router Physical Specifications on page 76](#)
- [M10i Router Power Requirements on page 82](#)
- [M10i Router Description on page 3](#)
- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
- [General Safety Warnings for Juniper Networks Devices on page 262](#)

M10i Chassis Grounding Cable and Lug Specifications

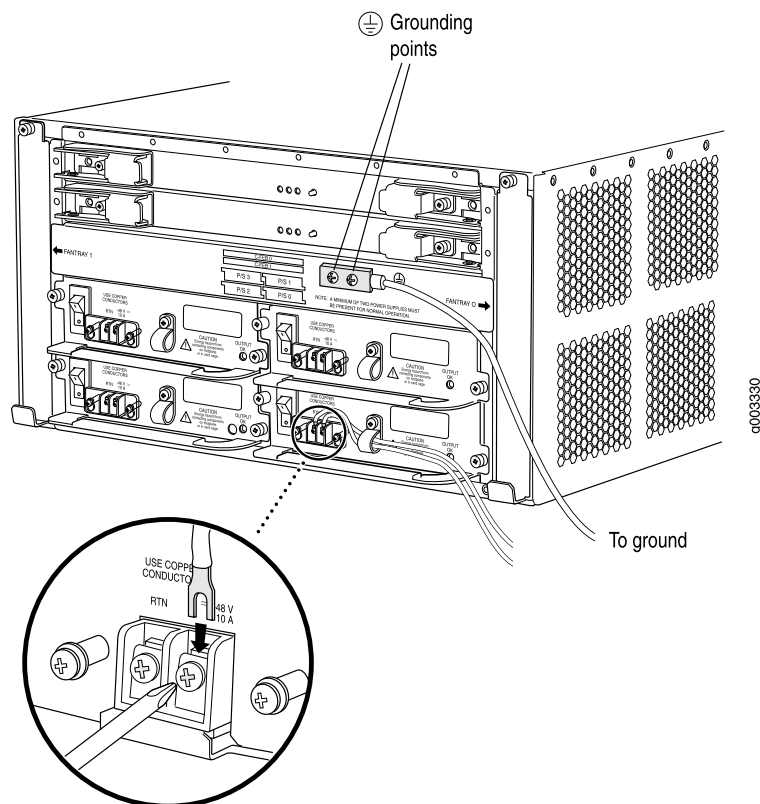
You must supply one 14-AWG (2.08 mm²) single-strand-count wire cable for the grounding the router.



CAUTION: Before router installation begins, a licensed electrician must attach a cable lug to the grounding cable that you supply. One terminal lug, 14-AWG (2.08 mm²), two hole for grounding is provided in the accessory box.

[Figure 22 on page 82](#) shows the grounding points on the router above the power supplies.

Figure 22: Grounding Cable and Grounding Points



- Related Documentation**
- [M10i Chassis Description on page 11](#)
 - [Grounding the M10i Router on page 117](#)

M10i Router Power Requirements

Table 44 on page 82 lists the power requirements for various hardware components when the router is operating under typical voltage conditions. For PIC power requirements, see the *M10i Multiservice Edge Router Interface Module Reference*.

Table 44: Component Power Requirements

Component	Power Requirement (Watts) @ 48 V	Power Requirement (Amps) @ 48 V
Base system including two HCMs, two power supplies, and one Routing Engine (with fans running at normal speed)	88.3	1.8 A (approximate)
Routing Engine	33.6	0.7 A
CFEB/CFEB-E	67.2	1.4 A

Table 44: Component Power Requirements (continued)

Component	Power Requirement (Watts) @ 48 V	Power Requirement (Amps) @ 48 V
HCM	10	0.2 A

You can use the information in [Table 44 on page 82](#) and the *M10i Multiservice Edge Router Interface Module Reference* to calculate power consumption for various hardware configurations, input current from a different source voltage, and thermal output, as shown in the following examples. (The examples use a generalized value for PICs of 0.625 A @ 48 V each.)

- Power consumption for minimum configuration:

Base system + 1 CFEB + 1 PIC =
 $1.8 \text{ A} + 0.625 \text{ A} = 2.425 \text{ A @ } 48 \text{ V} = 116.4 \text{ W DC}$

- Power consumption for maximum configuration:

Base system + 2 CFEBs + 8 PICs + second Routing Engine =
 $1.8 \text{ A} + 2(1.4 \text{ A}) + 8(0.625 \text{ A}) + 0.7 \text{ A} =$
 $1.8 \text{ A} + 2.8 \text{ A} + 5 \text{ A} + 0.7 \text{ A} = 10.3 \text{ A @ } 48 \text{ V} = 494.4 \text{ W DC}$

- Input current from a DC source other than 48 V (based on maximally configured router; applies to DC power supply only):

$(54 \text{ VDC input}) \times (\text{input current X}) = (48 \text{ VDC input}) \times (\text{input current Y})$
 $54 \times X = 48 \times 8.9 \text{ A}$
 $X = 48 \times 8.9 \text{ A} / 54 = 7.9 \text{ A}$

- Example of calculating system thermal output for an AC-powered router:

$\text{Watts DC} / 65\% \text{ AC PEM efficiency} / 0.293 = \text{BTU/hr}$
 $494.4 / 0.65 / 0.293 = 2595.96 \text{ BTU/hr}$

- Example of calculating System thermal output for aDC-powered router:

$\text{Watts DC} / 0.293 = \text{BTU/hr}$
 $494.4 / 0.293 = 1687.37 \text{ BTU/hr}$



NOTE: We recommend that you provision at least 9.1 A @ 48 VDC and use a facility circuit breaker rated for 15 A minimum. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure, and allows the router to function at full capacity using multiple power supplies.

Related Documentation

- [M10i Router AC Power Supply Specifications on page 85](#)

CHAPTER 10

AC Power Requirements and Specifications

- [M10i Router AC Power Supply Specifications on page 85](#)
- [M10i AC Power Cord Specifications on page 86](#)

M10i Router AC Power Supply Specifications

[Table 45 on page 85](#) lists electrical specifications for the AC Power Supply.

Table 45: Electrical Specifications for AC Power Supply

Description	Specification
Maximum power output	293 WDC
AC input voltage	Nominal: 100, 120, 200, 208, 220, 240 VAC Operating range: 90–264 VAC
AC input line frequency	47–63 Hz
AC input current rating	6–3 A
Output voltages	+3.3 V @ 40 A, +2.5 V @ 20 A, +5.0 V @ 15 A, +12 V @ 3 A

Related Documentation

- [M10i AC Power Supply Description on page 64](#)
- [Replacing an M10i AC Power Supply on page 195](#)
- [Replacing an M10i AC Power Cord on page 199](#)
- [M10i Router Power Requirements on page 82](#)
- [M10i AC Power Cord Specifications on page 86](#)

M10i AC Power Cord Specifications

Detachable AC power cords, each 2.5 m (approximately 8 ft) long, are supplied with the router. The C13 appliance coupler at the female end of the cord inserts into the AC appliance inlet coupler, type C14 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the AC power cord fits into the power source receptacle that is standard for your geographical location.



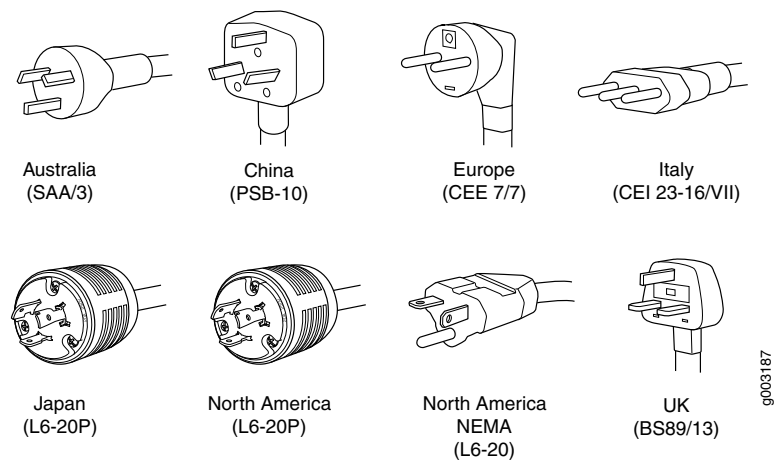
NOTE: In North America, AC power cords must not exceed 4.5 m (approximately 14.75 ft) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance.

Table 46 on page 86 provides specifications and Figure 23 on page 86 depicts the plug on the AC power cord provided for each country or region.

Table 46: AC Power Cord Specifications

Country	Electrical Specification	Plug Type
Australia	240 VAC, 50 Hz AC	SAA/3
Europe (except Italy and United Kingdom)	220 or 230 VAC, 50 Hz AC	CEE 7/7
Italy	230 VAC, 50 Hz AC	CEI 23-16
North America	120 VAC, 60 Hz AC	NEMA 5-15P
United Kingdom	240 VAC, 50 Hz AC	BS89/10

Figure 23: AC Plug Types





NOTE: AC power cords must not block access to router components or drape where people could trip on them.

**Related
Documentation**

- [M10i AC Power Supply Description on page 64](#)
- [Connecting Power on an AC-Powered M10i Router on page 123](#)
- [Replacing an M10i AC Power Supply on page 195](#)
- [Replacing an M10i AC Power Cord on page 199](#)
- [M10i Router Power Requirements on page 82](#)
- [M10i Router AC Power Supply Specifications on page 85](#)

DC Power Requirements and Specifications

- [M10i Router DC Power Supply Specifications on page 89](#)
- [M10i DC Power Cable and Lug Specifications on page 90](#)

M10i Router DC Power Supply Specifications

Table 47 on page 89 lists electrical specifications for the DC power supply.

Table 47: Electrical Specifications for DC Power Supply

Description	Specification
Maximum power output	293 W
DC input voltage	Nominal: -48, -60 VDC Operating range: -40.5 to -72 VDC
Input DC current rating	9.1 A @ -48 V
Output voltages	+3.3 V @ 40 A, +2.5 V @ 20 A, +5.0 V @ 15 A, +12 V@ 3 A



NOTE: The DC power supply requires -42 VDC to power on.



NOTE: The DC power supplies are marked -48 VDC. This is the nominal voltage associated with the battery circuit. Any higher voltages are associated only with float voltages for the charging function.

Related Documentation

- [M10i DC Power Supply Description on page 65](#)
- [Replacing an M10i DC Power Supply on page 201](#)
- [Replacing an M10i DC Power Cable on page 206](#)

- [M10i Router Power Requirements on page 82](#)
- [M10i DC Power Cable and Lug Specifications on page 90](#)

M10i DC Power Cable and Lug Specifications

You must provide two 14-AWG (2.08 mm²) single-strand-count wire cables for each power supply.



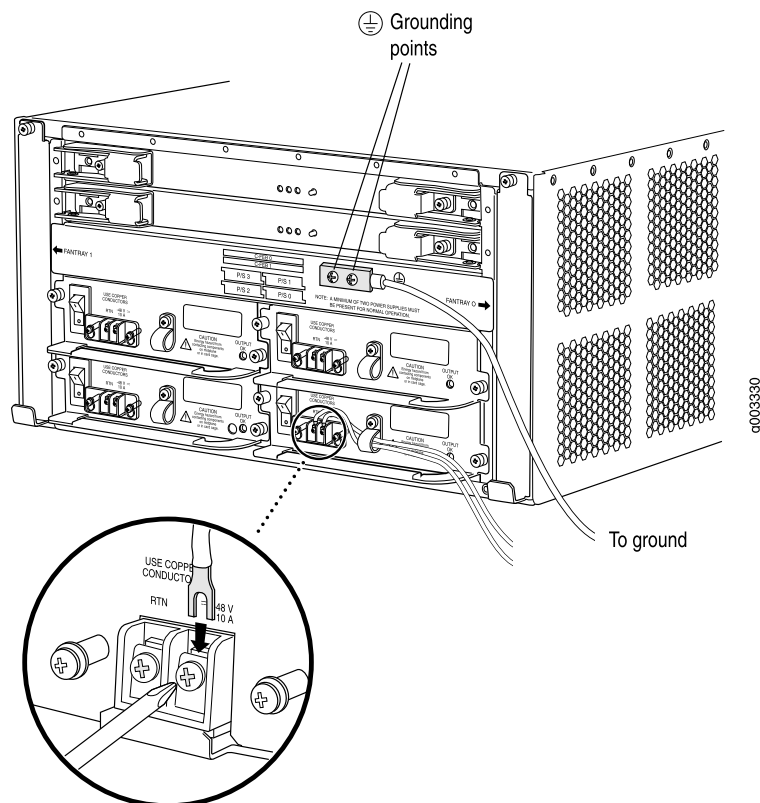
CAUTION: Before router installation begins, a licensed electrician must attach a cable lug to the DC power cables that you supply. The terminal fork lugs, 14-AWG (2.08 mm²), are provided in the accessories box for the DC power cables.



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

Figure 24 on page 90 shows how to attach the power cables. The DC power cables insert into the field-wiring terminals located on each power supply—the input terminal is labeled -48V and the return terminal is labeled RTN.

Figure 24: DC Power Cable Connections





NOTE: DC power cables must not block access to router components or drape where people could trip on them.

The DC power supplies in slots **P/S 0** and **P/S 1** must be powered by dedicated power feeds derived from feed A, and the DC power supplies in slots **P/S 2** and **P/S 3** must be powered by dedicated power feeds derived from feed B. This configuration provides the commonly deployed **A/B** feed redundancy for the system. Most sites distribute DC power through a main conduit that leads to frame-mounted DC power distribution panels, one of which might be located at the top of the rack that houses the router. A pair of cables (one input and one return) connects the field-wiring terminals to the power distribution panel.

**Related
Documentation**

- [M10i DC Power Supply Description on page 65](#)
- [Connecting Power on an DC-Powered M10i Router on page 125](#)
- [Disconnecting Power on an DC-Powered M10i Router on page 209](#)

CHAPTER 12

Network Cable and Transceiver Planning

- [Attenuation and Dispersion in Fiber-Optic Cable on M Series, MX Series, and T Series Routers on page 93](#)
- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cable for M10i Routers on page 94](#)
- [Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)
- [Calculating Power Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)

Attenuation and Dispersion in Fiber-Optic Cable on M Series, MX Series, and T Series Routers

Correct functioning of an optical data link depends on modulated light reaching the receiver with enough power to be demodulated correctly. *Attenuation* is the reduction in power of the light signal as it is transmitted. Attenuation is caused by passive media components, such as cables, cable splices, and connectors. While 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 in time. The following two types of dispersion can affect an optical data link:

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

**Related
Documentation**

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cable for M10i Routers on page 94](#)
- [Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)
- [Calculating Power Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)

Signal Loss in Multimode and Single-Mode Fiber-Optic Cable for M10i Routers

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. LEDs are not coherent sources, however. 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 (HOL) results. Together these factors limit the transmission distance of multimode fiber compared to 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. It is consequently more expensive.

The router uses optical lasers for SONET/SDH PIC single-mode interfaces. These optics comply with IR-1 of Bellcore GR-253-CORE Issue 2, December 1995 and ANSI T1.105.06.

For information about the maximum transmission distances and wavelength ranges supported by multimode and single-mode (ATM and SONET/SDH) PIC interfaces, see the interface module reference for your device. Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

**Related
Documentation**

- [Attenuation and Dispersion in Fiber-Optic Cable on M Series, MX Series, and T Series Routers on page 93](#)
- [Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)
- [Calculating Power Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)

Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers

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):

$$P_B = P_T - P_R$$

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

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

Related Documentation

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cable for M10i Routers on page 94](#)
- [Attenuation and Dispersion in Fiber-Optic Cable on M Series, MX Series, and T Series Routers on page 93](#)
- [Calculating Power Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)

Calculating Power Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers

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:

$$P_M = P_B - LL$$

A 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 (HOL), modal and chromatic dispersion, connectors, splices, and fiber attenuation. [Table 48 on page 96](#) 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 48: Estimated Values for Factors Causing Link Loss

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

The following example uses the estimated values in [Table 48 on page 96](#) to calculate link loss (LL) for a 2-km-long multimode link with a power budget (P_B) of 13 dB:

- Fiber attenuation for 2 km @ 1.0 dB/km = 2 dB
- Loss for five connectors @ 0.5 dB per connector = 5(0.5 dB) = 2.5 dB
- Loss for two splices @ 0.5 dB per splice = 2(0.5 dB) = 1 dB
- Higher-order mode loss = 0.5 dB
- Clock recovery module = 1 dB

The power margin (P_M) is calculated as follows:

$$P_M = P_B - LL$$

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

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

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

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 48 on page 96](#) 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:

$$P_M = P_B - LL$$

$$P_M = 13 \text{ dB} - 8 \text{ km (0.5 dB/km)} - 7(0.5 \text{ dB})$$

$$P_M = 13 \text{ dB} - 4 \text{ dB} - 3.5 \text{ dB}$$

$$P_M = 5.5 \text{ dB}$$

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.

Related Documentation

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cable for M10i Routers on page 94](#)
- [Attenuation and Dispersion in Fiber-Optic Cable on M Series, MX Series, and T Series Routers on page 93](#)
- [Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers on page 95](#)

CHAPTER 13

Management Cable and Transceiver Specifications and Pinouts

- [Routing Engine Interface Cable and Wire Specifications for M10i Routers on page 99](#)
- [RJ-45 Connector Pinouts for the M10i Routing Engine MGMT Port on page 100](#)
- [DB-9 Connector Pinouts for the M10i Routing Engine AUX/MODEM and CONSOLE Ports on page 100](#)

Routing Engine Interface Cable and Wire Specifications for M10i Routers

For management and service operations, you connect the Routing Engine to an external console or management network. (For more information, see [“M10i Routing Engine Description” on page 21.](#))

[Table 49 on page 99](#) lists the specifications for the cables that connect to management ports.

Table 49: Cable Specifications for Routing Engine Management Ports

Port	Cable Specification	Cable Supplied	Maximum Length	Router Receptacle
Routing Engine console or auxiliary interface	RS-232 (EIA-232) serial	One 6-ft (1.83-m) length with DB-9/DB-9 connectors	6 ft (1.83 m)	DB-9 male
Routing Engine Ethernet interface	Category 5 cable or equivalent suitable for 100Base-T operation	One 15-ft (4.92-m) length with RJ-45/RJ-45 connectors	328 ft (100 m)	RJ-45 autosensing

- Related Documentation**
- [M10i Routing Engine Description on page 21](#)
 - [Replacing an M10i Ethernet Management Cable on page 171](#)
 - [Replacing an M10i Console or Auxiliary Cable on page 171](#)

RJ-45 Connector Pinouts for the M10i Routing Engine MGMT Port

The port on the Routing Engine labeled **MGMT** is an autosensing 10/100-Mbps Ethernet RJ-45 receptacle that accepts an Ethernet cable for connecting the Routing Engine to a management LAN (or another device that supports out-of-band management). For more information, see “[M10i Routing Engine Interface Ports](#)” on page 29. Table 50 on page 100 describes the RJ-45 connector pinout.

Table 50: RJ-45 Connector Pinout

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

Related Documentation

- [M10i Routing Engine Description on page 21](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Replacing the M10i Routing Engine on page 158](#)
- [Replacing an M10i Ethernet Management Cable on page 171](#)
- [DB-9 Connector Pinouts for the M10i Routing Engine AUX/MODEM and CONSOLE Ports on page 100](#)

DB-9 Connector Pinouts for the M10i Routing Engine AUX/MODEM and CONSOLE Ports

The ports on the Routing Engine labeled **AUX/MODEM** and **CONSOLE** are DB-9 receptacles that accept RS-232 (EIA-232) cable. The **AUX/MODEM** port connects the Routing Engine to a laptop, modem, or other auxiliary unit, and the **CONSOLE** port connects it to a management console. The ports are configured as data terminal equipment (DTE). For more information, see “[M10i Routing Engine Interface Ports](#)” on page 29.

[Table 51 on page 101](#) describes the DB-9 connector pinouts.

Table 51: DB-9 Connector Pinout

Pin	Signal	Direction	Description
1	DCD	<—	Carrier Detect
2	RxD	<—	Receive Data
3	TxD	—>	Transmit Data
4	DTR	—>	Data Terminal Ready
5	Ground	—	Signal Ground
6	DSR	<—	Data Set Ready
7	RTS	—>	Request To Send
8	CTS	<—	Clear To Send
9	RING	<—	Ring Indicator

- Related Documentation**
- [M10i Routing Engine Description on page 21](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Replacing the M10i Routing Engine on page 158](#)
 - [Replacing an M10i Console or Auxiliary Cable on page 171](#)
 - [RJ-45 Connector Pinouts for the M10i Routing Engine MGMT Port on page 100](#)

PART 3

Initial Installation and Configuration

- [Installation Overview on page 105](#)
- [Unpacking the M10i on page 107](#)
- [Installing the M10i into a Rack on page 111](#)
- [Connecting the M10i to Ground on page 117](#)
- [Connecting the M10i to External Devices on page 119](#)
- [Providing Power to the M10i on page 123](#)
- [Configuring the Junos Software on page 131](#)

Installation Overview

- Overview of M10i Router Installation on page 105

Overview of M10i Router Installation

After you have verified that your installation site is prepared as described in “[M10i Router Site Preparation Checklist](#)” on page 75, you are ready to unpack and install the router. It is important to proceed through the installation process in the following order:

1. Review the safety guidelines explained in “[General Safety Guidelines for Juniper Networks Devices](#)” on page 261.
2. Unpack the router and verify that all parts have been received.
See “[Unpacking the M10i Router](#)” on page 107 and “[Verifying the M10i Router Parts Received](#)” on page 109.
3. If necessary, move the mounting brackets.
See “[Moving the Mounting Brackets](#)” on page 111.
4. Install the router.
See “[Installing the M10i Router into a Rack](#)” on page 113.
5. Connect the grounding cable.
See “[Grounding the M10i Router](#)” on page 117.
6. Connect a cables to a management device.
See “[Connecting to an M10i Management Console or Auxiliary Device](#)” on page 120.
7. Connect the AC power cords or DC power cables.
See “[Connecting Power on an AC-Powered M10i Router](#)” on page 123 or “[Connecting Power on an DC-Powered M10i Router](#)” on page 125.

8. Power on the router as described in [“Powering On an AC-Powered M10i Router” on page 124](#) or [“Powering On a DC-Powered M10i Router” on page 128](#).
9. Perform the initial system startup.
See [“Initially Configuring the M10i Router” on page 131](#).
10. Connect cables to the PICs. This can be performed either before or after the router is powered on. However, you can check the LEDs after you connect the cables if the router is powered on.

CHAPTER 15

Unpacking the M10i

- [Tools and Parts Required to Unpack the M10i Router on page 107](#)
- [Unpacking the M10i Router on page 107](#)
- [Verifying the M10i Router Parts Received on page 109](#)

Tools and Parts Required to Unpack the M10i Router

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

- Utility knife for cutting the sealing tape on the shipping carton
- Phillips (+) screwdriver, number 2

Related Documentation

- [M10i Router Description on page 3](#)
- [M10i Chassis Description on page 11](#)
- [M10i Chassis Lifting Guidelines on page 269](#)

Unpacking the M10i Router

The router is shipped in a cardboard carton, held in place with foam packing material. The crate also contains an accessory box, the front-mounting shelf, and the Quick Start.



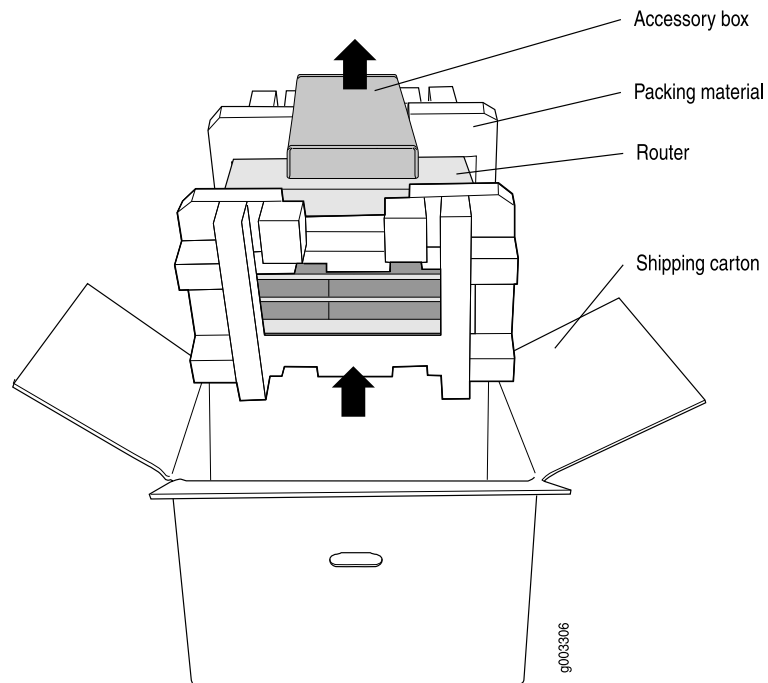
NOTE: The router is maximally protected inside the shipping carton. Do not unpack it until you are ready to begin installation.

To unpack the router:

1. Move the shipping carton to a staging area as close to the installation site as possible.
2. Position the carton so that the arrows are pointing up.
3. Using a utility knife, cut through the sealing tape on the top seam of the carton. Open the top flaps of the carton.

4. Remove the accessory box and packing material from the top of the router.
5. Open the accessory box and verify the contents against the parts inventory on the label attached to the box.
6. Remove the router from the shipping carton.
7. Verify the chassis components received against the packing list included with the router. A generic parts inventory appears in [“Verifying the M10i Router Parts Received” on page 109](#).
8. Save the shipping carton, packing materials, and pallet in case you later need to move or ship the router.

Figure 25: Unpacking the Router



- Related Documentation**
- [M10i Router Description on page 3](#)
 - [M10i Router Physical Specifications on page 76](#)
 - [Installation Safety Warnings for Juniper Networks Devices on page 269](#)

Verifying the M10i Router Parts Received

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

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

A fully configured router contains the router chassis with installed components, listed in [Table 52 on page 109](#), and an accessory box, which contains the parts listed in [Table 53 on page 109](#). The parts shipped with your router can vary.

Table 52: Parts List for a Fully Configured Router

Component	Quantity
Fan tray	Up to 2
CFEB or CFEB-E	Up to 2
HCM	2
Mounting brackets	2
PIC	Up to 8
Power supply	Up to 4
Routing Engine	Up to 2
Blank panels for slots without components	One blank panel for each slot not occupied by a component

Table 53: Accessory Box Parts List

Part	Quantity
Screws, Screw, Pan hd, Phil, 12-24 x 1/2", self-tapping	4
Screws, Flat Hd, Phil, 5 x 10.5mm Long, 1.6mm Pitch, self-tapping	4
Terminal lugs, 16-AWG to 14-AWG, #6 stud, ring terminal, vinyl insulated	2 (not used for the M10i router)
Terminal fork lugs, 14-AWG, #6, 0.25 Wide, insulation strain relieved, for DC power cables	9 are shipped, but only up to 8 are used for the M10i router (2 per each power supply)
Terminal lugs, 14-AWG, #8 stud, ring tongue, insulated	2 (not used for the M10i router)

Table 53: Accessory Box Parts List (continued)

Part	Quantity
Terminal lugs, 14-AWG, two hole for grounding	1
DB-9 (male) to DB-25 (female) serial adapter	1
Serial cable, Console, DB9F/DB9F	1
Label, contents, 3-1/3" x 4", M7i/M10i	1
Label, Accessory Kit Label, Green "Small Parts Enclosed"	1
Read me first document	1
JNPR Compliance Form Letter, RoHS Worldwide	1
Affidavit for T1 connection	1
Juniper Networks Product Warranty	1
End User License Agreement	1
Addendum, Documentation Card for Routing Platforms	1
Document sleeve	1
3" x 5" pink bag	2
9" x 12" pink bag, ESD	2
Accessory box, 19 x 12 x 3"	1
Ethernet cable, RJ-45/RJ-45, 4-pair stranded UTP, Category 5E, 15'	1
ESD wrist strap with cable	1

Related Documentation

- [M10i Router Description on page 3](#)
- [M10i Chassis Description on page 11](#)
- [M10i Router Physical Specifications on page 76](#)

CHAPTER 16

Installing the M10i into a Rack

- [Tools and Parts Required to Install the M10i Router Into a Rack on page 111](#)
- [Moving the Mounting Brackets on page 111](#)
- [Installing the M10i Router into a Rack on page 113](#)

Tools and Parts Required to Install the M10i Router Into a Rack

To install the chassis into a rack using a mechanical lift, you need the following tools and parts:

- Mechanical lift (recommended)
- Phillips (+) screwdrivers, numbers 1 and 2

Related Documentation

- [Installing the M10i Router into a Rack on page 113](#)
- [M10i Chassis Description on page 11](#)
- [M10i Chassis Lifting Guidelines on page 269](#)

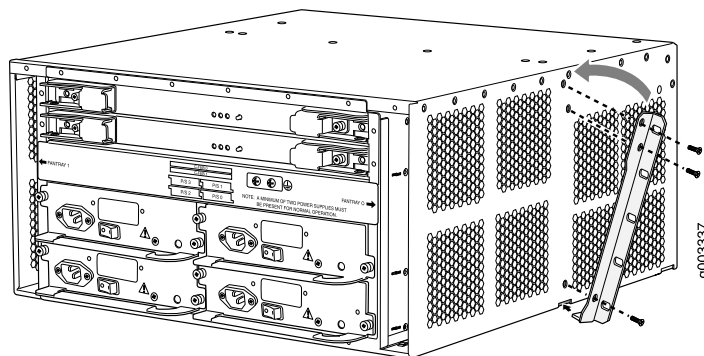
Moving the Mounting Brackets

The router is shipped with the mounting brackets installed in the front-mounting position, as shown in [Figure 5 on page 11](#). If you are center-mounting the router, you must move the brackets. To move the mounting brackets (see [Figure 26 on page 112](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. To install the mounting brackets in the center-mounting position, you must remove the fan trays:
 - a. Loosen the thumbscrew at the top of the fan tray faceplate, using a Phillips screwdriver if necessary.
 - b. Grasp the handle on the faceplate and slide the tray about halfway out of the chassis.

- c. Place one hand under the fan tray to support it and slide the tray completely out of the chassis.
3. Use a number 2 Phillips screwdriver to remove the screws securing the mounting brackets in the front-mounting position.
4. Remove the mounting brackets by tilting the top of the mounting bracket away from the chassis and sliding it out of the slot at the bottom of the chassis.
5. Insert the tab at the base of the mounting brackets at an angle into the slot at the bottom of the chassis in the center-mounting position (see [Figure 26 on page 112](#)).
6. Replace the screws that secure the mounting brackets to the chassis.
7. Reinstall the fan trays:
 - a. Grasp the handle on the faceplate of the fan tray with one hand and place the other hand under the unit to support it. Orient the fan tray so that the thumbscrew is at the top of the tray.
 - b. Slide the tray into the slot.
 - c. Tighten the thumbscrew to seat the fan tray firmly in the chassis.

Figure 26: Moving the Mounting Brackets on the Chassis



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Tools and Parts Required to Install the M10i Router Into a Rack on page 111](#)
- [Installing the M10i Router into a Rack on page 113](#)
- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)

Installing the M10i Router into a Rack



NOTE: Using a mechanical lift to maneuver the router into the rack is recommended because of the router's size and weight. The lift must be able to accommodate the router's weight—between 57 lb (25.9 kg) and about 79 lb (35.8 kg) depending on configuration—and must fit between the support posts of the rack. If you do not use a mechanical lift, installing the chassis safely requires two people to lift and an additional person to insert the mounting screws.

If you are installing multiple routers in one rack, install the lowest one first and proceed upward in the rack.

First, perform the following prerequisite procedures:

- Verify that the router site meets the requirements described in [“M10i Router Site Preparation Checklist” on page 75](#).
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure. For details, see [“Installation Safety Warnings for Juniper Networks Devices” on page 269](#).
- Read the following installation safety guidelines and warnings:
 - [M10i Chassis Lifting Guidelines on page 269](#)
 - [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
- Remove the router from the shipping carton, as described in [“Unpacking the M10i Router” on page 107](#).

Then perform the following procedures to install the router (see [Figure 27 on page 114](#) and [Figure 28 on page 115](#)):

1. If you are center-mounting the router, move the mounting brackets on the chassis from the front-mounting position to the center-mounting position. For instructions, see [“Moving the Mounting Brackets” on page 111](#).
2. Position the chassis at the appropriate height in the rack:
 - If using a mechanical lift, load the router onto the lift, making sure it rests securely on the lift platform. Use the lift to raise the chassis to the correct height.
 - If not using a mechanical lift, have one person stand behind the router and another person in front. Grasp the chassis, lift it, and position it at the correct height. Have a third person ready to install the mounting screws.
3. Align the bottom hole in both mounting brackets with a hole in each rack rail, making sure the chassis is level.

4. Install a mounting screw into each of the two aligned holes. Use a Phillips screwdriver to tighten the screws.
5. Moving up the router, install a mounting screw into the remaining holes in each mounting. At least two screws in each mounting bracket are required, at the top and bottom of the mounting bracket.
6. Verify that the router is level.
7. If using a mechanical lift, move it away from the rack.
8. To continue the installation, proceed to [“Initially Configuring the M10i Router” on page 131](#).

Figure 27: Installing the Chassis into a Open-Frame Rack

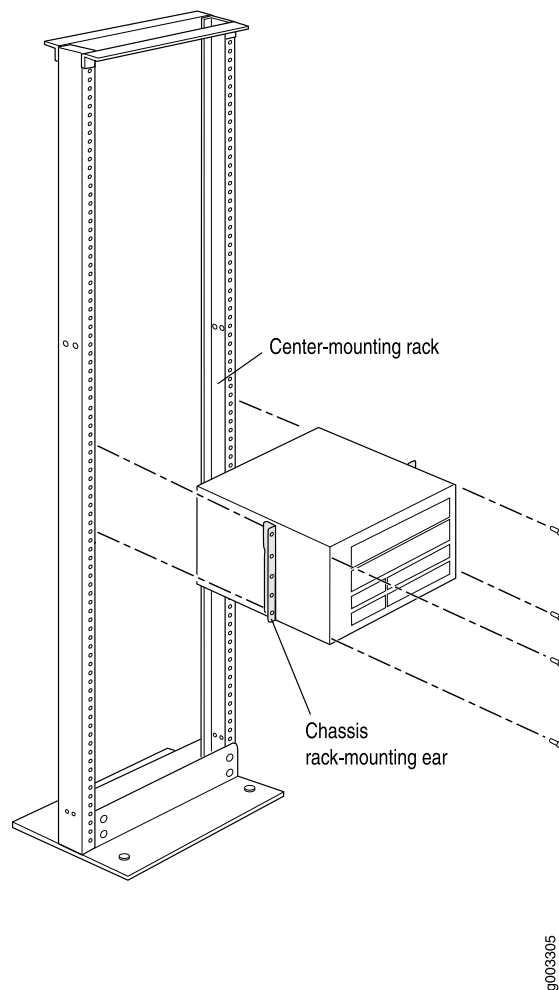
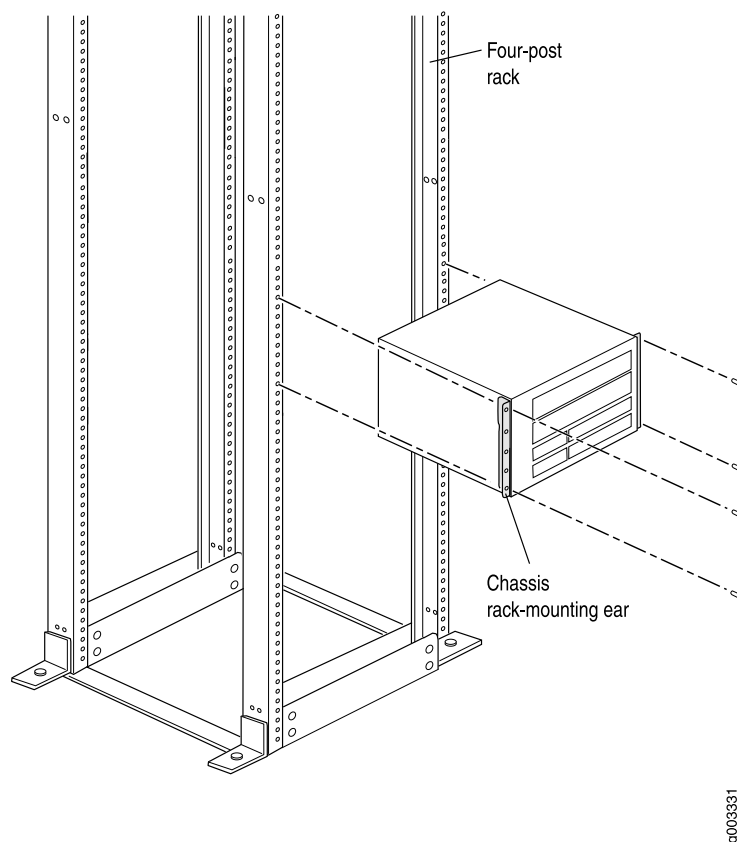


Figure 28: Installing the Chassis into a Four-Post Rack**Related Documentation**

- [M10i Rack Size and Strength on page 77](#)
- [M10i Chassis Description on page 11](#)
- [M10i Chassis Lifting Guidelines on page 269](#)

Connecting the M10i to Ground

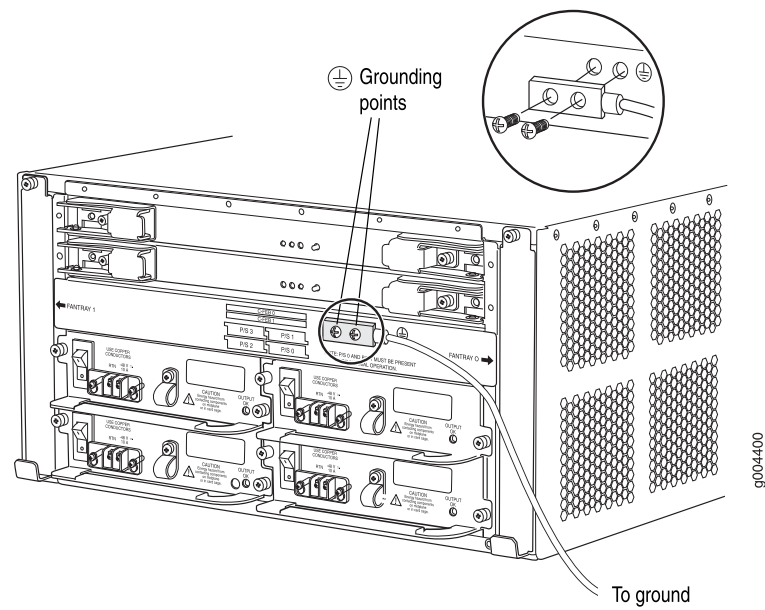
- [Grounding the M10i Router on page 117](#)

Grounding the M10i Router

You must provide the grounding cable. For grounding cable specifications, see [“M10i Chassis Grounding Cable and Lug Specifications” on page 81](#). To connect the grounding cable:

1. Verify that a licensed electrician has attached the two-hole cable lug provided with the router to the grounding cable.
2. Connect the grounding cable to a proper earth ground.
3. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
4. Using a number 2 Phillips screwdriver, remove the screws next to the grounding symbol above the power supplies on the chassis rear (see [Figure 29 on page 118](#)). Secure the grounding cable lug to the chosen grounding point by reinstalling and tightening the screws.
5. Verify that the grounding cable is connected correctly, 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 the Grounding Cable



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i Router Site Preparation Checklist on page 75](#)
- [Connecting Power on an AC-Powered M10i Router on page 123](#)
- [Connecting Power on an DC-Powered M10i Router on page 125](#)

CHAPTER 18

Connecting the M10i to External Devices

- [Connecting the M10i Router to External Devices on page 119](#)
- [Connecting the M10i Router to a Network for Out-of-Band Management on page 119](#)
- [Connecting to an M10i Management Console or Auxiliary Device on page 120](#)
- [Connecting M10i PIC Cables on page 121](#)

Connecting the M10i Router to External Devices

After you have grounded the M10i router, you can connect the following external devices:

- An external console or auxiliary device to the **CONSOLE** port on the Routing Engine.
[See “Connecting to an M10i Management Console or Auxiliary Device” on page 120](#)
- A laptop, modem, or other auxiliary device to the **AUX/MODEM** port on the Routing Engine.
[See “Connecting to an M10i Management Console or Auxiliary Device” on page 120.](#)
- A management network to the **MGMT** port on the Routing Engine.
[See “Connecting the M10i Router to a Network for Out-of-Band Management” on page 119.](#)

Related Documentation

- [M10i Chassis Description on page 11](#)
- [M10i Routing Engine 400 Description on page 23](#)
- [M10i Routing Engine 850 Description on page 25](#)
- [M10i Routing Engine Interface Ports on page 29](#)

Connecting the M10i Router to a Network for Out-of-Band Management

To connect the Routing Engine to a network for out-of-band management, connect an Ethernet cable with RJ-45/RJ-45 connectors to the **MGMT** port on the Routing Engine. One such cable is provided with the router. For cable specifications, see [“Routing Engine Interface Cable and Wire Specifications for M10i Routers” on page 99](#):

1. Turn off the power to the management device.

2. Plug one end of the Ethernet cable ([Figure 30 on page 120](#) shows the connector) into the **MGMT** port on the Routing Engine (see [Figure 31 on page 120](#)).
3. Plug the other end of the cable into the network device.

Figure 30: Routing Engine Ethernet Cable Connector

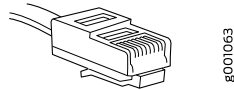
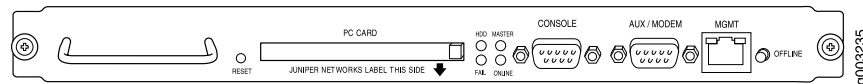


Figure 31: Routing Engine Management Ports



Related Documentation

- [M10i Chassis Description on page 11](#)
- [M10i Routing Engine 400 Description on page 23](#)
- [M10i Routing Engine 850 Description on page 25](#)
- [M10i Routing Engine Interface Ports on page 29](#)

Connecting to an M10i Management Console or Auxiliary Device

To use a system console to configure and manage the Routing Engine, connect it to the **CONSOLE** port on the Routing Engine. To use a laptop, modem, or other auxiliary device, connect it to the appropriate **AUX/MODEM** port on the Routing Engine. Both ports accept an RS-232 (EIA-232) serial cable with DB-9/DB-9 connectors. One cable is provided with the router. If you want to connect a device to both ports, you must supply another cable. See [“Routing Engine Interface Cable and Wire Specifications for M10i Routers” on page 99](#). To connect a management console or auxiliary device:

1. Turn off the power to the console or auxiliary device.
2. Plug the female end (shown in [Figure 32 on page 121](#)) of the provided console cable into the **CONSOLE** or **AUX/MODEM** port (see [Figure 33 on page 121](#)).



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

3. Using a 2.5 mm flat-blade screwdriver, tighten the screws on the connector.
4. Attach the other end of the cable to the console or auxiliary device.

Figure 32: Console and Auxiliary Serial Port Connector

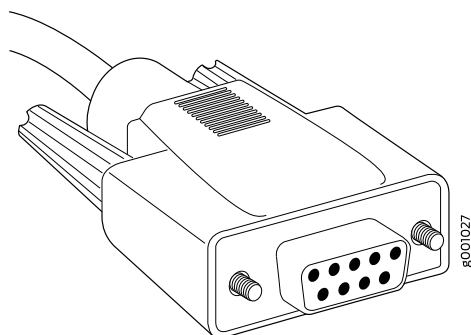
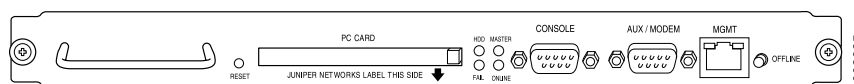


Figure 33: Routing Engine Management Ports



Related Documentation

- [M10i Chassis Description on page 11](#)
- [M10i Routing Engine 400 Description on page 23](#)
- [M10i Routing Engine 850 Description on page 25](#)
- [M10i Routing Engine Interface Ports on page 29](#)

Connecting M10i PIC Cables

Now connect PICs to the network by plugging in network cable. To connect cable to the PICs (see [Figure 34 on page 122](#), which shows a fiber-optic PIC):

1. Have ready a length of the type of cable used by the PIC. For cable specifications, see the *M10i Multiservice Edge Router Interface Module Reference*.
2. If the PIC 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 cable 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 PIC faceplate.
4. Arrange the cable in the cable management system 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 in the cable management system. Placing fasteners on the loop helps to maintain its shape.

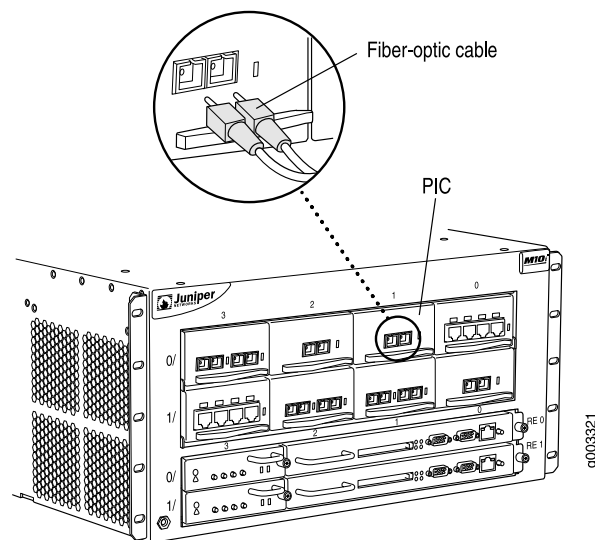


CAUTION: Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.



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.

Figure 34: Attaching Cable to a PIC



Related Documentation

- [M10i Chassis Description on page 11](#)
- [M10i PICs Description on page 51](#)
- [M10i Power System Description on page 63](#)

CHAPTER 19

Providing Power to the M10i

- [Tools and Parts Required to Connect the M10i Router to External Devices on page 123](#)
- [Connecting Power on an AC-Powered M10i Router on page 123](#)
- [Powering On an AC-Powered M10i Router on page 124](#)
- [Connecting Power on a DC-Powered M10i Router on page 125](#)
- [Powering On a DC-Powered M10i Router on page 128](#)
- [Powering Off the M10i Router on page 129](#)

Tools and Parts Required to Connect the M10i Router to External Devices

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

- Phillips (+) screwdrivers, numbers 1 and 2
- Flat-blade (-) screwdrivers, 2.5 mm for the connecting to the **CONSOLE** port or **AUX/MODEM** port on a Routing Engine and 3 mm
- Electrostatic damage (ESD) grounding wrist strap

Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Connecting to an M10i Management Console or Auxiliary Device on page 120](#)
- [Connecting the M10i Router to a Network for Out-of-Band Management on page 119](#)
- [Connecting M10i PIC Cables on page 121](#)

Connecting Power on an AC-Powered M10i Router

The AC power cord that plugs into the appliance inlet on the faceplate of each AC power supply provides direct connection to the external power source.

To connect AC power to the router:

1. Verify that the power supplies are fully inserted in the chassis and the thumbscrews on their faceplates are tightened.

2. For each power supply, plug in the ends of the AC power cord firmly into the appliance inlet on the power supply faceplate and the external power source receptacle.

**Related
Documentation**

- [M10i AC Power Supply Description on page 64](#)
- [M10i Router AC Power Supply Specifications on page 85](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Disconnecting Power on an AC-Powered M10i Router on page 208](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)

Powering On an AC-Powered M10i Router

To power on the router:

1. Verify that the power supplies are fully inserted in the chassis and the thumbscrews on their faceplates are tightened.
2. Verify that the ends of each AC power cord are firmly plugged into the appliance inlet on the power supply faceplate and the external power source receptacle.
3. Verify that an external management device is connected to one of the Routing Engine ports (**AUX/MODEM**, **CONSOLE**, or **MGMT**).



NOTE: The Ethernet **MGMT** port is not available until you complete the initial router software configuration after the router is powered on for the first time. You can monitor the startup process during the initial installation using devices connected to the **AUX/MODEM** or **CONSOLE** ports.

4. Turn on the power to the external management device.
5. Press the power switch on the faceplate of the power supplies in slots **P/S 0** and **P/S 1** to the **ON (|)** position.




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



NOTE: If the LED does not light after 60 seconds, verify that the power supply is properly inserted into the chassis and repeat the cable installation procedures described in [“Connecting Power on an AC-Powered M10i Router” on page 123](#).



NOTE: The Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#).

6. Verify that the **OUTPUT OK** LED on each power supply faceplate eventually lights steadily.
7. Press the power switch for any additional power supplies to the **ON** () position and verify that the **OUTPUT OK** LED on each power supply faceplate lights steadily.
8. On the external management device connected to the Routing Engine, monitor the startup process to verify that the system has booted properly.



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

Related Documentation

- [M10i AC Power Supply Description on page 64](#)
- [M10i Router AC Power Supply Specifications on page 85](#)
- [Connecting to an M10i Management Console or Auxiliary Device on page 120](#)
- [Connecting the M10i Router to a Network for Out-of-Band Management on page 119](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)

Connecting Power on an DC-Powered M10i Router

On a DC-powered router, the DC power cables from the external DC power sources connect to field-wiring terminals on each power supply.

Connect DC power to the router by inserting power cables into the field-wiring terminals on the faceplate of each power supply. DC power cables are not supplied with the router. For information about the required cable type, see [“M10i DC Power Cable and Lug Specifications” on page 90](#).



NOTE: The router must be connected to at least two separate external DC power sources.



CAUTION: 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 DC power cables that attach to the terminal studs on the power supply faceplate. You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity.

To connect DC power to the router (see [Figure 35 on page 127](#)):

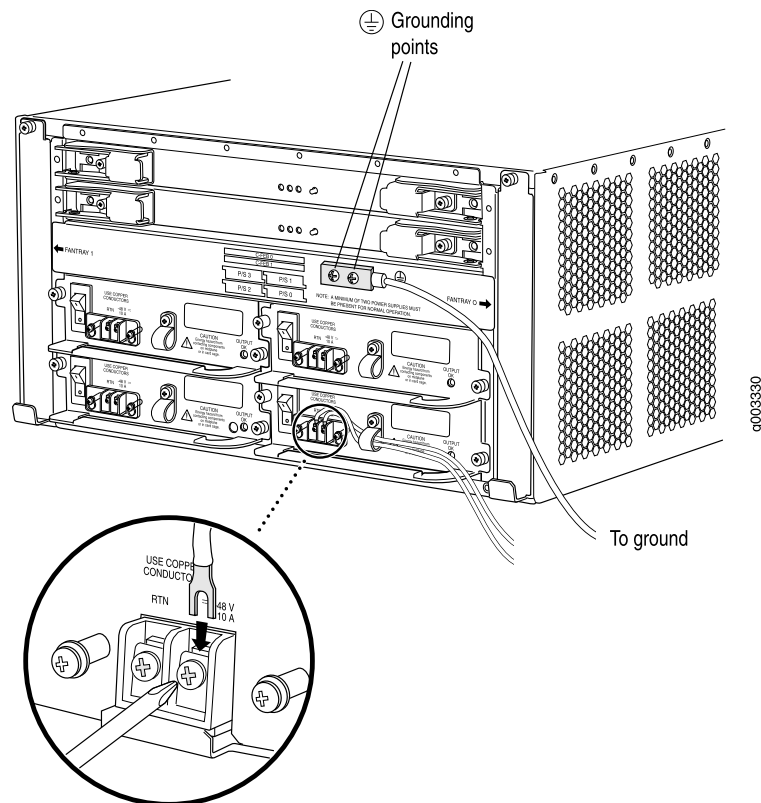
1. Verify that there is no power flowing from either external power source, so that the voltage across the leads of the DC power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
2. For each power supply, verify that the power switch on the power supply faceplate is in the **OFF (O)** position.
3. Verify that a licensed electrician has attached a listed DC power cable lug to each power source cable.
4. Loop the DC power cables through the hook located on the faceplate to the right of the field-wiring terminals.
5. Depending on the type of DC power cable lugs used, loosen or remove the screws on the field-wiring terminals.
6. Insert the DC power cable lugs into the appropriate field-wiring terminals. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal clockwise to secure the DC power cable lug. Apply between 8 lb-in. (.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw.
 - a. Insert the positive (+) source cable into the return terminal, which is labeled **RTN**.
 - b. Insert the negative (–) source cable into the input terminal, which is labeled **–48V**.



NOTE: The DC power supplies in slots P/S 0 and P/S 1 must be powered by dedicated power feeds derived from feed A, and the DC power supplies in slots P/S 2 and P/S 3 must be powered by dedicated power feeds derived from feed B. This configuration provides the commonly deployed A/B feed redundancy for the system.

7. Verify that the DC source power cabling and the grounding cabling are correct, that they are not touching or blocking access to router components, and that they do not drape where people could trip on them.

Figure 35: Connecting DC Power Cables to a DC Power Supply



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Router DC Power Supply Specifications on page 89](#)

Powering On a DC-Powered M10i Router

To power on a DC-powered router:

1. Verify that the power supplies are fully inserted in the chassis and the thumbscrews on their faceplates are tightened.
2. For each power supply on a DC-powered router, verify that the source DC power cables are connected to the appropriate terminal on the power supply faceplate: the positive (+) source cable to the return terminal (labeled **RTN**) and the negative (–) source cable to the input terminal (labeled **–48V**).
3. Verify that an external management device is connected to one of the Routing Engine ports on the Routing Engine (**AUX/MODEM**, **CONSOLE**, or **MGMT**).
4. Turn on the DC power source so that voltage flows to the router.
5. Turn on the power to the external management device.
6. Press the power switch for the power supplies in slots **P/S 0** and **P/S 1** to the **ON (|)** position. The power switch is located on the power supply faceplate.

The Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#). After powering on a power supply, wait at least 60 seconds before turning it off.



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

7. Press the power switch for any additional power supplies to the **ON (|)** position.
8. Verify that the green **OUTPUT OK** LED on each power supply faceplate lights steadily.



NOTE: If the LED does not light after 60 seconds, verify that the power supply is properly inserted into the chassis and repeat the cable installation procedures described in [“Connecting Power on an DC-Powered M10i Router” on page 125](#).

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

Related Documentation

- [Connecting to an M10i Management Console or Auxiliary Device on page 120](#)
- [Connecting the M10i Router to a Network for Out-of-Band Management on page 119](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Router DC Power Supply Specifications on page 89](#)

Powering Off the M10i Router

To power off the router:

1. On an external management device connected to the Routing Engine, issue the **request system halt both-routing-engines** operational mode command. The command shuts down the Routing Engines cleanly, so their state information is preserved. (If the router contains only one Routing Engine, issue the **request system halt** command.)



NOTE: The CFEB or CFEB-E might continue forwarding traffic for approximately 5 minutes after the **request system halt** command has been issued.

```
user@host> request system halt both-routing-engines
```

Wait until a message appears on the console confirming that the operating system has halted.

```
Halt the system ? [yes,no] (no) yes
*** FINAL System shutdown message from user@host ***
System going down IMMEDIATELY
Terminated
...
syncing disks... 11 8 done
The operating system has halted.
Please press any key to reboot.
```

For more information about the commands, see the [CLI Explorer](#).

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. For each power supply, press the power switch on the power supply faceplate to the **OFF (O)** position.



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

**Related
Documentation**

- [M10i AC Power Supply Description on page 64](#)
- [M10i DC Power Supply Description on page 65](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)

CHAPTER 20

Configuring the Junos Software

- [Initially Configuring the M10i Router on page 131](#)

Initially Configuring the M10i Router

The router is shipped with the Junos OS preinstalled and ready to be configured when the router is powered on. There are three copies of the software: one on a CompactFlash card (if installed) in the Routing Engine, one on the hard disk in the Routing Engine, and one on a PC card that can be inserted into the slot in the Routing Engine faceplate.

When the router boots, it first attempts to start the image on the PC card. If a PC card is not inserted into the Routing Engine or the attempt otherwise fails, the router next tries the CompactFlash card (if installed), and finally the hard disk.

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

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 one 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, as described in [“Powering On an AC-Powered M10i Router” on page 124](#) or [“Powering On a DC-Powered M10i Router” on page 128](#).
2. Log in as the root user. There is no password.

```
Amnesiac <tttyd0>
```

```
login: root
```

3. Start the CLI.

```
root@% cli  
root>
```

4. Enter configuration mode.

```
root> configure  
Entering configuration mode.  
[edit]  
root@#
```

5. Add a password to the root administration user account. Enter a clear-text password. For information about using an encrypted password, or an SSH public key string (DSA or RSA), see the *Junos OS Administration Library*.

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

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

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



NOTE: The DNS server does not use the host name to resolve to the correct IP address. This host name is used to display the name of the routing engine in the CLI. For example, this host name shows on the command line prompt when the user is logged on to the CLI:

```
user-name@host-name>
```

9. Configure the IP address of the DNS server.

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

10. Configure the router's domain name.

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

11. 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
```

12. Configure the IP address of a backup router. The backup router is used while the local router is booting and if the routing process fails to start. After the routing process starts, the backup router address is removed from the local routing and forwarding tables. For more information on the backup router, see the *Junos OS Administration Library*.

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

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 on 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]
set system services telnet
```

15. Optionally, display the configuration to verify that it is correct.

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

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

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

17. Optionally, 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>
```



NOTE: To reinstall the Junos OS, you boot the router from the removable media. Do not insert the removable media during normal operations. The router does not operate normally when it is booted from the removable media.

When the router boots from the storage media (removable media, CompactFlash card, or hard disk) it expands its search in the `/config` directory of the routing platform for the

following files in the following order: **juniper.conf** (the main configuration file), **rescue.conf** (the rescue configuration file), and **juniper.conf.1** (the first rollback configuration file). When the search finds the first configuration file that can be loaded properly, the file loads and the search ends. If none of the file can be loaded properly, the routing platform does not function properly. If the router boots from an alternate boot device, the Junos OS displays a message indicating this when you log in to the router.

**Related
Documentation**

- *Configuring CFEB Redundancy on the M10i Router*
- [Configuring the CompactFlash Card on an M10i Routing Engine on page 156](#)
- [M10i Router Site Preparation Checklist on page 75](#)

PART 4

Installing and Replacing Components

- [Overview of Installing and Replacing Components on page 139](#)
- [Replacing Chassis Components on page 141](#)
- [Replacing Cooling System Components on page 149](#)
- [Replacing Host Subsystem Components on page 153](#)
- [Replacing Line Card Components on page 173](#)
- [Replacing Power System Components on page 191](#)
- [Replacing Switch Fabric Components on page 211](#)

CHAPTER 21

Overview of Installing and Replacing Components

- [M10i Field-Replaceable Units \(FRUs\) on page 139](#)
- [Tools and Parts Required to Replace M10i Hardware Components on page 140](#)

M10i Field-Replaceable Units (FRUs)

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

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

[Table 54 on page 139](#) lists the FRUs for the M10i router.

Table 54: Field-Replaceable Units

Hot-Removable and Hot-Insertable FRUs	Hot-Pluggable FRUs	FRUs that Require Powering Off the Router
Fan tray	Compact Forwarding Engine Board (CFEB) (when swapping for an existing CFEB)	Nonredundant power supply (AC or DC)
Physical Interface Card (PIC)		AC power cord or DC power cable on a nonredundant power supply (AC or DC)
Redundant power supply (AC or DC)	Enhanced Compact Forwarding Engine Board (CFEB-E) (when swapping for an existing CFEB-E)	
Small form-factor pluggable (SFP)	High-Availability Chassis Manager (HCM)	
	Routing Engine	

- Related Documentation**
- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
 - [General Safety Warnings for Juniper Networks Devices on page 262](#)
 - [Guidelines for Packing M10i Components for Shipment on page 256](#)
 - [M10i Router Description on page 3](#)
 - [Contacting Customer Support on page 245](#)

Tools and Parts Required to Replace M10i Hardware Components

To replace hardware components, you need the tools and parts listed in [Table 55 on page 140](#).

Table 55: Tools and Parts Required

Tool or part	Components
Electrostatic bag or antistatic mat	<ul style="list-style-type: none"> • CFEB/CFEB-E • HCM • PIC • Routing Engine
Electrostatic discharge (ESD) grounding wrist strap	All
Flat-blade (–) screwdriver, 2.5 mm	Serial cable to AUX/MODEM or CONSOLE Routing Engine port
Needlenose pliers	CompactFlash card
Phillips (+) screwdrivers, numbers 1 and 2	<ul style="list-style-type: none"> • Fan tray • CFEB/CFEB-E • DC power cables • PIC • Power supply (AC or DC) • Routing Engine
Rubber safety cap	Fiber-optic PIC or PIC cable

- Related Documentation**
- [Displaying M10i Router Components and Serial Numbers on page 247](#)
 - [Guidelines for Packing M10i Components for Shipment on page 256](#)
 - [Contacting Customer Support on page 245](#)
 - [Routine Maintenance Procedures for the M10i Router on page 219](#)

CHAPTER 22

Replacing Chassis Components

- [Installing the M10i Cable Management System on page 141](#)
- [Installing an M10i HCM on page 142](#)
- [Replacing an M10i HCM on page 143](#)

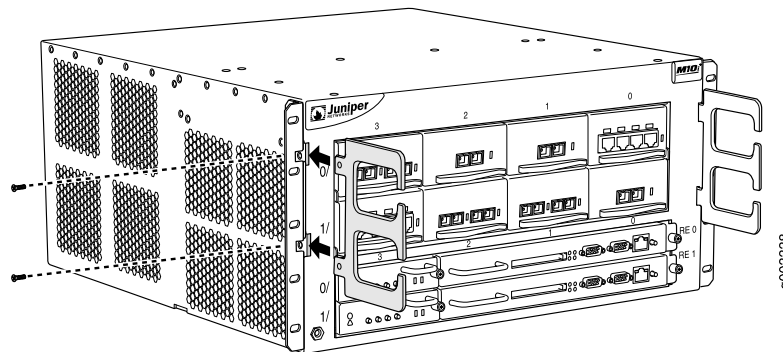
Installing the M10i Cable Management System

The cable management system organizes and supports the PIC cables to prevent damage.

To install the cable management system (see [Figure 36 on page 141](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Locate the cable management racks and appropriate screws in the accessory box.
3. Slide the cable management rack into the slots at the front of the chassis.
4. Use a number 2 Phillips screwdriver to tighten the screws that secure the cable management system to the chassis.

Figure 36: Installing the Cable Management System



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i Cable Management System Description on page 13](#)

- [M10i Chassis Description on page 11](#)

Installing an M10i HCM

To install an HCM (see [Figure 37 on page 143](#) and [Figure 38 on page 143](#)):

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 one hand under the HCM to support it and grasp the handle on the faceplate with the other hand.
3. Align the rear of the HCM with the guide rails inside the chassis and slide it in completely.



CAUTION: Align the HCM carefully with the guide rails and push it in evenly. Damage can result if it gets lodged in the rails because of uneven movement.

4. Place one hand under the Routing Engine to support it and grasp the handle on the faceplate with the other hand.
5. Align the rear of the Routing Engine with the guide rails inside the chassis and slide it in completely.



CAUTION: Align the Routing Engine carefully with the guide rails and push it in evenly. Damage can result if it gets lodged in the rails because of uneven movement.

6. Tighten the thumbscrews on the Routing Engine faceplate to secure the Routing Engine.
7. Issue the **show chassis hardware** command to verify that the HCM is functioning correctly.

Figure 37: Installing the HCM

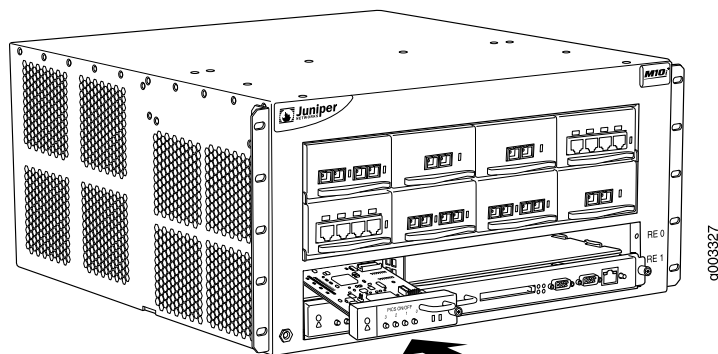
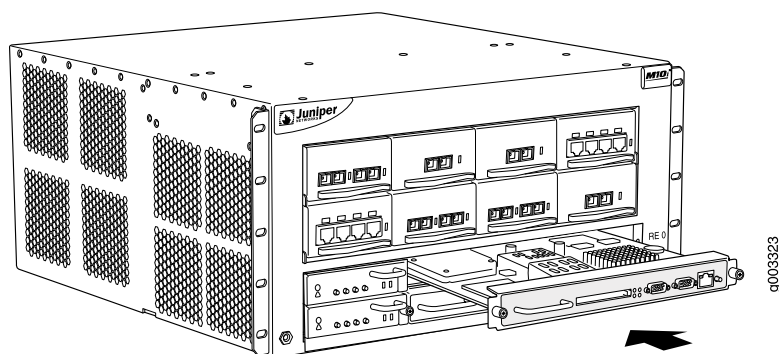


Figure 38: Installing a Routing Engine



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i HCM LEDs on page 16](#)
- [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
- [Troubleshooting the M10i HCM on page 230](#)
- [Removing an M10i HCM on page 143](#)

Replacing an M10i HCM

The HCM is hot-pluggable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on [page 139](#). For a description of the effect of removing an HCM, see “[M10i Routing Engine Description](#)” on [page 21](#).

1. [Removing an M10i HCM on page 143](#)
2. [Installing an M10i HCM on page 146](#)

Removing an M10i HCM

To remove an HCM (see [Figure 39 on page 146](#) and [Figure 40 on page 146](#)):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. If a Routing Engine is installed in the same row as the HCM you are removing, remove the Routing Engine first. If two Routing Engines are installed, use one of the following two methods to determine which is functioning as master:
 - Note which of the blue **MASTER** LEDs is lit on the Routing Engine faceplates.
 - Issue the following CLI command. The master Routing Engine is designated **Master** in the **Current state** field:

```
user@host> show chassis routing-engine
```

```
Routing Engine status:
Slot 0:
  Current state           Master
  Election priority       Master (default)
  Temperature             27 degrees C / 80 degrees F
  CPU temperature         27 degrees C / 80 degrees F
  DRAM                    768 MB
  Memory utilization      45 percent
  CPU utilization:
    User                  0 percent
    Background            0 percent
    Kernel                3 percent
    Interrupt             0 percent
    Idle                  97 percent
  Model                   RE-5.0
  Serial ID               1000647001
  Start time              2009-01-28 14:11:50 PST
  Uptime                  21 hours, 51 minutes, 16 seconds
  Load averages:         1 minute  5 minute  15 minute
                        0.00        0.02      0.00
```

```
Routing Engine status:
Slot 1:
  Current state           Backup
  Election priority       Backup (default)
  Temperature             26 degrees C / 78 degrees F
  CPU temperature         27 degrees C / 80 degrees F
  DRAM                    1536 MB
  Memory utilization      23 percent
  CPU utilization:
    User                  0 percent
    Background            0 percent
    Kernel                0 percent
    Interrupt             0 percent
    Idle                  99 percent
  Model                   RE-850
  Serial ID               1000648260
  Start time              2009-01-28 16:18:12 PST
  Uptime                  19 hours, 44 minutes, 51 seconds
```

3. If you are removing the master Routing Engine and a second Routing Engine is installed, issue the following CLI command to switch mastership to the backup host module:

```
user@host> request chassis routing-engine master switch
```




NOTE: Router performance might change if the backup Routing Engine's configuration differs from the former master's configuration. For the most predictable performance, configure the two Routing Engines identically, except for parameters unique to a Routing Engine, such as the hostname defined at the [edit system] hierarchy level and the management interface (fxp0 or equivalent) defined at the [edit interfaces] hierarchy level.

To configure Routing Engine-specific parameters and still use the same configuration on both Routing Engines, include the appropriate configuration statements under the re0 and re1 statements at the [edit groups] hierarchy level and use the apply-groups statement. For instructions, see the *Junos OS Administration Library*.

4. On the console or other management device connected to the Routing Engine, enter CLI operational mode and issue the following command to shut down the router software cleanly and preserve Routing Engine state information.

```
user@host> request system halt
```



NOTE: 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](#).



NOTE: The CFEB might continue forwarding traffic for approximately 5 minutes after the request system halt command has been issued.

5. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
6. Loosen the thumbscrews located at each end of the Routing Engine faceplate, using a Phillips screwdriver if necessary.
7. Grasp the handle and slide the unit about halfway out of the chassis.



CAUTION: Slide the Routing Engine straight out of the chassis. Damage can result if it gets lodged because of uneven movement.

8. Place one hand under the Routing Engine to support it, slide it completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.

9. Grasp the handle of the HCM and slide the unit about halfway out of the chassis.



CAUTION: Slide the HCM straight out of the chassis. Damage can result if it gets lodged because of uneven movement.

10. Place one hand under the HCM to support it, slide it completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.

Figure 39: Removing a Routing Engine

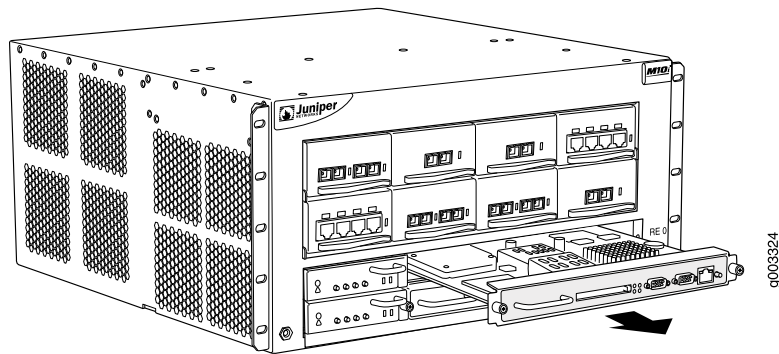
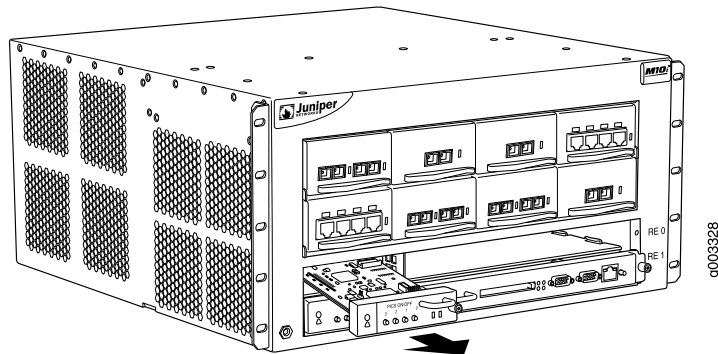


Figure 40: Removing an HCM



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i HCM LEDs on page 16](#)
 - [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
 - [Troubleshooting the M10i HCM on page 230](#)
 - [Installing an M10i HCM on page 142](#)

Installing an M10i HCM

To install an HCM (see [Figure 37 on page 143](#) and [Figure 38 on page 143](#)):

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 one hand under the HCM to support it and grasp the handle on the faceplate with the other hand.
3. Align the rear of the HCM with the guide rails inside the chassis and slide it in completely.



CAUTION: Align the HCM carefully with the guide rails and push it in evenly. Damage can result if it gets lodged in the rails because of uneven movement.

4. Place one hand under the Routing Engine to support it and grasp the handle on the faceplate with the other hand.
5. Align the rear of the Routing Engine with the guide rails inside the chassis and slide it in completely.



CAUTION: Align the Routing Engine carefully with the guide rails and push it in evenly. Damage can result if it gets lodged in the rails because of uneven movement.

6. Tighten the thumbscrews on the Routing Engine faceplate to secure the Routing Engine.
7. Issue the **show chassis hardware** command to verify that the HCM is functioning correctly.

Figure 41: Installing the HCM

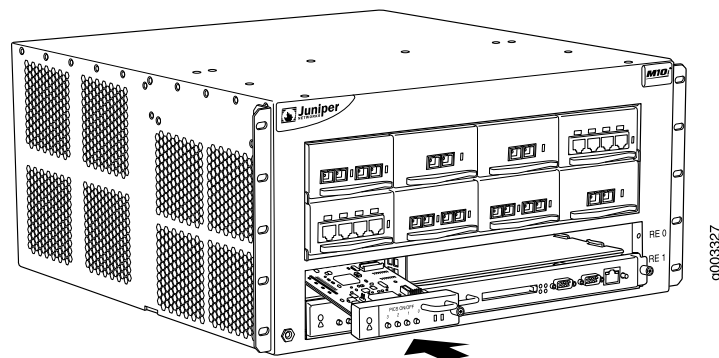
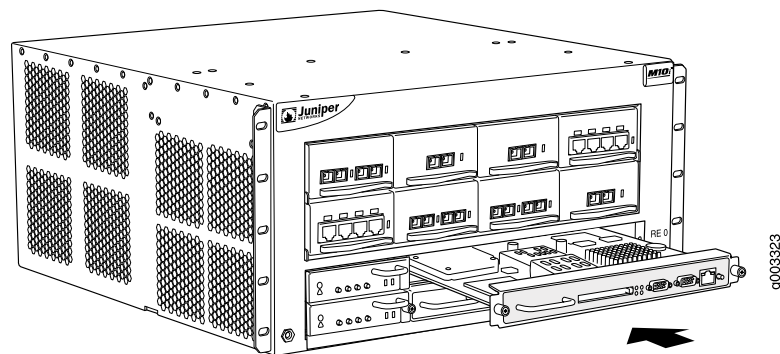


Figure 42: Installing a Routing Engine

- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i HCM LEDs on page 16](#)
 - [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
 - [Troubleshooting the M10i HCM on page 230](#)
 - [Removing an M10i HCM on page 143](#)

- Related Documentation**
- [M10i HCM LEDs on page 16](#)
 - [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
 - [Troubleshooting the M10i HCM on page 230](#)

Replacing Cooling System Components

- Installing an M10i Fan Tray on page 149
- Replacing an M10i Fan Tray on page 150

Installing an M10i Fan Tray

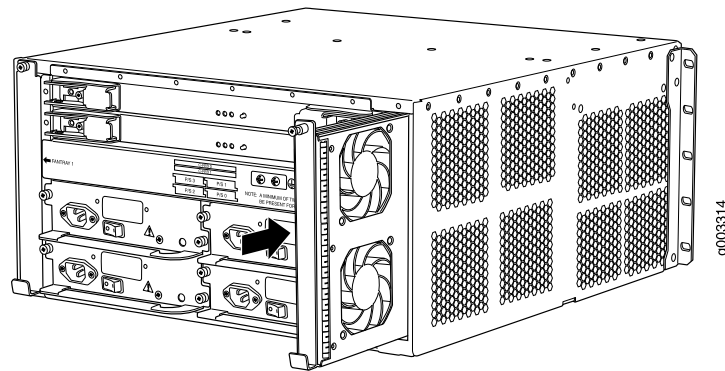
To install a fan tray (see [Figure 43 on page 150](#)):



CAUTION: For proper airflow, the primary fan tray should be installed in slot 1, on the left rear of the chassis. The redundant fan tray should be installed in slot 0 on the right.

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 handle on the faceplate of the fan tray with one hand and place the other hand under the unit to support it. Orient the fan tray so that the thumbscrew is at the top of the tray.
3. Slide the tray into the slot.
4. Tighten the thumbscrew to seat the fan tray firmly in the chassis.

Figure 43: Installing a Fan Tray



Related Documentation

- [M10i Fan Tray Description on page 19](#)
- [Troubleshooting the M10i Fan Tray on page 230](#)
- [Maintaining the M10i Cooling System on page 221](#)
- [Removing an M10i Fan Tray on page 150](#)

Replacing an M10i Fan Tray

The fan trays install into the rear of the chassis, as shown in [Figure 6 on page 12](#). They each house eight fans and weigh approximately 4 lb (1.8 kg).

1. [Removing an M10i Fan Tray on page 150](#)
2. [Installing an M10i Fan Tray on page 151](#)

Removing an M10i Fan Tray

To remove a fan tray (see [Figure 44 on page 151](#)):



CAUTION: Do not remove both fan trays for more than one minute while the router is operating. The fans are the sole source of cooling, and the router can overheat when they are absent.

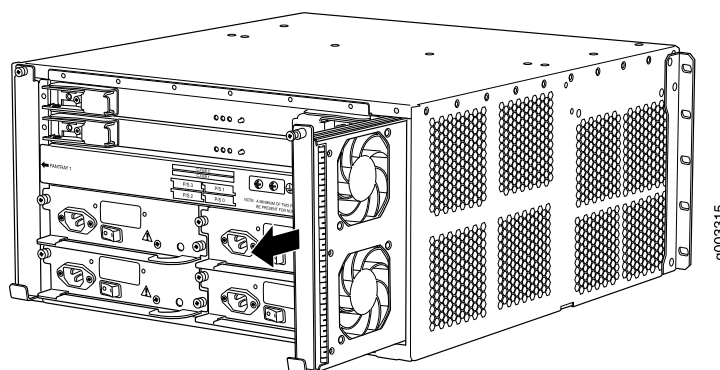
1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Loosen the thumbscrew at the top of the fan tray faceplate, using a Phillips screwdriver if necessary.
3. Grasp the handle on the faceplate and slide the tray about halfway out of the chassis.



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

4. Place one hand under the fan tray to support it and slide the tray completely out of the chassis after the fans stop spinning.

Figure 44: Removing a Fan Tray



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Fan Tray Description on page 19](#)
 - [Troubleshooting the M10i Fan Tray on page 230](#)
 - [Maintaining the M10i Cooling System on page 221](#)
 - [Installing an M10i Fan Tray on page 149](#)

Installing an M10i Fan Tray

To install a fan tray (see [Figure 43 on page 150](#)):

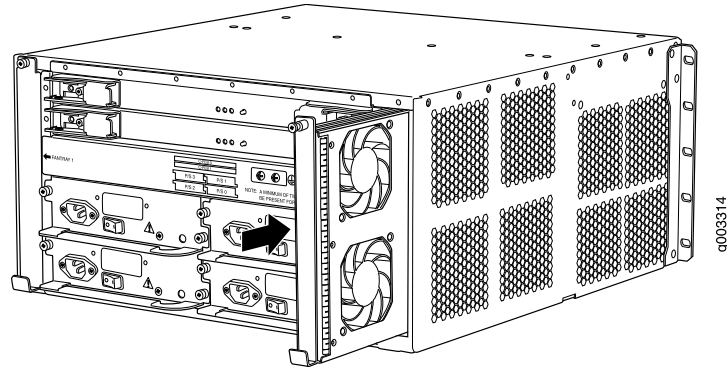


CAUTION: For proper airflow, the primary fan tray should be installed in slot 1, on the left rear of the chassis. The redundant fan tray should be installed in slot 0 on the right.

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 handle on the faceplate of the fan tray with one hand and place the other hand under the unit to support it. Orient the fan tray so that the thumbscrew is at the top of the tray.

3. Slide the tray into the slot.
4. Tighten the thumbscrew to seat the fan tray firmly in the chassis.

Figure 45: Installing a Fan Tray



See Also

- [M10i Fan Tray Description on page 19](#)
- [Troubleshooting the M10i Fan Tray on page 230](#)
- [Maintaining the M10i Cooling System on page 221](#)
- [Removing an M10i Fan Tray on page 150](#)

Related Documentation

- [M10i Fan Tray Description on page 19](#)
- [Troubleshooting the M10i Fan Tray on page 230](#)
- [Maintaining the M10i Cooling System on page 221](#)

Replacing Host Subsystem Components

- Installing the M10i Routing Engine on page 153
- Inserting the PC Card in an M10i Routing Engine on page 154
- Installing the CompactFlash Card in an M10i Routing Engine on page 155
- Configuring the CompactFlash Card on an M10i Routing Engine on page 156
- Installing an SDRAM Module in an M10i Routing Engine on page 157
- Replacing the M10i Routing Engine on page 158
- Removing and Inserting the PC Card from an M10i Routing Engine on page 162
- Replacing the CompactFlash Card in an M10i Routing Engine on page 165
- Replacing an SDRAM Module on an M10i Routing Engine on page 167
- Replacing the SSD on an RE-B-1800 Routing Engine on page 169
- Replacing an M10i Ethernet Management Cable on page 171
- Replacing an M10i Console or Auxiliary Cable on page 171

Installing the M10i Routing Engine

To install a Routing Engine (see [Figure 46 on page 154](#)):

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 one hand under the Routing Engine to support it and grasp the handle on the faceplate with the other hand.
3. Align the rear of the Routing Engine with the guide rails inside the chassis and slide it in completely.



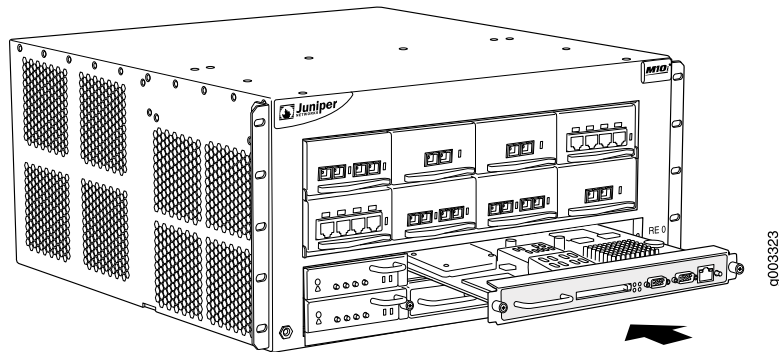
CAUTION: Align the Routing Engine carefully with the guide rails and push it in evenly. Damage can result if the Routing Engine gets lodged in the rails because of uneven movement.

4. Tighten the thumbscrews on the Routing Engine faceplate to secure the Routing Engine.

The Routing Engine might require several minutes to boot.

5. After the Routing Engine boots, issue the **show chassis routing-engine** command to verify correct Routing Engine functioning.

Figure 46: Installing a Routing Engine



Related Documentation

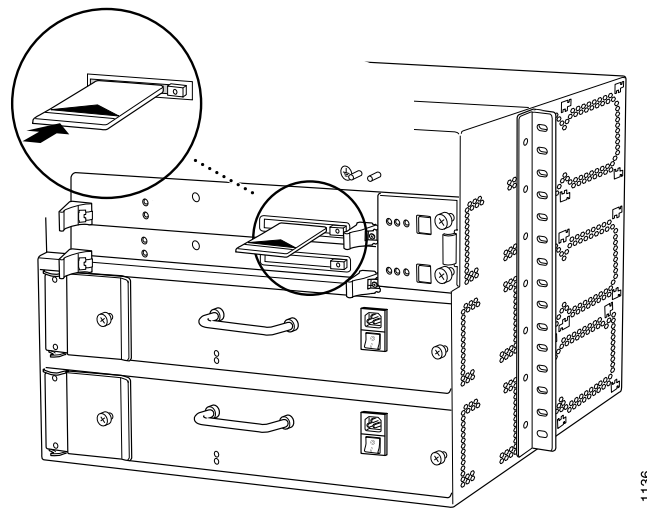
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Removing the M10i Routing Engine on page 159](#)

Inserting the PC Card in an M10i Routing Engine

To insert the PC Card (see [Figure 47 on page 155](#)):

1. Orient the PC Card with the Juniper Networks logo facing in the direction specified on the Routing Engine faceplate. Insert the card into the slot.
2. Press the card firmly all the way into the slot. Note that the PC Card slot might be located in a different position from that shown in [Figure 47 on page 155](#).

Figure 47: Inserting the PC Card



Related Documentation

- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Removing the PC Card from an M10i Routing Engine on page 163](#)

Installing the CompactFlash Card in an M10i Routing Engine

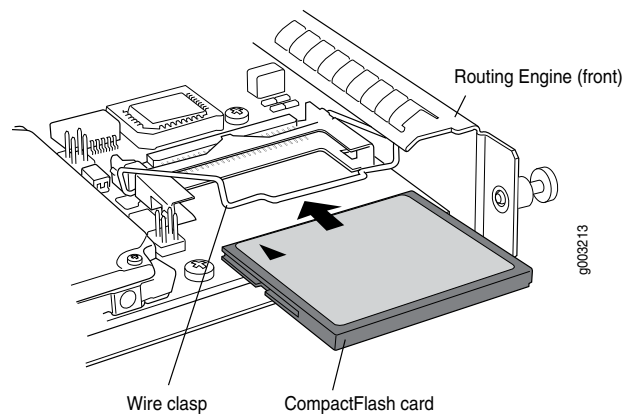
To install the CompactFlash card (see [Figure 48 on page 156](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. If the CompactFlash card is in a PCMCIA card adapter, slide it out of the adapter.
3. Orient the CompactFlash card with the Juniper Networks logo facing up. Slide the CompactFlash card into the connector on the Routing Engine (see [Figure 48 on page 156](#)).



NOTE: If there is no Juniper Networks logo on the CompactFlash card, orient the CompactFlash card so that the manufacturer's product code sticker is facing down.

4. Use needlenose pliers with grooved jaws to lower and secure the wire clasp.
5. Install the Routing Engine as described in ["Installing the M10i Routing Engine" on page 153](#).

Figure 48: Inserting the CompactFlash Card

Related Documentation

- [Installing the M10i Routing Engine on page 153](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Removing the CompactFlash Card from an M10i Routing Engine on page 165](#)

Configuring the CompactFlash Card on an M10i Routing Engine

After installing the CompactFlash card for the first time, you must copy the software from the Routing Engine's hard disk to the CompactFlash card.

To copy software to the CompactFlash card, perform the following procedure:

1. Install the CompactFlash card and replace the Routing Engine as described in ["Installing the CompactFlash Card in an M10i Routing Engine" on page 155](#) and ["Installing the M10i Routing Engine" on page 153](#).

2. Log into the UNIX shell on your router, and change to the `/var/tmp` directory.

3. Format the CompactFlash card using the following commands:

```
dd if=/dev/zero of=/dev/ad0 count=20
```

4. On the console or other management device connected to the Routing Engine, enter CLI operational mode and issue the following command to copy the currently running and active file system partitions on the router to standby partitions on the CompactFlash card.

```
user@host> request system snapshot partition
```

Wait until a message appears on the console confirming that the procedure is complete.

5. Issue the following command to reboot the router's software:

```
user@host> request system reboot
```

The CompactFlash card will now be the primary boot device.

6. You can verify correct boot order by issuing the **show system boot-messages** command. The output lists the devices mounted. The CompactFlash card is located at **ad0**.

Related Documentation

- *request system snapshot*
- *show system boot-messages*
- [Installing the M10i Routing Engine on page 153](#)
- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)

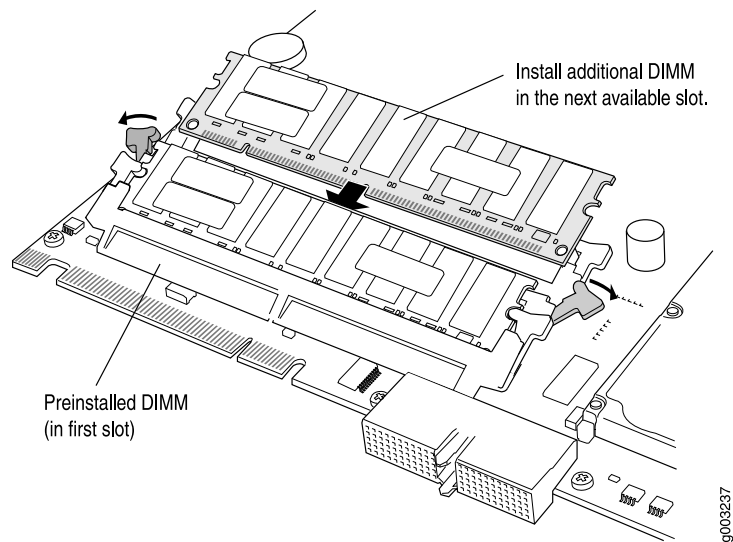
Installing an SDRAM Module in an M10i Routing Engine

To insert a SDRAM module onto the Routing Engine (see [Figure 49 on page 158](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Remove the SDRAM module from its electrostatic bag.
3. To open the empty SDRAM slot, press the plastic ejectors on both sides.
4. Grasp the SDRAM module by the edges, being careful not to touch any electrical components.
5. Pressing firmly on both ends, push the module into the slot until the ejectors return completely to the closed position.
6. Install the Routing Engine as described in ["Installing the M10i Routing Engine" on page 153](#).

You can view the SDRAM configuration and verify it was installed correctly by issuing the **show chassis routing-engine** command, described in ["Maintaining the M10i Routing Engine" on page 222](#).

Figure 49: Installing the SDRAM Module



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Removing an SDRAM Module from an M10i Routing Engine on page 167](#)

Replacing the M10i Routing Engine

The Routing Engines are hot-pluggable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on [page 139](#). If two Routing Engines are installed, removal or failure of the backup Routing Engine does not affect router function. Removal or failure of the master Routing Engine affects forwarding and routing depending on your high availability configuration. For detailed information, see “[M10i Routing Engine Description](#)” on [page 21](#).



NOTE: You can use RE-400 and RE-850 at the same time while upgrading to RE-B-1800.

To replace a Routing Engine, perform the following procedures:

1. [Removing the M10i Routing Engine on page 159](#)
2. [Installing the M10i Routing Engine on page 161](#)

Removing the M10i Routing Engine

To remove a Routing Engine (see [Figure 50 on page 161](#)):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. If two Routing Engines are installed, use one of the following two methods to determine which is functioning as master:
 - Note which of the blue **MASTER** LEDs is lit on the Routing Engine faceplates.
 - Issue the following CLI command. The master Routing Engine is designated **Master** in the **Current state** field:

```
user@host> show chassis routing-engine
```

Routing Engine status:

Slot 0:

Current state	Master
Election priority	Master (default)
Temperature	27 degrees C / 80 degrees F
CPU temperature	27 degrees C / 80 degrees F
DRAM	768 MB
Memory utilization	45 percent
CPU utilization:	
User	0 percent
Background	0 percent
Kernel	3 percent
Interrupt	0 percent
Idle	97 percent
Model	RE-5.0
Serial ID	1000647001
Start time	2009-01-28 14:11:50 PST
Uptime	21 hours, 51 minutes, 16 seconds
Load averages:	1 minute 5 minute 15 minute
	0.00 0.02 0.00

Routing Engine status:

Slot 1:

Current state	Backup
Election priority	Backup (default)
Temperature	26 degrees C / 78 degrees F
CPU temperature	27 degrees C / 80 degrees F
DRAM	1536 MB
Memory utilization	23 percent
CPU utilization:	
User	0 percent
Background	0 percent
Kernel	0 percent
Interrupt	0 percent
Idle	99 percent
Model	RE-850
Serial ID	1000648260
Start time	2009-01-28 16:18:12 PST
Uptime	19 hours, 44 minutes, 51 seconds

3. If you are removing the master Routing Engine and a second Routing Engine is installed, issue the following CLI command to switch mastership to the backup host module:

user@host> request chassis routing-engine master switch



NOTE: Router performance might change if the backup Routing Engine's configuration differs from the former master's configuration. For the most predictable performance, configure the two Routing Engines identically, except for parameters unique to a Routing Engine, such as the hostname defined at the [edit system] hierarchy level and the management interface (fxp0 or equivalent) defined at the [edit interfaces] hierarchy level.

To configure Routing Engine-specific parameters and still use the same configuration on both Routing Engines, include the appropriate configuration statements under the re0 and re1 statements at the [edit groups] hierarchy level and use the apply-groups statement. For instructions, see the *Junos OS Administration Library*.

4. On the console or other management device connected to the Routing Engine, enter CLI operational mode and issue the following command to shut down the router software cleanly and preserve Routing Engine state information.

user@host> request system halt



NOTE: 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](#).



NOTE: The CFEB might continue forwarding traffic for approximately 5 minutes after the request system halt command has been issued.

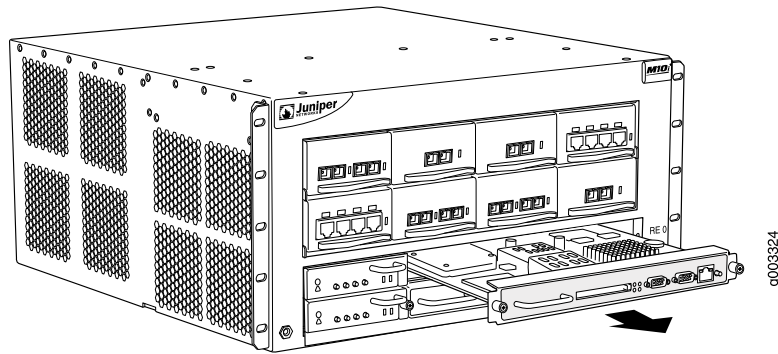
5. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
6. Loosen the thumbscrews located at each end of the Routing Engine faceplate, using a Phillips screwdriver if necessary.
7. Grasp the handle and slide the unit about halfway out of the chassis.



CAUTION: Slide the Routing Engine straight out of the chassis. Damage can result if the Routing Engine gets lodged because of uneven movement.

8. Place one hand under the Routing Engine to support it, slide it completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.

Figure 50: Removing a Routing Engine



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Installing the M10i Routing Engine on page 153](#)

Installing the M10i Routing Engine

To install a Routing Engine (see [Figure 46 on page 154](#)):

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 one hand under the Routing Engine to support it and grasp the handle on the faceplate with the other hand.
3. Align the rear of the Routing Engine with the guide rails inside the chassis and slide it in completely.



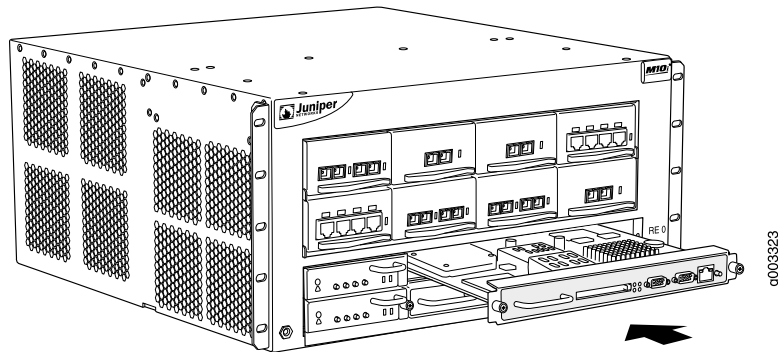
CAUTION: Align the Routing Engine carefully with the guide rails and push it in evenly. Damage can result if the Routing Engine gets lodged in the rails because of uneven movement.

4. Tighten the thumbscrews on the Routing Engine faceplate to secure the Routing Engine.

The Routing Engine might require several minutes to boot.

5. After the Routing Engine boots, issue the **show chassis routing-engine** command to verify correct Routing Engine functioning.

Figure 51: Installing a Routing Engine



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Removing the M10i Routing Engine on page 159](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Synchronizing Routing Engines](#)

Removing and Inserting the PC Card from an M10i Routing Engine

A slot labeled **PC CARD** on the Routing Engine faceplate accepts a Type I PC Card, as defined in the *PC Card Standard* published by the Personal Computer Memory Card International Association (PCMCIA). The router is shipped with a PC Card that contains Junos OS. The PC Card can be used to copy Junos OS from the PC Card onto the Routing Engine. You can also copy Junos OS from the Routing Engine onto a PC Card, for example, to create a backup copy of upgrade software that you have obtained from Juniper Networks. Instructions for copying software to a PC Card are available at the Juniper

Networks Support Web site (<https://www.juniper.net/support/>); after logging in, navigate to the Customer Support Center, then to the download page for Junos OS.



NOTE: The appearance and position of electronic components or the PC Card slot on your Routing Engine might differ from the figures in this section. These differences do not affect Routing Engine installation and removal or functionality.



NOTE: The software on a PC Card is loaded only onto the Routing Engine into which the PC Card is inserted. It is not automatically copied to the other Routing Engine.

To remove and insert a PC Card, perform the following procedures:

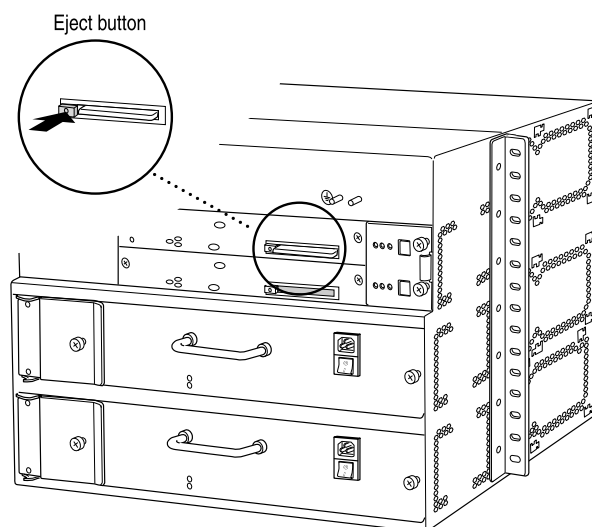
- [Removing the PC Card from an M10i Routing Engine on page 163](#)
- [Inserting the PC Card in an M10i Routing Engine on page 164](#)

Removing the PC Card from an M10i Routing Engine

The PC Card is inserted in the slot labeled **PC CARD** in the Routing Engine faceplate. To remove the PC Card (see [Figure 52 on page 163](#)):

1. Press the eject button located next to the PC Card slot in the Routing Engine faceplate. Note that the PC Card slot might be located in a different position from that shown in [Figure 52 on page 163](#).
2. When the PC Card pops partially out of the slot, grasp the card and pull it straight out of the slot.

Figure 52: Removing the PC Card



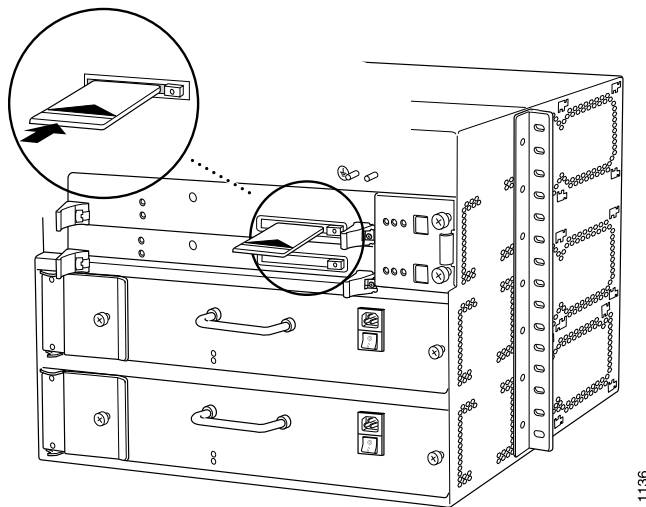
- See Also**
- [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Inserting the PC Card in an M10i Routing Engine on page 154](#)

Inserting the PC Card in an M10i Routing Engine

To insert the PC Card (see [Figure 47 on page 155](#)):

1. Orient the PC Card with the Juniper Networks logo facing in the direction specified on the Routing Engine faceplate. Insert the card into the slot.
2. Press the card firmly all the way into the slot. Note that the PC Card slot might be located in a different position from that shown in [Figure 47 on page 155](#).

Figure 53: Inserting the PC Card



1136

- See Also**
- [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Removing the PC Card from an M10i Routing Engine on page 163](#)

- Related Documentation**
- [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)

Replacing the CompactFlash Card in an M10i Routing Engine

The CompactFlash card is an optional component of the Routing Engine 400 and a standard component of the Routing Engine 850. If installed, it provides primary storage for the router. It accommodates software images, configuration files, and microcode.

To remove, install, and configure a CompactFlash card, perform the following procedures:

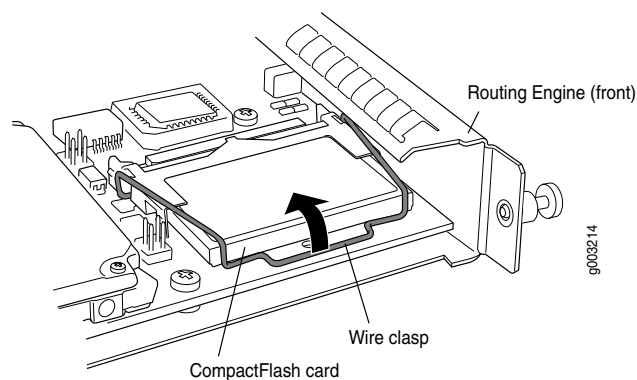
- [Removing the CompactFlash Card from an M10i Routing Engine on page 165](#)
- [Installing the CompactFlash Card in an M10i Routing Engine on page 166](#)

Removing the CompactFlash Card from an M10i Routing Engine

The CompactFlash card is located inside the Routing Engine. To remove the CompactFlash card (see [Figure 54 on page 165](#)):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
3. Remove the Routing Engine as described in “[Replacing the M10i Routing Engine](#)” on [page 158](#).
4. Use needlenose pliers with grooved jaws to pull the wire clasp out from under the CompactFlash card and lift it up (see [Figure 54 on page 165](#)).
5. Use the needlenose pliers to gently grasp the CompactFlash card and slide it out of the connector. Place the CompactFlash card on the antistatic mat or in the electrostatic bag.

Figure 54: Removing the CompactFlash Card



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)

- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Installing the CompactFlash Card in an M10i Routing Engine on page 155](#)

Installing the CompactFlash Card in an M10i Routing Engine

To install the CompactFlash card (see [Figure 48 on page 156](#)):

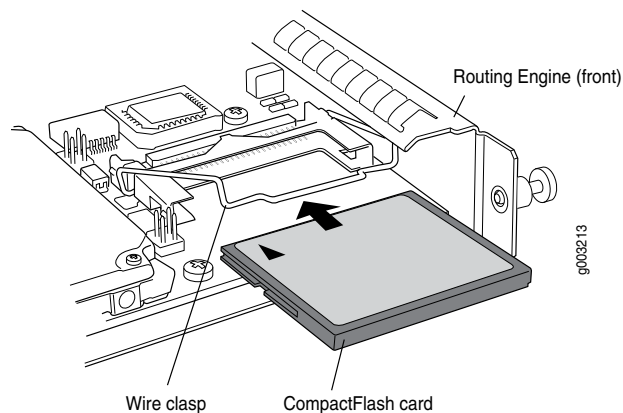
1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. If the CompactFlash card is in a PCMCIA card adapter, slide it out of the adapter.
3. Orient the CompactFlash card with the Juniper Networks logo facing up. Slide the CompactFlash card into the connector on the Routing Engine (see [Figure 48 on page 156](#)).



NOTE: If there is no Juniper Networks logo on the CompactFlash card, orient the CompactFlash card so that the manufacturer's product code sticker is facing down.

4. Use needlenose pliers with grooved jaws to lower and secure the wire clasp.
5. Install the Routing Engine as described in ["Installing the M10i Routing Engine" on page 153](#).

Figure 55: Inserting the CompactFlash Card



- See Also**
- [Installing the M10i Routing Engine on page 153](#)
 - [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)

- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Removing the CompactFlash Card from an M10i Routing Engine on page 165](#)

Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Installing the M10i Routing Engine on page 153](#)
- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)

Replacing an SDRAM Module on an M10i Routing Engine

The SDRAM installed on the Routing Engine provides storage for the routing and forwarding tables and for other Routing Engine processes. The design of the Routing Engine allows you to modify the SDRAM configuration by adding DIMM memory modules to or removing modules from the Routing Engine. The Routing Engine contains from one to three 168-pin DIMMs.

1. [Removing an SDRAM Module from an M10i Routing Engine on page 167](#)
2. [Installing an SDRAM Module in an M10i Routing Engine on page 168](#)

Removing an SDRAM Module from an M10i Routing Engine

The SDRAM modules are located on the top of the Routing Engine. To remove a SDRAM module:

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
3. Remove the Routing Engine as described in [“Replacing the M10i Routing Engine” on page 158](#).
4. To release the SDRAM module, press the plastic ejectors on both sides of the module.
5. Grasp the SDRAM module, being careful not to touch any electrical components on the module, and firmly pull it out of the slot on the Routing Engine.

6. Place the SDRAM module on the antistatic mat or in the electrostatic bag.
7. Push the plastic ejectors to close the empty SDRAM module slot.

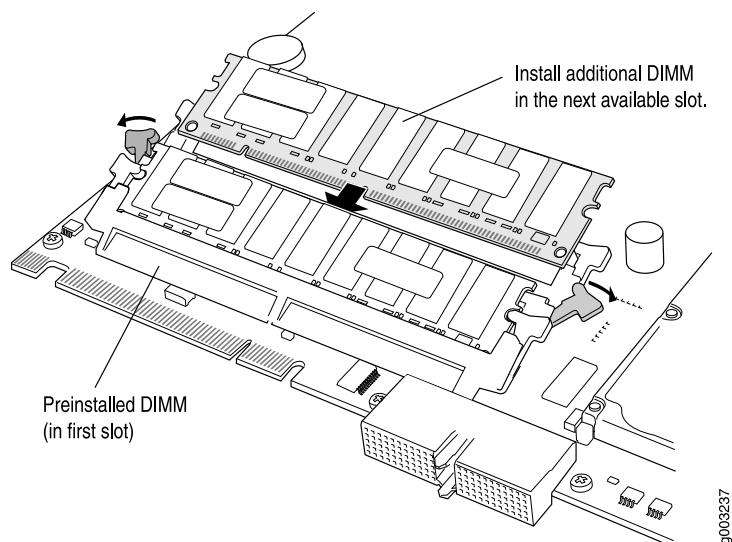
- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Installing an SDRAM Module in an M10i Routing Engine on page 157](#)

Installing an SDRAM Module in an M10i Routing Engine

To insert a SDRAM module onto the Routing Engine (see [Figure 49 on page 158](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Remove the SDRAM module from its electrostatic bag.
3. To open the empty SDRAM slot, press the plastic ejectors on both sides.
4. Grasp the SDRAM module by the edges, being careful not to touch any electrical components.
5. Pressing firmly on both ends, push the module into the slot until the ejectors return completely to the closed position.
6. Install the Routing Engine as described in [“Installing the M10i Routing Engine” on page 153](#).

You can view the SDRAM configuration and verify it was installed correctly by issuing the **show chassis routing-engine** command, described in [“Maintaining the M10i Routing Engine” on page 222](#).

Figure 56: Installing the SDRAM Module

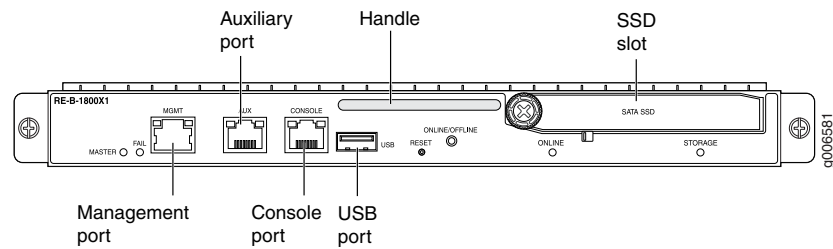
- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Removing an SDRAM Module from an M10i Routing Engine on page 167](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Installing the M10i Routing Engine on page 153](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)

Replacing the SSD on an RE-B-1800 Routing Engine

The RE-B-1800 Routing Engine supports a solid-state drive (SSD) specified by Juniper Networks and ships with one SSD installed. [Figure 57 on page 170](#) shows the arrangement of storage drive slots on an RE-B-1800 Routing Engine.

Figure 57: RE-B-1800 Storage Drive Slots



The following drive has been verified to work in the RE-B-1800 Routing Engines:

- SSD SLC 64 GB

To replace a storage drive:

1. Disable and deactivate the storage drive.
2. Remove the storage drive.
 - a. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an ESD point on the appliance.
 - b. Unfasten the thumbscrew that secures the access door in front of the storage drive slots, and open the door.
 - c. Slide the lock on the ejector to the unlocked position.
 - d. Carefully slide the drive out of the slot.
3. Reinstall the storage drive.
 - a. Carefully align the sides of the drive with the guides in the slot.
 - b. Slide the drive into the slot until you feel resistance, carefully ensuring that it is correctly aligned.
 - c. Close the access door and tighten the thumbscrew to secure the door.
4. Mount the new storage drive.

Related Documentation

- [Returning a Hardware Component to Juniper Networks, Inc. on page 253](#)

Replacing an M10i Ethernet Management Cable

The **MGMT** port on the Routing Engine accepts Ethernet cable with an RJ-45 connector. For cable specifications, see “[Routing Engine Interface Cable and Wire Specifications for M10i Routers](#)” on page 99:

Figure 58: Routing Engine Ethernet Cable Connector

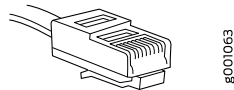
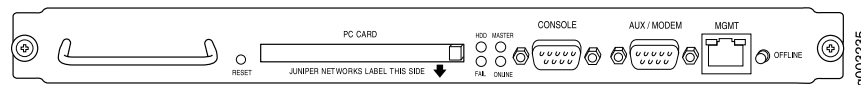


Figure 59: Ethernet Management Port



1. [Removing a Management Ethernet Cable on page 171](#)
2. [Installing a Management Ethernet Cable on page 171](#)

Removing a Management Ethernet Cable

1. Press the tab on the connector and pull the connector straight out of the port.
[Figure 58 on page 171](#) shows the connector.
2. Disconnect the cable from the network device.

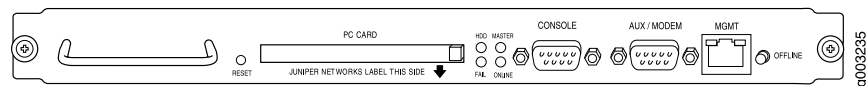
Installing a Management Ethernet Cable

1. Plug one end of the replacement Ethernet cable into the **MGMT** port.
[Figure 59 on page 171](#) shows the ports on the routing engine.
2. Plug the other end of the cable into the network device.

- See Also**
- [Installing the M10i Routing Engine on page 153](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Maintaining the M10i Routing Engine on page 222](#)
 - [Troubleshooting the M10i Routing Engine on page 233](#)
 - [Replacing an M10i Console or Auxiliary Cable on page 171](#)

Replacing an M10i Console or Auxiliary Cable

The **CONSOLE** and **AUX** ports on the Routing Engine accept an RS-232 (EIA-232) serial cable with a DB-9 connector. For cable specifications, see “[Routing Engine Interface Cable and Wire Specifications for M10i Routers](#)” on page 99.

Figure 60: Console and Auxiliary Ports

1. [Removing an M10i Console or Auxiliary Cable on page 172](#)
2. [Installing an M10i Console or Auxiliary Cable on page 172](#)

Removing an M10i Console or Auxiliary Cable

To remove a cable from the **CONSOLE** or **AUX** port:

1. Turn off the power to the console or auxiliary device.
2. Unscrew the screws that secure the cable connector to the port, using a 2.5-mm flat-blade screwdriver if necessary.
3. Pull the cable connector straight out of the port.
4. Disconnect the cable from the console or auxiliary device.

Installing an M10i Console or Auxiliary Cable

1. Plug the female end of the replacement serial cable into the **CONSOLE** or **AUX** port. [Figure 60 on page 172](#) shows the ports on the Routing Engine.
2. Tighten the screws on the connector, using a 2.5-mm flat-blade screwdriver if necessary.
3. Power on the auxiliary or console device.

CHAPTER 25

Replacing Line Card Components

- [Installing an M10i PIC on page 173](#)
- [Installing an M10i PIC Cable on page 175](#)
- [Installing an M10i SFP on page 177](#)
- [Replacing an M10i PIC on page 179](#)
- [Replacing an M10i PIC Cable on page 184](#)
- [Replacing an M10i SFP on page 187](#)

Installing an M10i PIC

To install a PIC (see [Figure 61 on page 175](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. If the PIC uses fiber-optic cable, verify that there is a rubber safety cap over each transceiver on the faceplate. Install a cap if necessary.
3. Prepare the PIC for insertion into the chassis:
 - For a regular PIC, hold the PIC in one hand and with your other hand pull the end of the ejector lever away from the PIC faceplate. Hold the lever out while you insert the PIC.
 - For a quad-wide PIC, verify that the end of each ejector lever is pulled away from the PIC faceplate, toward the ends of the PIC.
4. Align the rear of the PIC with the guides located at the bottom corners of the PIC slot.
5. Slide the PIC into the slot:
 - For a regular PIC, slide the PIC into the slot until about 0.5 in. (1 cm) of the PIC remains outside the slot and you feel some resistance. Release the ejector lever and gently push the PIC faceplate until you hear a click as the PIC contacts the midplane. The ejector lever engages and closes automatically.

- For a quad-wide PIC, slide the PIC into the slot until it contacts the midplane. Push the ejector levers inward toward the PIC faceplate to seat the PIC securely in the chassis.



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

6. If the PIC 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 you are inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.

7. Insert the appropriate cables into the cable connectors on the PIC.
8. Arrange each cable in the cable management system to prevent the cable 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 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.

9. Use one of the following methods to bring the PIC online:
 - Press and hold the PIC offline button until the status LED on the PIC faceplate indicates normal functioning, which usually takes about 5 seconds. The LED is usually green; for more information, see the *M10i Multiservice Edge Router Interface*

Module Reference. The offline button for each PIC is located on the HCM and is labeled with the PIC slot number. The PICs in FPC 0 are located on the upper HCM, and the PICs installed in FPC 1 are located on the lower HCM.

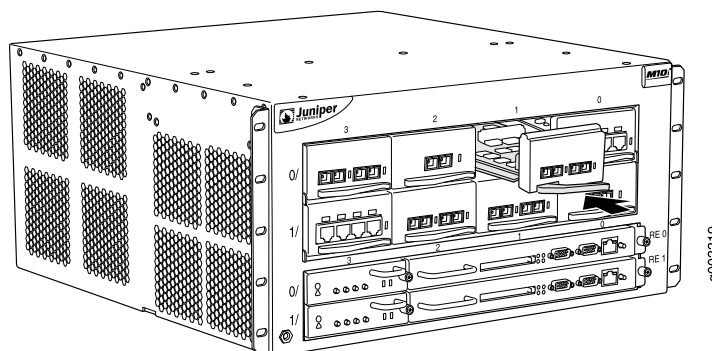
- Issue the following CLI command:

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

For more information about the command, see the [CLI Explorer](#).

The normal functioning status LED confirms that the PIC is online. You can also verify correct PIC functioning by issuing the **show chassis fpc pic-status** command described in [“Maintaining the M10i PICs and PIC Cables” on page 223](#).

Figure 61: Installing a PIC



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Connecting M10i PIC Cables on page 121](#)
- [M10i PICs Description on page 51](#)
- [Troubleshooting the M10i PICs on page 235](#)

Installing an M10i PIC Cable

To install a PIC cable (see [Figure 62 on page 177](#)):

1. Have ready a length of the type of cable used by the PIC. For cable specifications, see the *M10i Multiservice Edge Router Interface Module Reference*.
2. If the PIC 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 cable 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 PIC faceplate.
4. Arrange the cable in the cable management system 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 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.



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.

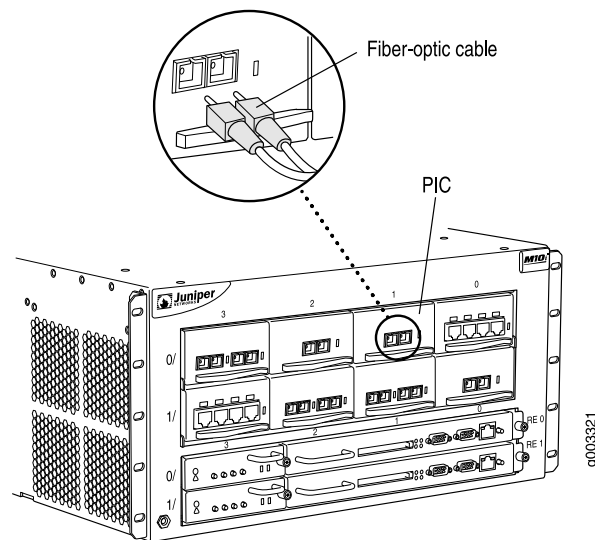
5. Insert the other end of the cable into the destination port.
6. Repeat the previous steps for any additional cables.
7. If the PIC is offline (its failure indicator LED is lit), use one of the following methods to bring the PIC online:
 - Press and hold the PIC offline button until the status LED on the PIC faceplate indicates normal functioning, which usually takes about 5 seconds. The LED is usually green; for more information, see the *M10i Multiservice Edge Router Interface Module Reference*. The offline button for each PIC is located on the HCM and is labeled with the PIC slot number. The PICs in FPC 0 are located on the upper HCM, and the PICs installed in FPC 1 are located on the lower HCM.
 - 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 [CLI Explorer](#).

The normal functioning indicator LED confirms that the PIC is online. You can also verify correct PIC functioning by issuing the **show chassis fpc pic-status** command described in “[Maintaining the M10i PICs and PIC Cables](#)” on page 223.

Figure 62: Connecting Fiber-Optic Cable to a PIC



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Connecting M10i PIC Cables on page 121](#)
- [M10i PICs Description on page 51](#)
- [Troubleshooting the M10i PICs on page 235](#)
- [Removing an M10i PIC Cable on page 184](#)

Installing an M10i SFP



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.



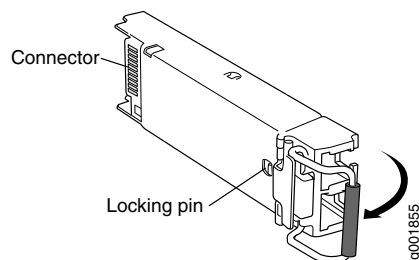
CAUTION: When handling fiber-optic transceivers and fiber-optic cable, observe the following precautions:

- 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.
- Do not bend 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.
- 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.

To install a replacement SFP (see [Figure 63 on page 178](#)):

1. Attach an 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 SFP transceiver, installing one if necessary.
3. Orient the SFP over the port in the PIC so that the connector end will enter the slot first and the SFP connector faces the appropriate direction:
 - If the PIC has ten SFP ports, the ports are arranged in two columns. The SFP connector faces to the right for ports in the left column, and to the left for ports in the right column.
 - If the PIC has one or two SFP ports, the SFP connector faces to the left on platforms in which FPCs install vertically in the chassis, and faces upward on platforms in which FPCs install horizontally in the chassis.
4. Slide the SFP into the slot. If there is resistance, remove the SFP 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.
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 is not supporting 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.
7. Verify that the status LEDs on the PIC faceplate indicate that the SFP is functioning correctly (there is an LED for each SFP port). For more information about the PIC LEDs, see the *M10i Multiservice Edge Router Interface Module Reference*. You can also verify PIC functioning by issuing the **show chassis fpc pic-status** command described in [“Maintaining the M10i PICs and PIC Cables” on page 223](#).

Figure 63: Small Form-Factor Pluggable (SFP)



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i PICs Description on page 51](#)

- [Troubleshooting the M10i PICs on page 235](#)
- [Removing an M10i SFP on page 187](#)

Replacing an M10i PIC

Up to eight regular PICs install into an M10i router, as shown in “[M10i Chassis Description](#)” on [page 11](#). Quad-wide PICs occupy all four slots in an FPC row.

PICs are hot-removable and hot-insertable. A removed PIC no longer receives or transmits data, and removing or inserting a PIC briefly interrupts forwarding of traffic through the remaining PICs.

1. [Removing an M10i PIC on page 179](#)
2. [Installing an M10i PIC on page 181](#)

Removing an M10i PIC

To remove a PIC (see [Figure 64 on page 181](#)):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. If the PIC connects to fiber-optic cable, have ready a rubber safety cap for each transceiver and cable.
3. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
4. If the PIC has multiple cable connector ports, label the cable connected to each port, to make it easier to reconnect the cables correctly.
5. Use one of the following methods to take the PIC offline:
 - Press and hold the PIC offline button until its failure indicator LED lights, which usually takes about 5 seconds. The failure LED is usually red; for more information, see the *M10i Multiservice Edge Router Interface Module Reference*. The offline button for each PIC is located on the HCM and is labeled with the PIC slot number. The PICs in FPC 0 are located on the upper HCM, and the PICs installed in FPC 1 are located on the lower HCM.
 - 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](#).

6. Disconnect the cables from the PIC. If the PIC 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 you are inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.

7. Arrange the cable in the cable management system 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 in the cable management system. Placing fasteners on the loop helps to maintain its shape.



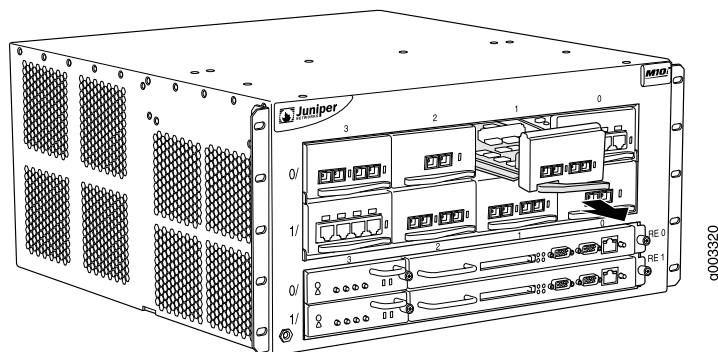
CAUTION: Do not let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.



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.

8. Unseat the PIC from the chassis:
 - For a regular PIC, pull the right end of the PIC ejector lever away from the PIC faceplate.
 - For a quad-wide PIC, pull the end of each ejector lever away from the PIC faceplate, toward the outer edges of the PIC.
9. Grasp both sides of the PIC faceplate and slide it out of the chassis. Do not use the ejector lever as a handle.
10. Place the PIC in the electrostatic bag or on the antistatic mat.
11. If you are not reinstalling a PIC into the emptied slot within a short time, install a blank PIC panel over the slot to maintain proper airflow in the chassis.

Figure 64: Removing a PIC



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Connecting M10i PIC Cables on page 121](#)
 - [M10i PICs Description on page 51](#)
 - [Maintaining the M10i PICs and PIC Cables on page 223](#)
 - [Troubleshooting the M10i PICs on page 235](#)

Installing an M10i PIC

To install a PIC (see [Figure 61 on page 175](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. If the PIC uses fiber-optic cable, verify that there is a rubber safety cap over each transceiver on the faceplate. Install a cap if necessary.
3. Prepare the PIC for insertion into the chassis:
 - For a regular PIC, hold the PIC in one hand and with your other hand pull the end of the ejector lever away from the PIC faceplate. Hold the lever out while you insert the PIC.
 - For a quad-wide PIC, verify that the end of each ejector lever is pulled away from the PIC faceplate, toward the ends of the PIC.
4. Align the rear of the PIC with the guides located at the bottom corners of the PIC slot.
5. Slide the PIC into the slot:
 - For a regular PIC, slide the PIC into the slot until about 0.5 in. (1 cm) of the PIC remains outside the slot and you feel some resistance. Release the ejector lever and gently push the PIC faceplate until you hear a click as the PIC contacts the midplane. The ejector lever engages and closes automatically.

- For a quad-wide PIC, slide the PIC into the slot until it contacts the midplane. Push the ejector levers inward toward the PIC faceplate to seat the PIC securely in the chassis.



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

6. If the PIC 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 you are inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.

7. Insert the appropriate cables into the cable connectors on the PIC.
8. Arrange each cable in the cable management system to prevent the cable 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 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.

9. Use one of the following methods to bring the PIC online:
 - Press and hold the PIC offline button until the status LED on the PIC faceplate indicates normal functioning, which usually takes about 5 seconds. The LED is usually green; for more information, see the *M10i Multiservice Edge Router Interface*

Module Reference. The offline button for each PIC is located on the HCM and is labeled with the PIC slot number. The PICs in FPC 0 are located on the upper HCM, and the PICs installed in FPC 1 are located on the lower HCM.

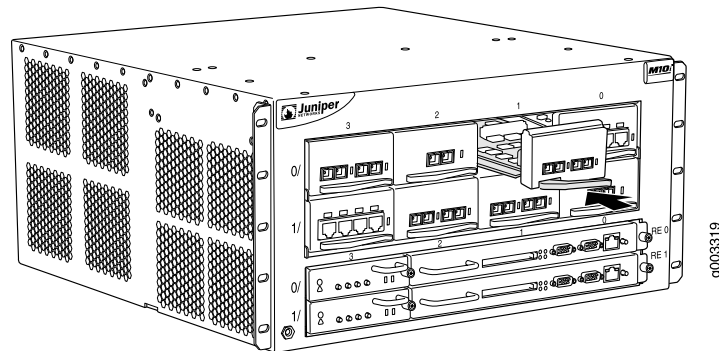
- Issue the following CLI command:

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

For more information about the command, see the [CLI Explorer](#).

The normal functioning status LED confirms that the PIC is online. You can also verify correct PIC functioning by issuing the **show chassis fpc pic-status** command described in [“Maintaining the M10i PICs and PIC Cables” on page 223](#).

Figure 65: Installing a PIC



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Connecting M10i PIC Cables on page 121](#)
 - [M10i PICs Description on page 51](#)
 - [Troubleshooting the M10i PICs on page 235](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Connecting M10i PIC Cables on page 121](#)
 - [M10i PICs Description on page 51](#)
 - [Maintaining the M10i PICs and PIC Cables on page 223](#)
 - [Troubleshooting the M10i PICs on page 235](#)

Replacing an M10i PIC Cable

Removing and installing PIC cables does not affect router function, except that a PIC does not receive or transmit data while its cable is disconnected.

1. [Removing an M10i PIC Cable on page 184](#)
2. [Installing an M10i PIC Cable on page 185](#)

Removing an M10i PIC Cable

To remove a PIC cable:

1. If the PIC connects to fiber-optic cable, have ready a rubber safety cap for each cable and transceiver.
2. If removing all cables connected to the PIC, use one of the following methods to take the PIC offline:
 - Press and hold the PIC offline button until its failure indicator LED lights, which usually takes about 5 seconds. The failure LED is usually red; for more information, see the *M10i Multiservice Edge Router Interface Module Reference*. The offline button for each PIC is located on the HCM and is labeled with the PIC slot number. The PICs in FPC 0 are located on the upper HCM, and the PICs installed in FPC 1 are located on the lower HCM.
 - 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. Unplug the cable from the cable connector port. If the PIC 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 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 system and detach it from the destination port.

- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Connecting M10i PIC Cables on page 121](#)
 - [M10i PICs Description on page 51](#)
 - [Maintaining the M10i PICs and PIC Cables on page 223](#)
 - [Troubleshooting the M10i PICs on page 235](#)
 - [Installing an M10i PIC Cable on page 175](#)

Installing an M10i PIC Cable

To install a PIC cable (see [Figure 62 on page 177](#)):

1. Have ready a length of the type of cable used by the PIC. For cable specifications, see the *M10i Multiservice Edge Router Interface Module Reference*.
2. If the PIC 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 cable 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 PIC faceplate.
4. Arrange the cable in the cable management system 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 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.



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.

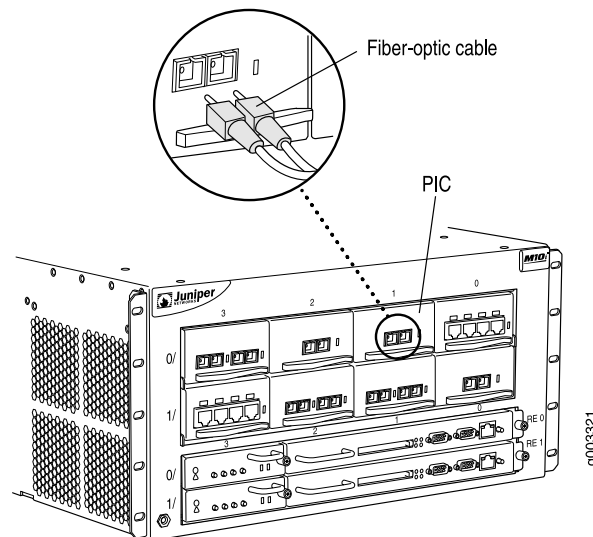
5. Insert the other end of the cable into the destination port.
6. Repeat the previous steps for any additional cables.
7. If the PIC is offline (its failure indicator LED is lit), use one of the following methods to bring the PIC online:
 - Press and hold the PIC offline button until the status LED on the PIC faceplate indicates normal functioning, which usually takes about 5 seconds. The LED is usually green; for more information, see the *M10i Multiservice Edge Router Interface Module Reference*. The offline button for each PIC is located on the HCM and is labeled with the PIC slot number. The PICs in FPC 0 are located on the upper HCM, and the PICs installed in FPC 1 are located on the lower HCM.
 - 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 [CLI Explorer](#).

The normal functioning indicator LED confirms that the PIC is online. You can also verify correct PIC functioning by issuing the **show chassis fpc pic-status** command described in “[Maintaining the M10i PICs and PIC Cables](#)” on page 223.

Figure 66: Connecting Fiber-Optic Cable to a PIC



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Connecting M10i PIC Cables on page 121](#)
 - [M10i PICs Description on page 51](#)
 - [Troubleshooting the M10i PICs on page 235](#)
 - [Removing an M10i PIC Cable on page 184](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Connecting M10i PIC Cables on page 121](#)
 - [M10i PICs Description on page 51](#)
 - [Maintaining the M10i PICs and PIC Cables on page 223](#)
 - [Troubleshooting the M10i PICs on page 235](#)

Replacing an M10i SFP

Small form-factor pluggables (SFPs) are transceivers that can be removed from a PIC (for more information, see [“M10i PICs Description” on page 51](#)).

SFPs are hot-insertable and hot-removable. Removing an SFP does not interrupt PIC functioning, but the removed SFP no longer receives or transmits data.

1. [Removing an M10i SFP on page 187](#)
2. [Installing an M10i SFP on page 188](#)

Removing an M10i SFP



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: When handling fiber-optic transceivers and fiber-optic cable, observe the following precautions:

- 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.
- Do not bend 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.
- 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.

To remove an SFP (see [Figure 67 on page 188](#)):

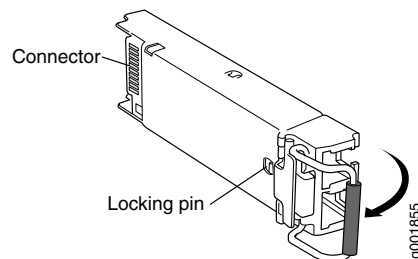
1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.

3. Label the cable connected to the SFP so that you can later reconnect it to the correct SFP.
4. Disconnect the cable from the SFP. Immediately cover the transceiver and the end of the cable with a rubber safety cap.
5. Arrange the cable in the cable management system 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 in the cable management system. Placing fasteners on the loop helps to maintain its shape.
6. Pull the ejector handle away from the SFP faceplate to unseat the SFP from the PIC. Pull the SFP out of the PIC and place it on the antistatic mat or in the 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.

Figure 67: Small Form-Factor Pluggable (SFP)



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i PICs Description on page 51](#)
 - [Troubleshooting the M10i PICs on page 235](#)
 - [Installing an M10i SFP on page 177](#)

Installing an M10i SFP



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: When handling fiber-optic transceivers and fiber-optic cable, observe the following precautions:

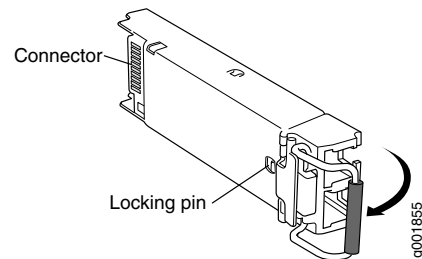
- Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and prevents accidental exposure to laser light.
- Do not bend fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.
- 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.

To install a replacement SFP (see [Figure 63 on page 178](#)):

1. Attach an 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 SFP transceiver, installing one if necessary.
3. Orient the SFP over the port in the PIC so that the connector end will enter the slot first and the SFP connector faces the appropriate direction:
 - If the PIC has ten SFP ports, the ports are arranged in two columns. The SFP connector faces to the right for ports in the left column, and to the left for ports in the right column.
 - If the PIC has one or two SFP ports, the SFP connector faces to the left on platforms in which FPCs install vertically in the chassis, and faces upward on platforms in which FPCs install horizontally in the chassis.
4. Slide the SFP into the slot. If there is resistance, remove the SFP 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.
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 is not supporting 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.
7. Verify that the status LEDs on the PIC faceplate indicate that the SFP is functioning correctly (there is an LED for each SFP port). For more information about the PIC LEDs, see the *M10i Multiservice Edge Router Interface Module Reference*. You can also

verify PIC functioning by issuing the **show chassis fpc pic-status** command described in [“Maintaining the M10i PICs and PIC Cables”](#) on page 223.

Figure 68: Small Form-Factor Pluggable (SFP)



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i PICs Description on page 51](#)
 - [Troubleshooting the M10i PICs on page 235](#)
 - [Removing an M10i SFP on page 187](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i PICs Description on page 51](#)
 - [Troubleshooting the M10i PICs on page 235](#)

CHAPTER 26

Replacing Power System Components

- [Installing an M10i AC Power Supply on page 191](#)
- [Installing an M10i DC Power Supply on page 193](#)
- [Replacing an M10i AC Power Supply on page 195](#)
- [Replacing an M10i AC Power Cord on page 199](#)
- [Replacing an M10i DC Power Supply on page 201](#)
- [Replacing an M10i DC Power Cable on page 206](#)
- [Disconnecting Power on an AC-Powered M10i Router on page 208](#)
- [Disconnecting Power on an DC-Powered M10i Router on page 209](#)

Installing an M10i AC Power Supply

To install an AC power supply (see [Figure 69 on page 192](#)):

1. Verify that the switch on the power supply faceplate is in the **OFF (O)** position.
2. Locate the AC power cord shipped with the router, which should be appropriate for your geographical location (see [“M10i AC Power Cord Specifications” on page 86](#)).
3. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
4. Grasp the handle on the power supply faceplate with one hand and place the other hand under the supply to support it.
5. Align the rear of the supply with the slide guides inside the chassis and slide the supply into the chassis until it contacts the midplane.
6. Tighten (but do not overtighten) the thumbscrews on the power supply faceplate.
7. Insert the appliance coupler end of the AC power cord into the appliance inlet on the power supply faceplate and insert the plug into an AC power source receptacle. Verify

that the AC power cord does not block access to router components or drape where people could trip on it.

8. Press the power switch on the faceplate to the **ON (|)** position. When the power supply has powered on successfully, the green **OUTPUT OK** LED lights steadily.

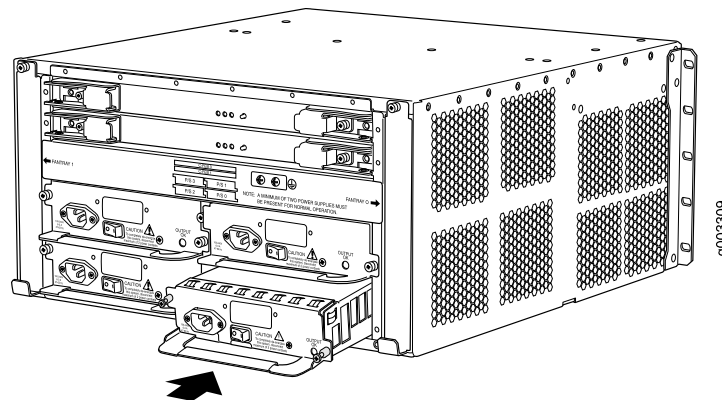


NOTE: After powering off a power supply, wait at least 60 seconds before turning it back on. After powering on a power supply, wait at least 60 seconds before turning it off.

If the router is completely powered off when you power on the power supply, the Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#).

After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the output status LED on the power supply, the command display output, and messages on the LED display on the craft interface—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Figure 69: Installing an AC Power Supply



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i AC Power Supply Description on page 64](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Router Power Requirements on page 82](#)
- [Maintaining the M10i Power Supplies on page 224](#)
- [Troubleshooting the M10i Power System on page 237](#)
- [Removing an M10i AC Power Supply on page 196](#)

Installing an M10i DC Power Supply

To install a DC power supply (see [Figure 70 on page 194](#) and [Figure 71 on page 195](#)):

1. Verify that there is no power flowing to the power supply from the external power source, so that the voltage across the leads of the DC power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
2. Verify that the power switch for the power supply (located on the power supply faceplate) is in the **OFF (O)** position.
3. Verify that the grounding cable is attached to the chassis and properly connected to an earth ground.
4. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
5. Grasp the handle on the power supply faceplate with one hand and place the other hand under the supply to support it.
6. Align the rear of the supply with the slide guides inside the chassis and slide the supply into the chassis until it contacts the midplane.
7. Tighten (but do not overtighten) the thumbscrews on the power supply faceplate.
8. Verify that a licensed electrician has attached a listed DC power cable lug to each power source cable.
9. Loop the DC power cables through the hook located on the faceplate to the right of the field-wiring terminals.
10. Depending on the type of DC power cable lugs used, loosen or remove the screws on the field-wiring terminals.
11. Insert the DC power cable lugs into the appropriate field-wiring terminals. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal clockwise to secure the DC power cable lug. Apply between 8 lb-in. (.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw.
 - a. Insert the positive (+) source cable into the return terminal, which is labeled **RTN**.
 - b. Insert the negative (–) source cable into the input terminal, which is labeled **–48V**.



NOTE: The DC power supplies in slots P/S 0 and P/S 1 must be powered by dedicated power feeds derived from feed A, and the DC power supplies in slots P/S 2 and P/S 3 must be powered by dedicated power feeds derived from feed B. This configuration provides the commonly deployed A/B feed redundancy for the system.

12. Verify that the DC source power cabling is correct, that the DC power cables are not touching or blocking access to router components, and that they do not drape where people could trip on them.
13. Turn on the DC power source so that voltage flows to the power supply.
14. Press the switch on the power supply faceplate to the **ON (I)** position. When the power supply has powered on successfully, the green **OUTPUT OK** LED lights steadily.



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 router is completely powered off when you power on the power supply, the Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#).

After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the output status LED on the power supply, the command display output, and messages on the LED display on the craft interface—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Figure 70: Installing a DC Power Supply

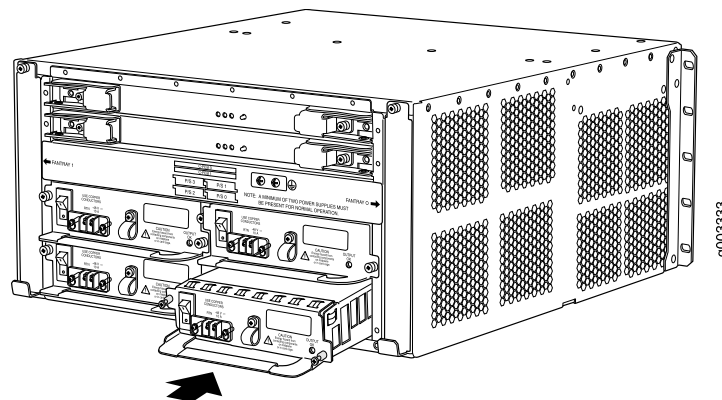
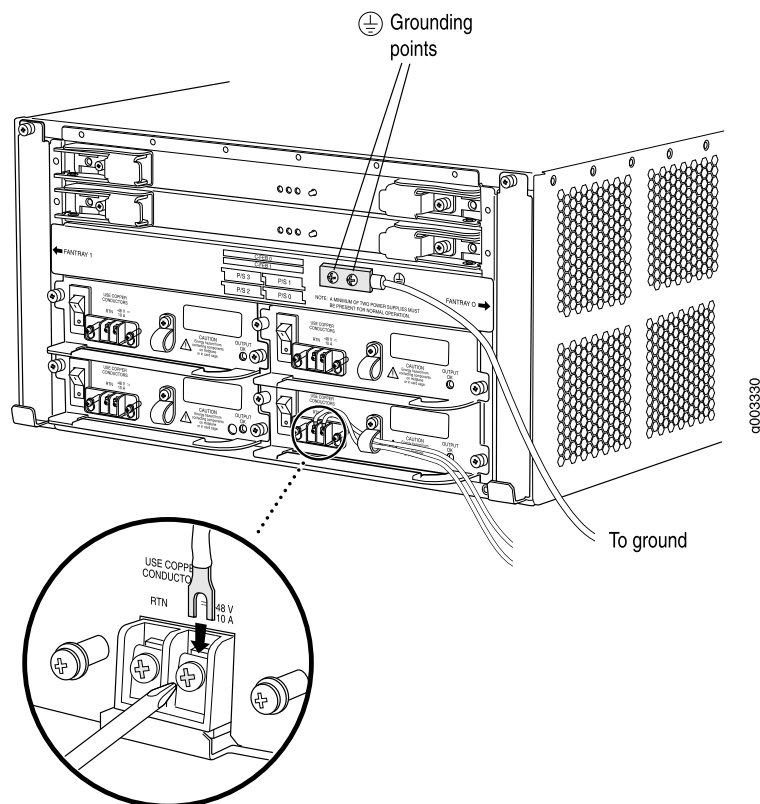


Figure 71: Connecting DC Power Cables to a DC Power Supply



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Router Power Requirements on page 82](#)
- [Maintaining the M10i Power Supplies on page 224](#)
- [Troubleshooting the M10i Power System on page 237](#)
- [Removing an M10i DC Power Supply on page 201](#)

Replacing an M10i AC Power Supply

An AC-powered router has up to three load-sharing AC power supplies. The router must have at least two AC power supplies, and any two AC power supplies can provide full power to the router. Three power supplies are required for redundancy. A redundant power supply is hot-removable and hot-insertable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on [page 139](#). For M10i routers with only two AC power supplies, you must power off the router before replacing an AC power supply.

1. [Removing an M10i AC Power Supply on page 196](#)
2. [Installing an M10i AC Power Supply on page 197](#)

Removing an M10i AC Power Supply

The AC power supplies are located at the bottom rear of the chassis, as shown in “[M10i Chassis Description](#)” on page 11. For information about power supply redundancy and replaceability, see “[M10i Power System Description](#)” on page 63.



CAUTION: Do not leave a power supply slot empty for more than a short time while the router is operational. The power supply must remain in the chassis for proper airflow.

To remove an AC power supply (see [Figure 72 on page 197](#)):

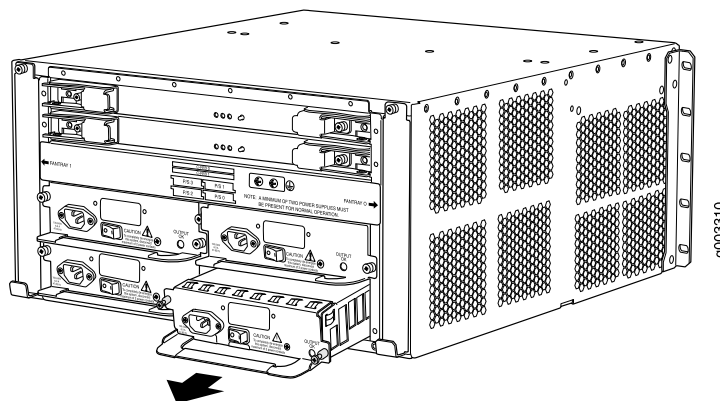
1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Press the power switch on the power supply faceplate to the **OFF (O)** position.



NOTE: If you are not removing the power supply, but simply powering it off, wait at least 60 seconds before turning it back on. If you need to power it off again, wait for at least 60 seconds after powering it on.

3. Unplug the AC power cord from the appliance inlet on the faceplate.
4. Loosen the thumbscrew at each end of the power supply faceplate, using a Phillips screwdriver if necessary.
5. Grasp the handle on the power supply faceplate and pull firmly to slide the unit about halfway out of the chassis.
6. Place one hand under the power supply to support it, then slide it completely out of the chassis.

Figure 72: Removing an AC Power Supply



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i AC Power Supply Description on page 64](#)
 - [M10i DC Power Supply Description on page 65](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)
 - [Installing an M10i AC Power Supply on page 191](#)

Installing an M10i AC Power Supply

To install an AC power supply (see [Figure 69 on page 192](#)):

1. Verify that the switch on the power supply faceplate is in the **OFF (O)** position.
2. Locate the AC power cord shipped with the router, which should be appropriate for your geographical location (see [“M10i AC Power Cord Specifications” on page 86](#)).
3. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
4. Grasp the handle on the power supply faceplate with one hand and place the other hand under the supply to support it.
5. Align the rear of the supply with the slide guides inside the chassis and slide the supply into the chassis until it contacts the midplane.
6. Tighten (but do not overtighten) the thumbscrews on the power supply faceplate.

7. Insert the appliance coupler end of the AC power cord into the appliance inlet on the power supply faceplate and insert the plug into an AC power source receptacle. Verify that the AC power cord does not block access to router components or drape where people could trip on it.
8. Press the power switch on the faceplate to the **ON** (I) position. When the power supply has powered on successfully, the green **OUTPUT OK** LED lights steadily.

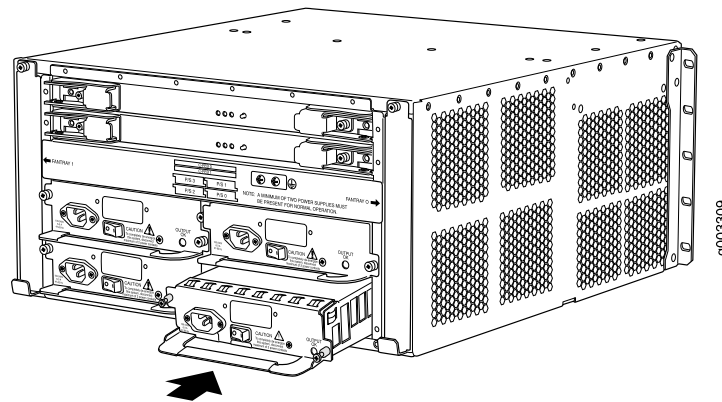


NOTE: After powering off a power supply, wait at least 60 seconds before turning it back on. After powering on a power supply, wait at least 60 seconds before turning it off.

If the router is completely powered off when you power on the power supply, the Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#).

After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the output status LED on the power supply, the command display output, and messages on the LED display on the craft interface—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Figure 73: Installing an AC Power Supply



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i AC Power Supply Description on page 64](#)
 - [M10i DC Power Supply Description on page 65](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)
 - [Removing an M10i AC Power Supply on page 196](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i AC Power Supply Description on page 64](#)
 - [M10i DC Power Supply Description on page 65](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)

Replacing an M10i AC Power Cord

An AC-powered router has up to three load-sharing AC power supplies. The router must have at least two AC power supplies, and any two AC power supplies can provide full power to the router. Three power supplies are required for redundancy. An AC power cord on a redundant power supply is hot-removable and hot-insertable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on [page 139](#). For M10i routers with only two AC power supplies, you must power off the router before replacing an AC power cord.

1. [Removing an M10i AC Power Cord on page 199](#)
2. [Installing an M10i AC Power Cord on page 200](#)

Removing an M10i AC Power Cord

To remove an AC power cord:

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 electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
3. Switch the power switch on the power supply faceplate to the **OFF (O)** position.
4. Remove the appliance coupler end of a AC power cord from the appliance inlet on the power supply faceplate.

- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i AC Power Supply Description on page 64](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)

Installing an M10i AC Power Cord

To install an AC power cord:

1. Locate an AC power cord with a plug appropriate for your geographical location (see [“M10i AC Power Cord Specifications” on page 86](#)).
2. Verify that the power switch on the power supply faceplate is in the **OFF (O)** position.
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. Insert the appliance coupler end of a AC power cord into the appliance inlet on a power supply faceplate.
5. Detach the ESD grounding strap from the ESD points on the chassis, and connect the strap to an approved site ESD grounding point. Follow the instructions for your site.
6. Switch on the dedicated customer site circuit breaker for the power supply, and insert the plug into an AC power source receptacle. Follow the instructions for your site.
7. Detach the ESD grounding strap from the approved site ESD grounding point, and connect the strap to the ESD points on the chassis.
8. Switch the power switch on the power supply to the on (I) position.
9. Observe the **OUTPUT OK** LEDs on the AC power supply faceplate. If the power supply is correctly installed and functioning normally, the **OUTPUT OK** lights steadily.
10. Verify that the AC power cord does not block access to router components or drape where people could trip on it.

- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i AC Power Supply Description on page 64](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i AC Power Supply Description on page 64](#)
 - [Maintaining the M10i Power Supplies on page 224](#)

- [Troubleshooting the M10i Power System on page 237](#)

Replacing an M10i DC Power Supply

A DC-powered router has up to four load-sharing DC power supplies. The router must have at least two DC power supplies, and any two DC power supplies can provide full power to the router. Each redundant power supply is hot-removable and hot-insertable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on page 139. For M10i routers with only two DC power supplies, you must power off the router before replacing a DC power supply.

1. [Removing an M10i DC Power Supply on page 201](#)
2. [Installing an M10i DC Power Supply on page 202](#)

Removing an M10i DC Power Supply

The DC power supplies are located at the bottom rear of the chassis, as shown in “[M10i Chassis Description](#)” on page 11. For information about power supply redundancy and replaceability, see “[M10i Power System Description](#)” on page 63.



CAUTION: Do not leave a power supply slot empty for more than a short time while the router is operational. The power supply must remain in the chassis for proper airflow.

To remove a DC power supply (see [Figure 74 on page 202](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Press the power switch for the power supply (located on the power supply faceplate) to the **OFF (O)** position.

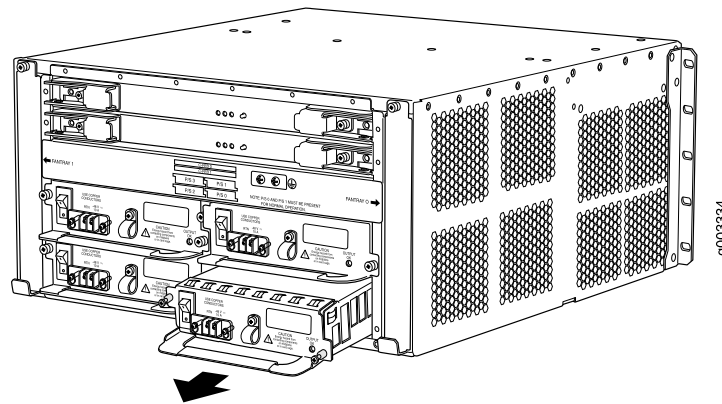


NOTE: If you are power cycling the power supply rather than shutting it off for a time, wait at least 60 seconds after turning it off before turning it back on. If you need to power it off again, wait for at least 60 seconds after powering it on.

3. Shut off the power flowing to the power supply from the external power source, so that the voltage across the leads of the DC power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
4. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal counter-clockwise to loosen the terminal connector from around the cable lug.

5. Remove the cables from the terminal connectors and from the hook located on the faceplate to the right of the field-wiring terminals.
6. Loosen the thumbscrew at each end of the power supply faceplate, using a Phillips screwdriver if necessary.
7. Grasp the handle on the power supply faceplate and pull firmly to slide the unit about halfway out of the chassis.
8. Place one hand under the power supply to support it, then slide it completely out of the chassis.

Figure 74: Removing a DC Power Supply



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)
 - [Installing an M10i DC Power Supply on page 193](#)

Installing an M10i DC Power Supply

To install a DC power supply (see [Figure 70 on page 194](#) and [Figure 71 on page 195](#)):

1. Verify that there is no power flowing to the power supply from the external power source, so that the voltage across the leads of the DC power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
2. Verify that the power switch for the power supply (located on the power supply faceplate) is in the **OFF (O)** position.

3. Verify that the grounding cable is attached to the chassis and properly connected to an earth ground.
4. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
5. Grasp the handle on the power supply faceplate with one hand and place the other hand under the supply to support it.
6. Align the rear of the supply with the slide guides inside the chassis and slide the supply into the chassis until it contacts the midplane.
7. Tighten (but do not overtighten) the thumbscrews on the power supply faceplate.
8. Verify that a licensed electrician has attached a listed DC power cable lug to each power source cable.
9. Loop the DC power cables through the hook located on the faceplate to the right of the field-wiring terminals.
10. Depending on the type of DC power cable lugs used, loosen or remove the screws on the field-wiring terminals.
11. Insert the DC power cable lugs into the appropriate field-wiring terminals. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal clockwise to secure the DC power cable lug. Apply between 8 lb-in. (.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw.
 - a. Insert the positive (+) source cable into the return terminal, which is labeled **RTN**.
 - b. Insert the negative (–) source cable into the input terminal, which is labeled **–48V**.



NOTE: The DC power supplies in slots P/S 0 and P/S 1 must be powered by dedicated power feeds derived from feed A, and the DC power supplies in slots P/S 2 and P/S 3 must be powered by dedicated power feeds derived from feed B. This configuration provides the commonly deployed A/B feed redundancy for the system.

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

13. Turn on the DC power source so that voltage flows to the power supply.
14. Press the switch on the power supply faceplate to the **ON (I)** position. When the power supply has powered on successfully, the green **OUTPUT OK** LED lights steadily.



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 router is completely powered off when you power on the power supply, the Routing Engine boots as the power supply completes its startup sequence. If the Routing Engine finishes booting and you need to power off the router again, see [“Powering Off the M10i Router” on page 129](#).

After a power supply is powered on, it can take up to 60 seconds for status indicators—such as the output status LED on the power supply, the command display output, and messages on the LED display on the craft interface—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Figure 75: Installing a DC Power Supply

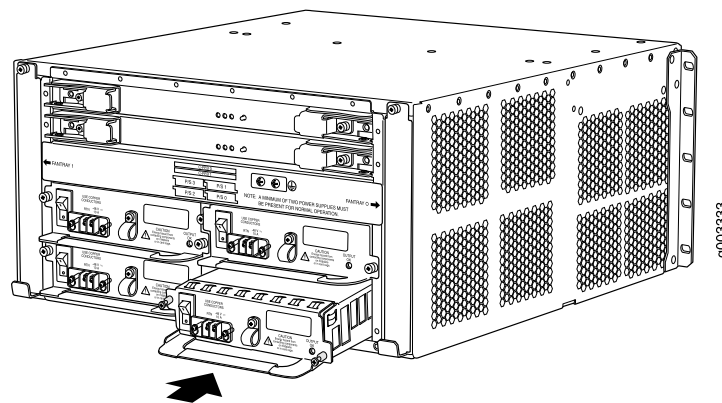
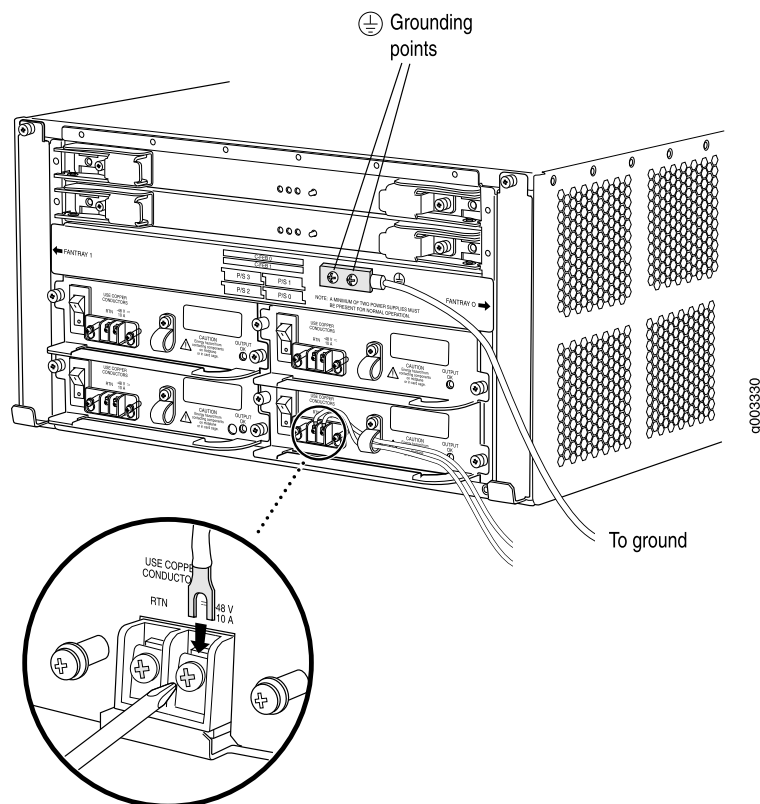


Figure 76: Connecting DC Power Cables to a DC Power Supply

- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i DC Power Supply Description on page 65](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)
 - [Removing an M10i DC Power Supply on page 201](#)

- Related Documentation**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i DC Power Supply Description on page 65](#)
 - [M10i Router Power Requirements on page 82](#)
 - [Maintaining the M10i Power Supplies on page 224](#)
 - [Troubleshooting the M10i Power System on page 237](#)

Replacing an M10i DC Power Cable

A DC-powered router has up to four load-sharing DC power supplies. The router must have at least two DC power supplies, and any two DC power supplies can provide full power to the router. The power cords on a redundant power supply are hot-removable and hot-insertable, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on page 139. For M10i routers with only two DC power supplies, you must power off the router before replacing the DC power cables. See “[Powering Off the M10i Router](#)” on page 129.

1. [Removing a DC Power Cable on page 206](#)
2. [Installing a DC Power Cable on page 207](#)

Removing a DC Power Cable

To remove a DC power cable:

1. For each power supply, press the power switch on the power supply faceplate to the **OFF (O)** position.



NOTE: If you are power cycling the power supply rather than shutting it off for a time, wait at least 60 seconds after turning it off before turning it back on. If you need to power it off again, wait for at least 60 seconds after powering it on.

2. Shut off the power flowing from both external power sources, so that the voltage across the leads of the DC power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
3. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal counter-clockwise to loosen the terminal connector from around the cable lug.
4. Remove the cables from the terminal connectors and from the hook located on the faceplate to the right of the field-wiring terminals.
5. Verify that the removed cables are not touching or blocking access to any router components.

- See Also**
- [M10i DC Power Supply Description on page 65](#)
 - [Troubleshooting the M10i Power System on page 237](#)
 - [Replacing an M10i DC Power Cable on page 206](#)
 - [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)

Installing a DC Power Cable

Connect DC power to the router by inserting DC power cables into the field-wiring terminals on the faceplate of each power supply. For information about the required cable type, see [“M10i DC Power Cable and Lug Specifications” on page 90](#).

1. Verify that there is no power flowing from the external power source, so that the voltage across the leads of the power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
2. Verify that a licensed electrician has attached a listed DC power cable lug to the DC power cable.
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. Verify that the power switch on the power supply faceplate is in the **OFF (O)** position.
5. Loop the DC power cables through the hook located on the faceplate to the right of the field-wiring terminals.
6. Depending on the type of DC power cable lugs used, loosen or remove the screws on the field-wiring terminals.
7. Insert the DC power cable lugs into the appropriate field-wiring terminals. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal clockwise to secure the DC power cable lug. Apply between 8 lb-in. (.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw.
 - a. Insert the positive (+) source cable into the return terminal, which is labeled **RTN**.
 - b. Insert the negative (–) source cable into the input terminal, which is labeled **–48V**.



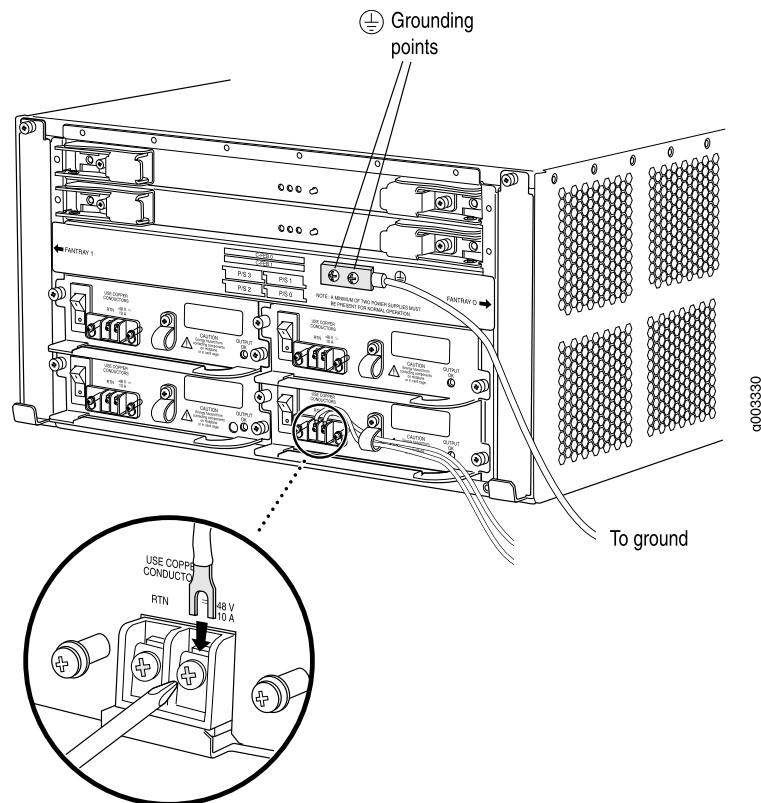
CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color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



NOTE: The DC power supplies in slots P/S 0 and P/S 1 must be powered by dedicated power feeds derived from feed A, and the DC power supplies in slots P/S 2 and P/S 3 must be powered by dedicated power feeds derived from feed B. This configuration provides the commonly deployed A/B feed redundancy for the system.

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

Figure 77: Connecting DC Power Cables



Related Documentation

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i DC Power Supply Description on page 65](#)
- [Troubleshooting the M10i Power System on page 237](#)

Disconnecting Power on an AC-Powered M10i Router

To disconnect AC power from the router:

1. Power off the router. See [“Powering Off the M10i Router” on page 129](#).
2. Press the power switch on each power supply faceplate to the **OFF (O)** position.
3. Unplug the AC power cord from each power supply.



NOTE: When multiple AC power supplies are installed in the chassis, all AC power cords (one for each power supply) must be unplugged to disconnect power completely.

**Related
Documentation**

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)
- [M10i AC Power Supply Description on page 64](#)
- [M10i Router AC Power Supply Specifications on page 85](#)

Disconnecting Power on an DC-Powered M10i Router

To disconnect DC power from the router:

1. Power off the router (see [“Powering Off the M10i Router” on page 129](#)).
2. For each power supply, press the power switch on the DC power supply faceplate to the **OFF (O)** position.
3. Shut off the power flowing from both external power sources, so that the voltage across the leads of the DC power cables is 0 V. Ensure that there is no chance that the cable leads might become active during the procedure.
4. Using a number 1 Phillips screwdriver, turn the screw on each field-wiring terminal counter-clockwise to loosen the terminal connector from around the cable.
5. Remove the cables from the terminal connectors and from the hook located on the faceplate to the right of the field-wiring terminals.
6. Verify that the removed cables are not touching or blocking access to any router components.

**Related
Documentation**

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)
- [M10i DC Power Supply Description on page 65](#)

- [M10i Router DC Power Supply Specifications on page 89](#)

Replacing Switch Fabric Components

- [Installing an M10i CFEB or CFEB-E on page 211](#)
- [Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E on page 212](#)

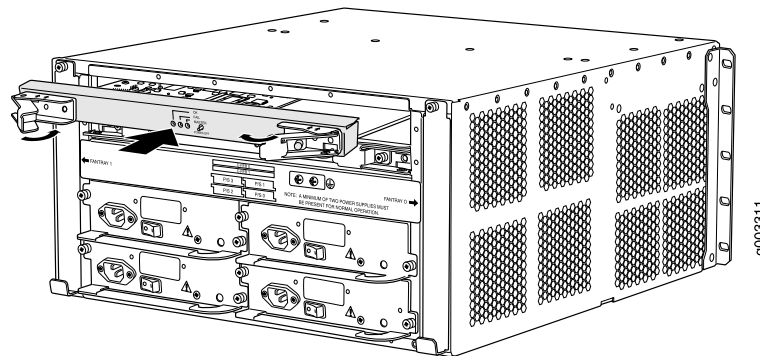
Installing an M10i CFEB or CFEB-E

To install a CFEB or CFEB-E (see [Figure 78 on page 212](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Verify that the ends of the ejector levers are pulled outward to a position nearly perpendicular to the faceplate of the CFEB or CFEB-E.
3. Place one hand under the CFEB or CFEB-E to support it and grasp one of the ejector levers at the front with the other hand.
4. Align the rear of the CFEB or CFEB-E with the guides inside the chassis and slide it in completely.
5. Press the ejector lever at each end of the CFEB or CFEB-E inward.
6. Tighten the thumbscrew on each ejector lever (shown in [“M10i CFEB and CFEB-E LEDs” on page 69](#)) to seat the CFEB or CFEB-E firmly in the chassis.
7. Press the online/offline button on the CFEB or CFEB-E faceplate and hold it down until the green LED labeled **OUTPUT OK** lights steadily.

You can also verify correct CFEB or CFEB-E functioning by issuing the **show chassis cfeb** commands described in [“Maintaining the M10i CFEB and CFEB-E” on page 225](#).

Figure 78: Installing a CFEB or CFEB-E



Related Documentation

- [Configuring CFEB Redundancy on the M10i Router](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
- [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)
- [Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E on page 212](#)
- [Removing an M10i CFEB or CFEB-E on page 213](#)

Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E

One or two CFEBs or CFEB-Es can install into the uppermost slots in the rear of the chassis, as shown in “[M10i Chassis Description](#)” on [page 11](#). Only one CFEB or CFEB-E is active at a time, with the optional second CFEB or CFEB-E in reset mode. CFEBs or CFEB-Es are hot-pluggable when you replace a CFEB with a CFEB or a CFEB-E with a CFEB-E, as described in “[M10i Field-Replaceable Units \(FRUs\)](#)” on [page 139](#). Upgrading or downgrading a CFEB device requires a system reboot, as described in “[Upgrading or Downgrading an M10i CFEB or CFEB-E](#)” on [page 215](#). Removing the standby CFEB or CFEB-E has no effect on router function. If the active CFEB or CFEB-E fails or is removed from the chassis, the effect depends on whether two CFEBs or CFEB-Es are installed:

- If there is only one CFEB or CFEB-E, forwarding halts until the CFEB or CFEB-E is replaced and functioning again.
- If there are two CFEBs or CFEB-Es, forwarding halts until the standby CFEB or CFEB-E boots and becomes active.

In both cases, all components in the Packet Forwarding Engine reset, and it takes approximately 1 minute for the new CFEB or CFEB-E to become active; synchronizing

router configuration information can take additional time, depending on the complexity of the configuration.

- [Removing an M10i CFEB or CFEB-E on page 213](#)
- [Installing an M10i CFEB or CFEB-E on page 214](#)
- [Upgrading or Downgrading an M10i CFEB or CFEB-E on page 215](#)

Removing an M10i CFEB or CFEB-E

To remove a CFEB or CFEB-E (see [Figure 79 on page 214](#)):

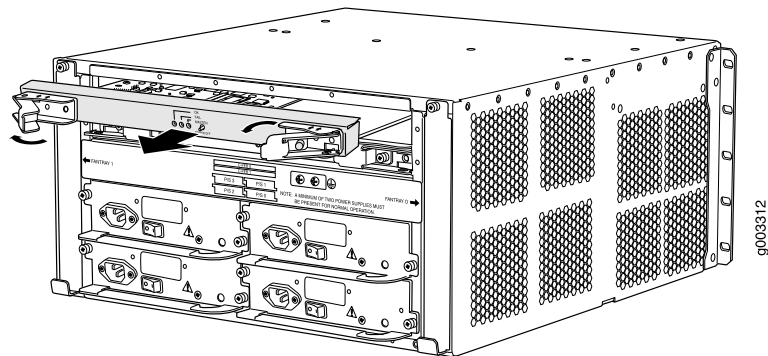
1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
3. If you are removing the active SIB or CFEB-E, press and hold the online/offline button on the faceplate until the yellow LED labeled **FAIL** lights, which takes about 5 seconds.
(The effect of removing the active SIB or CFEB-E depends on whether a second SIB or CFEB-E is installed.)
4. Loosen the thumbscrew on each ejector lever, using a Phillips screwdriver if necessary.
5. Pull the end of each ejector lever outward until it is nearly perpendicular to the CFEB or CFEB-E faceplate.
6. Grasp the ejector levers and pull firmly to slide the CFEB or CFEB-E about halfway out of the chassis.
7. Place one hand under the CFEB or CFEB-E to support it, slide it completely out of the chassis, and place it on the antistatic mat or in the electrostatic bag.



CAUTION: When a CFEB or CFEB-E is out of the chassis, do not hold it by the ejector levers. They cannot support its weight.

Do not stack CFEBs or CFEB-Es on top of or under other components. Place each one individually in an electrostatic bag or on its own antistatic mat on a flat, stable surface.

Figure 79: Removing a CFEB or CFEB-E



- See Also**
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [Configuring CFEB Redundancy on the M10i Router](#)
 - [M10i CFEB and CFEB-E LEDs on page 71](#)
 - [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
 - [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)
 - [Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E on page 212](#)
 - [Installing an M10i CFEB or CFEB-E on page 211](#)

Installing an M10i CFEB or CFEB-E

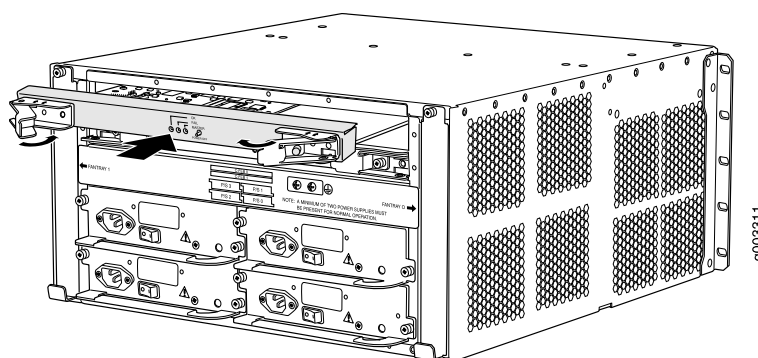
To install a CFEB or CFEB-E (see [Figure 78 on page 212](#)):

1. Attach an ESD grounding strap to your bare wrist and connect the strap to one of the ESD points on the chassis.
2. Verify that the ends of the ejector levers are pulled outward to a position nearly perpendicular to the faceplate of the CFEB or CFEB-E.
3. Place one hand under the CFEB or CFEB-E to support it and grasp one of the ejector levers at the front with the other hand.
4. Align the rear of the CFEB or CFEB-E with the guides inside the chassis and slide it in completely.
5. Press the ejector lever at each end of the CFEB or CFEB-E inward.

6. Tighten the thumbscrew on each ejector lever (shown in [“M10i CFEB and CFEB-E LEDs” on page 69](#)) to seat the CFEB or CFEB-E firmly in the chassis.
7. Press the online/offline button on the CFEB or CFEB-E faceplate and hold it down until the green LED labeled **OUTPUT OK** lights steadily.

You can also verify correct CFEB or CFEB-E functioning by issuing the **show chassis cfeb** commands described in [“Maintaining the M10i CFEB and CFEB-E” on page 225](#).

Figure 80: Installing a CFEB or CFEB-E



- See Also**
- [Configuring CFEB Redundancy on the M10i Router](#)
 - [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
 - [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
 - [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)
 - [Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E on page 212](#)
 - [Removing an M10i CFEB or CFEB-E on page 213](#)

Upgrading or Downgrading an M10i CFEB or CFEB-E

To upgrade by replacing a CFEB with a CFEB-E or downgrade by replacing a CFEB-E with a CFEB requires a system reboot after swapping the CFEB devices.

To upgrade from a CFEB to a CFEB-E or to downgrade from a CFEB-E to a CFEB:

1. Remove the CFEB or CFEB-E as described in [“Removing an M10i CFEB or CFEB-E” on page 213](#).
2. Install the upgrade CFEB-E or downgrade CFEB as described in [“Installing an M10i CFEB or CFEB-E” on page 211](#).
3. Reboot the router:
 - If the router has only one routing engine, issue the CLI command

```
user@host> request system reboot
```

- If the router has two routing engines (a primary routing engine and a backup routing engine), from the primary routing engine issue the following two CLI commands in immediate succession to force the router to reboot:

```
user@host> request system reboot other-routing-engine
```

```
user@host> request system reboot
```

After the reboot, the router recognizes the new CFEB or CFEB-E.

See Also • [*Configuring CFEB Redundancy on the M10i Router*](#)

- [M10i CFEB and CFEB-E LEDs on page 71](#)
- [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
- [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [Removing an M10i CFEB or CFEB-E on page 213](#)
- [Installing an M10i CFEB or CFEB-E on page 211](#)

Related Documentation

- [*Configuring CFEB Redundancy on the M10i Router*](#)
- [M10i CFEB and CFEB-E LEDs on page 71](#)
- [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
- [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)

PART 5

Maintaining the Chassis and Components

- [Routine Maintenance Procedures on page 219](#)
- [Maintaining Components on page 221](#)

CHAPTER 28

Routine Maintenance Procedures

- [Routine Maintenance Procedures for the M10i Router on page 219](#)

Routine Maintenance Procedures for the M10i Router

Purpose	For optimum router performance, perform preventive maintenance procedures.
Action	<ul style="list-style-type: none">• Inspect the installation site for moisture, loose wires or cables, and excessive dust. Verify that airflow is unobstructed around the router and into the air intake vents.• Check the LEDs on the HCM and on hardware components. See "M10i High-Availability Chassis Manager (HCM) Description" on page 14.
Related Documentation	<ul style="list-style-type: none">• M10i Router Environmental Specifications on page 80• M10i Router Physical Specifications on page 76• Packing the M10i Router for Shipment on page 254• M10i Chassis Description on page 11

Maintaining Components

- [Maintaining the M10i Cooling System on page 221](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Maintaining the M10i PICs and PIC Cables on page 223](#)
- [Maintaining the M10i Power Supplies on page 224](#)
- [Maintaining the M10i CFEB and CFEB-E on page 225](#)

Maintaining the M10i Cooling System

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

Action The fan trays install into the rear of the chassis, as shown in [Figure 6 on page 12](#). To check the status of the fans in the fan trays, issue the **show chassis environment** command. The output includes an entry for each fan, as shown in this example:

```
user@host> show chassis environment
```

Class	Item	Status	Measurement
...			
Fans	Left Fan 1	OK	Spinning at normal speed
	Left Fan 2	OK	Spinning at normal speed
	Left Fan 3	OK	Spinning at normal speed
	Left Fan 4	OK	Spinning at normal speed
	Left Fan 5	OK	Spinning at normal speed
	Left Fan 6	OK	Spinning at normal speed
	Left Fan 7	OK	Spinning at normal speed
	Left Fan 8	OK	Spinning at normal speed
...			

For further description of the output from the command, see the [CLI Explorer](#).

Related Documentation

- [Installing an M10i Fan Tray on page 149](#)
- [Troubleshooting the M10i Fan Tray on page 230](#)
- [Replacing an M10i Fan Tray on page 150](#)

Maintaining the M10i Routing Engine

Purpose For optimum performance, verify the condition of the Routing Engine.

- Action**
- Check the LEDs on the Routing Engine. The green LED labeled **ONLINE** lights steadily when it is functioning normally. For more information about the LEDs, see [“M10i Routing Engine Description” on page 21](#).
 - Issue the CLI **show chassis routing-engine** command to check the status of the Routing Engines:

```
user@host> show chassis routing-engine
```

```
Routing Engine status:
Slot 0:
  Current state           Master
  Election priority       Master (default)
  Temperature             27 degrees C / 80 degrees F
  CPU temperature         27 degrees C / 80 degrees F
  DRAM                    768 MB
  Memory utilization      45 percent
  CPU utilization:
    User                  0 percent
    Background            0 percent
    Kernel                3 percent
    Interrupt             0 percent
    Idle                  97 percent
  Model                   RE-5.0
  Serial ID                1000647001
  Start time              2009-01-28 14:11:50 PST
  Uptime                  21 hours, 51 minutes, 16 seconds
  Load averages:         1 minute   5 minute   15 minute
                        0.00         0.02         0.00

Routing Engine status:
Slot 1:
  Current state           Backup
  Election priority       Backup (default)
  Temperature             26 degrees C / 78 degrees F
  CPU temperature         27 degrees C / 80 degrees F
  DRAM                    1536 MB
  Memory utilization      23 percent
  CPU utilization:
    User                  0 percent
    Background            0 percent
    Kernel                0 percent
    Interrupt             0 percent
    Idle                  99 percent
  Model                   RE-850
  Serial ID                1000648260
  Start time              2009-01-28 16:18:12 PST
  Uptime                  19 hours, 44 minutes, 51 seconds
```

For further description of the output from the command, see the [CLI Explorer](#).

- Related Documentation**
- [Installing the M10i Routing Engine on page 153](#)
 - [M10i Routing Engine 400 LEDs on page 24](#)
 - [M10i Routing Engine 850 LEDs on page 26](#)
 - [M10i Routing Engine 1800 LEDs on page 28](#)
 - [M10i Routing Engine Architecture Overview on page 7](#)
 - [Replacing the M10i Routing Engine on page 158](#)

Maintaining the M10i PICs and PIC Cables

Purpose For optimum performance, verify the condition of the PICs and PIC cables.

- Action**
- Check the LEDs on PIC faceplates. The meaning of the LED states differs for various PICs. For more information, see the *M10i Multiservice Edge Router Interface Module Reference*. If the FPC that houses the PIC detects a PIC failure, the FPC generates an alarm message to be sent to the Routing Engine.
 - Issue the CLI **show chassis fpc pic-status** command. The PIC slots in an FPC are numbered from **0** through **3**, top to bottom:

```
user@host> show chassis fpc pic-status
```

```
Slot 0 Online
  PIC 0    4x OC-3 SONET, MM
  PIC 1    1x CSTM1, SMIR
  PIC 3    2x OC-3 ATM, MM
Slot 1 Online
  PIC 0    1x OC-12 SONET, MM
  PIC 1    1x OC-12 ATM, MM
  PIC 2    2x OC-3 ATM, MM
  PIC 3    2x OC-3 ATM, MM
```

For further description of the output from the command, see the [CLI Explorer](#).

- Use the cable management system (shown in [Figure 5 on page 11](#)) to support cables and prevent cables from dislodging or developing stress points. Place excess cable out of the way in the cable management system. Do not allow fastened loops of cable to dangle from the connector or cable management system, 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 PIC cables to identify them.

The following guidelines apply specifically to fiber-optic cable:

- When you unplug a fiber-optic cable from a PIC, always place a rubber safety plug over the transceiver on the PIC faceplate and on the end of the cable.
- Anchor fiber-optic cable to avoid stress on the connectors. When attaching fiber to a PIC, be sure to secure the fiber so it is not supporting its own weight as it hangs 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, such as ATM or SONET/SDH analyzers, 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 have cleaned the transceiver on the fiber-optic PIC, 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.

**Related
Documentation**

- [Connecting M10i PIC Cables on page 121](#)
- [Installing an M10i PIC on page 173](#)
- [Installing an M10i PIC Cable on page 175](#)
- [Troubleshooting the M10i PICs on page 235](#)
- [Replacing an M10i PIC on page 179](#)
- [Replacing an M10i PIC Cable on page 184](#)

Maintaining the M10i Power Supplies

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

- Action**
- Check that the green **OUTPUT OK** LED is lit on the faceplate of both power supplies. For more information about the LED, see [“M10i Power Supply LEDs” on page 66](#).
 - Issue the following CLI command to check the status of the power supplies. As shown in the sample output, the value **OK** in the **Status** column indicates that the power supply is operating normally:

```
user@host> show chassis environment
```


Class	Item	Status	Measurement
Power	Power Supply A	OK	
	Power Supply B	OK	
...			

For further description of the output from the command, see the [CLI Explorer](#).

- Check the red and yellow alarm LEDs on the HCM. 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 CLI command:

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

For a list of possible alarm messages, see “[M10i Hardware and Interface Alarm Messages](#)” on page 229.

- Verify that the power source has the proper current rating and that each power supply is connected to a separate power source.
- Verify that the cable or cord connecting the power supply to the external power source is securely in place and that there is no moisture accumulating near the router.
- Verify that the cable or cord from the power source to the router is not damaged. If the insulation is cracked or broken, replace the cable or cord immediately.
- Verify that the DC power cables or AC power cords do not touch or obstruct access to other router components, and that they do not drape where people could trip on them.
- Verify that the air flow in and out of cooling system components is not obstructed.

Related Documentation

- [M10i Power System Description on page 63](#)
- [M10i Router Power Requirements on page 82](#)
- [Troubleshooting the M10i Power System on page 237](#)
- [Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off on page 237](#)
- [Troubleshooting the M10i Power System When the LED on One Power Supply Is Off on page 237](#)

Maintaining the M10i CFEB and CFEB-E

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

Action The Compact Forwarding Engine Board (CFEB) or Enhanced Compact Forwarding Engine Board (CFEB-E) installs into the rear of the chassis, as shown in [Figure 6 on page 12](#). To maintain the CFEB or CFEB-E, perform the following procedures regularly:

- Check the system logging messages on the management console. The CFEB or CFEB-E notifies the Routing Engine of any errors it detects during normal operation.

- Issue the CLI **show chassis cfep** command to check the status of the CFEB (first output example) or the CFEB-E (second output example).

```
user@host> show chassis cfep
```

```
CFEB status:
  State                Online
  Intake Temperature    27 degrees C / 80 degrees F
  Exhaust Temperature   33 degrees C / 91 degrees F
  CPU utilization        3 percent
  Interrupt utilization  0 percent
  Heap utilization       8 percent
  Buffer utilization      21 percent
  Total CPU DRAM         128 MB
  Internet Processor II  Version 1, Foundry IBM, Part number 164
  Start time:            2003-06-11 11:41:22 PDT
  Uptime:                1 hour, 39 minutes, 31 seconds
```

```
CFEB-E status:
  State                Online
  Intake Temperature    27 degrees C / 80 degrees F
  Exhaust Temperature   33 degrees C / 91 degrees F
  CPU utilization        3 percent
  Interrupt utilization  0 percent
  Heap utilization       8 percent
  Buffer utilization      21 percent
  Total CPU DRAM         128 MB
  Internet Processor II  Version 1, Foundry IBM, Part number 164
  Start time:            2003-06-11 11:41:22 PDT
  Uptime:                1 hour, 39 minutes, 31 seconds
```

For a description of the output from the command, see the [CLI Explorer](#).

Related Documentation

- [Configuring CFEB Redundancy on the M10i Router](#)
- [Installing an M10i CFEB or CFEB-E on page 211](#)
- [M10i CFEB and CFEB-E LEDs on page 71](#)
- [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)

PART 6

Troubleshooting Hardware

- [Troubleshooting Components on page 229](#)

CHAPTER 30

Troubleshooting Components

- [M10i Hardware and Interface Alarm Messages on page 229](#)
- [Troubleshooting the M10i HCM on page 230](#)
- [Troubleshooting the M10i Fan Tray on page 230](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Troubleshooting the M10i PICs on page 235](#)
- [Troubleshooting the M10i Power System on page 237](#)
- [Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off on page 239](#)
- [Troubleshooting the M10i Power System When the LED on One Power Supply Is Off on page 239](#)
- [Troubleshooting the M10i CFEB and CFEB-E on page 241](#)

M10i Hardware and Interface Alarm Messages

When the Routing Engine detects an alarm condition, it lights the appropriate red or yellow alarm LED on the HCM. The HCM is located on the front of the chassis below the FPC card cage, as shown in [Figure 5 on page 11](#).

The circular red alarm LED indicates a critical condition that can result in a system shutdown. The triangular yellow alarm indicates a less severe condition that requires monitoring or maintenance. Both alarms can occur simultaneously. For more information about the alarm LEDs, see “[M10i HCM Alarm LEDs](#)” on [page 16](#).

- Chassis alarms—Indicate a problem with a chassis component such as the cooling system or power supplies.
- Interface alarms—Indicate a problem with a specific network interface, as described in [Table 59 on page 236](#).

In both tables, the text in the column labeled “CLI Message” appears in the output from the **show chassis alarms** command.

Table 56: Chassis Alarm Messages

Chassis Component	Alarm Severity	Alarm Condition	Remedy
Hot swapping	Red	Too many hot-swap interrupts are occurring. This message generally indicates that a hardware component that plugs into the router's midplane from the front is broken.	Contact technical support. See "Contacting Customer Support" on page 245 for more information.

- Related Documentation**
- [Displaying M10i Router Components and Serial Numbers on page 247](#)
 - [M10i Router Physical Specifications on page 76](#)
 - [M10i Routing Engine 400 LEDs on page 24](#)
 - [M10i Routing Engine 850 LEDs on page 26](#)

Troubleshooting the M10i HCM

Problem **Description:** The HCM is not functioning normally.

Solution A green LED labeled **PWR** reports the status of the HCM. When an HCM is functioning correctly, the green LED labeled **OUTPUT OK** is lit steadily. For more information, see [Table 3 on page 16](#).

- Related Documentation**
- [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
 - [Installing an M10i HCM on page 142](#)
 - [M10i HCM Alarm LEDs on page 16](#)
 - [M10i HCM LEDs on page 16](#)

Troubleshooting the M10i Fan Tray

Problem **Description:** The fans in the fan tray are not functioning normally.

Solution To troubleshoot the cooling system:

1. Check the alarm LEDs on the HCM:

- If the yellow or red alarm LED on the HCM is lit, issue the **show chassis alarms** CLI command to view a more detailed description of the alarm cause:

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

For a list of messages that can appear in the output, see [Table 57 on page 232](#).

- If all the LEDs on the HCM are not lit, it might indicate that power is not being provided to the router. See [“Troubleshooting the M10i Power System” on page 237](#). In some cases, the Routing Engine shuts down the router by turning off the power supplies if the temperature passes the acceptable maximum.
2. Check the status of the cooling system by issuing the **show chassis environment** command. The output includes an entry for each fan and temperature for components, as shown in this example:

```
user@host> show chassis environment
```

Class	Item	Status	Measurement
Power	Power Supply 0	OK	
	Power Supply 1	OK	
	Power Supply 2	Absent	
	Power Supply 3	Absent	
Temp	Intake	OK	25 degrees C / 77 degrees F
	FPC 0	OK	30 degrees C / 86 degrees F
	FPC 1	OK	28 degrees C / 82 degrees F
	Lower Power Supplies	OK	28 degrees C / 82 degrees F
	Upper Power Supplies	OK	28 degrees C / 82 degrees F
	Upper Power Supplies	OK	28 degrees C / 82 degrees F
	CFEB Intake	OK	27 degrees C / 80 degrees F
	CFEB Exhaust	OK	35 degrees C / 95 degrees F
	Routing Engine 0	OK	32 degrees C / 89 degrees F
	Routing Engine 1	Absent	
Fans	Fan Tray 0	Absent	
	Fan Tray 1 Fan 1	OK	Spinning at normal speed
	Fan Tray 1 Fan 2	OK	Spinning at normal speed
	Fan Tray 1 Fan 3	OK	Spinning at normal speed
	Fan Tray 1 Fan 4	OK	Spinning at normal speed
	Fan Tray 1 Fan 5	OK	Spinning at normal speed
	Fan Tray 1 Fan 6	OK	Spinning at normal speed
	Fan Tray 1 Fan 7	OK	Spinning at normal speed
	Fan Tray 1 Fan 8	OK	Spinning at normal speed

For further description of the output from the command, see the [CLI Explorer](#).

3. If you receive a temperature alarm:

- Check the temperature of each component by issuing the **show chassis environment** command. Temperature sensors on the components detect temperatures above the acceptable range. Verify that the temperature is **OK** for each component.
- Check the room temperature.

- Check the airflow and clearance around the chassis. For the fan tray to function properly, the clearance around the chassis must be sufficient for unobstructed airflow. See [“Clearance Requirements for Airflow and Hardware Maintenance” on page 79](#). For a graphic depiction of the airflow, see [Figure 11 on page 19](#).
 - Check if a faulty fan is causing the temperature to be elevated for one or more components.
4. Check the fan tray:
 - Check the status of the fans by issuing the **show chassis environment** command. Verify that the status is **OK** and that the fans are **Spinning at Normal Speed**.
 - If the fan tray fails, determine whether you can distinguish individual blades in a fan—this is not possible when the fans are rotating at normal speed.
 5. If you are unable to correct the problem, replace the fan tray with a spare. For instructions, see [“Replacing an M10i Fan Tray” on page 150](#). If the LED lights correctly on the spare, the original fan tray is faulty. Return it to Juniper Networks for replacement, as described in [“Returning a Hardware Component to Juniper Networks, Inc.” on page 253](#).

Table 57: Cooling System Alarm Messages

Chassis Component	Alarm Severity	CLI Message	Alarm Condition	Solution
Fan Trays	Red	<i>fan-name</i> Failure	A fan has failed.	Replace failed fan tray.
	Red	Too many fans missing or failing.	Both fan trays are absent from the chassis.	Install missing fan trays.
	Yellow	<i>fan-name</i> Removed	A fan is absent.	Install missing fan tray.
Temperature	Yellow	Temperature warm	<p>If the fans are running at full speed and one or more fans have failed, the chassis temperature has exceeded 55° C.</p> <p>If the fans are running at full speed but no fans have failed, the chassis temperature has exceeded 65° C.</p>	<ul style="list-style-type: none"> • Check room temperature. • Check air flow. • Check fan tray.

Table 57: Cooling System Alarm Messages (continued)

Chassis Component	Alarm Severity	CLI Message	Alarm Condition	Solution
	Red	Temperature hot	<p>If a fan has failed, the chassis temperature has exceeded 65° C. If this condition persists for more than 4 minutes, the router shuts down.</p> <p>The chassis temperature has exceeded 75° C. If this condition persists for more than 4 minutes, the router shuts down.</p>	<ul style="list-style-type: none"> • Check room temperature. • Check air flow. • Check fan tray.
	Red	Temperature sensor failure	The temperature sensor has failed.	Contact technical support. See “Contacting Customer Support” on page 245 for more information.

- Related Documentation**
- [Installing an M10i Fan Tray on page 149](#)
 - [M10i Router Physical Specifications on page 76](#)
 - [Maintaining the M10i Cooling System on page 221](#)

Troubleshooting the M10i Routing Engine

Problem **Description:** The Routing Engine is not functioning normally.

Solution A green LED labeled **ONLINE** reports the status of the Routing Engine. When a Routing Engine is functioning correctly, the green LED labeled **ONLINE** is lit steadily. For more information, see [Table 6 on page 26](#). To troubleshoot a Routing Engine:

1. Check the alarm LEDs on the HCM.
2. Issue the **show chassis alarms** CLI command to view a more detailed description of the alarm cause:

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

For a list of messages that can appear in the output, see [Table 58 on page 234](#).

3. If an alarm indicates a problem with the CompactFlash card, reinstall the Junos OS from Removable Media. See the *Software Installation and Upgrade Guide*.

4. Verify that the Routing Engine is properly seated.
5. If you are unable to correct the problem, replace the Routing Engine with a spare. For instructions, see [“Replacing the M10i Routing Engine” on page 158](#). If the LED lights correctly on the spare, the original Routing Engine is faulty. Return it to Juniper Networks, as described in [“Contacting Customer Support” on page 245](#).

Table 58: Routing Engine Alarm Messages

Alarm Severity	CLI Message	Alarm Condition	Solution
Yellow	Host <i>routing-engine-number</i> hard-disk drive error	Error in reading or writing hard disk.	Reinstall the Junos OS from Removable Media.
Yellow	Host <i>routing-engine-number</i> compact-flash drive error	Error in reading or writing the CompactFlash card.	Reinstall the Junos OS from Removable Media.
Yellow	ECC multibit parity error	A parity error occurred in the memory DIMMs	Replace the memory DIMMs. See “Replacing an SDRAM Module on an M10i Routing Engine” on page 167 .
Yellow	Host <i>routing-engine-number</i> Boot from alternate media	A CompactFlash card is installed, but the system booted from the hard disk.	No action is required if you configure your router to boot from the hard disk. If not, reinstall the Junos OS from Removable Media.
Red	Backup RE Active	Backup Routing Engine is active. Either a command was issued to switch to the backup Routing Engine or the master Routing Engine has failed.	No action is required if the backup Routing Engine was intentionally made active. If the master Routing Engine failed, replace it.
Red	Mixed Master and Backup RE types	One Routing Engine 400 and one Routing Engine 850 are installed in the same router.	Both Routing Engines must be the same model number. Replace one of the Routing Engines.
Red	Host <i>routing-engine-number</i> compact-flash missing in boot list	CompactFlash card missing in boot list.	Replace the failed Routing Engine.

Table 58: Routing Engine Alarm Messages (continued)

Alarm Severity	CLI Message	Alarm Condition	Solution
Red	Host routing-engine-number hard-disk missing in boot list	Hard disk missing in boot list.	Replace the failed Routing Engine.
Red	Loss of Communication with Backup RE	Backup Routing Engine failed to boot.	Replace the failed Routing Engine.

Related Documentation

- [Installing the M10i Routing Engine on page 153](#)
- [M10i Routing Engine 400 LEDs on page 24](#)
- [M10i Routing Engine Architecture Overview on page 7](#)
- [Maintaining the M10i Routing Engine on page 222](#)

Troubleshooting the M10i PICs

Problem **Description:** The PICs are not functioning normally.

Solution To troubleshoot the PICs:

1. Check the status of the LEDs located on the PIC faceplate. Many PICs have an LED labeled **STATUS** on their faceplate. Some PICs have additional LEDs, often one per port. For information about the LEDs on each PICs, see the *M10i Multiservice Edge Router Interface Module Reference*.
2. Issue the following CLI command to check the status of a PIC:

```
user@host> show chassis fpc pic-status
```

```
Slot 0 Online
  PIC 0    4x OC-3 SONET, MM
  PIC 1    1x CSTM1, SMIR
  PIC 3    2x OC-3 ATM, MM
Slot 1 Online
  PIC 0    1x OC-12 SONET, MM
  PIC 1    1x OC-12 ATM, MM
  PIC 2    2x OC-3 ATM, MM
  PIC 3    2x OC-3 ATM, MM
```

For further description of the output from the command, see the [CLI Explorer](#).

The PIC slots are numbered from 0 through 3, right to left

3. If an LED is lit indicating a problem with the PIC, issue the **show chassis alarms** CLI command to view a more detailed description of the alarm cause:

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

For a list of messages that can appear in the output, see [Table 59 on page 236](#).

4. If you are unable to correct the problem, replace the PIC with a spare. For instructions, see [“Replacing an M10i PIC” on page 179](#). If the LEDs light correctly on the spare, the original PIC is faulty. Return it to Juniper Networks for replacement, as described in [“Contacting Customer Support” on page 245](#).

Table 59: SONET/SDH Interface Alarm Messages

CLI Message
<i>interface-name</i> so-x/x/x - SONET bit error rate defect
<i>interface-name</i> so-x/x/x - SONET bit error rate fault
<i>interface-name</i> so-x/x/x - SONET line AIS
<i>interface-name</i> so-x/x/x - SONET line remote defect indicator
<i>interface-name</i> so-x/x/x - SONET loss of frame
<i>interface-name</i> so-x/x/x - SONET loss of light
<i>interface-name</i> so-x/x/x - SONET loss of pointer
<i>interface-name</i> so-x/x/x - SONET loss of signal
<i>interface-name</i> so-x/x/x - SONET path AIS
<i>interface-name</i> so-x/x/x - SONET path mismatch
<i>interface-name</i> so-x/x/x - SONET path remote defect indicator
<i>interface-name</i> so-x/x/x - SONET PLL lock
<i>interface-name</i> so-x/x/x - SONET remote error indicator
<i>interface-name</i> so-x/x/x - SONET severely errored frame
<i>interface-name</i> so-x/x/x - SONET unequipped

- Related Documentation**
- [Installing an M10i PIC on page 173](#)
 - [M10i PIC LEDs on page 53](#)
 - [M10i PICs Description on page 51](#)
 - [Maintaining the M10i PICs and PIC Cables on page 223](#)

Troubleshooting the M10i Power System

A green LED labeled **OUTPUT OK** reports the status of the power supply. When a power supply is functioning correctly, the green LED labeled **OUTPUT OK** is lit steadily. For more information, see [“M10i Power Supply LEDs” on page 66](#).

If any other LED states apply, consult the following topics:

- [Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off on page 237](#)
- [Troubleshooting the M10i Power System When the LED on One Power Supply Is Off on page 237](#)

Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off

Problem **Description:** When no power is provided to the router, no LEDs are lit, including the power supply LEDs and the alarm LEDs on the HCM.

Solution To troubleshoot the power system when no LEDs are lit:

1. Check if the router has been powered off or if a power failure has occurred.
2. Check that the power is being provided from the facility power distribution.
3. Check if the system temperature has exceeded the acceptable maximum. The Routing Engine shuts down all power supplies if the temperature exceeds the maximum. Excessive system temperature is almost always caused by excessive environmental temperature. Correct the environmental temperature before repowering the router.

- See Also**
- [M10i AC Power Supply Description on page 64](#)
 - [M10i DC Power Supply Description on page 65](#)
 - [M10i Power System Description on page 63](#)
 - [M10i Power Supply LEDs on page 66](#)
 - [M10i Router Power Requirements on page 82](#)

Troubleshooting the M10i Power System When the LED on One Power Supply Is Off

Problem **Description:** The LED on one power supply is off, but the LED on the other supplies indicate that they are functioning properly.

Solution Perform the following diagnostic procedure:

1. Check the red alarm LED on the HCM:

- If it is lit, issue the following CLI command for information about the cause of an alarm condition:

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

For a list of messages that can appear in the output, see [Table 60 on page 238](#).

A common cause of power supply shutdown is that the temperature of the power supply or another router component has exceed the maximum limit.

- If the red alarm LED is not lit, check that the power switch is in the **ON** position on the power supply faceplate.
2. Replace the faulty power supply with a spare. For instructions, see “[Replacing an M10i AC Power Supply](#)” on page 195 and “[Replacing an M10i DC Power Supply](#)” on page 201. If the LED lights correctly on the spare, the original power supply is faulty. Return it to Juniper Networks for replacement, as described in “[Returning a Hardware Component to Juniper Networks, Inc.](#)” on page 253.
 3. If the spare power supply also does not work, connect the router to a different power source. You might also try replacing the AC power cord (on an AC-powered router) or DC power cable (on a DC-powered router). For instructions, see “[Replacing an M10i AC Power Cord](#)” on page 199 or “[Replacing an M10i DC Power Cable](#)” on page 206 (you do not need to disconnect and reconnect the grounding cable on a DC-powered router).
 4. If you cannot determine the cause of the problem or need additional assistance, see “[Contacting Customer Support](#)” on page 245.

Table 60: Power System Alarm Messages

Alarm Severity	CLI Message	Alarm Condition	Solution
Yellow	PEM <i>pem-number</i> removed	A power supply has been removed.	Insert missing power supply.
Red	PEM <i>pem-number</i> Not OK	A power supply has failed.	Replace failed power supply
Red	Too many PEMs missing	Only one power supply is operating.	Insert or replace secondary power supply.

- See Also**
- [M10i AC Power Supply Description on page 64](#)
 - [M10i DC Power Supply Description on page 65](#)

- [M10i Power System Description on page 63](#)
- [M10i Power Supply LEDs on page 66](#)
- [M10i Router Power Requirements on page 82](#)

Related Documentation

- [M10i AC Power Supply Description on page 64](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Power System Description on page 63](#)
- [M10i Power Supply LEDs on page 66](#)
- [M10i Router Power Requirements on page 82](#)

Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off

Problem **Description:** When no power is provided to the router, no LEDs are lit, including the power supply LEDs and the alarm LEDs on the HCM.

Solution To troubleshoot the power system when no LEDs are lit:

1. Check if the router has been powered off or if a power failure has occurred.
2. Check that the power is being provided from the facility power distribution.
3. Check if the system temperature has exceeded the acceptable maximum. The Routing Engine shuts down all power supplies if the temperature exceeds the maximum. Excessive system temperature is almost always caused by excessive environmental temperature. Correct the environmental temperature before repowering the router.

Related Documentation

- [M10i AC Power Supply Description on page 64](#)
- [M10i DC Power Supply Description on page 65](#)
- [M10i Power System Description on page 63](#)
- [M10i Power Supply LEDs on page 66](#)
- [M10i Router Power Requirements on page 82](#)

Troubleshooting the M10i Power System When the LED on One Power Supply Is Off

Problem **Description:** The LED on one power supply is off, but the LED on the other supplies indicate that they are functioning properly.

Solution Perform the following diagnostic procedure:

1. Check the red alarm LED on the HCM:
 - If it is lit, issue the following CLI command for information about the cause of an alarm condition:


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

For a list of messages that can appear in the output, see [Table 60 on page 238](#).

A common cause of power supply shutdown is that the temperature of the power supply or another router component has exceed the maximum limit.
 - If the red alarm LED is not lit, check that the power switch is in the **ON** position on the power supply faceplate.
2. Replace the faulty power supply with a spare. For instructions, see [“Replacing an M10i AC Power Supply” on page 195](#) and [“Replacing an M10i DC Power Supply” on page 201](#). If the LED lights correctly on the spare, the original power supply is faulty. Return it to Juniper Networks for replacement, as described in [“Returning a Hardware Component to Juniper Networks, Inc.” on page 253](#).
3. If the spare power supply also does not work, connect the router to a different power source. You might also try replacing the AC power cord (on an AC-powered router) or DC power cable (on a DC-powered router). For instructions, see [“Replacing an M10i AC Power Cord” on page 199](#) or [“Replacing an M10i DC Power Cable” on page 206](#) (you do not need to disconnect and reconnect the grounding cable on a DC-powered router).
4. If you cannot determine the cause of the problem or need additional assistance, see [“Contacting Customer Support” on page 245](#).

Table 61: Power System Alarm Messages

Alarm Severity	CLI Message	Alarm Condition	Solution
Yellow	PEM <i>pem-number</i> removed	A power supply has been removed.	Insert missing power supply.
Red	PEM <i>pem-number</i> Not OK	A power supply has failed.	Replace failed power supply
Red	Too many PEMs missing	Only one power supply is operating.	Insert or replace secondary power supply.

- Related Documentation**
- [M10i AC Power Supply Description on page 64](#)
 - [M10i DC Power Supply Description on page 65](#)

- [M10i Power System Description on page 63](#)
- [M10i Power Supply LEDs on page 66](#)
- [M10i Router Power Requirements on page 82](#)

Troubleshooting the M10i CFEB and CFEB-E

Problem **Description:** The CFEB or CFEB-E is not functioning normally.

Solution When a CFEB or CFEB-E is functioning correctly, the green LED labeled **OK** is lit steadily. For more information about the CFEB or CFEB-E LEDs, see [Table 40 on page 71](#). If the CFEB or CFEB-E fails, the forwarding and routing functions of the router halt immediately and do not resume until the CFEB or CFEB-E failure has been corrected.

To troubleshoot a CFEB or CFEB-E:

1. Check the alarm LEDs on the HCM. If the yellow or red alarm LED on the HCM is lit, issue the **show chassis alarms** CLI command to view a more detailed description of the alarm cause:

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

For a list of messages that can appear in the output, see [Table 62 on page 241](#).

2. Verify that the CFEB or CFEB-E is properly seated in the midplane. Use a Phillips screwdriver to ensure that the screws are securely tightened.
3. If you are unable to correct the problem, replace the CFEB or CFEB-E with a spare. For instructions, see “[Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E](#)” on page 212. If the LED lights correctly on the spare, the original CFEB or CFEB-E is faulty. Return it to Juniper Networks, as described in “[Contacting Customer Support](#)” on page 245.

Table 62: CFEB or CFEB-E Alarm Messages

Alarm Severity	Alarm Condition	Solution
Red	Both CFEBs/CFEB-Es have been removed or have failed.	Replace failed or missing CFEB/CFEB-E.
Red	Too many hard errors in CFEB/CFEB-E memory.	Replace failed CFEB/CFEB-E.
Red	Too many soft errors in CFEB/CFEB-E memory.	Replace failed CFEB/CFEB-E.

Table 62: CFEB or CFEB-E Alarm Messages (continued)

Alarm Severity	Alarm Condition	Solution
Red	A CFEB/CFEB-E microcode download has failed.	Replace failed CFEB/CFEB-E.

- Related Documentation**
- *Configuring CFEB Redundancy on the M10i Router*
 - [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
 - [Removing an M10i CFEB or CFEB-E on page 213](#)

PART 7

Contacting Customer Support and Returning the Chassis or Components

- [Contacting Customer Support on page 245](#)
- [Locating Component Serial Numbers on page 247](#)
- [Packing and Returning Components on page 253](#)

Contacting Customer Support

- [Contacting Customer Support on page 245](#)

Contacting Customer Support

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

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

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

- By telephone:

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

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

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

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

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

CHAPTER 32

Locating Component Serial Numbers

- [Displaying M10i Router Components and Serial Numbers on page 247](#)
- [M10i HCM Serial Number ID Label on page 248](#)
- [M10i Routing Engine Serial Number ID Label on page 249](#)
- [M10i PIC Serial Number ID Label on page 250](#)
- [M10i Power Supply Serial Number ID Label on page 251](#)
- [M10i CFEB and CFEB-E Serial Number ID Label on page 251](#)

Displaying M10i Router Components and Serial Numbers

Before contacting Juniper Networks, Inc. to request a Return Materials Authorization (RMA), you must find the serial number on the router or component. To list all the router components and their serial numbers, enter the following command-line interface (CLI) command (the first example output is for a CFEB, the second example output is for a CFEB-E):

```
user@host> show chassis hardware
```

Hardware inventory:

Item	Version	Part number	Serial number	Description
Chassis			19152	M10i
Midplane	REV 02	710-008920	CA0345	
Power Supply 0	Rev 02	740-008985	PE10738	DC
Power Supply 1	Rev 02	740-008985	PE10745	DC
HCM slot 0	REV 02	710-008661	CA0374	
HCM slot 1	REV 02	710-008661	CA0364	
Routing Engine 0	REV 01	740-008846	1000413124	RE-5.0
Routing Engine 1	REV 01	740-008846	1000413128	RE-5.0
CFEB slot 0	REV 05	710-008599	CA0153	Internet Processor IIv1
CFEB slot 1	N/A	N/A	N/A	backup
FPC 0				E-FPC
PIC 0	REV 03	750-005726	HK8844	1x OC-12 ATM-II, MM
PIC 1	REV 03	750-000611	AB8861	4x OC-3 SONET, MM
PIC 2	REV 02	750-002987	HB3841	1x OC-12 SONET, SMIR
PIC 3	REV 02	750-003037	HD4550	4x T1, RJ48
FPC 1				E-FPC
PIC 0	REV 04	750-003343	HA7349	4x T3 ATM
PIC 1	REV 04	750-003036	HD0124	4x E1, RJ48
PIC 2	REV 01	750-002982	HC7606	1x Tunnel
PIC 3	REV 05	750-003845	HF7007	1x 800M Crypto

```
user@host>show chassis hardware
```

Hardware inventory:

Item	Version	Part number	Serial number	Description
Chassis			39894	M10i
Midplane	REV 04	710-008920	CN4635	M10i Midplane
Power Supply 0	Rev 02	740-008985	5425307	DC Power Supply
Power Supply 1	Rev 02	740-008985	5425481	DC Power Supply
Power Supply 2	Rev 02	740-008985	5425418	DC Power Supply
Power Supply 3	Rev 02	740-008985	5425448	DC Power Supply
HCM 0	REV 03	710-010580	CN6681	M10i HCM
HCM 1	REV 03	710-010580	CN6670	M10i HCM
Routing Engine 0	REV 01	740-011202	1000610328	RE-850
Routing Engine 1	REV 08	740-011202	9009006957	RE-850
CFEB 0	REV 01	750-023594	PR4674	Enhanced CFEB
CFEB 1	N/A	N/A	N/A	Backup
FPC 0				E-FPC
PIC 0	REV 01	750-014628	DA5519	4x OC-3 1x OC-12 SFP
PIC 1	REV 07	750-010238	CS9646	1x G/E SFP, 1000 BASE
Xcvr 0	REV 01	740-011782	P8C1Q8N	SFP-SX
PIC 2	REV 11	750-002992	CN8292	4x F/E, 100 BASE-TX
PIC 3	REV 12	750-002992	DC1621	4x F/E, 100 BASE-TX
FPC 1				E-FPC
PIC 0	REV 04	750-014627	WM4750	4x OC-3 1x OC-12 SFP
PIC 1	REV 01	750-014630	DA5535	1x OC-12-3 SFP
PIC 2	REV 01	750-014630	DA5530	1x OC-12-3 SFP
PIC 3	REV 10	750-007641	RE0082	1x G/E IQ, 1000 BASE
Xcvr 0	REV 01	740-011782	P9S0VPF	SFP-SX
Fan Tray 1				Rear Right Fan Tray

Most components also have a small rectangular serial number ID label (see [Figure 81 on page 248](#)) attached to the component body.

Figure 81: Serial Number ID Label

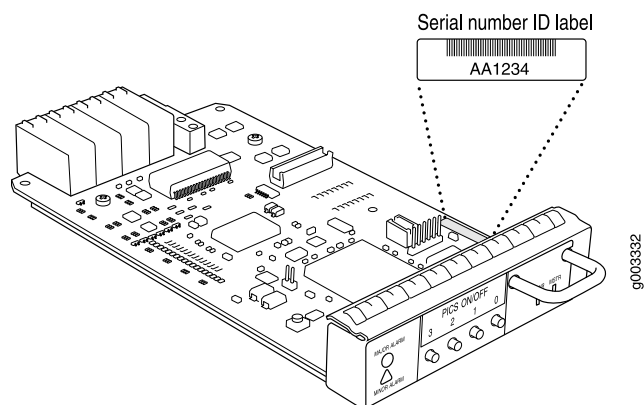


Related Documentation

- [M10i CFEB and CFEB-E Serial Number ID Label on page 251](#)
- [M10i HCM Serial Number ID Label on page 248](#)
- [M10i PIC Serial Number ID Label on page 250](#)
- [M10i Power Supply Serial Number ID Label on page 251](#)
- [M10i Routing Engine Serial Number ID Label on page 249](#)
- [Contacting Customer Support on page 245](#)

M10i HCM Serial Number ID Label

The serial number ID label on an HCM is located near the front on the right side, as shown in [Figure 82 on page 249](#).

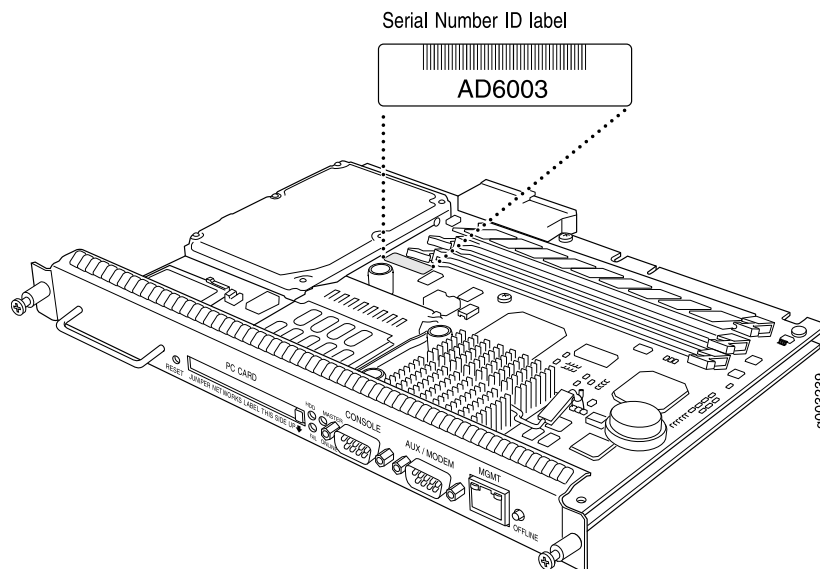
Figure 82: HCM Serial Number ID Label

Related Documentation

- [M10i High-Availability Chassis Manager \(HCM\) Description on page 14](#)
- [M10i HCM LEDs on page 16](#)
- [M10i HCM Alarm LEDs on page 16](#)
- [Troubleshooting the M10i HCM on page 230](#)
- [Replacing an M10i HCM on page 143](#)
- [Contacting Customer Support on page 245](#)

M10i Routing Engine Serial Number ID Label

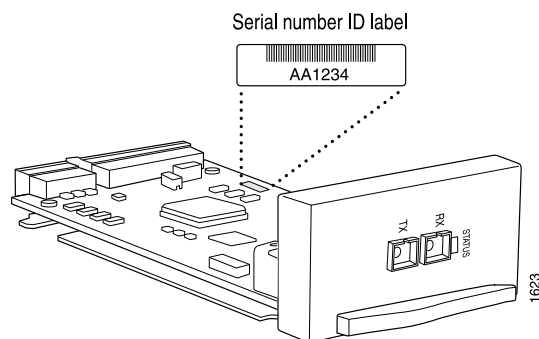
The serial number ID label on a Routing Engine is located on the left side, near the back, as shown in [Figure 83 on page 250](#). Some Routing Engines might have more than one serial number. Contact your Juniper Networks support representative if you need assistance in determining which serial number to provide.

Figure 83: Routing Engine Serial Number ID Label
Related Documentation

- [M10i Routing Engine Description on page 21](#)
- [Maintaining the M10i Routing Engine on page 222](#)
- [Troubleshooting the M10i Routing Engine on page 233](#)
- [Replacing the M10i Routing Engine on page 158](#)
- [Contacting Customer Support on page 245](#)

M10i PIC Serial Number ID Label

The serial number ID label for a PIC is located on the right side of the PIC, as shown in [Figure 84 on page 250](#).

Figure 84: PIC Serial Number ID Label
Related Documentation

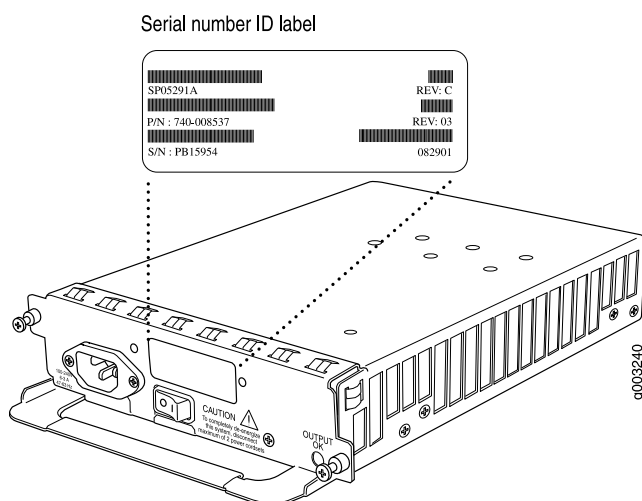
- [M10i PICs Description on page 51](#)
- [M10i PIC LEDs on page 53](#)

- [Maintaining the M10i PICs and PIC Cables on page 223](#)
- [Troubleshooting the M10i PICs on page 235](#)
- [Replacing an M10i PIC on page 179](#)
- [Contacting Customer Support on page 245](#)

M10i Power Supply Serial Number ID Label

The serial number ID label on a power supply is located on the faceplate, as shown in [Figure 85 on page 251](#).

Figure 85: Power Supply Serial Number ID Label

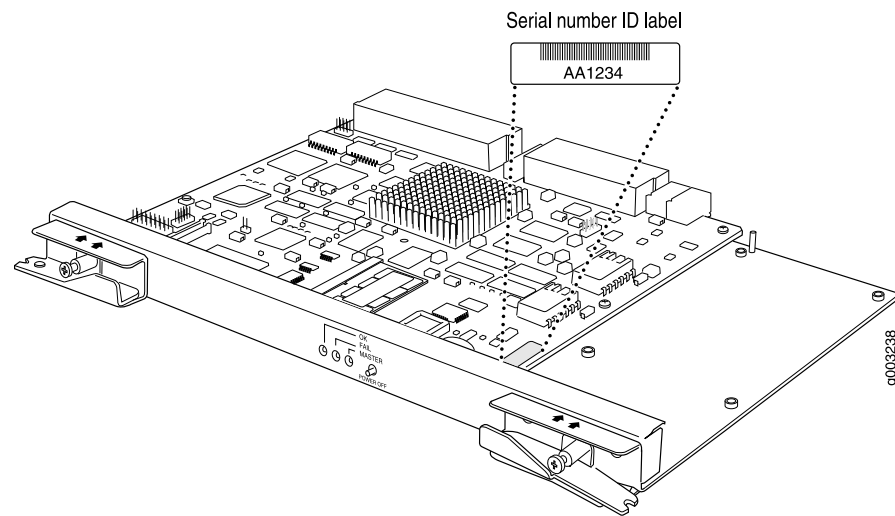


Related Documentation

- [M10i Power System Description on page 63](#)
- [Replacing an M10i DC Power Supply on page 201](#)
- [Troubleshooting the M10i Power System When LEDs on All Power Supplies Are Off on page 237](#)
- [Troubleshooting the M10i Power System When the LED on One Power Supply Is Off on page 237](#)
- [Replacing an M10i AC Power Supply on page 195](#)
- [Replacing an M10i DC Power Supply on page 201](#)
- [Contacting Customer Support on page 245](#)

M10i CFEB and CFEB-E Serial Number ID Label

The serial number ID label on a CFEB or CFEB-E is located on the right side of the top panel, as shown in [Figure 86 on page 252](#).

Figure 86: CFEB or CBEF-E Serial Number ID Label**Related Documentation**

- [M10i Compact Forwarding Engine Board \(CFEB\) and Enhanced Compact Forwarding Engine Board \(CFEB-E\) Description on page 67](#)
- [M10i CFEB and CFEB-E LEDs on page 71](#)
- [Maintaining the M10i CFEB and CFEB-E on page 225](#)
- [Replacing, Upgrading, or Downgrading an M10i CFEB or CFEB-E on page 212](#)
- [Contacting Customer Support on page 245](#)

Packing and Returning Components

- Returning a Hardware Component to Juniper Networks, Inc. on page 253
- Tools and Parts Required to Remove Components from an M10i Router on page 254
- Packing the M10i Router for Shipment on page 254
- Guidelines for Packing M10i Components for Shipment on page 256

Returning a Hardware Component to Juniper Networks, Inc.

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



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

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

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

To return a defective hardware component:

1. Determine the part number and serial number of the defective component.
2. Obtain an RMA number from the Juniper Networks Technical Assistance Center (JTAC). You can send e-mail or telephone as described above.
3. Provide the following information in your e-mail message or during the telephone call:
 - Part number and serial number of component
 - Your name, organization name, telephone number, and fax number

- Description of the failure
- 4. The support representative validates your request and issues an RMA number for return of the component.
- 5. Pack the component for shipment.

Tools and Parts Required to Remove Components from an M10i Router

To remove components from the router or the router from a rack, you need the following tools and parts:

- 2.5-mm flat-blade (–) screwdriver, for detaching alarm relay terminal block
- 7/16-in. (11 mm) nut driver
- Blank panels to cover empty slots
- Electrostatic bag or antistatic mat, for each component
- Electrostatic discharge (ESD) grounding wrist strap
- Flat-blade (–) screwdriver
- Mechanical lift, if available
- Phillips (+) screwdrivers, numbers 1 and 2
- Rubber safety cap for fiber-optic interfaces or cable
- Wire cutters

Related Documentation

- [Contacting Customer Support on page 245](#)
- [Returning a Hardware Component to Juniper Networks, Inc. on page 253](#)
- [Packing the M10i Router for Shipment on page 254](#)
- [Guidelines for Packing M10i Components for Shipment on page 256](#)

Packing the M10i Router for Shipment

To pack the router for shipment:

1. Retrieve the shipping crate and packing materials in which the router was originally shipped. If you do not have these materials, contact your Juniper Networks representative about approved packaging materials.
2. Power off the router. See [“Powering Off the M10i Router” on page 129](#).
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. Disconnect power from the router. For instructions, see [“Disconnecting Power on an AC-Powered M10i Router” on page 208](#) or [“Disconnecting Power on an DC-Powered M10i Router” on page 209](#).
5. Remove the cables that connect to all external devices. For instructions, see [“Replacing an M10i Ethernet Management Cable” on page 171](#), [“Replacing an M10i Console or Auxiliary Cable” on page 171](#), and [“Removing an M10i PIC” on page 179](#).
6. Remove all Field Replaceable Units (FRUs) from the router.
7. Remove the router from the rack:
 - If you are using a mechanical lift, place the lift platform under the router, unscrew and remove the mounting screws from the rack, and move the router to the shipping crate.
 - If you are not using a mechanical lift and the router weight is fully supported by a shelf or another router, unscrew and remove the mounting screws from the rack. Three people can then lift the router and move it to the shipping crate.
 - If you are not using a mechanical lift and the router weight is not fully supported by a shelf or another router, three people should grasp the router while a fourth person unscrews and removes the mounting screws from the rack. The three lifters can then move the router to the shipping crate.
8. Place the router in the shipping crate or onto the pallet. If on a pallet, bolt the router to the pallet.
9. Cover the router with an ESD bag and place the packing foam on top of and around the router.
10. Replace the accessory box on top of the packing foam.
11. Securely tape the box closed or place the crate cover over the router.
12. Write the RMA number on the exterior of the box to ensure proper tracking.

Related Documentation

- [Contacting Customer Support on page 245](#)
- [Returning a Hardware Component to Juniper Networks, Inc. on page 253](#)
- [Tools and Parts Required to Remove Components from an M10i Router on page 254](#)
- [Guidelines for Packing M10i Components for Shipment on page 256](#)

Guidelines for Packing M10i Components for Shipment

To pack and ship individual components:

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



CAUTION: Do not stack any of the hardware components.

Related Documentation

- [Contacting Customer Support on page 245](#)
- [Returning a Hardware Component to Juniper Networks, Inc. on page 253](#)
- [Tools and Parts Required to Remove Components from an M10i Router on page 254](#)
- [Packing the M10i Router for Shipment on page 254](#)

PART 8

Safety

- [General Safety Guidelines and Warnings on page 259](#)
- [Fire Safety Requirements on page 267](#)
- [Installation Safety Guidelines and Warnings on page 269](#)
- [Laser and LED Safety Guidelines and Warnings on page 277](#)
- [Maintenance and Operational Safety Guidelines and Warnings on page 281](#)
- [Electrical Safety Guidelines and Warnings on page 287](#)
- [Agency Approvals and Compliance Statements on page 299](#)

General Safety Guidelines and Warnings

- [Definition of Safety Warning Levels on page 259](#)
- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
- [General Safety Warnings for Juniper Networks Devices on page 262](#)
- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)

Definition of Safety Warning Levels

The documentation uses the following levels of safety warnings:



NOTE: You might find this information helpful in a particular situation, or might otherwise overlook it.



CAUTION: You must observe the specified guidelines to avoid minor injury or discomfort to you, or severe damage to the hardware device.



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



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

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

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa,

ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.

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

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

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

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

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

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

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

**Related
Documentation**

- [General Safety Warnings for Juniper Networks Devices on page 262](#)
- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
- [Maintenance and Operational Safety Warnings for Juniper Networks Devices on page 281](#)
- [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)
- [DC Power Electrical Safety Warnings for Juniper Networks Devices on page 293](#)

General Safety Guidelines for Juniper Networks Devices

The following guidelines help ensure your safety and protect the hardware equipment 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 this documentation. Make sure that only authorized service personnel perform other system services.
- Keep the area around the chassis 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, that could become caught in the chassis.
- Wear safety glasses if you are working under any conditions that could be hazardous to your eyes.
- Do not perform any actions that create a potential hazard to people or make the equipment unsafe.
- Never attempt to lift an object that is too heavy for one person to handle.
- Never install or manipulate wiring during electrical storms.
- Never install electrical jacks in wet locations unless the jacks are specifically designed for wet environments.
- Operate the hardware equipment only when the chassis is properly grounded.
- Do not open or remove chassis covers or sheet metal parts unless instructions are provided in this documentation. 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 hardware component. Such an action could cause electrical shock or damage the hardware equipment.
- 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 router might become hot. The following label provides the warning of the hot surfaces on the router:



Related Documentation

- [General Safety Warnings for Juniper Networks Devices on page 262](#)

General Safety Warnings for Juniper Networks Devices

- [Qualified Personnel Warning on page 262](#)
- [Restricted-Access Area Warning on page 262](#)

Qualified Personnel Warning



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

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

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

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

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

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

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

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

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

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

Restricted-Access Area Warning



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

Waarschuwing Dit toestel is bedoeld voor installatie op plaatsen met beperkte toegang. Een plaats met beperkte toegang is een plaats waar toegang slechts door servicepersoneel verkregen kan worden door middel van een speciaal

instrument, een slot en sleutel, of een ander veiligheidsmiddel, en welke beheerd wordt door de overheidsinstantie die verantwoordelijk is voor de locatie.

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

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

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

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

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

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

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

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

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Related Documentation

- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
- [Maintenance and Operational Safety Warnings for Juniper Networks Devices on page 281](#)
- [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)
- [DC Power Electrical Safety Warnings for Juniper Networks Devices on page 293](#)

Preventing Electrostatic Discharge Damage to an M10i Router

Many router hardware components 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:

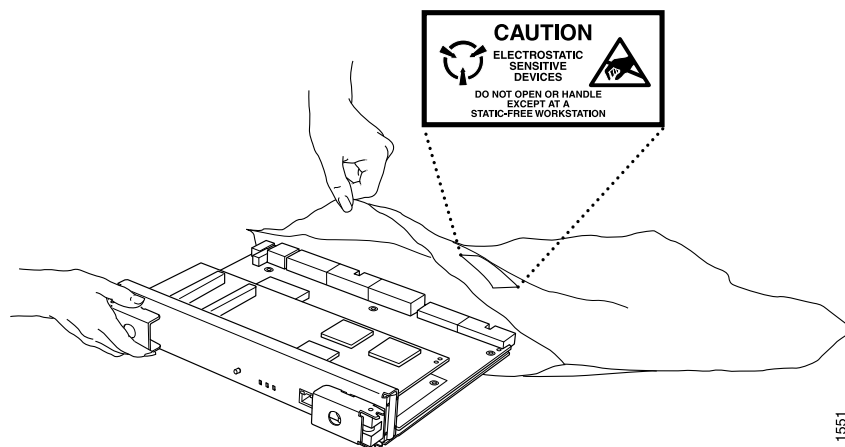
- Always use an ESD wrist strap or ankle strap, and make sure that it is in direct contact with your skin.



CAUTION: For safety, periodically check the resistance value of the ESD strap. The measurement should be in the range of 1 through 10 Mohms.

- When handling any component that is removed from the chassis, make sure the equipment end of your ESD strap is attached to one of the ESD points on the chassis.
- Avoid contact between the component and your clothing. ESD voltages emitted from clothing can still damage components.
- When removing or installing a component, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an electrostatic bag (see [Figure 87 on page 264](#)). If you are returning a component, place it in an electrostatic bag before packing it.

Figure 87: Placing a Component into an Electrostatic Bag



Related Documentation

- [M10i Chassis Description on page 11](#)

CHAPTER 35

Fire Safety Requirements

- [Fire Safety Requirements for Juniper Networks Devices on page 267](#)

Fire Safety Requirements for Juniper Networks Devices

- [General Fire Safety Requirements on page 267](#)
- [Fire Suppression on page 267](#)
- [Fire Suppression Equipment on page 267](#)

General Fire Safety Requirements

In the event of a fire emergency involving network devices, the safety of people is the primary concern. Establish procedures for protecting people in a fire emergency, provide safety training, and properly provision fire-control equipment and fire extinguishers.

In addition, establish procedures to protect your equipment in a fire emergency. Juniper Networks products must 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 you observe all local fire, safety, and electrical codes and ordinances when installing and operating your equipment.

Fire Suppression

In the event of an electrical hazard or an electrical fire, first turn off power 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 (CO₂) and Halotron, are most effective for suppressing electrical fires. Type C fire extinguishers displace the 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, use this type of inert oxygen displacement extinguisher instead of an extinguisher that leave residues on equipment.

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers) near Juniper Networks devices. The primary ingredient in these fire extinguishers is monoammonium phosphate, which is very sticky and difficult to clean.

In addition, in 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.

**Related
Documentation**

- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
- [General Safety Warnings for Juniper Networks Devices on page 262](#)
- [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)
- [DC Power Electrical Safety Warnings for Juniper Networks Devices on page 293](#)

CHAPTER 36

Installation Safety Guidelines and Warnings

- [M10i Chassis Lifting Guidelines on page 269](#)
- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)

M10i Chassis Lifting Guidelines

The weight of a fully configured chassis is about 79 lb (35.8 kg). Observe the following guidelines for lifting and moving the router:

- Before moving the router, read the guidelines in “[M10i Router Site Preparation Checklist](#)” on [page 75](#) to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Do not attempt to lift a fully configured router by yourself. Using a mechanical lift to maneuver the router into a rack is recommended. If a lift cannot be used, a minimum of two people must lift the router.
- Before lifting or moving the router, disconnect all external cables.
- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

Related Documentation

- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
- [Installation Safety Warnings for Juniper Networks Devices on page 269](#)
- [Maintenance and Operational Safety Warnings for Juniper Networks Devices on page 281](#)

Installation Safety Warnings for Juniper Networks Devices

Observe the following warnings before and during hardware equipment installation:

- [Intrabuilding Ports Warning on page 270](#)
- [Installation Instructions Warning on page 270](#)

- [Rack-Mounting Requirements and Warnings on page 271](#)
- [Ramp Warning on page 274](#)

Intrabuilding Ports Warning



WARNING: The intrabuilding ports of the equipment or subassembly are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of the equipment or subassembly **MUST NOT** be metalically connected to interfaces that connect to the Outside Plant (OSP) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metalically to OSP wiring.

Installation Instructions Warning



WARNING: Read the installation instructions before you connect the hardware equipment 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.

Rack-Mounting Requirements and Warnings

Ensure that the equipment rack into which the chassis is installed is evenly and securely supported, to avoid the hazardous condition that could result from uneven mechanical loading.



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

- The chassis must be installed into a rack that is secured to the building structure.
- The chassis should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting the chassis in 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 devices, install the stabilizers before mounting the chassis in the rack or servicing the hardware equipment.

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

- De router 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 välttyään loukkaantumiselta. Noudata seuraavia turvallisuusohjeita:

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

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

- Der router 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 router 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:

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

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

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

¡Atención! Para evitar lesiones durante el montaje de este equipo sobre un bastidor, o posteriormente 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 router 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:

- Router 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.

Ramp Warning



WARNING: When installing the hardware equipment, 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 käyttää 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.

- Related Documentation**
- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
 - [General Safety Warnings for Juniper Networks Devices on page 262](#)
 - [Maintenance and Operational Safety Warnings for Juniper Networks Devices on page 281](#)

CHAPTER 37

Laser and LED Safety Guidelines and Warnings

- [General Laser Safety Guidelines for M10i Routers on page 277](#)
- [M10i Laser and LED Safety Warnings on page 277](#)

General Laser Safety Guidelines for M10i Routers

Physical Interface Cards (PICs) with single-mode optical interfaces 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 +A11 +A2 requirements.

When working around PICs, 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.

Related Documentation

- [M10i Laser and LED Safety Warnings on page 277](#)

M10i Laser and LED Safety Warnings

- [Class 1 Laser Product Warning on page 278](#)
- [Class 1 LED Product Warning on page 278](#)
- [Laser Beam Warning on page 278](#)
- [Radiation from Open Port Apertures Warning on page 279](#)

Class 1 Laser Product Warning



WARNING: Class 1 laser product.

Waarschuwing Klasse-1 laser produkt.

Varoituis Luokan 1 lasertuote.

Attention Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning



WARNING: Class 1 LED product.

Waarschuwing Klasse 1 LED-product.

Varoituis Luokan 1 valodiodituote.

Attention Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning



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

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

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

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

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

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

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

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

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

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

Radiation from Open Port Apertures Warning



WARNING: Because invisible radiation may 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 emitteres fra portens åpning når det ikke er tilkoblet en fiberkabel.

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

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

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

Related Documentation

- [General Laser Safety Guidelines for M10i Routers on page 277](#)

CHAPTER 38

Maintenance and Operational Safety Guidelines and Warnings

- [Maintenance and Operational Safety Warnings for Juniper Networks Devices on page 281](#)

Maintenance and Operational Safety Warnings for Juniper Networks Devices

As you maintain the hardware equipment, observe the following warnings:

- [Battery Handling Warning on page 281](#)
- [Jewelry Removal Warning on page 282](#)
- [Lightning Activity Warning on page 283](#)
- [Operating Temperature Warning on page 284](#)
- [Product Disposal Warning on page 285](#)

Battery Handling Warning



WARNING: Replacing the battery incorrectly might result in an explosion. Replace the 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.

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.

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.

Aviso Existe perigo de explosão se a bateria for substituída incorrectamente. Substitua a bateria por uma bateria igual ou de um tipo equivalente recomendado pelo fabricante. Destrua as baterias usadas conforme as instruções do fabricante.

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

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

Jewelry Removal Warning



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

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

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

Attention Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés

à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

Warnung Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

Avvertenza Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

Advarsel Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

Aviso Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

¡Atención! Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.

Varning! Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.

Lightning Activity Warning



WARNING: Do not work on the system or connect or disconnect cables during periods of lightning activity.

Waarschuwing Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.

Varoitus Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.

Attention Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.

Warnung Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.

Avvertenza Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.

Advarsel Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.

Aviso Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).

¡Atención! No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.

Varning! Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.

Operating Temperature Warning



WARNING: To prevent the hardware equipment from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104° F (40° C). To prevent airflow restriction, allow at least 6 inches (15.2 cm) of clearance around the ventilation openings.

Waarschuwing Om te voorkomen dat welke router van de 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 router-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 router, 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 router 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 router, 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 router 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 router, não utilize este equipamento numa área que exceda a temperatura máxima recomendada de 40° C. Para evitar a restrição à circulação de ar, deixe pelo menos um espaço de 15,2 cm à volta das aberturas de ventilação.

¡Atención! Para impedir que un encaminador de la serie router 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 router 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 product 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.

**Related
Documentation**

- [General Safety Guidelines for Juniper Networks Devices on page 261](#)
- [General Safety Warnings for Juniper Networks Devices on page 262](#)

CHAPTER 39

Electrical Safety Guidelines and Warnings

- General Electrical Safety Warnings for Juniper Networks Devices on page 287
- General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291
- M10i AC Power Electrical Safety Guidelines on page 291
- Japanese AC Power Cord Warning for M Series and MX Series Routers on page 292
- M10i DC Power Electrical Safety Guidelines on page 292
- DC Power Electrical Safety Warnings for Juniper Networks Devices on page 293

General Electrical Safety Warnings for Juniper Networks Devices

- Grounded Equipment Warning on page 287
- Grounding Requirements and Warning on page 288
- Midplane Energy Hazard Warning on page 289
- Multiple Power Supplies Disconnection Warning on page 289
- Power Disconnection Warning on page 290

Grounded Equipment Warning



WARNING: The network device is intended to be grounded. Ensure that the network device is connected to earth ground during normal use.

Waarschuwing Deze apparatuur hoort geaard te worden. Zorg dat de host-computer tijdens normaal gebruik met aarde is verbonden.

Varoitus Tämä laitteisto on tarkoitettu maadoitettavaksi. Varmista, että isäntälaitte on yhdistetty maahan normaalikäytön aikana.

Attention Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.

Warnung Dieses Gerät muß geerdet werden. Stellen Sie sicher, daß das Host-Gerät während des normalen Betriebs an Erde gelegt ist.

Avvertenza Questa apparecchiatura deve essere collegata a massa. Accertarsi che il dispositivo host sia collegato alla massa di terra durante il normale utilizzo.

Advarsel Dette utstyret skal jordes. Forviss deg om vertsterminalen er jordet ved normalt bruk.

Aviso Este equipamento deverá estar ligado à terra. Certifique-se que o host se encontra ligado à terra durante a sua utilização normal.

¡Atención! Este equipo debe conectarse a tierra. Asegurarse de que el equipo principal esté conectado a tierra durante el uso normal.

Varning! Denna utrustning är avsedd att jordas. Se till att värdenheten är jordad vid normal användning.

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 unit. The grounding conductor is a separately derived system at the supply transformer or motor generator set.



WARNING: When installing the network device, you must always make the ground connection first and disconnect it last.

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

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

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

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

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

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

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

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

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

Midplane Energy Hazard Warning



WARNING: High levels of electrical energy are distributed across the midplane. Be careful not to contact the midplane connectors, or any component connected to the midplane, with any metallic object while servicing components.

Multiple Power Supplies Disconnection Warning



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

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

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

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

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

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

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

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

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

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

Power Disconnection Warning



WARNING: Before working on the chassis or near power supplies, switch off the power at the DC circuit breaker.

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; voor gelijkstroom toestellen dient u de stroom uit te schakelen bij de stroomverbreker.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto ja katkaise tasavirtalaitteiden virta suojakytkimellä, 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; couper l'alimentation des unités en courant continu au niveau du disjoncteur.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw. schalten Sie bei Gleichstromeinheiten den Strom am Unterbrecher ab.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA; scollegare l'alimentazione all'interruttore automatico sulle unità CC.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut p vekselstrømsenheter og strømmen kobles fra ved strømbryteren på likestrømsenheter.

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; desligue a corrente no disjuntor nas unidades de corrente contínua.

¡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); cortar la alimentación desde el interruptor automático en los equipos de corriente continua (CC).

Varning! Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden och för likströmsenheter bryta strømmen vid överspänningsskyddet.

- Related Documentation**
- [DC Power Electrical Safety Warnings for Juniper Networks Devices on page 293](#)

General Electrical Safety Guidelines and Electrical Codes for M10i Routers

- Install the router in compliance with the following local, national, or international electrical codes:
 - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
 - Canada—Canadian Electrical Code, Part 1, CSA C22.1.
 - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
- 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.
- 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 router within marked electrical ratings and product usage instructions.
- For the router and peripheral equipment to function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

Many router components can be removed and replaced without powering off or disconnecting power to the router. Never install equipment if it appears damaged.

- Related Documentation**
- [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)

M10i AC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to AC-powered routers:

- AC-powered routers 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 should comply with local and national electrical codes.
- You must provide an external circuit breaker rated minimum 15 A (250 VAC) in the building installation.
- The AC power cord serves as the main disconnecting device. The socket outlet must be near the router and be easily accessible.
- The cores in the mains lead are colored in accordance with the following code:

- Green and yellow—Earth
- Blue—Neutral
- Brown—Live
- When a router is equipped with multiple AC power supplies, all AC power cords (one for each power supply) must be unplugged to completely disconnect power to the router.
- Note the following warnings printed on the AC power supply faceplate:
 - To completely de-energize the system disconnect maximum of 2 AC power cordsets.
 - Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk. [Swedish]

**Related
Documentation**

- [Preventing Electrostatic Discharge Damage to an M10i Router on page 264](#)
- [General Electrical Safety Guidelines and Electrical Codes for M10i Routers on page 291](#)
- [M10i DC Power Electrical Safety Guidelines on page 292](#)

Japanese AC Power Cord Warning for M Series and MX Series Routers



WARNING:

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。

9017253

Translation from Japanese: The attached power cable is only for this product.
Do not use the cable for another product.

**Related
Documentation**

M10i DC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to a DC-powered router:

- A DC-powered router is equipped with a DC terminal block that is rated for the power requirements of a maximally configured router. To supply sufficient power, terminate the DC input wiring on a facility DC source capable of supplying at least 31 A @ -48 VDC per input for each power supply.
- Incorporate an easily accessible disconnect device into the facility wiring. We recommend that the 48 VDC facility DC source should be equipped with a circuit

breaker rated at 40 A (–48 VDC) minimum, or as required by local code. In the United States and Canada, the 48 VDC facility should be equipped with a circuit breaker rated a minimum of 125% of the power provisioned for the input in accordance with the National Electrical Code in the US and the Canadian Electrical Code in Canada.

- Run two wires from the circuit breaker box to a source of 48 VDC. Use appropriate gauge wire to handle up to 50 A.
- Be sure to connect the ground wire or conduit to a solid office (earth) ground. A closed loop ring is recommended for terminating the ground conductor at the ground stud.
- A DC-powered router that is equipped with a DC terminal block is intended only for installation in a restricted access location. In the United States, a restricted access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.



NOTE: Primary overcurrent protection is provided by the building circuit breaker. This breaker should protect against excess currents, short circuits, and earth faults in accordance with NEC ANSI/NFPA70.

- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.
- For personal safety, connect the green and yellow wire to safety (earth) ground at both the router and the supply side of the DC wiring.
- The marked input voltage of –48 VDC for a DC-powered router is the nominal voltage associated with the battery circuit, and any higher voltages are only to be associated with float voltages for the charging function.
- Because the router is a positive ground system, you must connect the positive lead to the terminal labeled **RETURN**, the negative lead to the terminal labeled **–48V**, and the earth ground to the chassis grounding points.

**Related
Documentation**

- [DC Power Electrical Safety Warnings for Juniper Networks Devices on page 293](#)
- [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)

DC Power Electrical Safety Warnings for Juniper Networks Devices

When working with DC-powered equipment, observe the following warnings:

- [DC Power Copper Conductors Warning on page 294](#)
- [DC Power Disconnection Warning on page 294](#)
- [DC Power Wiring Terminations Warning on page 295](#)

DC Power Copper Conductors Warning



WARNING: Use copper conductors only.

Waarschuwing Gebruik alleen koperen geleiders.

Varoitus Käytä vain kuparijohtimia.

Attention Utilisez uniquement des conducteurs en cuivre.

Warnung Verwenden Sie ausschließlich Kupferleiter.

Avvertenza Usate unicamente dei conduttori di rame.

Advarsel Bruk bare kobberledninger.

Aviso Utilize apenas fios condutores de cobre.

¡Atención! Emplee sólo conductores de cobre.

Varning! Använd endast ledare av koppar.

DC Power Disconnection Warning



WARNING: Before performing any procedures on power supplies, 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.

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, vérifiez que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

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

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

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

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

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

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

DC Power 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 johdinliitääntää, esimerkiksi suljettua silmukkaa tai kourumaista liitääntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Attention Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

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

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

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

Aviso Quando forem requeridas montagens de instalação elétrica 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.

- Related Documentation**
- [General Safety Warnings for Juniper Networks Devices on page 262](#)
 - [General Electrical Safety Warnings for Juniper Networks Devices on page 287](#)

CHAPTER 40

Agency Approvals and Compliance Statements

- Agency Approvals for M10i Routers on page 299
- Compliance Statements for EMC Requirements for Juniper Networks Devices (Canada) on page 300
- Compliance Statements for EMC Requirements for M10i Routers (European Community) on page 301
- Compliance Statements for EMC Requirements for Juniper Networks Devices (Israel) on page 301
- Compliance Statements for EMC Requirements for Juniper Networks Devices (Japan) on page 301
- Compliance Statements for EMC Requirements for Juniper Networks Devices (United States) on page 302
- Compliance Statements for Environmental Requirements on page 302
- M10i Compliance Statements for NEBS on page 302
- Compliance Statements for Acoustic Noise for M10i Routers on page 302
- Statements of Volatility for Juniper Network Devices on page 303

Agency Approvals for M10i Routers

The router complies with the following standards:

- Safety
 - CAN/CSA-22.2 No. 60950-00/UL 1950 Third Edition, Safety of Information Technology Equipment
 - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
 - EN 60950 Safety of Information Technology Equipment
- EMC
 - AS/NZS 3548 Class A (Australia/New Zealand)
 - EN55022 Class A (Europe)

- FCC Part 15 Class A (USA)
- VCCI Class B (Japan)
- 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 Low Frequency Common Immunity
 - EN-61000-4-11 Voltage Dips and Sags
- ETSI
 - ETSI EN-300386-2 Telecommunication Network Equipment. Electromagnetic Compatibility Requirements
- NEBS
 - GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment
 - SR-3580 NEBS Criteria Levels (Level 3 Compliance)
 - GR-63-Core: NEBS, Physical Protection

**Related
Documentation**

- [M10i Compliance Statements for NEBS on page 302](#)
- [Compliance Statements for EMC Requirements for M10i Routers \(European Community\) on page 301](#)
- [Compliance Statements for Environmental Requirements on page 302](#)
- [Compliance Statements for Acoustic Noise for M10i Routers on page 302](#)

Compliance Statements for EMC Requirements for Juniper Networks Devices (Canada)

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

**Related
Documentation**

- [Compliance Statements for EMC Requirements for Juniper Networks Devices \(Israel\) on page 301](#)
- [Compliance Statements for EMC Requirements for Juniper Networks Devices \(Japan\) on page 301](#)

- [Compliance Statements for EMC Requirements for Juniper Networks Devices \(United States\)](#) on page 302

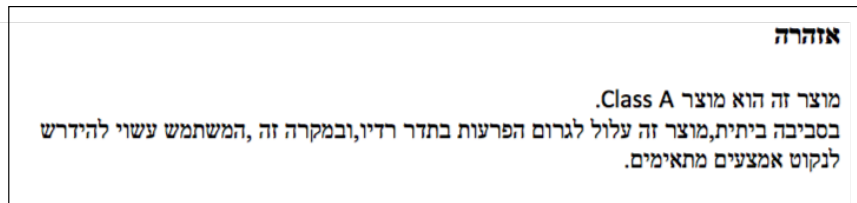
Compliance Statements for EMC Requirements for M10i Routers (European Community)

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

Related Documentation

- [Agency Approvals for M10i Routers](#) on page 299

Compliance Statements for EMC Requirements for Juniper Networks Devices (Israel)

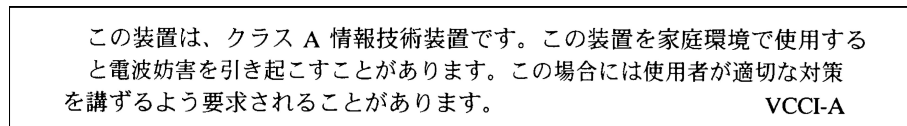


Translation from Hebrew—Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

Related Documentation

- [Compliance Statements for EMC Requirements for Juniper Networks Devices \(Canada\)](#) on page 300
- [Compliance Statements for EMC Requirements for Juniper Networks Devices \(Japan\)](#) on page 301
- [Compliance Statements for EMC Requirements for Juniper Networks Devices \(United States\)](#) on page 302

Compliance Statements for EMC Requirements for Juniper Networks Devices (Japan)



Translation from Japanese—This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. VCCI-A

Related Documentation

Compliance Statements for EMC Requirements for Juniper Networks Devices (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, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Related Documentation

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.

M10i Compliance Statements for NEBS

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

Related Documentation

- [Agency Approvals for M10i Routers on page 299](#)
- [Compliance Statements for EMC Requirements for M10i Routers \(European Community\) on page 301](#)
- [Compliance Statements for Environmental Requirements on page 302](#)
- [Compliance Statements for Acoustic Noise for M10i Routers on page 302](#)

Compliance Statements for Acoustic Noise for M10i Routers

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**

- [Agency Approvals for M10i Routers on page 299](#)
- [M10i Compliance Statements for NEBS on page 302](#)
- [Compliance Statements for EMC Requirements for M10i Routers \(European Community\) on page 301](#)
- [Compliance Statements for Environmental Requirements on page 302](#)

Statements of Volatility for Juniper Network Devices

A *statement of volatility*—sometimes known as *letter of volatility*—identifies the volatile and non-volatile storage components in Juniper Networks devices, and describes how to remove non-volatile storage components from the device.



NOTE: Statements of volatility are not available for all Juniper Networks devices.

CTP series:

- [CTP2000](#)

EX series:

- [EX2200 and EX2200-C](#)
- [EX2300-24P, EX2300-24T, and EX2300-24T-DC](#)
- [EX2300-48P and EX2300-48T](#)
- [EX2300-C](#)
- [EX3300](#)
- [EX3400-24P, EX3400-24T, EX3400-24T-DC](#)
- [EX3400-48P, EX3400-48T, EX3400-48T-AFI](#)
- [EX4200](#)
- [EX4300](#)
- [EX4500](#)
- [EX4550](#)
- [EX4600](#)
- [EX8200](#)
- [XRE200 External Routing Engine](#)

LN Series:

- [LN1000-CC](#)

MX series:

- [M7i](#)
- [M7i Compact Forwarding Engine Board \(CFEB\)](#)
- [M40e and M10i](#)
- [M320](#)
- [MX5, MX10, MX40, and MX80](#)
- [MX240, MX480, and MX960](#)
- [RE-A-2000 Route Engine](#)
- [RE-S-X6-64G Routing Engine](#)

QFX series:

- [QFX3008-I](#)
- [QFX3100](#)
- [QFX3500](#)
- [QFX3600](#)
- [QFX5100-24Q](#)
- [QFX5100-48S6Q](#)
- [QFX5100-48T](#)
- [QFX5200](#)
- [QFX5200-32C](#)
- [QFX10008 and QFX10016](#)

SRX series:

- [SRX100](#)
- [SRX110](#)
- [SRX210B](#)
- [SRX210H-POE](#)
- [SRX210H-P-MGW](#)
- [SRX220](#)
- [SRX240H](#)
- [SRX240H-POE](#)
- [SRX300](#)

- [SRX320](#)
- [SRX340 and SRX345](#)
- [SRX550](#)
- [SRX650](#)
- [SRX1400](#)
- [SRX1500](#)
- [SRX3400 and SRX3600](#)
- [SRX5400, SRX5600, and SRX5800](#)
- [SRX-MP-1SERIAL](#)
- [SSG-520M](#)

T series:

- [RE-A-2000 Route Engine](#)

