JUNIPER NETWORKS | Engineering Simplicity

MX2008 Universal Routing Platform Hardware Guide

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YEAR 2000 NOTICE

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Initial Installation and Configuration

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Safety and Compliance Information

About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the MX2008 Universal Routing Platform. After completing the installation and basic configuration procedures covered in this guide, refer to the Junos OS documentation for information about further software configuration.

RELATED DOCUMENTATION

MX2008 Quick Start

Junos OS for MX Series 5G Universal Routing Platforms

1

CHAPTER

Fast Track: Initial Installation

Fast Track to Rack Installation and Power

SUMMARY

This procedure guides you through the steps to install your MX2008 router in a four-post rack or cabinet using a router transport kit, and connect it to AC power.

Install the MX2008 Router for a Rack or Cabinet

The MX2008 Universal Routing Platform with standard cable managers and EMI cover measures 42in. (106.68cm) high, 19in. (48.26cm) wide, and 30.90in. (78.49cm) deep (from the front-mounting flanges to the rear of the chassis). An extended cable manager extends the total depth to 36.82in. (93.53cm). One router can be installed in a 24-U or taller open-frame or four-post rack if the rack can support the combined weight, which can be greater than 664.8lb (301.55kg).

The MX2008 router is 24-U tall. The MX2008 router has 10 dedicated line-card slots, which means a maximum of 10 Modular Port Concentrators (MPCs) including Adapter cards and Modular Interface Cards (MICs) can be installed on MX2008. ADCs provide housing to MPCs. The MPCs attach to the adapter cards, which in 1 turn connect to the backplane. Up to 2 MICs can be installed in each MPC.

Fully populated, the MX2008 router supports up to 20 MICs. The MX2008 host subsystem consists of two Routing and Control Boards (RCBs). The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality and supports virtualization. The router contains 8 SFBs that provide 7+1 redundancy.

We'll walk you through the steps to install the router in a four-post rack or cabinet.

Figure 1: MX2008 Rack Clearance and Router Dimensions for Four-Post Rack Installation
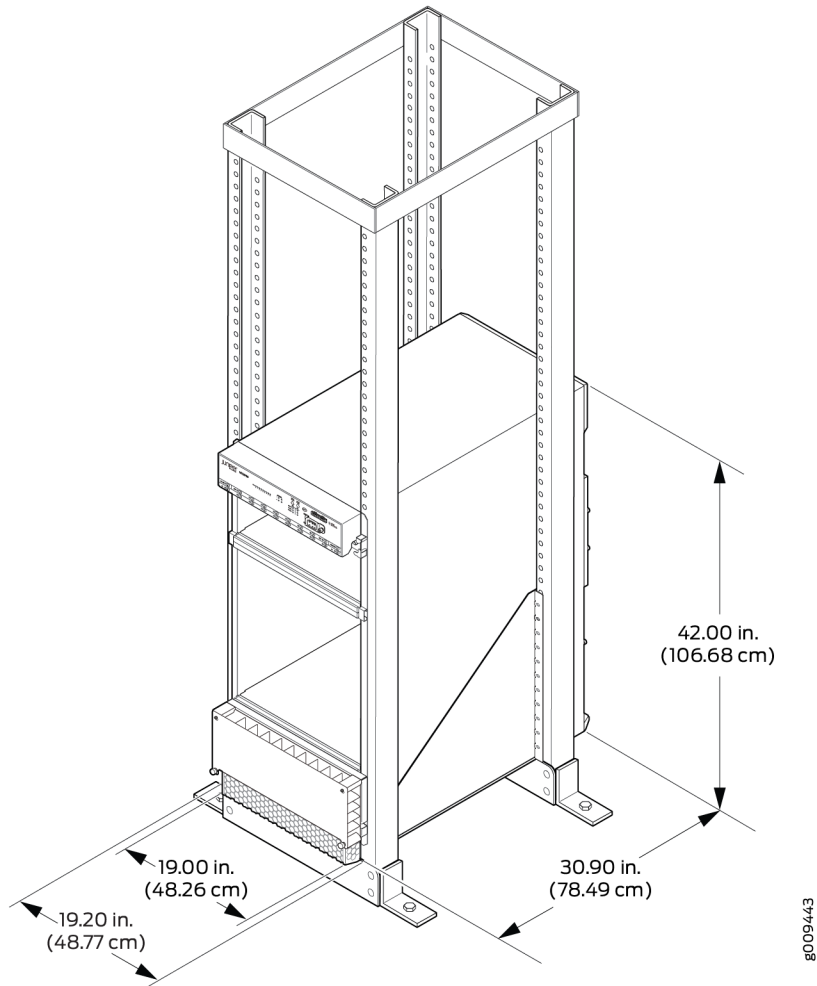
Before you install, review the following:

- "MX2008 Site Guidelines and Requirements" on page 232

- "Safety Warnings" on page 653

- "Preventing Electrostatic Discharge Damage to an MX2008 Router" on page 628

- Unpacking the MX2008 Router

> **CAUTION**: When mounting the router in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

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

Mount the router

To connect the MX2020 router to a four-post rack using a router transport kit (model number MX2K-TRNSPRT-KIT):

1. Slide the four-post rack mounting shelf between the rack rails, resting the bottom of the shelf on the rack supports. The four-post rack mounting shelf installs on the rear rack rails, extending toward the front of the rack.

   > **NOTE**: There must be a minimum of 45-U unobstructed front-to-back usable rack space when installing the MX2020 router into a four-post rack or cabinet.

2. Partially insert screws into the open holes in the front ears of the four-post rack mounting shelf.

3. Tighten all the screws completely.

4. On the front of the rear rack rails, partially insert screws into the holes in each ear of the four-post rack mounting shelf.

Figure 2: Mounting Hardware for a Four-Post Rack or Cabinet

24 in. (60.96 cm)
to 30.6 in. (77.72 cm)

g007101
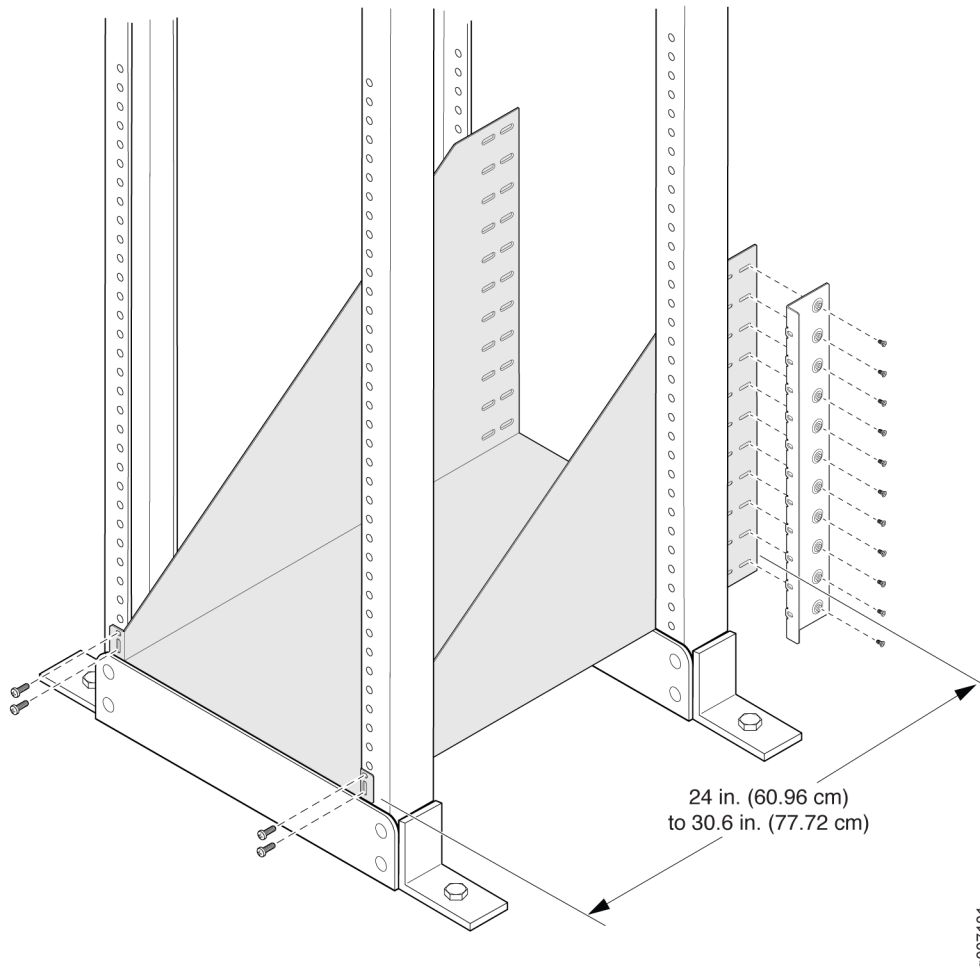
5. Tighten all the screws completely.

> **NOTE**:
>
> - The two rear flanges on the four-post mounting shelf are adjustable from 24 in. (60.96 cm) through 30 in. (76.2 cm) to accommodate different types of racks rails.
>
> - There must be a minimum of 24-U unobstructed front-to-back usable rack space when installing the MX2008 router into a four-post rack or cabinet.

6. Remove the center-mounting brackets. The center-mounting brackets are not used for a four-post rack, and must be removed from the chassis:

    a. Loosen the screws from each bracket.

Figure 3: Center-Mounting Bracket Removal
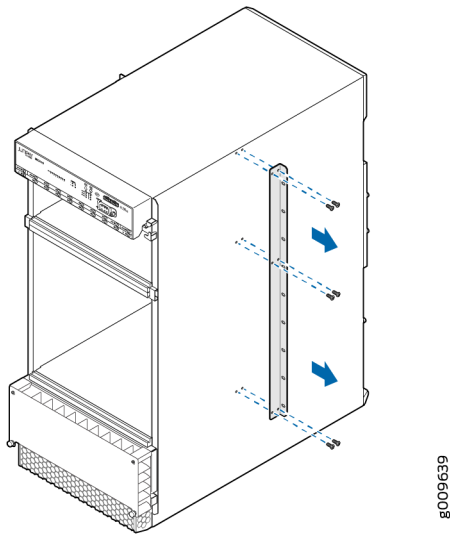
b. Remove each bracket.

7. Install the Router Transport Kit. See "Installing the Router Transport Kit" on page 321.

8. Take each component out of its electrostatic bag, and identify the slot on the component where it will be connected.

> **NOTE**: Remove the shipping covers before installing router components.

9. Slide each component into the chassis evenly so that it does not become stuck or damaged.

10. Tighten the captive screws, and secure all levers for each component.

> **NOTE**: Make sure that all empty slots are covered with a blank panel before operating the router.

Connect to Power

The MX2008 routers supports a three-phase delta AC power system, three-phase wye AC power system, or a single-phase AC power system. The MX2008 routers are available in -48 V and 240 V China DC power configurations, three-phase (delta and wye) AC power configurations, single-phase power configurations, and high-voltage AC (HVAC) or high-voltage DC (HVDC) configurations. You can add additional power to the rack as needed.

In this section, we show you how to connect to power using a three-phase delta AC power distribution module.

⚠️ **CAUTION**: Do not mix AC, DC, 240 V China, or universal (HVAC/HVDC) PSMs or different PDM types within a single system. The MX2000 line of routers configured for three-phase wye AC input power must use only three-phase wye AC PDMs and threephase AC PSMs. The systems configured for three-phase delta AC input power must use only three-phase delta AC PDMs and AC PSMs. The systems configured for singlephase AC input power must use only single phase AC PDMS and AC PSMs. The 49 systems configured for universal (HVAC/HVDC) input power must use universal (HVAC/HVDC) PDMs and universal PSMs.

Ground the MX2008 Router

You ground the router by connecting a grounding cable to earth ground and then attaching it to the chassis grounding points by using two screws. To connect the grounding cable:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. Ensure that all grounding surfaces are clean and brought to a bright finish before you make grounding connections.

3. Connect the grounding cable to a proper earth ground.

4. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.

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

6. Place the grounding cable lug over one of the grounding points on the rear of the chassis. The upper pair is sized for UNC 1/4-20 nuts, and the lower pair is sized for M6 nuts.

7. Secure the grounding cable lug to the grounding points, first with the washers, and then with the nuts.

8. Verify that the grounding cabling is correct, that the grounding cable does not touch or block access to router components, and that it does not drape where people could trip on it.

Figure 4: Connecting the Grounding Cable

Connect AC Power to an MX2008 Router with Three-Phase Delta AC Power Distribution Modules

> **CAUTION**: Do not mix AC and DC power modules within the same router.

> **WARNING**: Power connections must be performed by a licensed electrician only.

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules (AC/DC PSMs and AC/DC PDMs).

You connect AC power to the router with three-phase delta AC power distribution modules (PDMs) by connecting the AC power cord from an AC PDM to an AC power source.

To connect an AC power cord to an AC power source:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

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

3. Detach the ESD grounding strap from the approved site ESD grounding point, and connect the strap to one of the ESD points on the chassis.

4. Move the power switches on all the power supply module (PSM) faceplates to the off (**O**) position.

5. Verify that the correct three-phase delta PDMs are installed and secured in the chassis before connecting power cables.

   > **NOTE**: The power cables must be uninstalled and removed from the three-phase delta PDM before removal of the PDM from the chassis.

6. Using a number 2 Phillips (+) screwdriver, unscrew the four captive screws located on either side of the metal AC wiring compartment (four screws total per PDM).

7. Remove the metal cover of the metal AC wiring compartment.

8. Unscrew the retaining nut from the AC power cord.

9. Place the retaining nut inside the metal wiring compartment.

10. Insert the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

11. Insert the wires of the AC power cord through the hole of the metal wiring compartment.

12. Connect the wires to the AC terminal block on the three-phase delta AC PDM (see Figure 5 on page 10). Loosen the input terminal or grounding point screw, insert each wire into the grounding point input terminal, and tighten the screw (see Table 1 on page 11 for approved AC wire gauge).

    > **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

To connect wires to the terminal block that serves six PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

Figure 5: Connecting Power to a Three-Phase Delta AC Power Distribution Module

NOTE: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

NOTE: The color of each AC power wire might vary. The MX2008 chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

> ⚠️ **CAUTION**: Wire label configuration is for Juniper Networks supplied cable only. If you are using your own cable, make sure you use the proper connections.

To connect wires to the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

> ⚡ **WARNING**: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment apply AC voltage to the PDM (with disengaged PSM) make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-B1, B1-C1, C1-A1, A2-B2, B2-C2, and C2-A2 for three-phase delta PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker, de-energizing the PDM, and install the metal cover and engage all AC PSMs.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws

> **NOTE**: Three-phase delta AC wire assembly kits can be purchased from Juniper Networks.

Table 1: Supported Three-Phase Delta AC Wire Gauge

Wire Gauge	Description
4 x 6-AWG or equivalent	4 conductor wires, each wire is 6-AWG

> **NOTE**: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring results in the cable clamps not tightening properly.

> ⚠ **WARNING**: Power connections must be performed by a licensed electrician only.

13. Verify that the power cable connections are correct.

14. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

15. Reinstall the metal PDM wiring cover, and using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

16. Use the provided plastic cable tie to fasten the AC power cord to the PDM.

17. Verify that the AC power cord does not touch or block access to router components, and that it does not drape where people could trip on it.

18. Repeat the procedure for the other three-phase delta AC PDMs.

Onboard, Configure, and Monitor MX2008

SUMMARY

This topic provides you with pointers to onboard, configure, and monitor MX2008 routers using Mist, or Junos OS CLI.

IN THIS SECTION

- Mist Routing Assurance | **12**
- Junos OS CLI | **13**

Mist Routing Assurance

The MX2008 is a cloud-ready router, and you can onboard and monitor the performance of the router through the Mist Routing Assurance portal. You can use the routing insights that Juniper Mist Routing Assurance provides to proactively respond to network events and anomalies. See Onboard and Monitor MX2008 Using Mist Routing Assurance on page 13 for more information.

Table 2: Onboard and Monitor MX2008 Using Mist Routing Assurance

If you want to	Then
Setup Mist Routing Assurance, onboard routers, and monitor their performance	See Mist Routing Assurance.
Use the Mist Routing Assurance	See Mist Routing Assurance User Guide.
See all documentation available for Mist AI Routing	Visit Mist Routing Assurance documentation.

Junos OS CLI

You can configure and monitor MX2008 routers using the Junos OS CLI. See Configure MX2008 Using Junos OS CLI on page 13 for more information.

Table 3: Configure MX2008 Using Junos OS CLI

If you want to	Then
Customize basic configuration	See "Initially Configuring the MX2008 Router" on page 406.
Explore the software features supported on the MX2008	See Feature Explorer.
Configure Junos features on the MX2008	See User Guides.

2
CHAPTER

Overview

MX2008 Router Overview

The MX2008 Universal Routing Platform is an Ethernet-optimized router that provides both switching and carrier-class Ethernet routing. The MX2008 router supports service provider core, converged core and edge, and edge applications, and enables a wide range of business and residential and services, including high-speed transport and VPN services, next-generation broadband multiplay services, and high-volume Internet data center internetworking.

Benefits of the MX2008 Router

- **System Capacity**—MX2008 delivers 40 Tbps of throughput in support of dense multirate interfaces for 100-Gigabit Ethernet, 200-Gigabit Ethernet, or 400-Gigabit Ethernet in a single chassis.

- **Always-on infrastructure base**—MX Series routers ensure network and service availability with a broad set of multilayered physical, logical, and protocol-level resiliency aspects. Junos OS Virtual Chassis technology on MX Series routers supports chassis-level redundancy and enables you to manage two routers as a single element. Multichassis link aggregation group (MC-LAG) implementation supports stateful chassis, card, and port redundancy.

- **Junos Continuity and Unified In-Service Software Upgrade (Unified ISSU)**—With the Junos continuity plug-in package, you can perform a smooth upgrade when new hardware is installed in your MX Series router.

  Unified in-service software upgrade (unified ISSU) enables software upgrades and changes without disrupting network traffic.

- **Junos Telemetry Interface**—Using the Junos telemetry interface data, you can stream component-level data to monitor, analyze, and enhance the performance of the network. Analytics derived from this streaming telemetry can identify current and trending congestion, resource utilization, traffic volume, and buffer occupancy.

- **Power Optimization and Design Efficiency**—Dynamically managed power consumption provide significant operational savings. Fan speed is dynamically monitored to consume only 20 percent of their maximum power. Power optimization enables to achieve power-to-throughput efficiency ratio of 0.3W/G.

System Overview

The MX2008 chassis provides redundancy and resiliency. All major hardware components including the power system, the cooling system, the Routing and Control Boards (RCBs), and the Switch Fabric Boards (SFBs) are fully redundant.

The MX2008 router is 24 rack units (U) tall. One router can be installed in an open-frame rack, four-post rack, or cabinet. The MX2008 router has 10 dedicated line-card slots, which means a maximum of 10 Modular Port Concentrators (MPCs) including adapter cards (ADCs) and Modular Interface Cards (MICs) can be installed on the MX2008. Up to 2 MICs can be installed in each MPC. Fully populated, the MX2008 router supports up to 20 MICs. The MX2008 host subsystem consists of two RCBs. The RCB is an integrated board and a single field-replaceable unit (FRU) that provides Routing Engine and Control Board functionality and supports virtualization. The router contains 8 Switch Fabric Boards (SFBs) that provides 7+1 redundancy.

For a list of the supported MPCs, and MICs, see the *MX Series Interface Module Reference*.

The MX2008 chassis contains nine power supply modules (PSMs) and two power distribution modules (PDMs) for the power feeds. Each PSM delivers 2500 W of power, and provides 8+1 redundancy. The two PDMs provide feed redundancy, with each PDM connected to primary and backup feeds separately. The MX2008 cooling system contains two fan trays, with six fans in each fan tray. The fan trays can be installed at or removed from the back of the chassis, which allows the space in the front to be used for cable management. The MX2008 supports temperature thresholds for each temperature sensor, which enables the router to precisely control the cooling, raise alarms, and shut down a FRU.

The MX2008 router is powered by the Junos Trio chipset and runs the Junos® operating system (Junos OS) for high-performance routing and switching. For a list of related Junos OS documentation, see https://www.juniper.net/documentation/software/junos/.

RELATED DOCUMENTATION

MX2008 Chassis

IN THIS SECTION

MX2008 Chassis Description

The router chassis is a rigid sheet metal structure that houses all the other router components (see Figure 6 on page 19, Figure 7 on page 20, and Figure 8 on page 22). The MX2008 Universal Routing Platform with standard cable managers and EMI cover measures 42 in. (106.68 cm) high, 19 in. (48.26 cm) wide, and 30.90 in. (78.49 cm) deep (from the front-mounting flanges to the rear of the chassis). An extended cable manager extends the total depth to 36.82 in. (93.53 cm). The chassis can be installed in a standard 19-in. open-frame or four-post rack, or an enclosed cabinet.

> **NOTE**: There must be a minimum of 24 rack units (U) of usable rack space when installing the MX2008 router into a rack.

> **NOTE**: If you are installing the MX2008 router into a network cabinet, make sure that no hardware, device, rack, or cabinet component obstructs the 24 U rack space from access during installation.

The chassis includes the following features (see).

- Front-mounting flanges for mounting in a four-post rack or cabinet.

- Center-mounting metal brackets for center-mounting in an open-frame rack (optional).

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

> **WARNING**: The router must be connected to earth ground during normal operation.

The MX2008 router is 24 rack units (U) tall. One router can be installed in an open-frame rack, four-post rack, or cabinet. The MX2008 router has 10 dedicated line-card slots, which means a maximum of 10 Modular Port Concentrators (MPCs) including adapter cards and Modular Interface Cards (MICs) can be installed on MX2008. ADCs provide housing to MPCs. The MPCs attach to the adapter cards, which in turn connect to the backplane. Up to 2 MICs can be installed in each MPC. Fully populated, the MX2008 router supports up to 20 MICs. The MX2008 host subsystem consists of two Routing and Control Boards (RCBs). The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality and supports virtualization. The router contains 8 SFBs that provide 7+1 redundancy.

One router can be installed in a 24 U or taller open-frame or four-post rack if the rack can support the combined weight, which can be greater than 664.8 lb (301.55 kg).

> **NOTE**: The dimensions also include the cable managers and EMI cover.

Figure 6: Front View of a Fully Configured MX2008 Router Chassis
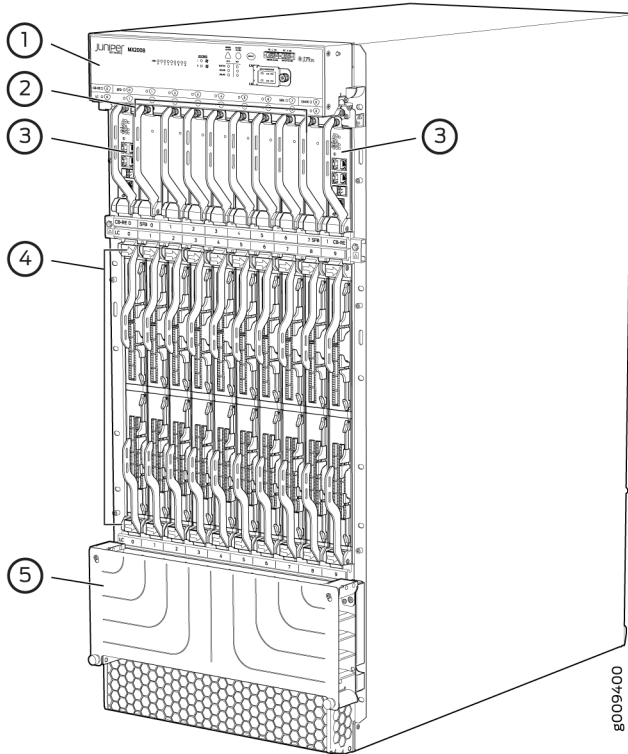
> **NOTE**: Remove field-replacement units (FRUs) from the front of the MX2008 router before you install the router.

See Table 4 on page 19 for information about the components on the front of the MX2008 router.

Table 4: Front Components in a Fully Configured MX2008 Router

Component No.	Component Description	Slots	Number of FRUs
1	Craft interface	–	1
2	Enhanced Switch Fabric Board (SFB2)	0 through 7	8
3	Routing and Control Boards (RCB)	0 and 1	2

Table 4: Front Components in a Fully Configured MX2008 Router *(Continued)*

Component No.	Component Description	Slots	Number of FRUs
4	MPCs (with MICs installed)	0 through 9	10
5	Cable manager	–	1

See for information about components on the back of an AC-powered MX2008 router.

Figure 7: Rear View of a Fully Configured AC-Powered MX2008 Router Chassis
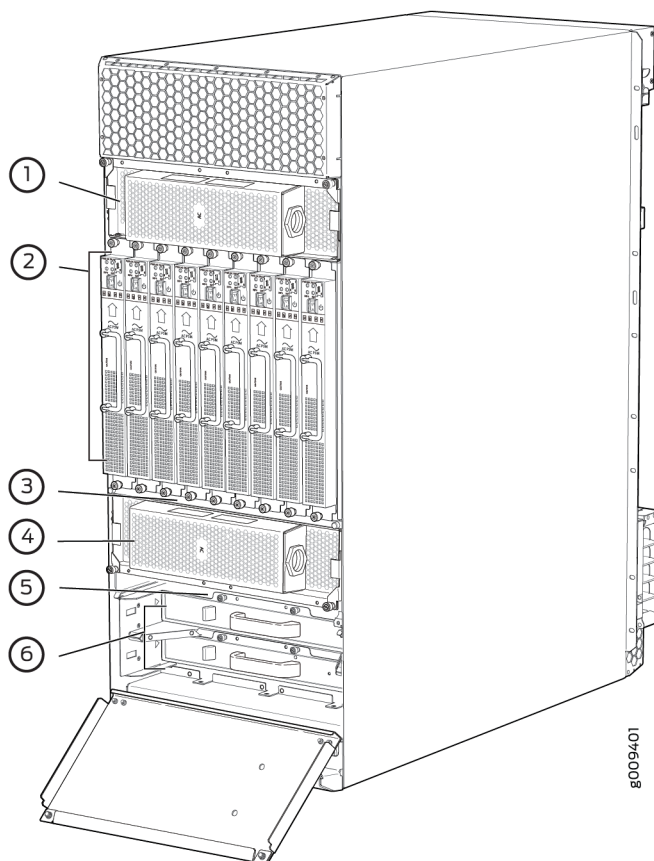
Table 5: Rear Components in a Fully Configured AC-Powered MX2008 Router

Component No.	Component Description	Slots	Number of FRUs
1	AC PDM—Three-phase delta or wye, or a single-phase AC PDM, or a high-voltage second-generation universal (HVAC/HVDC) PDM	PDM1/Input1	1
2	AC PSMs or high-voltage second-generation universal (HVAC/HVDC) PSMs	0 through 8	9
3	PSM air filter	–	1
4	AC PDM—Three-phase delta or wye, or a single-phase AC PDM, or a high-voltage second-generation universal (HVAC/HVDC) PDM	PDM0/Input0	1
5	Fan tray air filter	–	1
6	Fan trays (two)	Fan tray 0 and fan tray 1 (behind access door)	2

NOTE: Remove field-replacement units (FRUs) from the rear of the MX2008 router before you install the router.

Figure 8: Rear View of a Fully Configured DC-Powered MX2008 Router Chassis
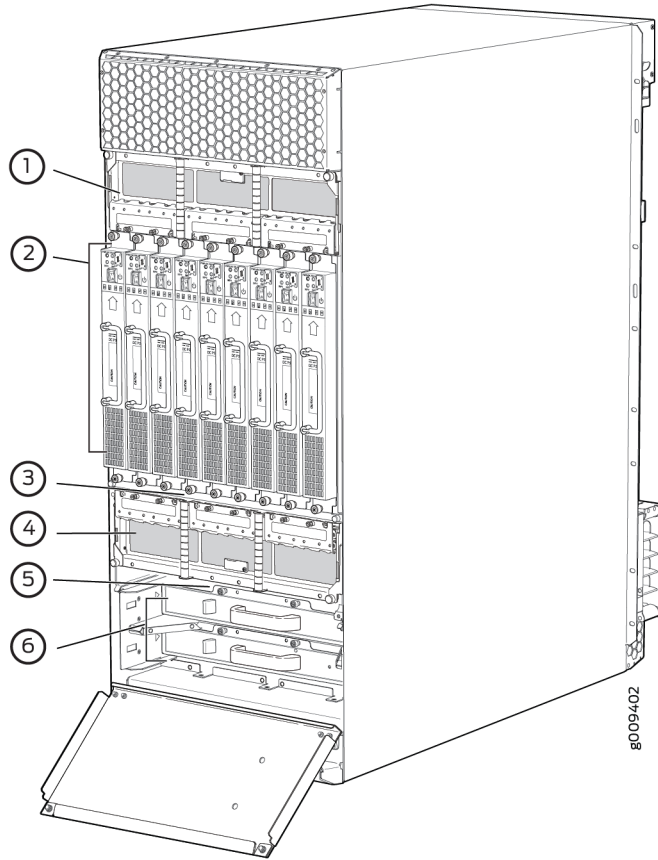
> **NOTE**: Remove field replacement units (FRUs) from the rear of the MX2008 router before you install the router.

See Table 6 on page 22 for information about router components on the back of a DC-powered MX2008 router.

Table 6: Rear Components in a Fully Configured DC-Powered MX2008 Router

Component No.	Component Description	Slots	Number of FRUs
1	DC PDM, a DC PDM (240 V China), or a high-voltage second-generation universal (HVAC/HVDC) PDM	PDM1/Input1	1

Table 6: Rear Components in a Fully Configured DC-Powered MX2008 Router *(Continued)*

Component No.	Component Description	Slots	Number of FRUs
2	DC PSMs, DC PSMs (240 V China), or high-voltage second-generation universal (HVAC/HVDC) PSMs	0 through 8	9
3	PSM air filter	–	1
4	DC PDM, a DC PDM (240 V China), or a high-voltage second-generation universal (HVAC/HVDC) PDM	PDM0/Input0	1
5	Fan tray air filter	–	1
6	Fan trays (two)	Fan tray 0 and fan tray 1 (behind access door)	2

NOTE: Remove field replacement units (FRUs) from the rear of the MX2008 router before you install the router.

The MX2008 router has two ESD points. These are located on either side of the MPCs on the front of the chassis (see).

Figure 9: MX2008 Router ESD Points
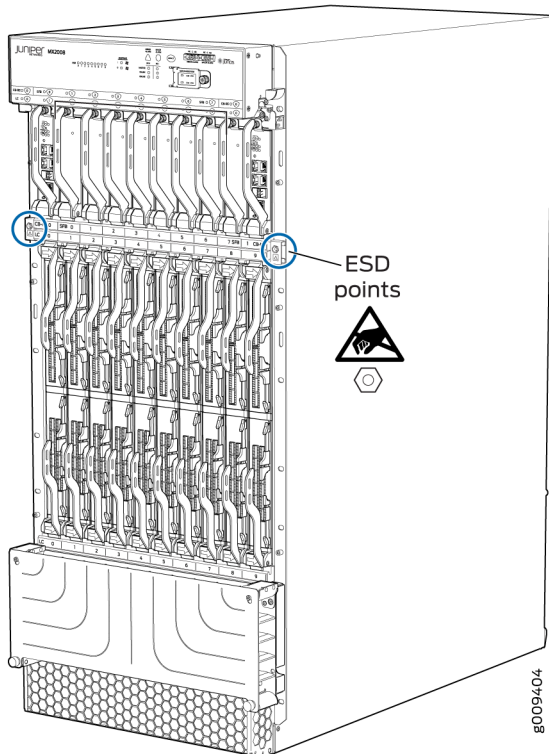
MX2008 Backplane Description

The MX2008 router consist of a signal backplane and a power backplane that connect PSMs and PDMs to the chassis. The adapter cards are carrier cards used to house the MPCs. The MPCs install into the bottom card-cage signal backplanes from the front of the chassis and mate to the signal backplane to connect to the Enhanced Switch Fabric Boards (SFB2s) and the Routing and Control Boards (RCBs). The backplane connects 10 line cards to 8 SFBs and 2 RCBs. The SFBs and RCBs are installed at the top of the chassis from the front. The cooling system components also connect to the signal backplane. The PSMs install into the power backplane, and the PDMs mate to the power backplane.

The backplanes performs the following major functions:

- Data path—Data packets are transferred across the signal backplane between the MPCs through the fabric ASICs on the SFBs.

- Power distribution—The router PDMs relay power from the feeds to the input of the PSMs through the power backplane. In addition, the output power from PSMs is distributed to the components of the chassis (MPCs, SFBs, and RCBs), using the power backplane.

- Control/management path—The backplanes provides management and control path connectivity among the various system components.

SEE ALSO

MX2008 Component Redundancy

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

- Host subsystem—The host subsystem consists of two Routing and Control Boards (RCBs). The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality. The router can have one or two host subsystems. If two host subsystems are installed, one functions as the primary and the other functions as the backup. If the primary host subsystem (or either of its components) fails, the backup can take over as the primary.

- DC power system—The MX2008 DC power system (-48 V and 240 V China) is made up of three components: nine power supply modules (PSMs), two power distribution modules (PDMs), and a power midplane. For telecom (48 VDC) power supplies the power system distributes power from a pool of 22.5 KW (20 KW for non-redundant PSMs and 2.5 KW reserved for PSM redundancy). This pool provides power to the whole chassis including the ten line-card slots, two fan trays, and critical FRUs. These critical FRUs consist of two RCBs and eight SFBs located in the top portion of the chassis.

- Power distribution modules (PDMs)—In the DC configuration, each system provides N+1 PSM redundancy along with N+N feed redundancy. The power feeds from different sources need to be connected to different PDMs. If feeds that connect to one PDM fail in a redundant configuration, the other feed starts to provide full power.

  > **NOTE**: Depending on the voltage of the DC feeds, power can be drawn from both feeds. The feed with higher voltage provides more power. If the difference between the voltages is sufficient, then the higher voltage feed provides all the power. When the voltages are exactly the same, equal power is drawn from both feeds.

  A total of two PDMs can be installed into a router. Each DC PDM operates with up to nine separate feeds of either 60-A or 80-A current limit. The 240 V China DC PDMs have nine feeds and do not have a switch selection. The capacity of these feeds is relayed to system software through a switch located on the DC PDM.

  The MX2008 router supports two types of three-phase power system PDMs. The three-phase delta and three-phase wye. Individual phases are taken from three-phase feeds to individual PSMs. One feed provides power to six PSMs, while the second input feed provides power to the remaining three PSMs (supporting a total of nine PSMs).

- DC power feed redundancy—The MX2008 DC power system is feed redundant. Each PSM can be connected to two separate feeds from different sources that are used to provide feed redundancy. There are two PDMs per power subsystem that carry nine feeds each. Feeds from one power source must be connected to one PDM and feeds from the other power source must be connected to the second PDM of the power subsystem (see).

Figure 10: DC Power System Feed Redundancy
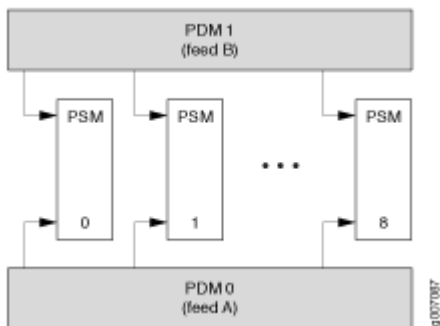
Each PSM has a set of two DIP switches located on the faceplate. These DIP switches are used to indicate whether a user wants to connect one feed to the power system, two feeds, or none. These DIP switches provide critical information to the power management system to help generate alarms in case of a feed failure or a wrong connection. Each PDM has an LED per feed indicating whether

the feed is active or not, or whether the feed is connected properly. See "MX2008 DC Power Supply Module (-48 V) Description" on page 106.

- Universal power system—The MX2008 supports connection of a high-voltage second-generation universal (HVAC/HVDC) power system.

  High-Voltage Second-Generation Universal (HVAC/HVDC) PDMs—The universal PDM accepts either an HVAC or HVDC input. You can install a total of two PDMs into a router. Each universal PDM operates with nine feeds of a 30-A current limit. Each universal PSM is capable of delivering 3400 W of power with-dual feeds and 3000 W of power with a single-feed. In this configuration, each subsystem provides *N+1* output PSM redundancy along with *N+N* feed redundancy. The power feeds from different sources need to be connected to different PDMs. If feeds that connect to one PDM fail in a redundant configuration, the other feed provides full power. For high-voltage second-generation universal (HVAC/HVDC) power system, both input power feeds are active and share the load when present.

  Figure 11 on page 27 illustrates the power distribution from the universal (HVAC/HVDC) PDMs to the universal (HVAC/HVDC) PSMs.

Figure 11: MX2010 Router Universal (HVAC/HVDC) Power Subsystem Feed Redundancy
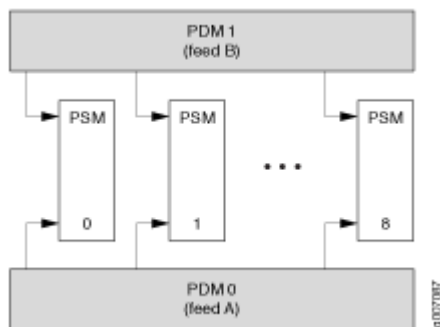
- AC power system—The MX2008 supports connection of three-phase and single-phase AC power systems.

  There are two types of three-phase power systems: the three-phase delta and three-phase wye. The AC power going to the PSMs is split into three individual phases—each PSM works on a single phase. This means the power system works independent of the kind of AC feed is connected. You can connect one or two feeds, depending on the power system configuration (number of PSMs, redundancy, and so on). Each phase from each of the two feeds is distributed among one or two PSMs (one feed has each phase going to two PSMs, and the other feed has each phase going to a single PSM). See Figure 13 on page 28 and Figure 14 on page 29.

  The single-phase AC PDM provides an AC input power interface to the PSM through the system power midplane. Up to nine PSMs can be connected to a single-phase AC PDM. Each single-phase

AC PDM accepts seven or nine AC power cords from a single-phase AC source. Each AC input is independent and feeds one PSM. See Figure 12 on page 28.

Figure 12: Power Distribution from Single-Phase Feed Delta PDM to the AC PSMs
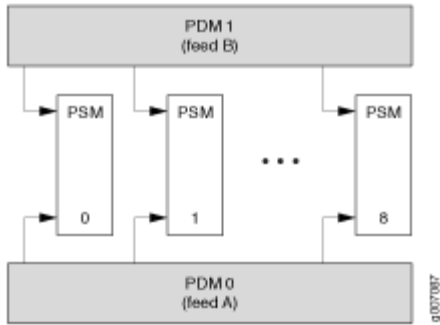
Figure 13: Power Distribution from Three-Phase Feed Delta PDM to the AC PSMs
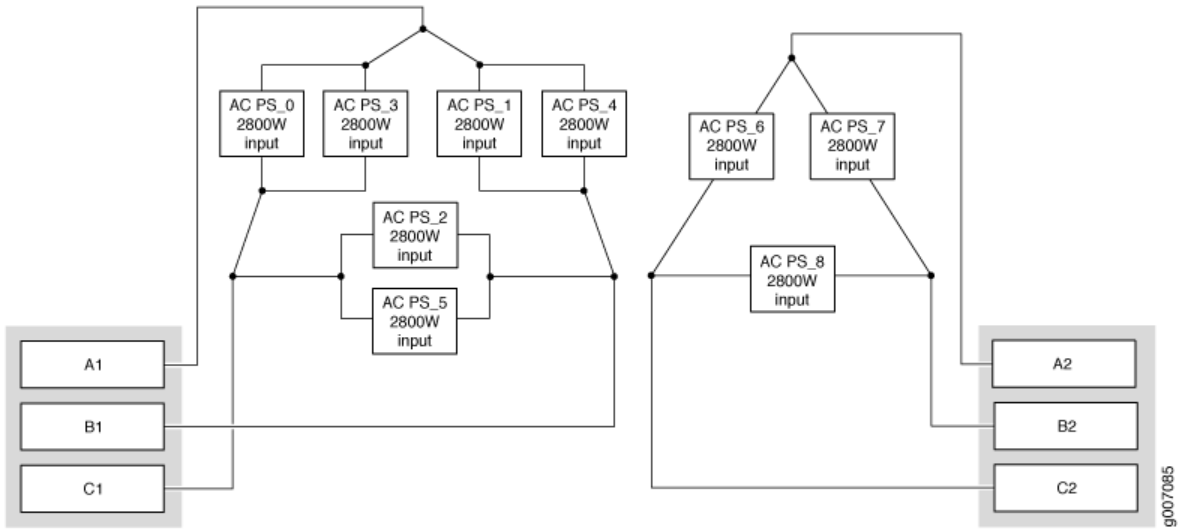
Figure 14: Power Distribution from Three-Phase Feed Wye PDM to the AC PSMs
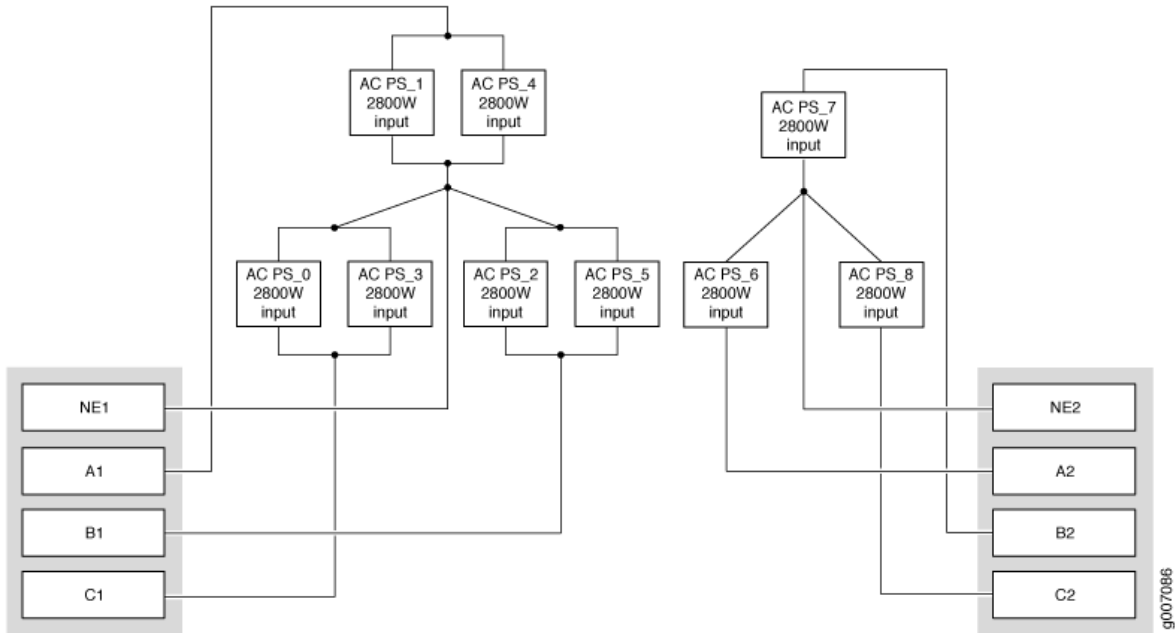
The AC power system is feed redundant—each PSM takes in two AC feeds and uses one of the two. One AC feed is active at a time. If one feed fails, the PSM automatically switches over to the other feed without disrupting system function (see "MX2008 AC Power Supply Module Description" on page 62).

- AC power requirements—Table 7 on page 29 shows the MX2008 current requirements for the three-phase delta and wye power feeds.

Table 7: AC PDM Delta and Wye Current Requirements

Three-Phase Voltage	Input Feed	Current Delta per Three-Phase PDM	Current Wye per Three-Phase PDM
200 V (minimum–nominal) (line-to-line) for delta (per phase)	1	50 A	–
	2	25 A	–
200 V (minimum–nominal) (line-to-neutral) for wye (per phase)	1	–	30 A
	2	–	15 A

> **NOTE**: This is the minimum required to provide 2.5 KW per PSM. Based on facilities guidelines, you should overprovision the MX2008 router. The two numbers listed in the current columns reflect the distribution of phases from the feed to PSM. For example, from one feed each phase goes to two PSMs and from the other feed each phase goes to only one PSM.

- Power supply modules (PSMs)—All nine AC, DC, 240 V China, or universal HVAC/HVDC PSMs in a system share the load. If one PSM fails in a redundant configuration, the remaining eight PSMs provide power to FRUs. Up to nine PSMs might be required to supply power to a fully configured router. Nine PSMs supply power to the two RCBs (active and redundant), eight SFBs, ten MPCs, and two fan trays (active and redundant).

- Cooling system—The cooling system has a total of two fan trays—which are controlled and monitored by the host subsystem. The fan trays are at the bottom and are used to cool RCBs, SFBs, and ten line cards. If a fan fails or the temperature rises above the temperature threshold, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range (see "MX2008 Cooling System Description" on page 51).

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules (AC/DC or HVAC/HVDC PSMs and PDMs).

SEE ALSO

MX2008 Field-Replaceable Units

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

- Hot-removable and hot-insertable FRUs—You can remove and replace these components without powering off the router or disrupting the routing functions.

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

  NOTE: Before you replace most host subsystem components, such as the RCBs, you must take the host subsystem offline.

lists the FRUs for the MX2008 router.

Table 8: Field-Replaceable Units

Hot-Removable and Hot-Insertable FRUs	Hot-Pluggable FRUs
- PSM air filter - Air filter (lower) - Lower cable manager - Craft interface - Switch Fabric Board (SFB) (if redundant) - Backup RCB (if redundant) - Primary RCB (if *nonstop active routing* is configured) - Modular Port Concentrators (MPCs) - Adapter cards - Modular Interface Cards (MICs) - AC power supply modules (if redundant) - AC power distribution modules (if redundant) - DC (-48 V) power supply modules (if redundant) - DC (-48 V) power distribution modules (if redundant) - DC (240 V China) power supply modules (if redundant) - DC (240 V China) power distribution modules (if redundant) - Universal (HVAC/HVDC) power supply modules (if redundant) - Universal (HVAC/HVDC) power distribution modules (if redundant) - Fan trays	- Routing and Control Boards (RCB) (nonredundant) - Switch Fabric Board (SFB) (nonredundant)

SEE ALSO

MX2008 Router Hardware Components and CLI Terminology

The MX2008 router supports the components listed in Table 9 on page 33.

Table 9: MX2008 Router Hardware Components and CLI Terminology

Component	Hardware Model Number	CLI Name	Description
Chassis			
Chassis	CHAS-MX2008	**MX2008**	"MX2008 Physical Specifications" on page 238
AC optimized power chassis	MX2008-PREMIUM2-AC		"MX2008 Chassis Description" on page 17
DC optimized power chassis	MX2008-PREMIUM2-DC		
Craft interface panel	MX2008-CRAFT	**Front Panel Display**	"MX2008 Craft Interface Description " on page 37
Cooling System, Including Air Baffle, Fan Trays, and Air Filters			
Fan tray	MX2000-FANTRAY	**172 mm FanTray - 6 Fans**	"MX2008 Cooling System Description" on page 51

Table 9: MX2008 Router Hardware Components and CLI Terminology *(Continued)*

Component	Hardware Model Number	CLI Name	Description
Optimized power fan tray	MX2K-FANTRAY	**Optimized Power fan tray**	
Air filter kit	MX2000-FLTR-KIT-S	N/A	
Power System Components			"MX2008 Power System Description" on page 55
PDM blank cover	MX2000-PDM-BLANK	N/A	"MX2008 DC Power Distribution Module (-48 V) Description" on page 102
Power distribution module (PDM)	MX2000-PDM-DC	**DC 52V Power Dist Module**	
	MX2K-PDM-DC240V	**MX2K 240V HVDC PDM**	"MX2000 DC Power Distribution Module (240 V China) Description" on page 103
	MX2K-PDM-HV	**MX2K UNIVERSAL HV PDM**	"MX2008 High-Voltage Universal (HVAC/HVDC) Power Distribution Module Description" on page 132
	MX2000-PDM-AC-DELTA	**AC Delta Power Dist Module**	"MX2008 Three-Phase Delta AC Power Distribution Module Description" on page 66 *MX2000 Three-Phase Delta AC Power Distribution Module Description*

Table 9: MX2008 Router Hardware Components and CLI Terminology *(Continued)*

Component	Hardware Model Number	CLI Name	Description
	MX2000-PDM-AC-WYE	**AC Y Power Dist Module**	"MX2008 Three-Phase Wye AC Power Distribution Module Description" on page 69 *MX2000 Three-Phase Wye AC Power Distribution Module Description*
	MX2K-PDM-AC-1PH	**Single-phase AC PDM**	
	MX2K-PDM-OP-AC	**Single-phase AC PDM (6+1)**	
	MX2K-PDM-OP-DC	**Optimized Power DC PDM (6+1)**	
PSM blank cover	MX2000-PSM-BLANK	N/A	"MX2008 Power System Description" on page 55
Power supply module (PSM)	MX2000-PSM-AC	**AC 52V Power Supply Module**	
	MX2000-PSM-DC	**DC 52V Power Supply Module**	
	MX2K-PSM-DC240V	MX2K 240V HVDC PSM	"MX2000 DC Power Supply Module (240 V China) Description" on page 109
	MX2K-PSM-HV	**MX2K UNIVERSAL HV PSM**	"MX2008 High-Voltage Universal (HVAC/HVDC) Power Supply Module Description" on page 134

MICs and MPCs, Including ADC and Transceiver

Table 9: MX2008 Router Hardware Components and CLI Terminology *(Continued)*

Component	Hardware Model Number	CLI Name	Description
MIC	See *MX Series Interface Module Reference*		"MX2008 Modular Interface Card Description" on page 212
MPC blank cover	MX2000-LC-BLANK	N/A	"MX2008 Modular Port Concentrator Description" on page 201
MPC	See *MX Series Interface Module Reference*		
ADC	MX2000-LC-ADAPTER	**Adapter Card**	"MX2000 Adapter Card (ADC) Description" on page 199
Transceiver	See *MX Series Interface Module Reference*	**Xcvr**	"Connecting MPC or MIC Cables to the MX2008 Router" on page 404

Host Subsystem Components

Component	Hardware Model Number	CLI Name	Description
SFB	MX2008-SFB2	**MX2008 Switch Fabric Board 2**	"MX2008 Enhanced Switch Fabric Board (MX2008 SFB2) Description" on page 195
SFB blank cover	MX2008-RE-SFB-BLANK	N/A	
Routing and Control Board (RCB)	REMX2008-X8-64G	**Control Board**	"MX2008 Routing and Control Board (MX2008 RCB) Description" on page 154
Routing Engine		RE-MX2008-X8-64G	

SEE ALSO

MX2008 Craft Interface Description

The craft interface enables the user to view status and troubleshooting information at a glance and to perform many system control functions. It is hot-insertable and hot-removable.

The craft interface is located on the front of the router and contains LEDs for the router components, the alarm relay contacts, and alarm cutoff button (see Figure 15 on page 37). Table 10 on page 37 describes the LEDs, buttons, and connectors.

Figure 15: Front Panel of the Craft Interface
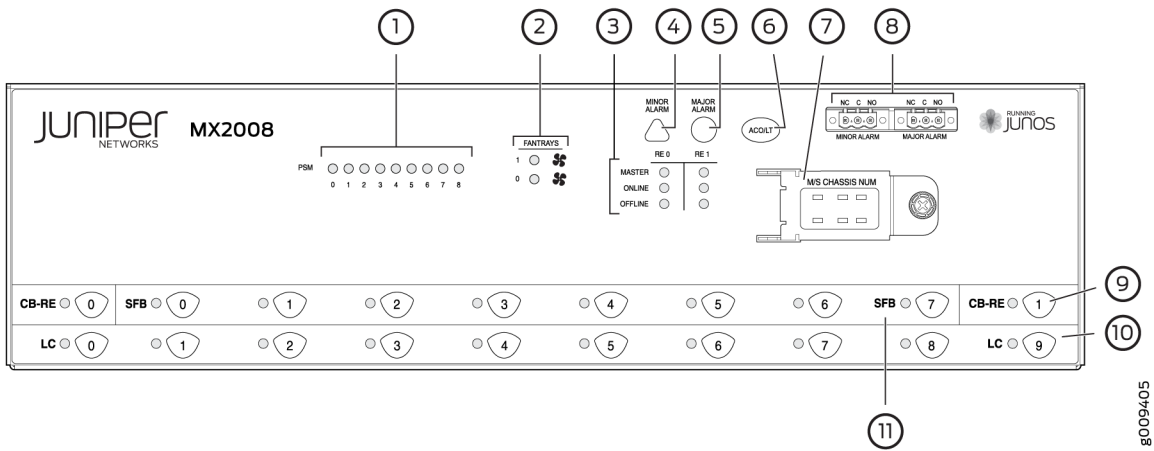
Table 10: Craft Interface LEDs, Buttons, and Connectors

Function No.	Label	Description
1	**PSM**	Status LEDs for PSMs **0** through **8**
2	**FANTRAYS**	Status LEDs for fan trays **0** and **1**
3	**RE0** (**MASTER**, **ONLINE**, and **OFFLINE**) **RE1** (**MASTER**, **ONLINE**, and **OFFLINE**)	Two sets of status LEDs per host subsystem. There are three LEDs per Routing Engine.
4	**MINOR ALARM**	Minor Alarm LED for monitoring or maintaining the MX2008

Table 10: Craft Interface LEDs, Buttons, and Connectors *(Continued)*

Function No.	Label	Description
5	**MAJOR ALARM**	Major Alarm LED for critical conditions, which can result in system shutdown
6	**ACO/LT**	Alarm Cutoff/ Lamp Test button. Turns off both minor and major alarms and deactivates the device attached to the corresponding alarm relay contact on the craft interface
7	**M/S CHASSIS NUM**	Chassis ID Dial and Standalone Dial. One dial is used to indicate the chassis number for multichassis configurations. The second dial is used to indicate whether the chassis is operating in standalone mode or as part of a multichassis system.
8	**MINOR ALARM–[NC C NO]** **MAJOR ALARM–[NC C NO]**	Two sets of alarm terminal contacts, each consisting of normal open and normal closed relays that signal a minor or major alarm when broken.
9	**CB-RE 0** and **CB-RE 1**	Status LEDs for the two RCBs.
10	**LC 0** through **LC 9**	Status LEDs for the ten line cards.
11	**SFB 0** through **SFB 7**	Status LEDs for eight SFBs.

SEE ALSO

MX2008 Alarm Relay Contacts on the Craft Interface

The craft interface has two alarm relay contacts for connecting the router to external alarm devices (see Figure 16 on page 39). Whenever a system condition triggers either the red or yellow alarm on the craft interface, the alarm relay contacts are also activated. The alarm relay contacts are located on the upper right of the craft interface (see Table 11 on page 39).

Figure 16: Alarm Relay Contacts
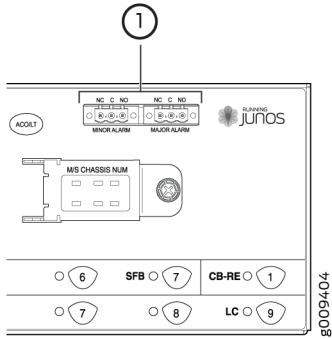
Table 11: Alarm Relay Contacts

Function No.	Label	Description
1	**MINOR ALARM–[NC C NO]** **MAJOR ALARM–[NC C NO]**	The alarm relays consist of three terminal contacts with normal closed (NC), common (C), and normal open (NO) relays that signal a minor or major alarm when broken.

SEE ALSO

MX2008 Alarm LEDs and Alarm Cutoff/Lamp Test Button

Two large alarm LEDs are located at the upper right of the craft interface. When lit, the circular red LED indicates a critical condition that can result in a system shutdown. A lit triangular yellow LED indicates a less severe condition that requires monitoring or maintenance. Both LEDs can be lit simultaneously.

A condition that causes an LED to light also activates the corresponding alarm relay contact on the craft interface.

To deactivate red and yellow alarms, press the button labeled **ACO/LT** (for "alarm cutoff/lamp test"), which is located to the right of the alarm LEDs. Deactivating an alarm turns off both LEDs and deactivates the device attached to the corresponding alarm relay contact on the craft interface.

describes the alarm LEDs and alarm cutoff button in more detail.

Table 12: Alarm LEDs and Alarm Cutoff/Lamp Test Button

Shape	Color	State	LED Control Name	Description
○	Red	On steadily	Critical alarm	Indicates a critical condition that can cause the router to stop functioning. Possible causes include component removal, failure, or overheating.
△	Yellow	On steadily	Warning alarm	Indicates a serious but nonfatal error condition, such as a maintenance alert or a significant increase in component temperature.
(ACO/LT)	–	–	Alarm cutoff/lamp test button	Deactivates red and yellow alarms. Causes all LEDs on the craft interface to light (for testing) when pressed and held.

SEE ALSO

MX2008 Component LEDs on the Craft Interface

MX2008 Host Subsystem LEDs and Buttons on the Craft Interface

Each host subsystem has three LEDs, located in the upper middle of the craft interface, that indicate its status. The LEDs labeled **RE0** show the status of the Routing Engine on the RCB in slot **0**. The LEDs labeled **RE1** show the status of the Routing Engine on the RCB in slot **1**. Table 13 on page 41 describes the functions of the host subsystem LEDs.

Table 13: Host Subsystem LEDs on the Craft Interface

Label	Color	State	Description
MASTER	Green	On steadily	Host is functioning as the primary.
ONLINE	Green	On steadily	Host is online and is functioning normally.
OK/FAIL	Red	On steadily	Host is installed but the Routing Engine on the RCB is offline.
	–	Off	Host is not installed.

If you need to take the Control Board offline, you must first take the Routing Engine offline. The Routing Engine gets powered by the Control Board. The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality.

MX2008 Power Supply Module LEDs on the Craft Interface

Each power supply module (PSM) has one bicolor LED on the craft interface that indicates its status. The LEDs, labeled **0** through **8**, are located on the upper left of the craft interface next to the **PSM** label. describes the functions of the PSM LEDs on the craft interface.

Table 14: Power Supply Module LEDs on the Craft Interface

Label	Color	State	Description
PSM	Green	On steadily	PSM is functioning normally.
	Red	On steadily	PSM module has failed or power input has failed.

MX2008 Line-Card LEDs and Buttons on the Craft Interface

Each line card (or MPC) has one bicolor LED on the craft interface that indicates its status. The LEDs, labeled **LC 0** through **LC 9**, are located along the bottom of the craft interface. describes the functions of the LEDs present on the MPC.

Table 15: Line-Card LEDs on the Craft Interface

Label	Color	State	Description
LC	Green	On steadily	Line card functioning normally.
		Blinking	Line card is transitioning online or offline.
	–	Off	The slot is not online.
	Red	On steadily	Line card has failed.

There are ten push buttons located next to each of the line card LEDs on the craft interface. These buttons are used to place the line cards online or offline. When a line card is inserted into an adapter card, and installed into the MX2008 router, the online/offline buttons can turn both the line card and its adapter card on or off.

> **NOTE**: When installing an adapter card without the line card, the online/offline buttons have no effect.

MX2008 SFB LED and Buttons on the Craft Interface

Each SFB has one bicolor LED on the craft interface that indicates its status. The SFB LEDs, labeled **0** through **7**, are located along the bottom of the craft interface. Table 16 on page 43 describes the functions of the SFB LED.

Table 16: SFB LED on the Craft Interface

Label	Color	State	Description
SFB	Green	On steadily	SFB functioning normally.
		Blinking	SFB is transitioning online or offline.
	–	Off	The slot is not online.
	Red	On steadily	SFB has failed.

There are eight push buttons located next to each of the SFB LEDs on the craft interface. These buttons are used to place the SFBs online or offline.

MX2008 Fan Tray LEDs on the Craft Interface

The fan tray LEDs, labeled **0** and **1**, are located on the top middle of the craft interface. Table 17 on page 43 describes the functions of the fan tray LEDs.

Table 17: Fan LEDs on the Craft Interface

Label	Color	State	Description
FANTRAYS	Green	On steadily	Fan is functioning normally.

Table 17: Fan LEDs on the Craft Interface *(Continued)*

Label	Color	State	Description
	Red	On steadily	Fan in a fan tray has failed. Fan tray has failed.

SEE ALSO

MX2008 Cable Manager Description

IN THIS SECTION

The MX2008 router supports the following cable managers:

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same cable managers.

Standard Cable Manager

The standard cable manager consists of the following components:

- Card-cage cable manager—MX2000-CBL-MID

- Lower cable manager—MX2000-CBL-BTM-S

- DC power cable manager—MX2000-DC-CBL-MGR-S

- Cable manager for the DC PDM (240 V China) and the universal (HVAC/HVDC PDM)—MX2K-HV-CBL-MGR

The lower cable manager (see) is located just below the lower card cage, has a removable cover that is secured by two captive screws with access to rows used for routing and securing the cables away from the front of the Modular Port Concentrators (MPCs) and Modular Interface Cards (MICs) (see).

You can use cable strips or other ties to gently secure the cables in the lower cable manager. To secure the cables in place, loop the tie through the cable anchor and secure the tie.

Each DC PDM has one cable manager. The DC cable manager routes cables away from the rear of the PDMs (see).

You can use cable strips or other ties to gently secure the cables in the DC cable manager. To secure the cables in place, loop the tie through the cable anchor and secure the tie. You can pull the DC cable manager up and outward to lock it into the maintenance position.

Figure 17: MX2008 Standard Cable Manager

Front bottom

Rear DC Cable (for DC PDM)

g007421
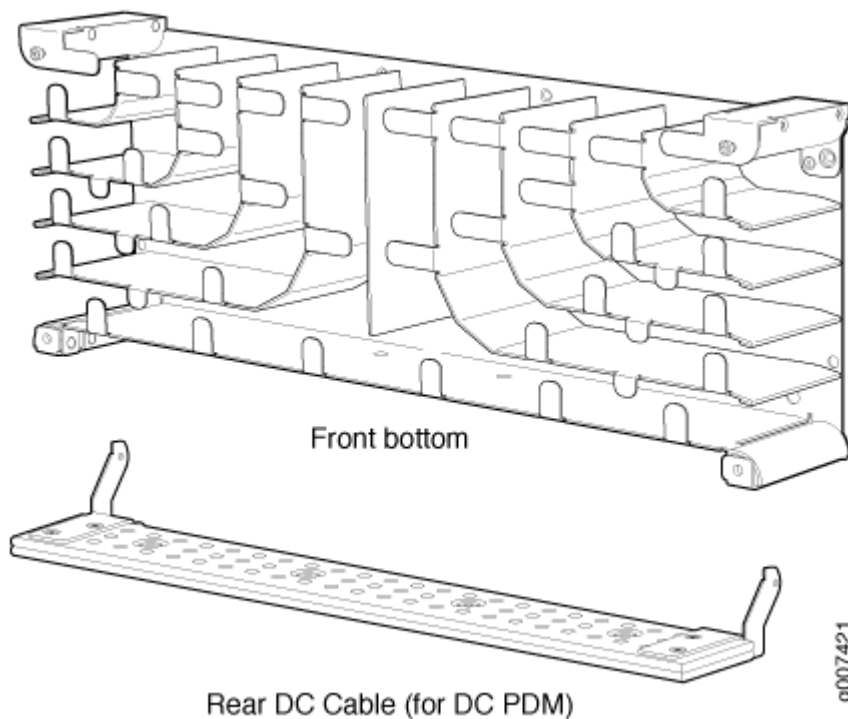
Figure 18: Lower Cable Manager
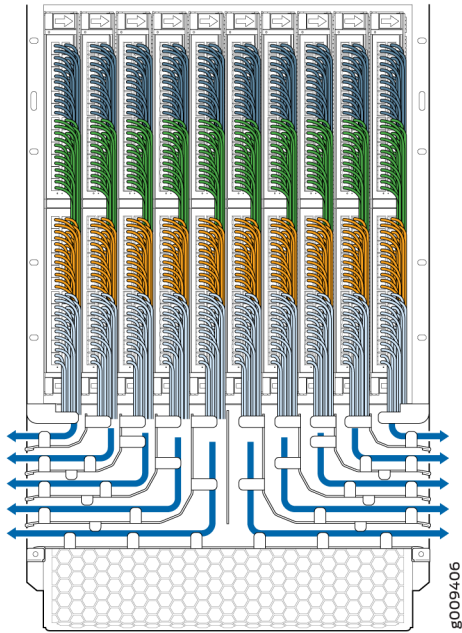
The card-cage cable manager (see) is located in the upper card cage, which has rows for routing and securing the cables away from the front of the RCBs and SFBs.

You can use cable strips or other ties to gently secure the cables in the card-cage cable manager. To secure the cables in place, loop the tie through the cable anchor and secure the tie. To access the air filter, the cable manager needs to be opened.

Figure 19: Card-Cage Cable Manager
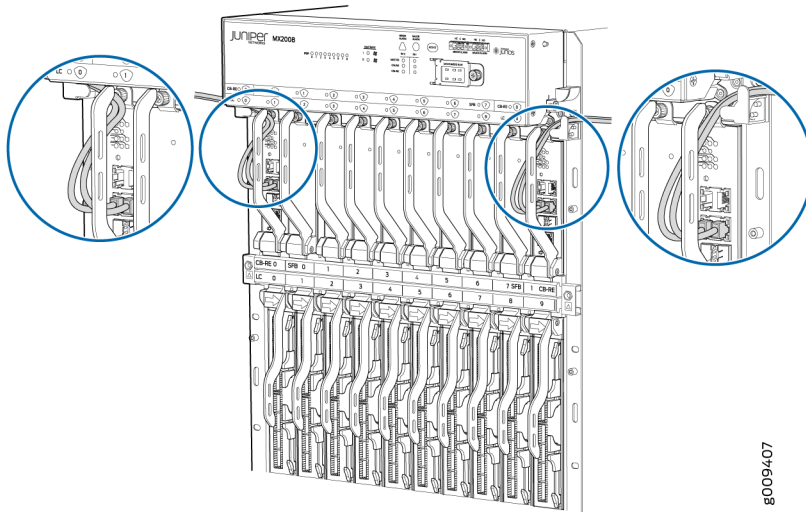
Extended Cable Manager

The extended cable manager consists of the following components:

- Extended lower cable manager—MX2000-CBL-BTM-XT-S

- Extended DC cable manager—MX2020-DC-CBL-MGR-XT-S

Figure 20: MX2008 Extended Cable Manager

Front lower
cable manager

Rear DC PDM
cable manager

g009408
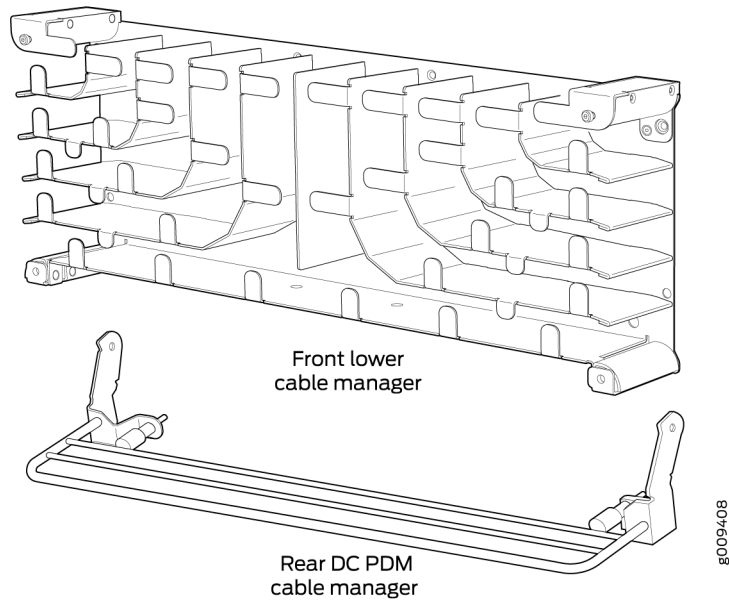
Figure 21: MX2000 Extended Cable Manager for the DC PDM (240 V China) and the Universal (HVAC/HVDC) PDM

Rear Extended Cable Manager

g100799
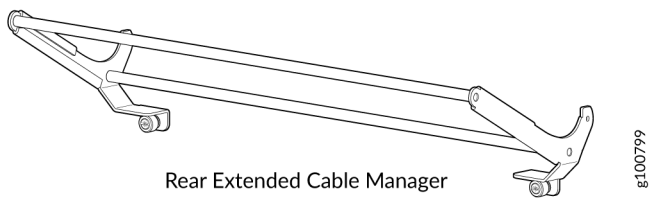
The extended cable manager provides additional support to route and secure a large number of cables away from the front of the MPCs and MICs (see).

Figure 22: MX2008 Lower Extended Cable Manager
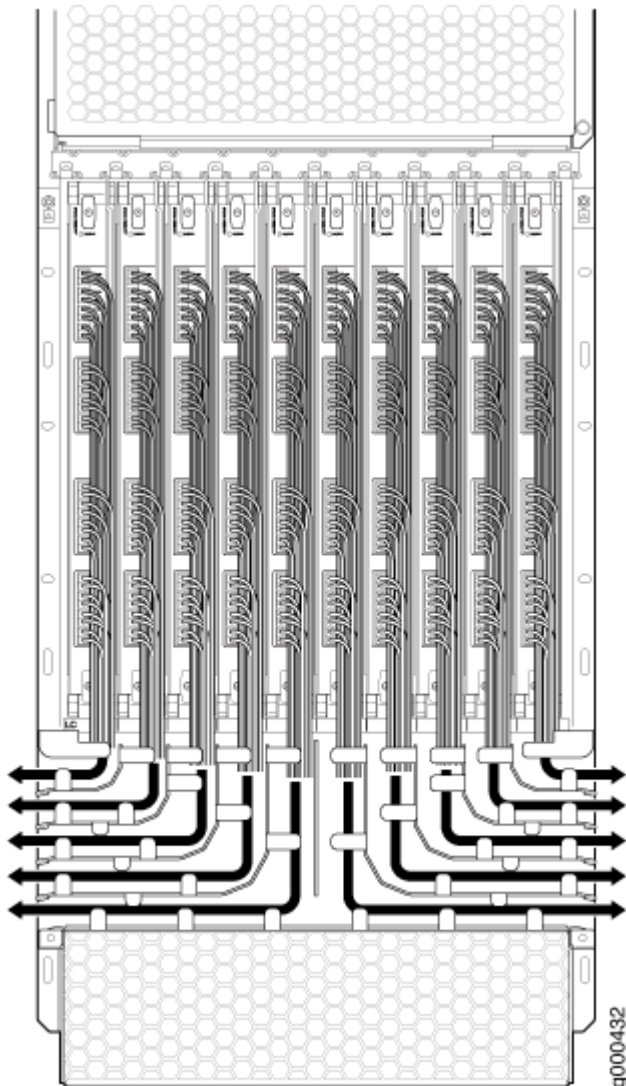
The extended DC cable manager provides additional support to route and secure a large number of cables away from the rear of the PDMs.

You can use cable strips or other ties to gently secure the cables in the upper and lower extended cable managers. To secure the cables in place, loop the tie through the cable anchor and secure the tie.

SEE ALSO

Replacing the MX2008 Standard Cable Managers

Replacing the MX2008 Extended Cable Manager | **417**

MX2008 Rack-Mounting Hardware

The rack-mounting hardware for the MX2008 router includes:

- One large adjustable mounting shelf for mounting in four-post racks or cabinets

- Built-in front-mounting flanges on the front of the chassis for front-mounting in a four-post rack or cabinet

- One open-frame mounting shelf for mounting in an open-frame rack (optional)

- Two center-mounting brackets for mounting the router in an open-frame rack (optional)

- Mounting screws

- Cage-nuts

NOTE: There must be a minimum or 24 U of usable rack space when installing the MX2008 router into a rack.

SEE ALSO

MX2008 Cooling System

IN THIS SECTION

MX2008 Cooling System Description

The cooling system consists of the following components:

- Fan tray

- Fan tray air filter

NOTE: The MX2008, MX2010, and MX2020 routers support the same fan modules (fan tray and fan tray air filter).

The host subsystem monitors the temperature of the router components. When the router is operating normally, the fans function at lower than full speed. If a fan fails or the ambient temperature rises above a threshold, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range (see and). The fan tray filter is shown in .

Figure 23: Airflow Through the Chassis
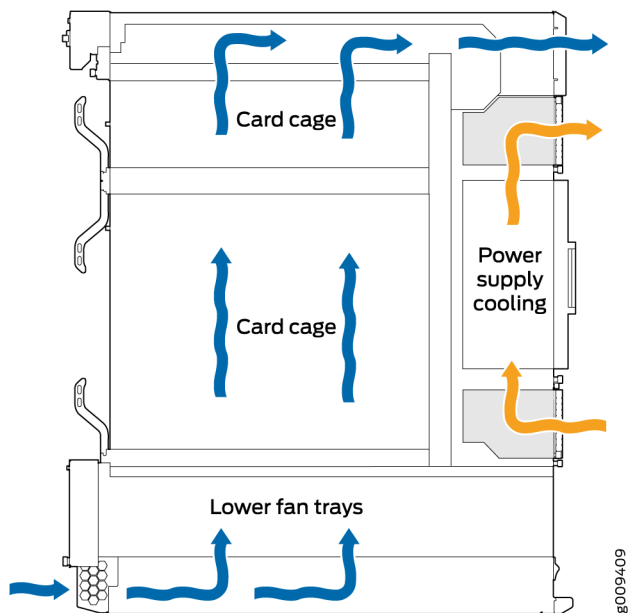
The MX2008 router provides front-to-back cooling system. Air is pushed into the bottom inlet and up through the fan tray, and is exhausted out the upper rear of the system. The cooling system cools the MPCs, SFBs, and RCBs.

The cooling system components work together to keep all router components within the acceptable temperature range. The MX2008 router has two fan trays located at the bottom of the router that install horizontally. Each fan tray contains six fans. These are labeled **1** through **6** and each fan is 172 mm in diameter. The fan trays are interchangeable and are hot-insertable and hot-removable.

Each fan tray has a double safety latch, so the fan tray cannot be removed in one swift motion (see). To remove the fan tray, press and hold the latch until the **STATUS** LED turns off. The secondary latch will engage during removal. Press the secondary latch to fully remove the fan tray.

Figure 24: Fan Tray

1– Safety double latch system	2– **STATUS** LED
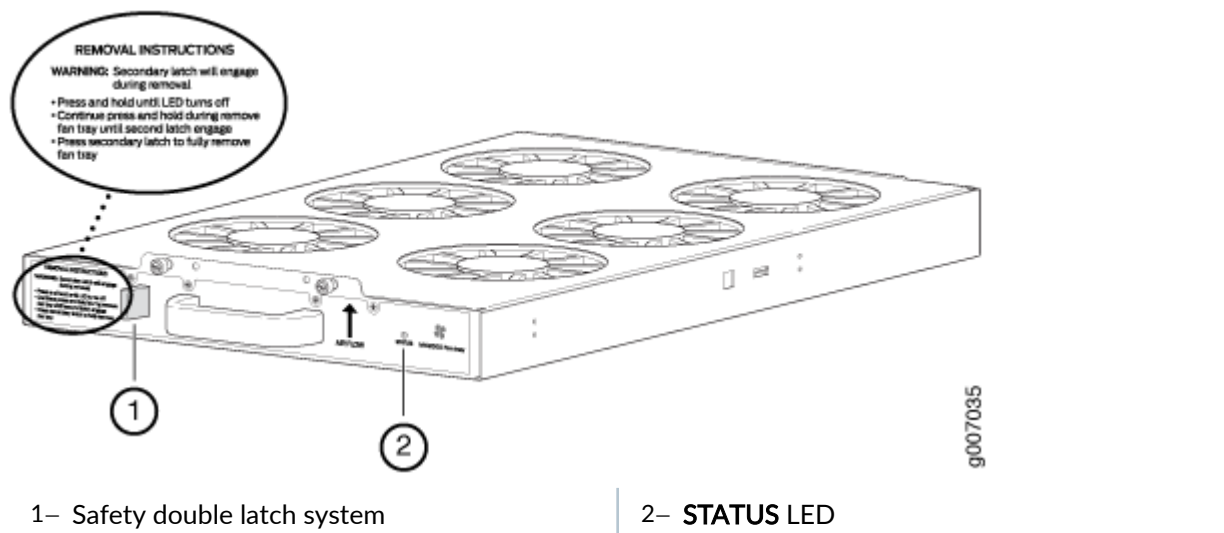
Figure 25: Removing the Fan Tray
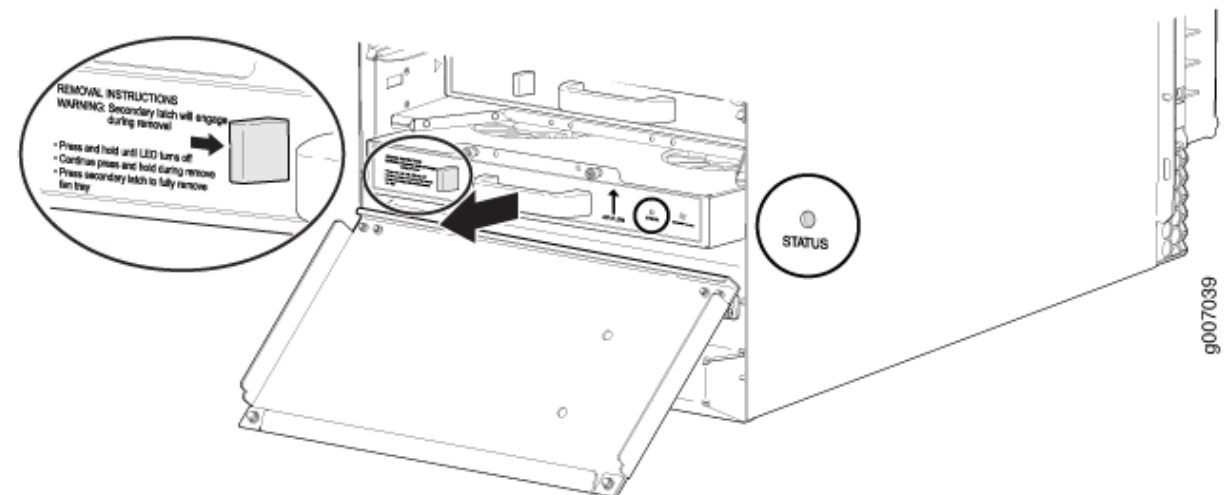
> ⚠️ **WARNING**: Before removing a fan tray, make sure the fan blades have stopped completely.

> ⚠️ **WARNING**: The fan trays use a double latch safety mechanism. Press and hold the latch until the **STATUS** LED turns off. Continue to press and hold the latch while removing the fan trays. See Figure 24 on page 52.

The fan tray air filter sits right on top of the fan trays and help in filtering the air that enters the chassis. The air filter is hot-insertable and hot-removable. See Figure 26 on page 53.

Figure 26: Fan Tray Air Filter
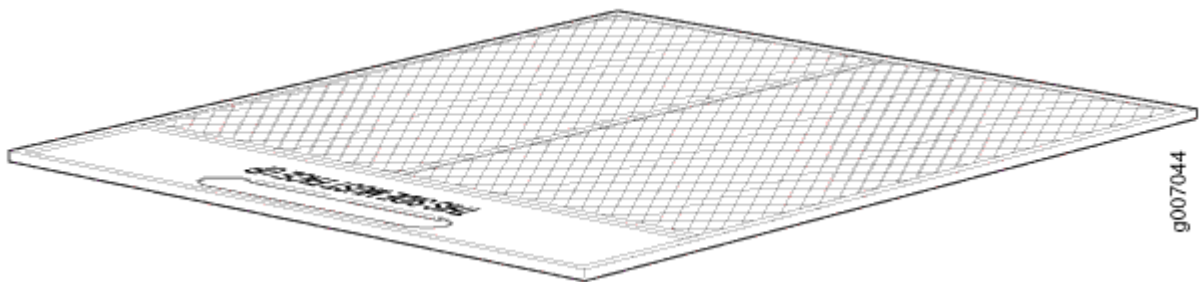
SEE ALSO

Troubleshooting the MX2008 Cooling System | **583**

Replacing an MX2008 Fan Tray | **446**

Replacing the MX2008 Air Filters | **435**

MX2008 Fan Tray LED

Each fan tray (both the standard fan tray and optimized power fan tray) contains one tricolor LED located on the front faceplate (see Table 18 on page 54). A set of two bicolor fan tray LEDs is located on the top middle of the craft interface. For more information, see "MX2008 Component LEDs on the Craft Interface" on page 41.

Table 18: Fan Tray LEDs

Label	Color	State	Description
STATUS	Green	On	Fan tray is operating properly.
	Yellow	On	Fan tray is not receiving enough power to operate.
			Fan temperature might indicate warm threshold.
	Red	On	Fan tray is nonoperational.
			One or more fans are bad or not operating.
			Fan temperature might indicate high threshold.

SEE ALSO

Replacing an MX2008 Fan Tray | **446**

Troubleshooting the MX2008 Cooling System | **583**

MX2008 Component LEDs on the Craft Interface | **41**

MX2008 Power System

IN THIS SECTION

- MX2008 Power System Description | **55**
- MX2008 Power Midplane Description | **61**

MX2008 Power System Description

The MX2000 routers are available in -48 V and 240 V China DC power configurations, three-phase (delta and wye) AC power configurations, single-phase power configurations, and high-voltage AC (HVAC) or high-voltage DC (HVDC) configurations. You can add additional power to the rack as needed. The MX2008 router is configurable with up to two AC, DC, 240 V China, or high-voltage second-generation universal (HVAC/HVDC) power distribution modules (PDMs), and up to nine AC, DC, 240 V China, or universal HVAC/HVDC power supply modules (PSMs). The PSMs connect to the top and bottom power backplanes that distribute the output voltages produced by the PSMs to the router components. describes the MX2008 DC power components and describes the MX2008 AC power components.

> ⚠️ **CAUTION**: Do not mix AC, DC, 240 V China, or universal (HVAC/HVDC) PSMs or different PDM types within a single system. The MX2000 line of routers configured for three-phase wye AC input power must use only three-phase wye AC PDMs and three-phase AC PSMs. The systems configured for three-phase delta AC input power must use only three-phase delta AC PDMs and AC PSMs. The systems configured for single-phase AC input power must use only single phase AC PDMS and AC PSMs. The systems configured for universal (HVAC/HVDC) input power must use universal (HVAC/HVDC) PDMs and universal PSMs.

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules (AC, DC, 240 V China, or universal (HVAC/HVDC) PSMs and AC, DC, 240 V China, or universal HVAC/HVDC PDMs).

Table 19: MX2008 DC Power Components

Component	Description
DC power system	The MX2008 DC power system comprises three components: nine PSMs, two PDMs, and a power midplane. The power system distributes power from a pool of 22.5 KW (20 KW for PSM nonredundant and 2.5 KW reserved for PSM redundancy). This pool provides power to 10 line-card slots, two fan trays, two RCBs and eight SFBs.

Table 19: MX2008 DC Power Components *(Continued)*

Component	Description
DC Power Distribution Modules (PDMs)	In the DC power configuration, the router contains up to two DC PDMs located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system. Two PDMs provide full redundancy. The DC PDM provides a power interface to nine PSMs. Each DC PDM operates with seven feeds or nine feeds of either a 60-A or 80-A amp current limit. You can select the input feed capacity (60-A or 80-A) by setting the DIP switch on the PDM to the rated amperage of the DC power input feeds. Each DC PDM has seven or nine DC inputs (−48 VDC and return terminals for each input). **NOTE**: The selected input capacity applies to all inputs of this PDM. Selecting 60 A reduces the available power output capacity of the PSMs supplied by this PDM. In a redundant configuration, the 7-feed DC PDMs support a total of fourteen 60-A or 80-A feeds, and the 9-feed DC PDMs support a total of eighteen 60-A or 80-A feeds.
DC Power Distribution Modules (240 V China)	In the DC power configuration, the router contains up to two DC power distribution modules (PDMs) located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system (two PDMs per chassis) for nonredundant power. The DC PDM provides a power interface to nine power supply modules (PSMs). Two PDMs provide full redundancy for the router. In a redundant configuration, a total of a total of eighteen (9-feed DC PDMs) are supported.

Table 19: MX2008 DC Power Components *(Continued)*

Component	Description
DC Power Supply Modules (PSMs)	The MX2008 DC PSMs (-48 V and 240 V China) are hot-removable and hot-insertable. The DC PSMs are a dual redundant feed (**INP0** and **INP1**). To provide feed redundancy, you can connect each DC PSM to two separate feeds from different sources. When both input feeds are present, power is drawn from the feed supplying higher DC voltage. You can set these feeds by using the input mode DIP switch located on the DC PSM (see "MX2008 DC Power Supply Module (-48 V) Description" on page 106). There are two PDMs per power system capable of carrying seven feeds or nine feeds each. Each DC PSM is capable of delivering 2500 W of power if -48 V/80 A is applied to the -48 V PSM, and 240 V/20 A is applied to the China 240 VDC PSM.

Table 20: MX2008 AC Power Components

Component	Description
AC power system	The MX2008 supports connection of a single-phase or three-phase (delta or wye) AC power system. In the three-phase power systems, the AC power going to the PSMs is split into three individual phases (wye) or a pair of phases (delta). Each PSM works on a single phase; therefore, the power system works independent of the type of AC feed connected. You can connect one or two AC feeds, depending on the power system configuration (number of PSMs, redundancy, and so on). Each phase from each of the two feeds is distributed among one or two PSMs. One feed has each phase going to two PSMs, and the other feed has each phase going to a single PSM. The single-phase AC PDM provides an AC input connection from the single-phase AC power source, and also provides an input power interface to the PSM through a system power midplane.

Table 20: MX2008 AC Power Components *(Continued)*

Component	Description
AC Power Distribution Modules (PDMs)	The MX2008 supports connection of a single-phase or three-phase (delta or wye) AC PDM. Four AC PDM models are available: three-phase delta, three-phase wye, seven-feed single-phase, and nine-feed single-phase. • Each three-phase AC PDM requires two three-phase feeds to be connected. Each phase from each of the two feeds is distributed among one or two PSMs (one feed has each phase going to two PSMs, and the other feed has each phase going to a single PSM). 　• The single-phase AC PDM provides an AC input connection from the single-phase AC power source, and also provides an input power interface to the PSM through a system power midplane. The single-phase AC PDMs accept seven or nine AC power cords from a single-phase AC source. 　• Each AC input is independent and feeds one PSM. Up to nine PSMs can be connected through the AC PDM.
AC Power Supply Modules (PSMs)	The MX2008 AC PSMs are hot-removable and hot-insertable. The AC PSMs have a dual redundant feed (**INP0** and **INP1**). One input feed is active during operation. These feeds are set by the input mode DIP switch located on the AC PSM (see "MX2008 AC Power Supply Module Description" on page 62). Each AC PSM works with a single phase derived from either three-phase delta 200–240 VAC (line-to-line) or three-phase wye 200–240 VAC (line-to-neutral). Each AC PSM is capable of delivering 2500 W of power.

Table 21: MX2008 High-Voltage Universal (HVAC/HVDC) Power Components

Component	Description
HVAC/HVDC power subsystem	The MX2008 HVAC/HVDC power system comprises three components: nine PSMs, two PDMs, and a power midplane (PMP). If dual inputs are used, the power system distributes power from a pool of 30.6 KW (27.2 KW nonredundant and 3.4 KW reserved for redundancy). If single inputs are used, the power system distributes power from a pool of 27 KW (24 KW nonredundant and 3 KW reserved for redundancy).

Table 21: MX2008 High-Voltage Universal (HVAC/HVDC) Power Components *(Continued)*

Component	Description
Universal HVAC/HVDC Power Distribution Modules	In the universal HVAC/HVDC PDM power configuration, the router contains up to two HVAC/HVDC PDMs located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system. Two PDMs provide full redundancy. The HVAC/HVDC PDM provides a power interface to nine PSMs. If feeds that connect to one PDM fail in a redundant configuration, the other feed provides full power. You can install a total of two PDMs into a router. Each HVAC/HVDC PDM operates with nine feeds.
Universal HVAC/HVDC Power Supply Modules (PSMs)	The MX2008 universal HVAC/HVDC PSMs are hot-removable and hot-insertable. The universal PSMs are a dual-redundant feed (**INP0** and **INP1**). To provide feed redundancy, you can connect each PSM to two separate feeds from different sources. When both input feeds are present, power is drawn from both feeds equally. The DIP switch sets which feeds are expected to connected. The input mode DIP switch is located on the HVAC/HVDC PSM (see *MX2000 High-Voltage Universal (HVAC/HVDC) Power Supply Module Description*). There are two PDMs per system capable of carrying nine feeds each. Each HVAC/HVDC PSM is capable of delivering 3400 W if both feeds are present, and 3000 W if one feed is present.

The MX2008 router supports the power systems models and Junos OS releases in .

Table 22: Supported MX2008 Power System Components

Name	Model Number	First Junos OS Release Supported
DC PSM	MX2000-PSM-DC	15.1F7 and later
Nine-feed DC PDM	MX2000-PDM-DC	15.1F7 and later
Seven-feed DC PDM	MX2K-PDM-OP-DC	15.1F7 and later
AC PSM	MX2000-PSM-AC	15.1F7 and later

Table 22: Supported MX2008 Power System Components *(Continued)*

Name	Model Number	First Junos OS Release Supported
Three-phase delta AC PDM	MX2000-PDM-AC-DELTA	15.1F7 and later
Three-phase wye AC PDM	MX2000-PDM-AC-WYE	15.1F7 and later
Nine-feed single-phase AC PDM	MX2K-PDM-AC-1PH	15.1F7 and later
Seven-feed single-phase AC PDM	MX2K-PDM-OP-AC	15.1F7 and later
Nine-feed Universal HVAC/HVDC PDM	MX2K-PDM-HV	19.4R1 and later

NOTE: Routers configured with AC, DC, 240 V China, or universal (HVAC/HVDC) PDMs and PSMs are shipped with blank panels installed.

NOTE: To avoid triggering any PSM-related or power-related alarms for the PSMs that are not used but still plugged into the MX2008 router, make sure that you:

- Do not connect external power feeds to the PSM through the PDM.

- Move the DIP switch on the PSMs to the off position.

- Turn off the PSM by using its **ON/OFF** switch.

SEE ALSO

MX2008 Power Midplane Description

The MX2008 power system consists of a power midplane. This midplane is used to connect power from the PDM feeds (AC, DC, 240 V China, or HVAC/HVDC universal) to the input of the PSMs (AC, DC, 240 V China, or HVAC/HVDC universal) as well as the output from the PSMs to the FRUs (MPCs, RCBs, SFBs, and fan trays). The power midplane plugs into the signal backplane. The PSMs and PDMs get plugged into the power midplane.

SEE ALSO

MX2008 AC Power System

IN THIS SECTION

MX2008 AC Power Supply Module Description

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

There are a total of nine AC power supply modules (PSMs) located at the rear of the chassis in slots **PSM0** through **PSM8** (left to right). The AC PSMs in slots **PSM0** through **PSM8** provide power to:

- Fan trays (**0** and **1**)

- MPCs in slot **0** through **9**

- RCBs in slot **0** and **1**

- SFBs in slot **0** through **7**

The MX2008 routers supports a three-phase delta AC power system, three-phase wye AC power system, or a single-phase AC power system.

CAUTION: Do not mix AC, DC, 240 V China, or universal (HVAC/HVDC) PSMs or different PDM types within a single system. The MX2000 line of routers configured for three-phase wye AC input power must use only three-phase wye AC PDMs and three-phase AC PSMs. The systems configured for three-phase delta AC input power must use only three-phase delta AC PDMs and AC PSMs. The systems configured for single-phase AC input power must use only single phase AC PDMS and AC PSMs. The

systems configured for universal (HVAC/HVDC) input power must use universal (HVAC/HVDC) PDMs and universal PSMs.

In a three-phase AC power system, the AC power going to the PSMs is split into a pair of phases. Each PSM works on a single phase. This means the power system works independent of the kind of AC feed connected. You can connect one or two feeds, depending on the power system configuration, number of PSMs, redundancy, and so on. Each phase from each of the two feeds is distributed among one or two PSMs. One feed has each phase going to two PSMs and the other feed has each phase going to a single PSM.

The single-phase AC power distribution module (PDM) provides an AC input power interface to the PSM through the system power midplane. Up to nine PSMs can be connected to a single-phase AC PDM. Each single-phase AC PDM accepts seven or nine AC power cords from a single-phase AC source. Each AC input is independent and feeds one PSM.

NOTE: For the single-phase AC power system, you must connect each input of the PSM to a dedicated AC power feed and a dedicated customer site circuit breaker. Juniper recommends that you use a customer site circuit breaker rated for 15 A (250 VAC) minimum, or as required by local code.

The AC PSMs are hot-removable and hot-insertable.

Up to nine PSMs may be connected in parallel per power subsystem to increase available power for MPCs, as needed and to provide redundancy. Figure 27 on page 64 shows the AC PSM.

Figure 27: AC Power Supply Module
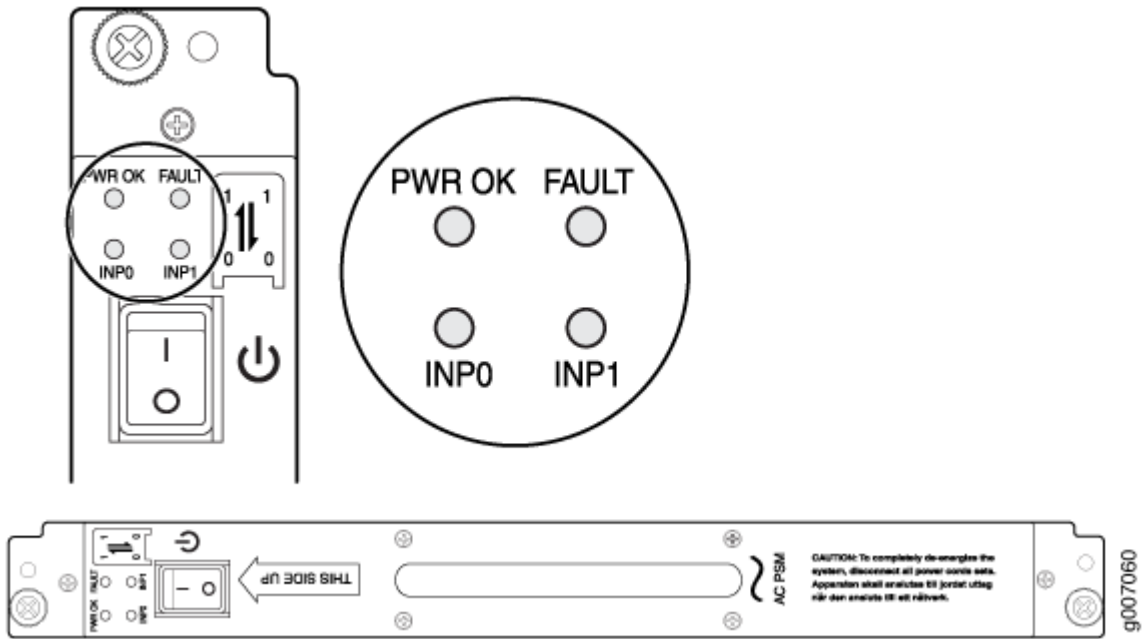
The AC power system provides dual redundant feeds (**INP0** and **INP1**). Each PSM takes in two AC feeds and uses one of the two. One input feed is active during operation. Each feed is a single-phase AC system 200–240 VAC derived from a three-phase delta or wye AC input system. These feeds are set by the input mode DIP switch located on the AC PSM. Move the input mode DIP switch to the on or off position to determine the power supply feeds (see and).

Table 23: DIP Switch Positions on the AC PSM

Left Switch Position	Right Switch Position	Input Source
Off	Off	None
On	Off	Input 0 (**INP0**)
Off	On	Input 1 (**INP1**)
On	On	Both Input 0 and Input 1

Figure 28: Selecting the Input Feed on the AC Power Supply Module
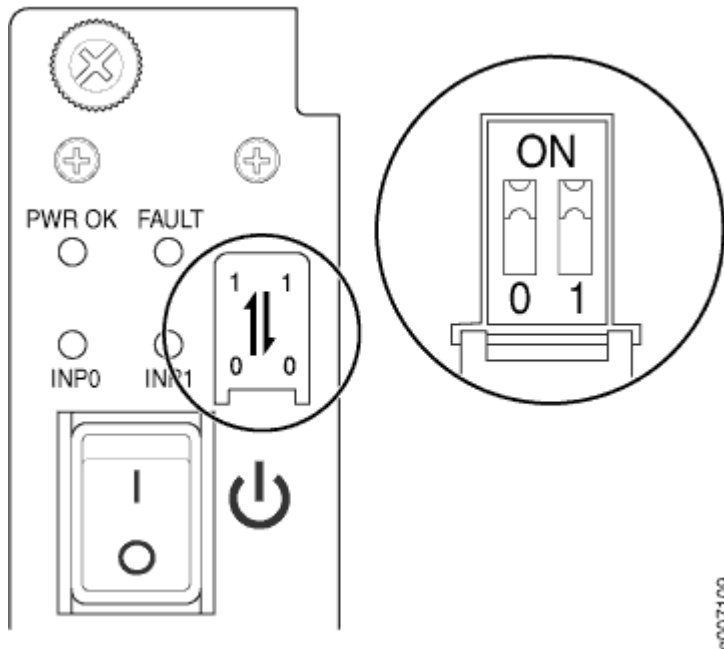
A PSM failure triggers the alarm LED on the craft interface. For information about connecting to AC power sources, see "MX2008 AC Power System Electrical Specifications" on page 89.

MX2008 AC Power Supply Module LEDs

Each AC PSM faceplate contains four LEDs. These LEDs are described in Table 24 on page 65. There are a total of nine bicolor LEDs located in the craft interface, and are labeled **0** through **8** for the nine PSMs. Both feeds are alive during operation, but only one feed provides current. In addition, a PSM failure triggers the red alarm LED on the craft interface.

Table 24: MX2008 AC Power Supply Module LEDs

Label	Color	State	Description
PWR OK	Green	On	Power is functioning normally with no alarms.
	Yellow	On	PSM controller is off with both **INP0** and **INP1** voltage out of range.
	—	Off	PSM is not functioning normally or the AC input voltage is out of range.

Table 24: MX2008 AC Power Supply Module LEDs *(Continued)*

Label	Color	State	Description
FAULT	Red	On	PSM is not functioning normally or the AC input voltage is out of range.
	—	Off	PSM is functioning normally.
INP0	Green	On	AC input is within the required voltage range and the DIP switch is set to on.
	Yellow	On	AC input is out of the required voltage range.
	—	Off	AC input to the PSM is not present.
INP1	Green	On	AC input is within the required voltage range and the DIP switch is set to on.
	Yellow	On	AC input is out of the required voltage range.
	—	Off	AC input to the PSM is not present.

SEE ALSO

MX2008 Three-Phase Delta AC Power Distribution Module Description

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

Each three-phase delta AC power distribution module (PDM) weighs approximately 12 lb (5.44 kg). A metal wiring compartment contains two AC terminal blocks and ground labeled **GND**. One AC terminal block consists of three input terminals that serves six power supply modules (PSMs) and the second terminal block serves three PSMs. The terminal block on the left is labeled **A1**, **B1**, and **C1** (bottom to top). The second terminal block on the right is labeled **A2**, **B2**, and **C2** (bottom to top). The PDMs are located at the rear of the chassis in slots **PDM0/Input0** through **PDM1/Input1**, (bottom to top). LEDs provide the status of the PDM. Figure 29 on page 67 shows the three-phase delta AC PDM.

> **NOTE**: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

Figure 29: Three-Phase Delta AC Power Distribution Module
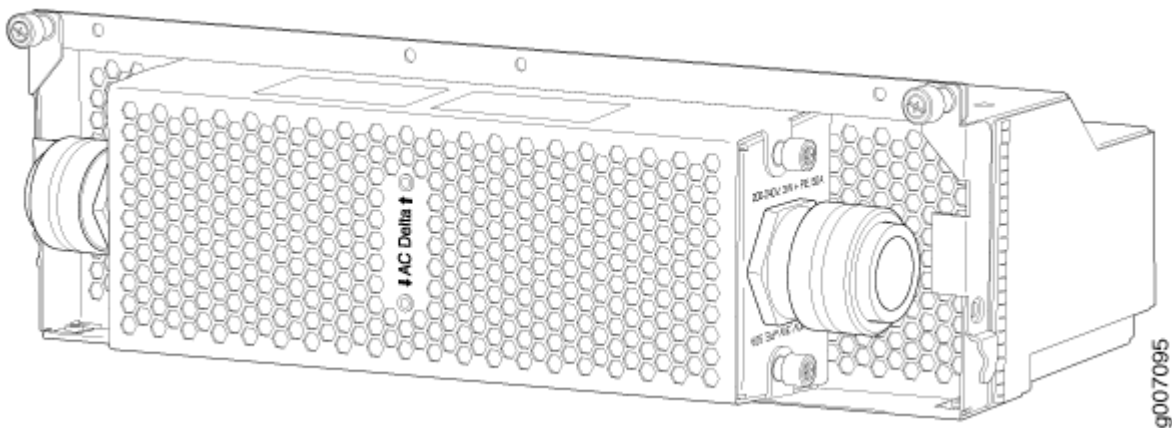
Figure 30 on page 68 shows the three-phase delta AC PDM connections.

> ⚠️ **CAUTION**: The three-phase delta AC PDM must be installed and secured in the chassis before connecting the power input cables. If the PDM must be removed, both input power cables must be uninstalled and removed from the PDM before the PDM can be removed from the chassis. The MX series chassis is not sensitive to phase rotation sequence—either clockwise or counter-clockwise will operate correctly.

Figure 30: Three-Phase Delta AC Power Distribution Module Connections
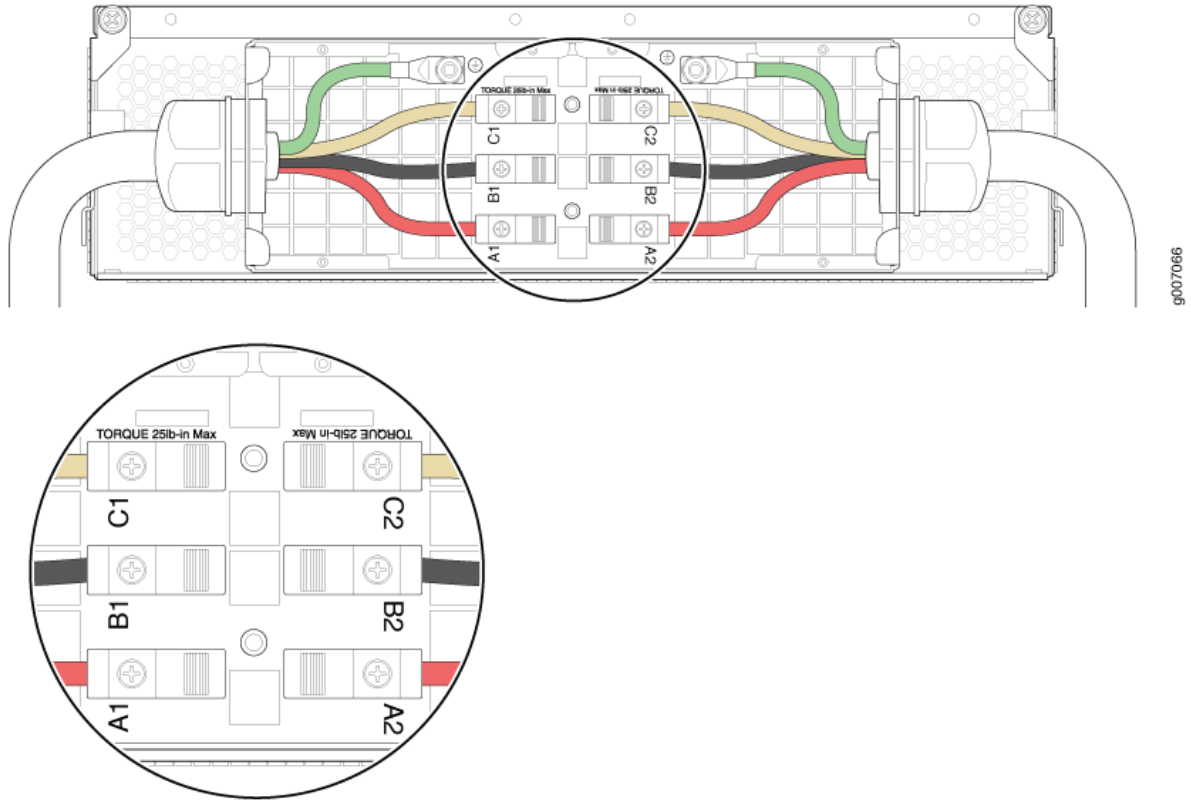
shows the three-phase delta AC power cord.

Figure 31: Three-Phase Delta AC Power Cord
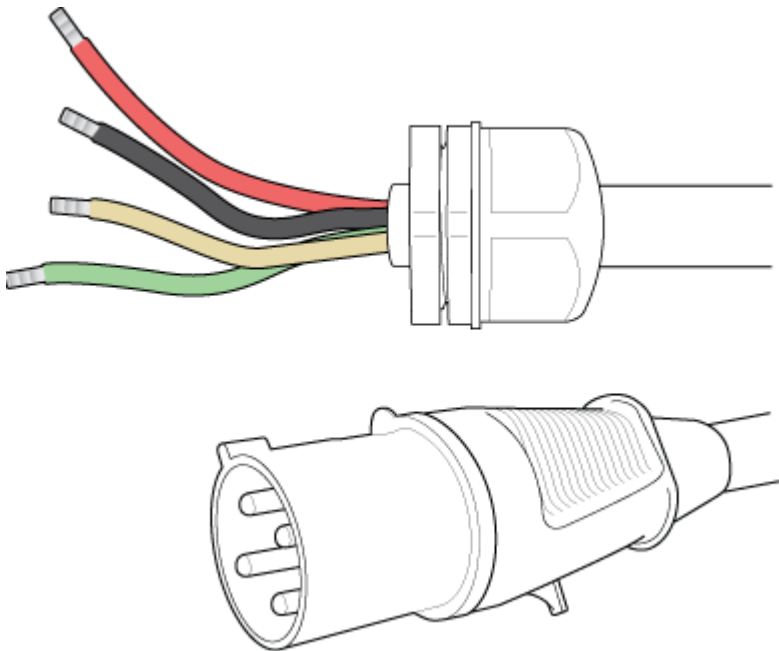
MX2008 Three-Phase Wye AC Power Distribution Module Description

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

Each three-phase wye AC PDM weighs approximately 12 lb (5.44 kg). A metal wiring compartment contains two AC terminal blocks and ground labeled **GND**. One AC terminal block consists of three input terminals that serve six PSMs and the second terminal block serves three PSMs. The terminal block on the far left is labeled **A1**, **B1**, **C1**, and **N1** (bottom to top). The second terminal block is labeled **A2**, **B2**, **C2**, and **N2** (bottom to top). The PDMs are located at the rear of the chassis in slots **PDM0/**

Input0 through **PDM1/Input1**, (bottom to top). LEDs provide the status of the PDM. shows the three-phase wye AC PDM.

> **NOTE**: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

Figure 32: Three-Phase Wye AC Power Distribution Module
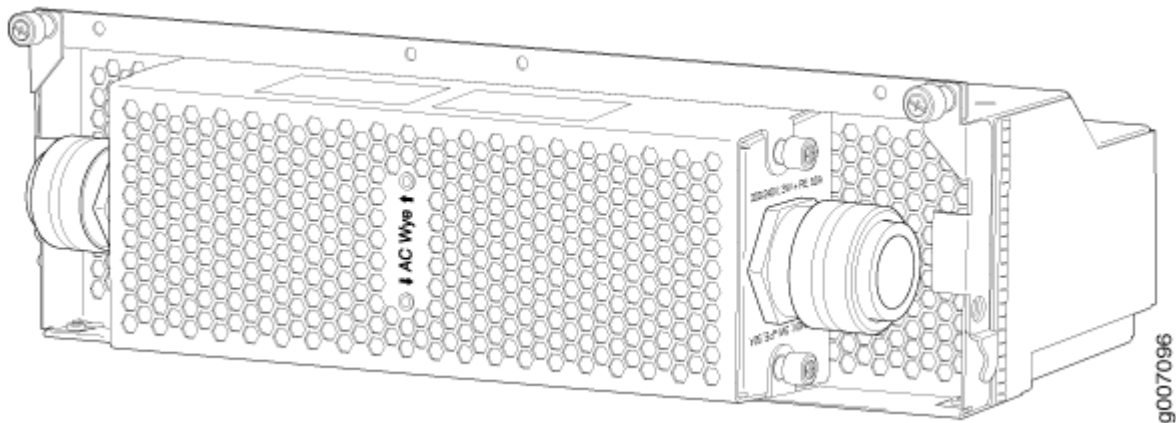
shows the three-phase wye AC PDM connections.

> ⚠ **CAUTION**: The three-phase wye AC PDM must be installed and secured in the chassis before connecting the power input cables. If the PDM must be removed, both input power cables must be uninstalled and removed from the PDM before the PDM can be removed from the chassis. The MX Series chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

Figure 33: Three-Phase Wye AC Power Distribution Module Connections
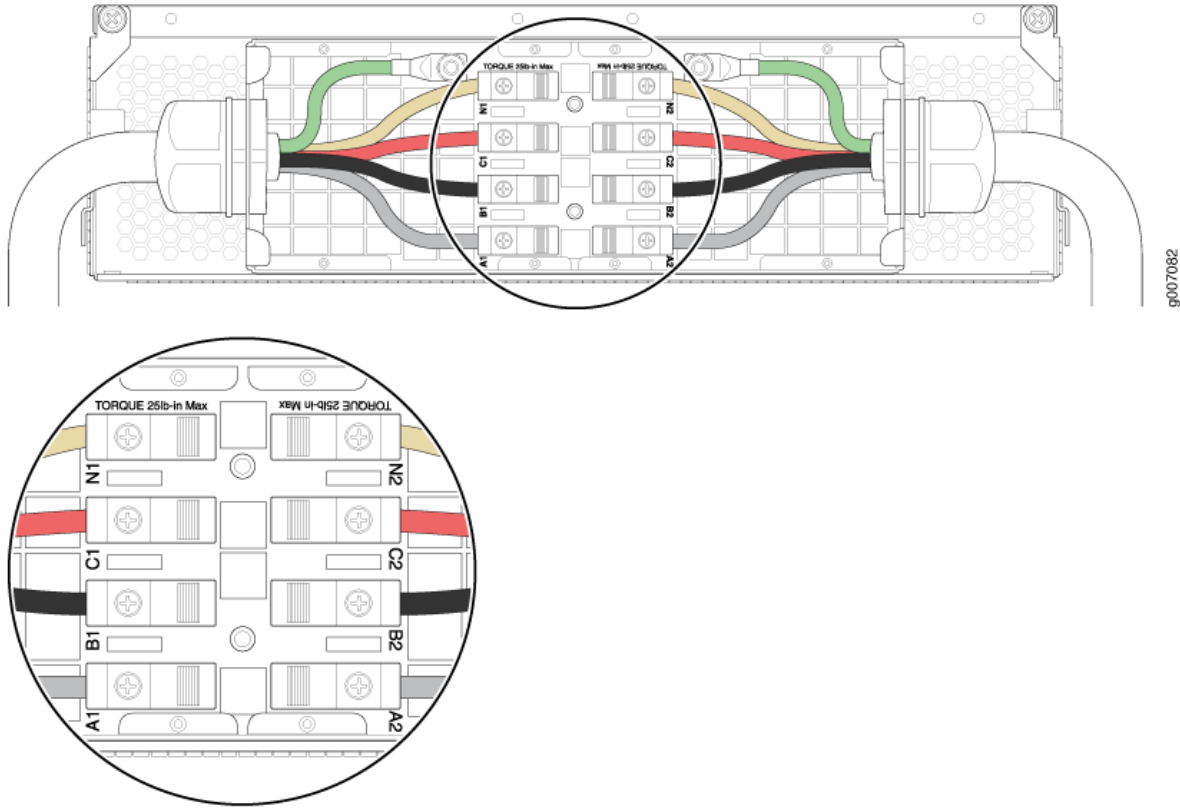
shows the three-phase wye AC power cord.

Figure 34: Three-Phase Wye AC Power Cord
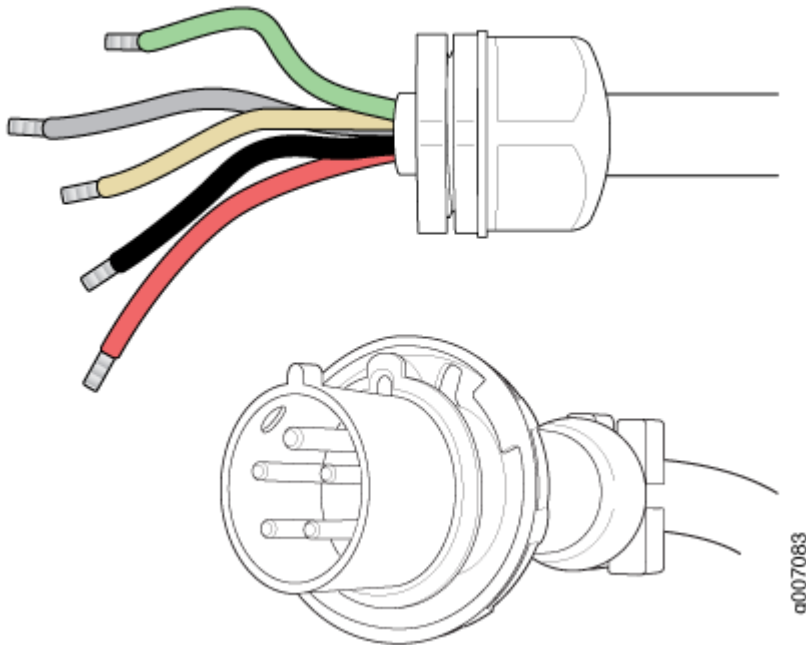
SEE ALSO

MX2008 Nine-Feed Single-Phase AC Power Distribution Module Description

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

The MX2008 nine-feed single-phase AC power distribution module (PDM) provides AC input connection from a single-phase AC source, and also provides an input power interface to the power supply module (PSM) through a system power midplane. Up to nine PSMs can be connected to the single-phase AC PDM. Each AC input is independent and feeds one PSM.

The nine-feed single-phase AC PDM weighs approximately 9 lb (4.1 kg). The front of the PDM has nine type C21 power cord connections for connecting to single-phase AC power. shows the nine-feed single-phase AC PDM.

Figure 35: Nine-Feed Single-Phase AC Power Distribution Module
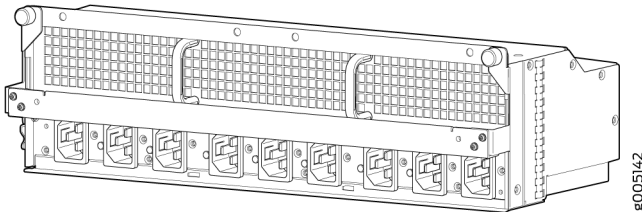
> ⚠️ **CAUTION**: The single-phase AC PDM must be installed and secured in the chassis before connecting the input power cables. If the PDM must be removed, all input power cables must be removed from the PDM before the PDM can be removed from the chassis.

SEE ALSO

MX2008 Seven-Feed Single Phase AC Power Distribution Module Description

Each single-phase seven-feed AC PDM weighs approximately 12 lb (5.44 kg). The front of the PDM has seven type C21 power cord connections for connecting single-phase AC power. shows the single-phase seven-feed AC PDM.

Figure 36: Seven Feed Single Phase AC Power Distribution Module

SEE ALSO

MX2008 Three-Phase Delta and Wye AC Power Distribution Module LEDs

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

Figure 37 on page 75 shows the LEDs on the three-phase delta AC PDM faceplate. The three-phase wye AC PDM has the same LEDs. The LEDs in Table 25 on page 75 indicate the status of the AC PDM. In addition, a PDM failure triggers the red alarm LED on the craft interface.

Figure 37: Three-Phase Delta AC PDM LEDs
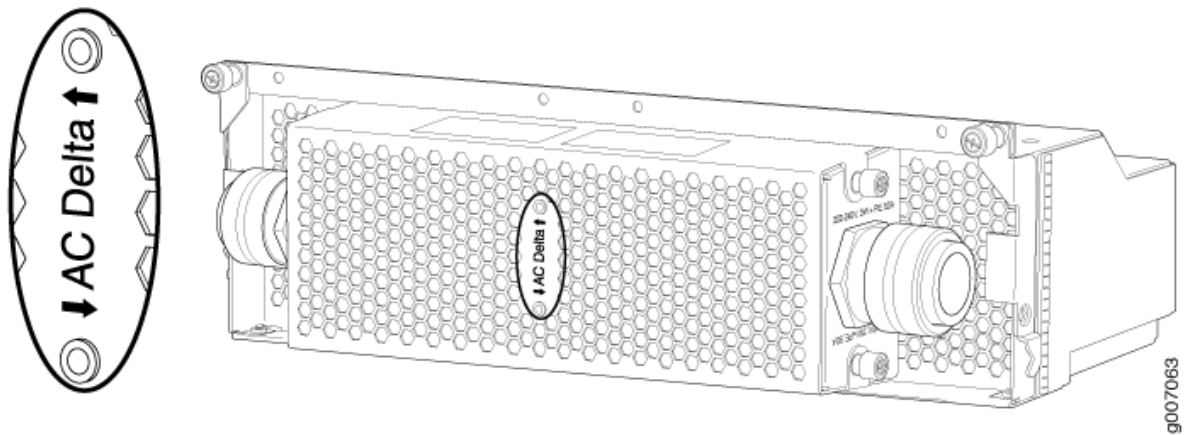
Table 25: Three-Phase Delta AC PDM LEDs

Label	Color	State	Description
←	Green	On	The left AC terminal block is receiving voltage.
	—	Off	The left AC terminal block is not receiving voltage.
→	Green	On	The right AC terminal block is receiving voltage.
	—	Off	The right AC terminal block is not receiving voltage.

SEE ALSO

MX2008 AC Power System Electrical Specifications | **89**

MX2008 AC Power Requirements

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

To allow for future growth so that you can operate the router in any hardware configuration without upgrading the power infrastructure, we recommend that you provision 2800 W for each AC PDM (delta or wye).

If you do not plan to provision 2800 W for each AC PSM, you can use the information in Table 26 on page 76 and Table 27 on page 76 to calculate power consumption for various hardware configurations, input current from a different source voltage, and thermal output, as shown in the following examples for an AC-powered router.

Table 28 on page 77 lists the power requirements for various hardware components when the router is operating under typical voltage conditions.

> **NOTE**: Unlike all the other MPCs, *MPC6E*, *MPC8E*, and *MPC9E* does not require an adapter card (ADC) to house the MPC in the MX2008 router.

Table 26: Base AC Power Requirements

Component	Power Requirement (Watts)
Base system, (not including MPCs, ADCs, and MICs) includes seven SFBs, one host subsystem (RCB), two fan trays, and craft interface, three PSMs, and two PDMs	1,520 W (typical at 25° C) 4,420 W (at 55° C)

Table 27: Typical AC Power Requirements for MX2008 Router

Component	Model Number	Power Requirement (Watts) with 91% Efficiency
Base chassis	CHAS-BP-MX2008	
Fan trays, lower	MX2000-FANTRAY	1500 W * 2 = 3000 W

Table 27: Typical AC Power Requirements for MX2008 Router *(Continued)*

Component	Model Number	Power Requirement (Watts) with 91% Efficiency
MPC	MPC-3D-16XGE-SFPP	440 W * 10 = 4400 W
ADC	ADC	150 W * 10 = 1500 W
RCB	REMX2008-X8-64G	100 W
SFB—slots 0 through 7	MX2008-SFB2	100 W * 8 = 800 W
MX2008 three-phase delta AC power system (PDM and PSM) @ 50 A/25 A MX2008 three-phase wye power system (PDM and PSM) @ 30 A/ 15 A		2800 W 2800 W

If you do not plan to provision as recommended above, you can use the information in to calculate the power consumption for your hardware configuration.

Table 28: MX2008 FRU AC Power Requirements

Component	Model Number	Maximum Power Requirement
Switch Fabric Boards (SFBs)		
SFB2	MX2008-SFB2	100 W (Typical) 110 W at 55° C 100 W at 40° C 95 W at 25° C
Fan Trays		

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
Fan Trays	MX2000-FANTRAY	1500 W (Typical)
		1700 W at 55° C
		1500 W at 40° C
		350 W at 25° C
Adapter Cards		
ADC	MX2000-LC-ADAPTER	150 W
Routing Control Board		
RCB	REMX2008-X8-64G	100 W (Typical)
		120 W at 55° C
		100 W at 40° C
		95 W at 25° C
MPCs		
16x10GE MPC (see *MPC-3D-16XGE-SFPP*)	MPC-3D-16XGE-SFPP	440 W at 55° C ambient
MPC1 (see *MPC1*)	MX-MPC1-3D	165 W
	MX-MPC1E-3D	**With MICs and optics:** 239 W at 55° C
		227 W at 40° C
		219 W at 25° C

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MPC1 Q (see *MPC1 Q*)	MX-MPC1-3D-Q	175 W
	MX-MPC1E-3D-Q	**With MICs and optics:** 249 W at 55° C 237 W at 40 C 228 W at 25° C
MPC2 (see *MPC2*)	MX-MPC2-3D	274 W
	MX-MPC2E-3D	**With MICs and optics:** 348 W at 55° C 329 W at 40° C 315 W at 25° C
MPC2 Q (see *MPC2 Q*) MPC2 EQ (see *MPC2 EQ*)	MX-MPC2-3D-Q MX-MPC2-3D-EQ MX-MPC2E-3D-Q MX-MPC2E-3D-EQ	294 W **With MICs and optics:** 368 W at 55° C 347 W at 40° C 333 W at 25° C
MPC2E P (see *MPC2E P*)	MX-MPC2E-3D-P	294 W **With MICs and optics:** 368 W at 55° C 347 W at 40° C 333 W at 25° C

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MPC3E (see *MPC3E*)	MX-MPC3E-3D	440 W **With MICs and optics:** 500 W at 55° C, two 40 W MICs 485 W at 40° C, two CFP MICs with LR4 optics 473 W at 25° C, two CFP MICs with LR4 optics
32x10GE MPC4E (see *32x10GE MPC4E*)	MX-MPC4E-3D-32XGE-SFPP	610 W **With MICs and optics:** 607 W at 55° C, two 40 W MICs 590 W at 40° C, two CFP MICs with LR4 optics 585 W at 25° C, two CFP MICs with LR4 optics
2x100GE + 8x10GE MPC4E (see *2x100GE + 8x10GE MPC4E*)	MX-MPC4E-2CGE-8XGE	610 W **With MICs and optics:** 610 W at 55° C, two 40 W MICs 550 W at 40° C, two CFP MICs with LR4 optics 530 W at 25° C, two CFP MICs with LR4 optics

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
6x40GE + 24x10GE MPC5E	MPC5E-40G10G	645 W
6x40GE + 24x10GE MPC5EQ	MPC5EQ-40G10G	**With optics:** 604 W at 55° C, with SFPP ZR and CFP LR4 optics 541 W at 40° C, with SFPP ZR and CFP LR4 optics 511 W at 25° C, with SFPP ZR and CFP LR4 optics
2x100GE + 4x10GE MPC5E	MPC5E-100G10G	**With optics:** 607 W at 55° C
2x100GE + 4x10GE MPC5EQ	MPC5EQ-100G10G	541 W at 40° C 511 W at 25° C
MPC6E	MX2K-MPC6E	1088 W with MICs and optics
MPC7E-MRATE	MPC7E-MRATE	400 W (Typical) 545 W at 55° C 465 W at 40° C 440 W at 25° C
MPC8E (without MICs)	MX2K-MPC8E	688 W (Typical) 805 W at 55° C 720 W at 40° C 690 W at 25° C

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MPC9E (without MICs)	MX2K-MPC9E	838 W (Typical) 1018 W at 55° C 870 W at 40° C 840 W at 25° C
MICs		
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	35 W
Gigabit Ethernet MIC with SFP	MIC-3D-20-GE-SFP	37 W
10-Gigabit Ethernet MIC with XFP	2-Port: MIC-3D-2XGE-XFP 4-Port: MIC-3D-4XGE-XFP	2-Port: 29 W 4-Port: 37 W
10-Gigabit Ethernet MIC with SFP+	MIC6-10G	74 W **With optics:** 53 W at 55° C, 40° C and 25° C with 10G BASE-SR and 10G BASE-LR optics 66 W at 55° C, 40° C and 25° C with 10G BASE-ER optics 74 W at 55° C, 40° C and 25° C with 10G BASE-ZR optics

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
10-Gigabit Ethernet DWDM OTN MIC	MIC6-10G-OTN	84 W **With optics:** 63 W at 55° C with 10G BASE-LR OTN optics 63 W at 40° C with 10G BASE-LR OTN optics 63 W at 25° C with 10G BASE-LR OTN optics
40-Gigabit Ethernet MIC with QSFPP	MIC3-3D-2X40GE-QSFPP	18 W
100-Gigabit Ethernet MIC with CFP	MIC3-3D-1X100GE-CFP	40 W
100-Gigabit Ethernet MIC with CXP	MIC3-3D-1X100GE-CXP	20 W
100-Gigabit Ethernet MIC with CFP2	MIC6-100G-CFP2	104 W **With optics:** 94 W at 55° C with 100G BASE-LR4 OTN optics 86 W at 40° C with 100G BASE-LR4 OTN optics 74 W at 25° C with 100G BASE-LR4 OTN optics

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
100-Gigabit Ethernet MIC with CXP	MIC6-100G-CXP	57 W 49 W at 55° C with CXP SR10 optics 49 W at 40° C with CXP SR10 optics 49 W at 25° C with CXP SR10 optics
100-Gigabit DWDM OTN MIC with CFP2	MIC3-100G-DWDM	**With optics:** 91 W at 55° C 83 W at 25° C
SONET/SDH OC3/STM1 Multi-Rate MIC	4-Port: MIC-3D-4OC3OC12-1OC48 8-Port: MIC-3D-8OC3OC12-4OC48	4-Port: 24 W at 55° C 22.75 W at 40° C 21.5 W at 25° C 8-Port: 29 W at 55° C 27.75 W at 40° C 26.5 W at 25° C
OC192/STM64 MIC with XFP	MIC-3D-1OC192-XFP	41 W at 55° C 38.5 W at 40° C 36 W at 25° C

Table 28: MX2008 FRU AC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
Channelized SONET/SDH OC3/STM1 Multi-Rate MIC	4-Port: MIC-3D-4CHOC3-2CHOC12 8-Port: MIC-3D-8CHOC3-4CHOC12	4-Port: 41 W at 55° C 40 W at 40° C 39 W at 25° C 8-Port: 52 W at 55° C 50.5 W at 40° C 49 W at 25° C
Channelized OC48/STM16 MIC with SFP	MIC-3D-1CHOC48	56.5 W at 55° C 54.5 W at 40° C 53 W at 25° C
Tri-Rate MIC	MIC-3D-40GE-TX	41 W
MIC MRATE	MIC-MRATE	• When installed into MPC8E: 1.250 A @ 48 V (60 W) • When installed into MPC9E: 1.771 A @ 48 V (85 W)
DS3/E3 MIC	MIC-3D-8DS3-E3 MIC-3D-8CHDS3-E3-B	36 W at 55° C 35 W at 40° C 34 W at 25° C
Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1COC12-CE	33.96 W

SEE ALSO

MX2008 AC Power Cord Specifications

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

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

For more information about AC PDM input power mapping, see "Mapping Input Power from AC Power Distribution Modules to AC Power Supply Modules on MX2008 Router" on page 96.

Detachable AC power cords, each approximately 14.8 ft (4.5 m) long, are supplied with the router. The AC power cord wires are inserted into the AC input terminal with the help of a screwdriver. The plug end of the power cord fits into the power source receptacle for your geographical location.

Table 29 on page 86 and Table 30 on page 87 provide specifications for the AC power cords for each region supported. Figure 38 on page 87, Figure 39 on page 88, and Figure 40 on page 88 illustrate the plug on the 3-phase and single-phase AC power cords.

Table 29: Three-Phase Delta and Wye AC Power Cord Specifications

Country	Model Number
North America	CBL-MX2000-3PH-DELTA
Europe	CBL-MX2000-3PH-WYE

Table 30: Single-Phase AC Power Cord Specifications

Country	Part Number
CBLCBL-PWR-C21S-AU	AC Power Cable, Australia
CBL-PWR-C21S-CH AC	Power Cable, China
CBL-PWR-C21S-EU	AC Power Cable, Europe
CBL-PWR-C21S-INTL	AC Power Cable, International
CBL-PWR-C21S-IT	AC Power Cable, Italy
CBL-PWR-C21S-JP	AC Power Cable, Japan
CBL-PWR-C21S-US	AC Power Cable, US/Canada

Figure 38: Three-Phase Delta AC Power Cord
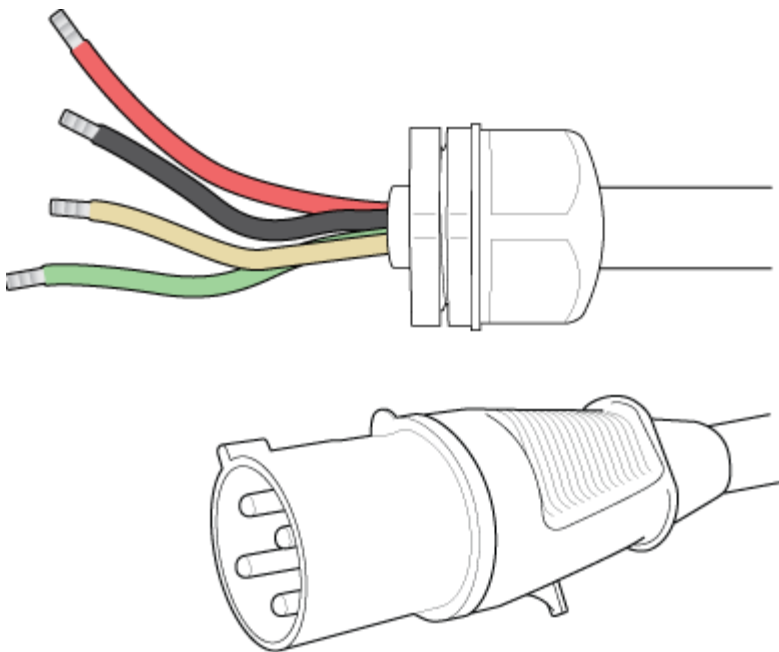
Figure 39: Three-Phase Wye AC Power Cord
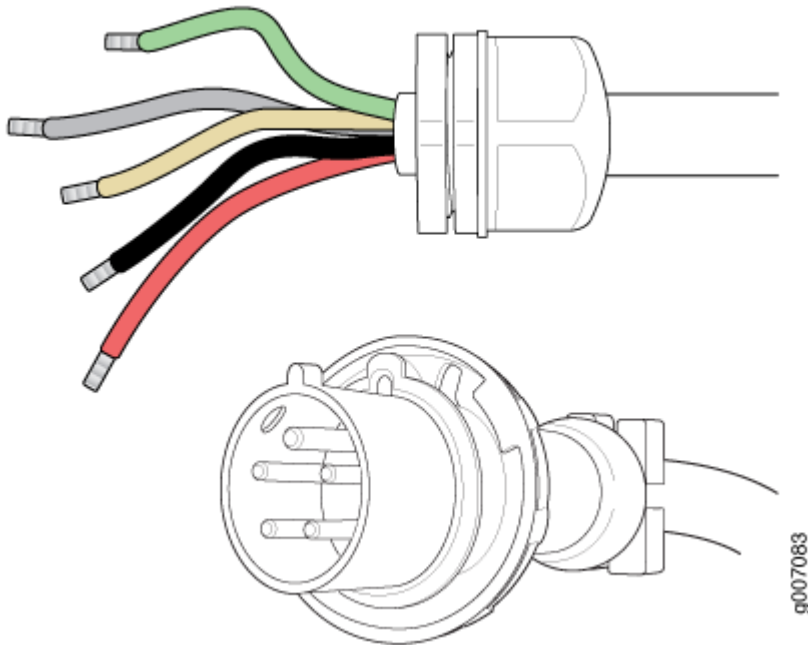
Figure 40: Single-Phase AC Power Cord (C21 plug)
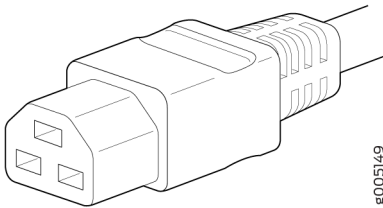
> ⚠ **CAUTION**: In North America, AC power cords must not exceed approximately 14.75 ft (4.5 m) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance.

> ⚠ **CAUTION**: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal (size for UNC 1/4-20 ground

lugs) provided on the chassis in addition to the grounding pin on the power cord. This separate protective earthing terminal must be permanently connected to earth.

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

SEE ALSO

MX2008 AC Power System Electrical Specifications

IN THIS SECTION

- AC Power Supply Input Fuses | 90

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

lists the AC power system electrical specifications for the MX2000 line of routers.

Table 31: MX2008 AC Power System Electrical Specifications

Item	Specification
AC input voltage	Delta operating range: 200–240 VAC (line-to-line) (nominal)
	Wye operating range: 200–240 VAC (line-to-neutral) (nominal)
	Single-phase operating range: 200-240 VAC (nominal)

Table 31: MX2008 AC Power System Electrical Specifications *(Continued)*

Item	Specification
AC input line frequency	Delta: 50/60 Hz (+/-3Hz)
	Wye: 50/60 Hz (+/-3Hz)
	Single-phase: 50/60 Hz (+/-3Hz)
AC system current rating	Delta: 50 A @ 200 VAC–(input #1 for each PDM) and 25 A @ 200 VAC–(input #2 for each PDM)
	Wye: 30 A @ 200 VAC–(input #1 for each PDM) and 15 A @ 200 VAC–(input #2 for each PDM)
	Single-phase: 30 A @ 200 VAC
AC system input power	Delta: 16800 W (input #1), 8400 W (input #2)
	Wye: 16800 W (input #1), 8400 W (input #2)
Efficiency	90.5% at 50% load and 220 VAC IN

AC Power Supply Input Fuses

The AC PSM has line and neutral power supply input fuses in both INP0 and INP1. lists the electrical specifications for each fuse.

Table 32: Electrical Specifications for AC Power Supply Input Fuses

Electrical Characteristic	Value
INP0/INP1 Line Fuse	Littelfuse 0324020.MX65LP
• Ampere Rating	20A
• Voltage Rating	250V

Table 32: Electrical Specifications for AC Power Supply Input Fuses *(Continued)*

Electrical Characteristic	Value
• Interrupting Rating	1000A @ 250V
• Nominal Cold Resistance	3.55 mOhm
• Melting Integral	631 A² sec
INP0/INP1 Neutral Fuse	Littelfuse 0325020.MXD65LP
• Ampere Rating	20A
• Voltage Rating	250V
• Interrupting Rating	1500A @ 250V
• Nominal Cold Resistance	4.2 mOhm
• Melting Integral	2500 A² sec

SEE ALSO

Replacing an MX2008 AC Power Supply Module **| 493**

MX2008 AC Power Requirements **| 76**

Preventing Electrostatic Discharge Damage to an MX2008 Router **| 628**

MX2008 AC Power Electrical Safety Guidelines

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

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

The following electrical safety guidelines apply to AC-powered devices:

- Note the following warnings printed on the device:

  CAUTION: THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK.

  ATTENTION: CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE.

- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.

- You must provide an external certified circuit breaker rated minimum 20 A in the building installation.

- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.

- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

Power Cable Warning (Japanese)

WARNING: The attached power cable is only for this product. Do not use the cable for another product.

注意

附属の電源コードセットはこの製品専用です。
他の電気機器には使用しないでください。

SEE ALSO

## MX2008 Three-Phase Delta AC Power Distribution Module Electrical Specifications

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

Table 33 on page 93 lists the three-phase delta AC power distribution monitor (PDM) electrical specifications.

Table 33: Three-Phase Delta AC Power Distribution Module Electrical Specifications

Item	Specification
AC input voltage	Operating range: 200–240 VAC (line-to-line) (nominal)
AC input line frequency	50/60 Hz (nominal)

Table 33: Three-Phase Delta AC Power Distribution Module Electrical Specifications *(Continued)*

Item	Specification
AC input current rating	50 A @ 200 VAC (input #1 for each PDM) 25 A @ 200 VAC (input #2 for each PDM)
AC system input power	16800 W (input #1), 8400 W (input #2)
Efficiency	90.5% at 50% load and 220 VAC IN

SEE ALSO

MX2008 Three-Phase Wye AC Power Distribution Module Electrical Specifications

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

Table 34 on page 94 lists the three-phase wye AC PDM electrical specifications.

Table 34: Three-Phase Wye AC Power Distribution Module Electrical Specifications

Item	Specification
AC input voltage	Operating range: 200-240 VAC (line-to-neutral) or 345-415 VAC (line-to-line) (nominal)

Table 34: Three-Phase Wye AC Power Distribution Module Electrical Specifications *(Continued)*

Item	Specification
AC input line frequency	50/60 Hz (nominal)
AC input current rating	30 A @ 200 VAC (input #1 for each PDM) 15 A @ 200 VAC (input #2 for each PDM)

SEE ALSO

MX2008 AC Power Requirements **| 76**

Preventing Electrostatic Discharge Damage to an MX2008 Router **| 628**

MX2008 AC Power Cord Specifications **| 86**

MX2008 Single-Phase AC Power Distribution Module Electrical Specifications

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

Table 35 on page 95 lists the single-phase AC power distribution module (PDM) electrical specifications for the MX2000 line of routers.

Table 35: Single-Phase AC Power Distribution Module Electrical Specifications

Item	Specification
AC input voltage	Operating range: 200–240 VAC (nominal)
AC input line frequency	50/60 Hz (nominal)

Table 35: Single-Phase AC Power Distribution Module Electrical Specifications *(Continued)*

Item	Specification
AC input current rating	14 A @ 200 VAC

SEE ALSO

Mapping Input Power from AC Power Distribution Modules to AC Power Supply Modules on MX2008 Router

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

You connect AC power to the router by connecting two AC power cords to each AC PDM. One feed maps to six PSMs and the other maps to three PSMs. Figure 41 on page 97 shows the mapping for the MX2008. The arrangement matches the internal components of the PDM. Table 36 on page 97 shows the AC PDM input mapping to AC **PDM0/Input0** and **PDM1/Input1**.

Figure 41: Mapping AC Power Distribution Module Input to AC Power Supply Modules (MX2008)
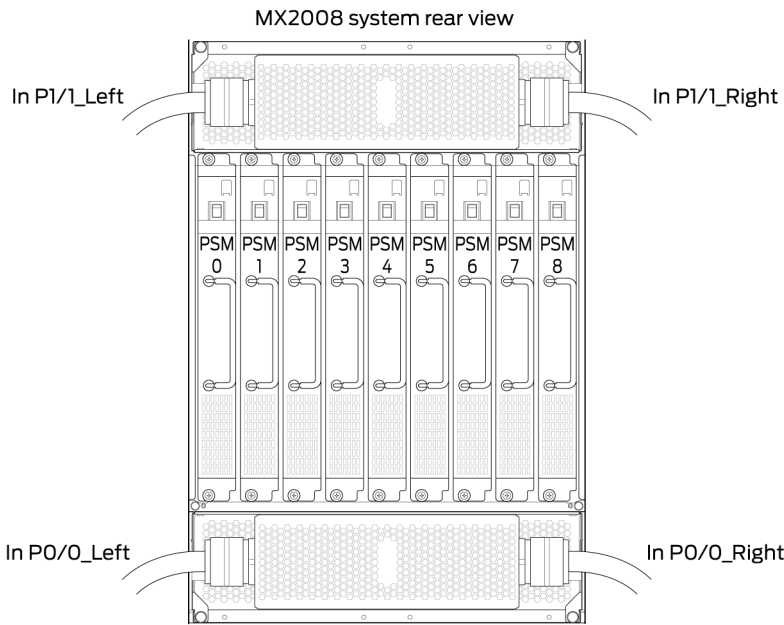
Table 36: Input AC Power Mapping for PDM0 and PDM1

PDM0/Input0 (Left)	PDM0/Input0 (Right)	PDM1/Input1 (Left)	PDM1/Input1 (Right)
PSM0	PSM3	PSM0	PSM6
PSM1	PSM4	PSM1	PSM7
PSM2	PSM5	PSM2	PSM8
–	PSM6	PSM3	–
–	PSM7	PSM4	–
–	PSM8	PSM5	–

> **BEST PRACTICE**: To achieve complete redundancy when you have two power sources, such as Source A and Source B, we recommend that you connect them as follows:
>
> - Connect Source A to PDM0-left and PDM0-right
>
> - Connect Source B to PDM1-left and PDM1-right

SEE ALSO

MX2000 Three-Phase Delta AC Power Distribution Module Description

MX2000 Three-Phase Wye AC Power Distribution Module Description

MX2008 DC Power System

IN THIS SECTION

MX2008 Seven-Feed DC Power Distribution Module Description

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDM.

In the DC power configuration, the router contains up to two DC PDMs located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system (two PDMs per MX2008 chassis) for nonredundant power. The DC PDMs provides power interface to nine PSMs.

Four PDMs provide full redundancy.

NOTE: Power backplane distributes regulated 52 VDC to all boards supplied by that system.

Each DC PDM has seven DC inputs (–48 VDC and return terminals for each input) (see). Select 60 A or 80 A input feed capacity on the DC PDM by setting the switch to the rated amperage of DC power input feeds.

NOTE: This switch applies to all inputs of this PDM. Selecting 60 A reduces the available power output capacity of the PSMs supplied by this PDM.

Figure 42: DC Power Distribution Module
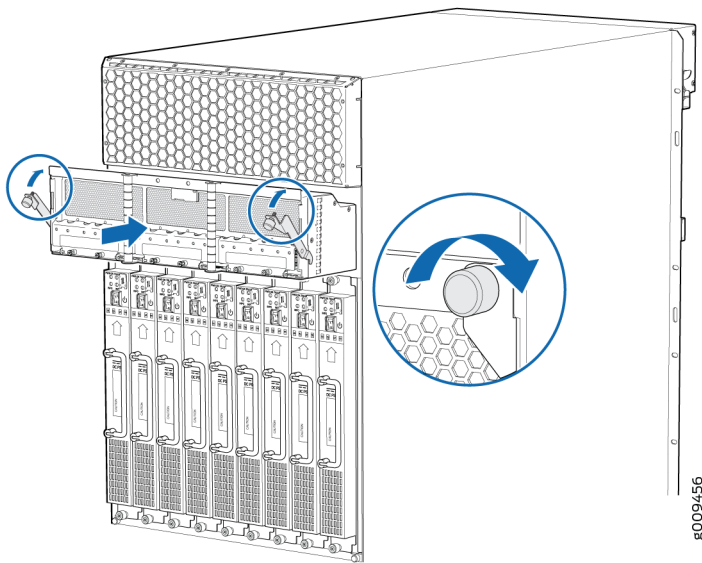
> **NOTE**: The type of feed that you use on the DC PDM (60 A or 80 A) depends on the distribution scheme and distribution equipment. With a 60-A feed, the maximum power supply output power is limited to 2100 W while the maximum power supply input power is limited to 2400 W. With an 80-A feed, the maximum power supply output is limited to 2500 W while maximum power supply input power is limited to 2800 W. The system power management software calculates the available and used power based on DIP switch positions in the PDM.

Figure 43: DC Power Distribution Module (240 V China)

SEE ALSO

MX2008 DC Power Distribution Module (-48 V) Description

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

In the DC power configuration, the router contains up to two DC power distribution modules (PDMs) located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system (two PDMs per chassis) for nonredundant power. The DC PDM provides a power interface to nine power supply modules (PSMs).

Two PDMs provide full redundancy. In a redundant configuration, a total of fourteen 60-A or 80-A input feeds (7-feed DC PDMs), and a total of eighteen 60-A or 80-A input feeds (9-feed DC PDMs) are supported.

> **NOTE**: The power backplane for a subsystem distributes regulated 52 VDC to all boards supplied by that subsystem.

Each DC PDM has seven or nine DC inputs (–48 VDC and return terminals for each input). You can select 60-A or 80-A input feed capacity on the DC PDM by setting the DIP switch on the PDM to the rated amperage of the DC power input feeds.

> **NOTE**: The selected input capacity applies to all inputs of this PDM. Selecting 60 A reduces the available power output capacity of the PSMs supplied by this PDM.

shows the MX2008 DC PDM.

Figure 44: MX2008 DC PDM
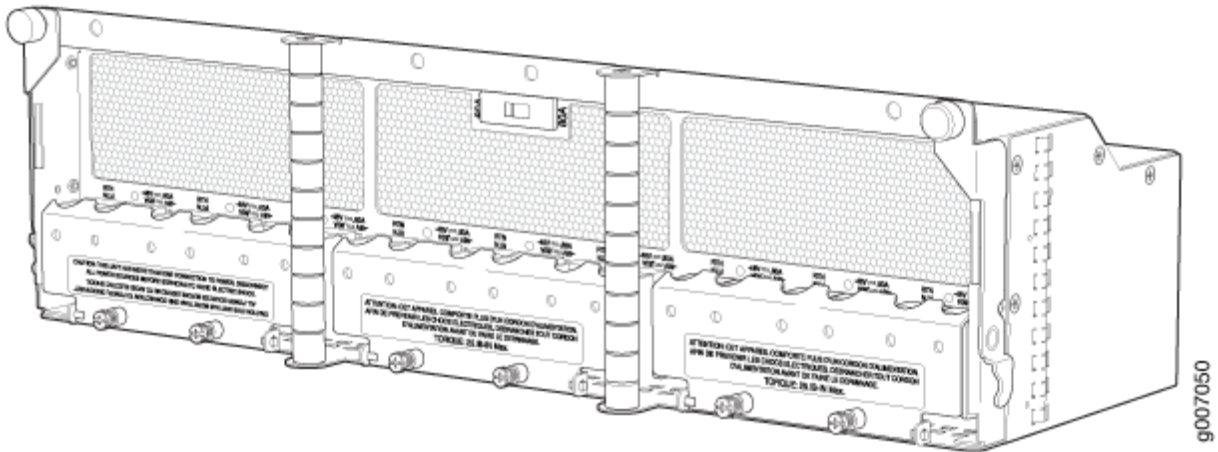
> **NOTE**: The type of feed that you use on the DC PDM (60-A or 80-A) depends on the distribution scheme and distribution equipment. With a 60-A feed, the maximum power supply output power is limited to 2100 W while the maximum power supply input power is limited to 2400 W. With an 80-A feed, the maximum power supply output is limited to 2500 W while the maximum power supply input power is limited to 2800 W. The system power management software calculates the available and used power based on DIP switch positions in the PDM.

SEE ALSO

Calculating DC Power Requirements for MX2008 Routers | 267

MX2008 DC Power (-48 V) System Electrical Specifications | 125

MX2008 Power System | 54

Site Electrical Wiring Guidelines for MX Series Routers | 664

MX2000 DC Power Distribution Module (240 V China) Description

In the DC power configuration, the router contains up to two DC power distribution modules (PDMs) located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system (two PDMs per chassis) for nonredundant power. The DC PDM provides a power interface to nine power supply modules (PSMs).

Two PDMs provide full redundancy for the router. In a redundant configuration, a total of a total of eighteen (9-feed DC PDMs) are supported.

> **NOTE**: The power backplane for a subsystem distributes regulated 52 VDC to all boards supplied by that subsystem.

Each DC PDM (240 V China) has nine DC inputs, (see).

Figure 45: MX2000 DC PDM (240 V China)
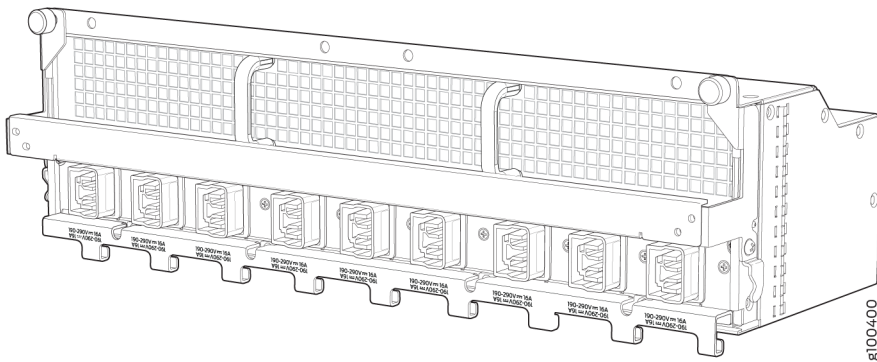
MX2008 DC Power Distribution Module (-48 V) LEDs

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

Each DC PDM faceplate contains one bicolor LED for each of the nine −48 V input power feeds, indicating the correct or incorrect polarity connection of each feed. See .

Figure 46: DC Power Distribution Module LEDs
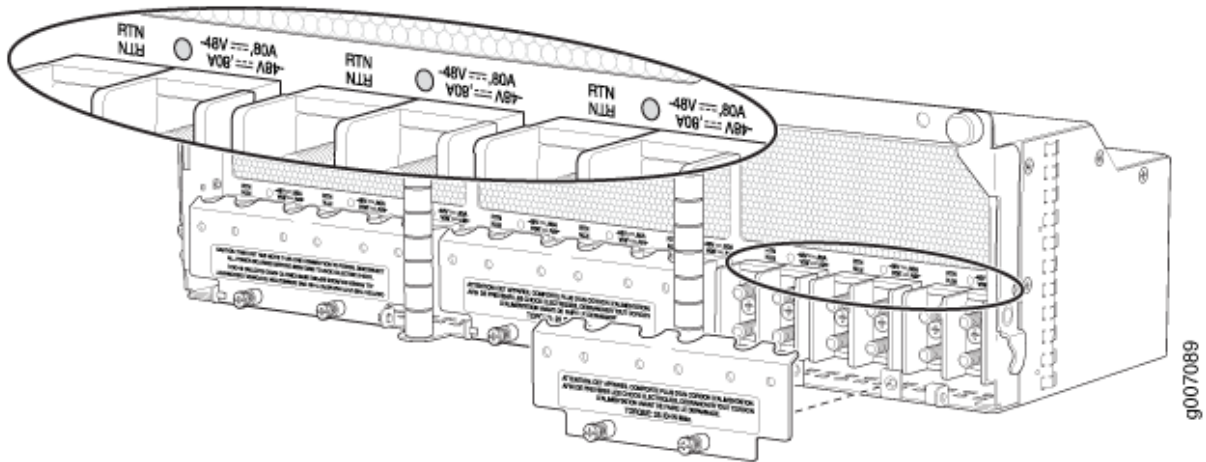
Table 37: DC Power Distribution Module LEDs

Label	Color	State	Description
–48V=80A	Green	On	RTN and –48V input feeds are connected. PDM is functioning normally.
	–	Off	RTN input feed is not connected or present.
			–48V input feed is not connected or present.
			RTN and –48V input feeds are not connected.
	Red	On	RTN or –48V input feeds may be reversed, feed live.

SEE ALSO

MX2000 DC Power Distribution Module (240 V China) LEDs

Each DC PDM (240 V China) faceplate contains one LED for each of the nine input power feeds, indicating the correct or incorrect polarity connection of each feed. See Figure 47 on page 106 and Table 38 on page 106 DC PDM (240 V China) LEDs.

Figure 47: DC Power Distribution Module (240 V China) LEDs
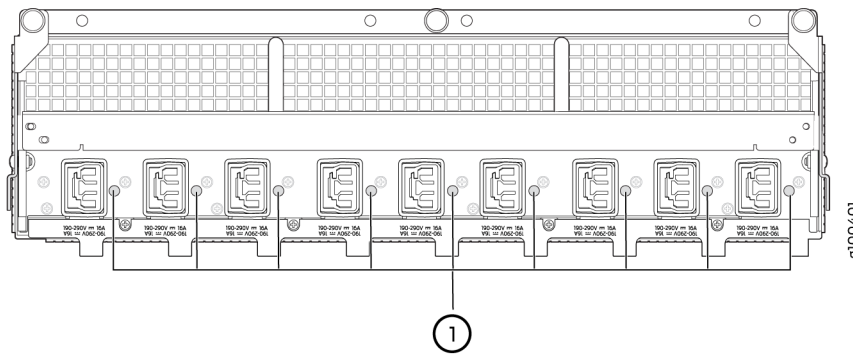
1– LED

Table 38: DC Power Distribution Module (240 V China) LEDs

Color	State	Description
Green	On	Positive and negative input feeds are connected. PDM is functioning normally.
–	Off	Positive input feed is not connected or present.
		Negative input feed is not connected or present.

MX2008 DC Power Supply Module (-48 V) Description

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

The MX2008 supports a DC power system. The DC power system operates with feeds of 60 A or 80 A current limited. A total of nine feeds are required to fully power the MX2008. Another nine feeds are required to provide feed redundancy (a total of 18 60-A or 80-A feeds). In the DC power configuration, the router contains up to nine DC PSMs located at the rear of the chassis in slots **PSM0** through **PSM8**, (left to right). The DC PSMs in slots **PSM0** through **PSM8** provide power to the all router components including MPCs in slot **0** through **9**, RCBs in slot **0** and **1**, SFBs in slot **0** through **7**, and fan trays **0** and **1**.

> **NOTE**: The MX2008 systems configured for DC input power must use only DC PDMs and DC PSMs. You cannot mix AC and DC PSMs or PDMs within a single system.

Up to nine PSMs may be connected in parallel to increase available system power across MPCs as needed and provide redundancy. Figure 48 on page 107 shows the DC PSM.

Figure 48: DC (-48 V) Power Supply Module
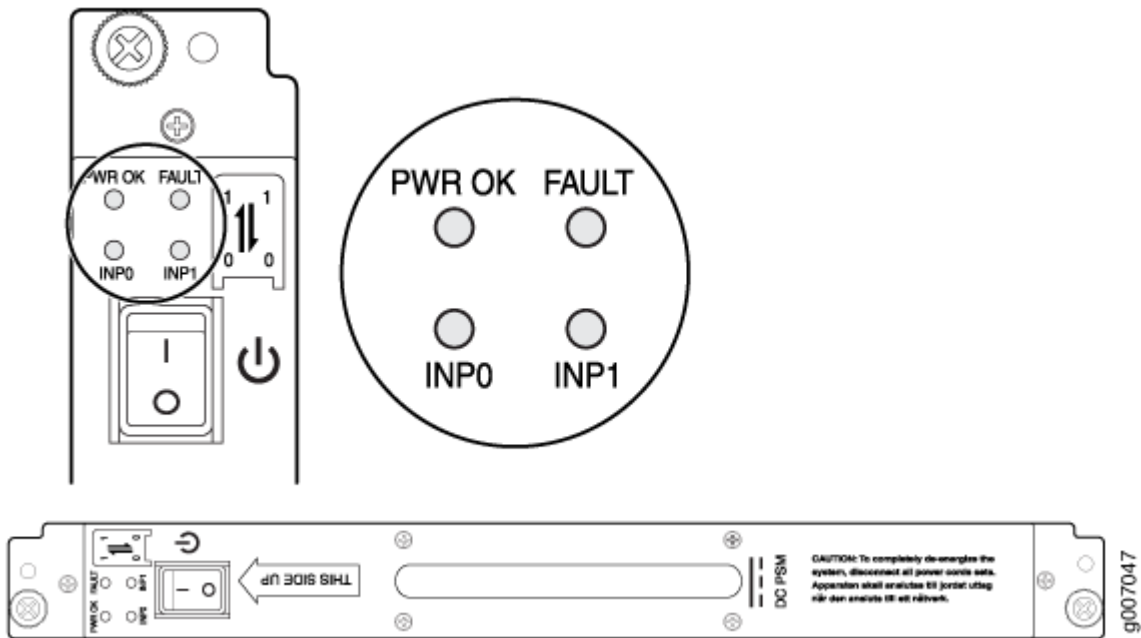
The DC power system is feed redundant. Each DC PSM can be connected to two separate feeds from different sources that are used to provide feed redundancy. If two feeds are connected, PSM input power is drawn from the feed with the higher voltage present. There are two PDMs per power system capable of carrying nine feeds each. Connect feeds from one source to one PDM and feeds from the other source to the second PDM of the power system. The primary input of the PSM is a dual redundant feed, **INP0** and **INP1**. Both feeds are active during operation, but both feeds might or might not be providing current. Move the input mode DIP switch to the on or off position to determine the power supply feeds (see Table 39 on page 108 and Figure 49 on page 108). In addition, a PSM failure triggers

the alarm LED on the craft interface. Each PDM has an LED per feed indicating whether the feed is active or not, or whether the feed is connected properly, see "MX2008 DC Power (-48 V) System Electrical Specifications" on page 125.

Table 39: DIP Switch Positions on the DC (-48 V) PSM

Left Switch Position	Right Switch Position	Input Source
Off	Off	None
On	Off	Input 0 (**INP0**)
Off	On	Input 1 (**INP1**)
On	On	Both Input 0 and Input 1

Figure 49: Selecting Input Feed on the DC (-48 V) Power Supply Module
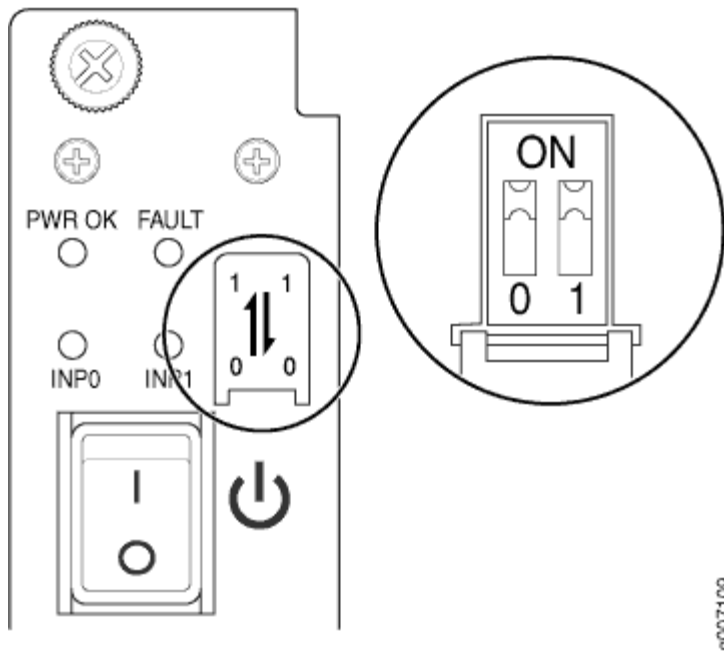
SEE ALSO

MX2000 DC Power Supply Module (240 V China) Description

The MX2008 supports a DC power system. The 240 V China DC power system operates with nine feeds. A total of nine feeds are required to fully power the MX2008. Another nine feeds are required to provide feed redundancy (a total of 18 feeds In the DC power configuration, the router contains up to nine DC PSMs located at the rear of the chassis in slots **PSM0** through **PSM8**, (left to right). The DC PSMs in slots **PSM0** through **PSM8** provide power to the all router components including MPCs in slot **0** through **9**, RCBs in slot **0** and **1**, SFBs in slot **0** through **7**, and fan trays **0** and **1**.

> **NOTE**: The MX2008 systems configured for DC (240 V China) input power must use only DC (240 V China) PDMs and DC PSMs. AC and DC PSMs or PDMs must not be mixed within a single system.

Up to nine PSMs may be connected in parallel to increase available system power across MPCs as needed and provide redundancy. "MX2008 DC Power Supply Module (-48 V) Description" on page 106) shows the DC PSM.

Figure 50: DC Power Supply Module (240 V China)
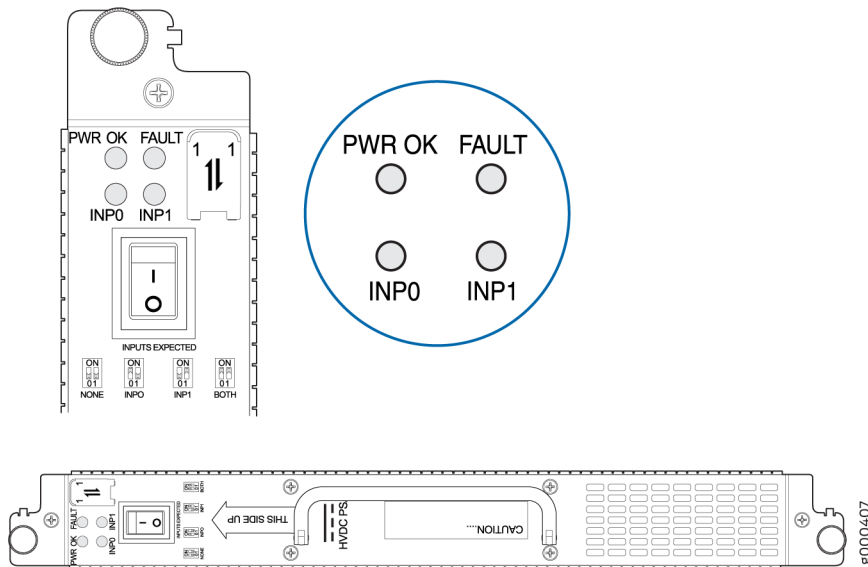
The DC power system is feed redundant. Each DC PSM can be connected to two separate feeds from different sources that are used to provide feed redundancy. If two feeds are connected, PSM input power will be drawn from the feed with the higher voltage present. There are two PDMs per power subsystem capable of carrying nine feeds each. Connect feeds from one source to one PDM and feeds from the other source to the second PDM of the power subsystem. The primary input of the PSM is a dual redundant feed, **INP0** and **INP1**. Both feeds are active during operation, but both feeds may or may not be providing current. Move the input mode DIP switch to the on or off position to determine the power supply feeds (see "MX2008 DC Power Supply Module (-48 V) Description" on page 106 and "MX2008 DC Power Supply Module (-48 V) Description" on page 106). In addition, a PSM failure triggers the alarm LED on the craft interface. Each PDM has an LED per feed indicating whether the feed is active or not, or whether the feed is connected properly, see "MX2008 Router DC (240 V China) System Electrical Specifications" on page 127.

Table 40: DIP Switch Positions on the DC (240 V China) PSM

Left Switch Position	Right Switch Position	Input Source
Off	Off	None
On	Off	Input 0 (**INP0**)
Off	On	Input 1 (**INP1**)

Table 40: DIP Switch Positions on the DC (240 V China) PSM *(Continued)*

Left Switch Position	Right Switch Position	Input Source
On	On	Both Input 0 and Input 1

Figure 51: Selecting Input Feed on the DC Power Supply Module (240 V China)
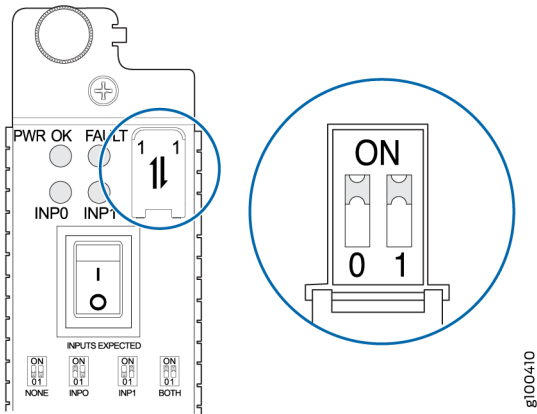
MX2008 DC Power Supply Module LEDs

Each DC PSM (-48 V and 240 China) faceplate contains four LEDs. These LEDs are described in . Nine bicolor LEDs, labeled **0** through **8** for the nine PSMs, are located in the center of the craft interface.

The primary input of the PSM is a dual redundant feed, **INP0** and **INP1**. Both feeds are active during operation, but both feeds might or might not be providing current. In addition, a PSM failure triggers the alarm LED on the craft interface.

Table 41: MX2008 DC Power Supply Module LEDs

Label	Color	State	Description
PWR OK	Green	On	PSM is functioning normally with no alarms.

Table 41: MX2008 DC Power Supply Module LEDs *(Continued)*

Label	Color	State	Description
	Yellow	On	PSM controller is off with both **INP0** and **INP1** voltage out of range.
	–	Off	PSM is not functioning normally or the PSM controller is off.
FAULT	Red	On	PSM is not functioning normally or the DC input voltage of one or more feeds is out of range.
	–	Off	PSM is functioning normally or both the DIP switches are set to off.
INP0	Green	On	DC input is within required voltage range and the DIP switch is set to on.
	Yellow	On	DC input is detected but voltage is out of range.
	–	Off	DC input to the PSM is not present.
INP1	Green	On	DC input is within required voltage range and the DIP switch is set to on.
	Yellow	On	DC input is detected but voltage is out of range.
	–	Off	DC input to the PSM is not present.

SEE ALSO

MX2008 Router Grounding Specifications | **248**

Site Electrical Wiring Guidelines for MX Series Routers | **664**

MX2008 DC Power Requirements

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

lists the FRU power requirements for SFBs, RCBs, MPCs, and MICs. In addition, lists the MPC power requirements with MICs and optics at various operating temperatures.

Typical power represents power under certain temperatures and normal operating conditions.

For PDMs with 60 A feeds, we recommend that you select the 60 A @ –48 VDC switch for each input.

For PDMs with 80 A feeds, we recommend that you select the 80 A @ –48 VDC switch for each input.

> **NOTE**: The 240 V China DC PDMs do not have a switch selection.

If you do not plan to provision as recommended above, you can use the information in to calculate the power consumption for your hardware configuration.

> **NOTE**: Unlike all the other MPCs, *MPC6E*, *MPC8E*, and *MPC9E* does not require an adapter card (ADC) to house the MPC in the MX2008 router.

Table 42: FRU DC Power Requirements

Component	Model Number	Maximum Power Requirement
Switch Fabric Boards (SFBs)		
MX2008 SFB2	MX2008-SFB2	100 W (Typical)
		110 W at 55° C
		100 W at 40° C
		95 W at 25° C
Fan Trays		

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
Fan Trays	MX2000-FANTRAY-S	1500 W (Typical)
		1700 W at 55° C
		1500 W at 40° C
		350 W at 25° C
Adapter Cards		
ADC	MX2000-LC-ADAPTER	150 W
Routing Control Board (RCB)		
RCB	REMX2008-X8-64G	100 W (Typical)
		120 W at 55° C
		100 W at 40° C
		95 W at 25° C
MPCs		
16x10GE MPC (see *MPC-3D-16XGE-SFPP*)	MPC-3D-16XGE-SFPP	440 W at 55° C ambient
MPC1 (see *MPC1*)	MX-MPC1-3D	165 W
	MX-MPC1E-3D	**With MICs and optics:** 239 W at 55° C
		227 W at 40° C
		219 W at 25° C

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MPC1 Q (see *MPC1 Q*)	MX-MPC1-3D-Q MX-MPC1E-3D-Q	175 W **With MICs and optics:** 249 W at 55° C 237 W at 40° C 228 W at 25° C
MPC2 (see *MPC2*)	MX-MPC2-3D MX-MPC2E-3D	274 W **With MICs and optics:** 348 W at 55° C 329 W at 40° C 315 W at 25° C
MPC2 Q (see *MPC2 Q*) MPC2 EQ (see *MPC2 EQ*)	MX-MPC2-3D-Q MX-MPC2-3D-EQ MX-MPC2E-3D-Q MX-MPC2E-3D-EQ	294 W **With MICs and optics:** 368 W at 55° C 347 W at 40° C 333 W at 25° C
MCP2E P (see *MPC2E P*)	MX-MPC2E-3D-P	294 W **With MICs and optics:** 368 W at 55° C 347 W at 40° C 333 W at 25° C

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MPC3E (see *MPC3E*)	MX-MPC3E-3D	440 W **With MICs and optics:** 520 W at 55° C, two 40 W MICs 420 W at 40° C, two CFP MICs with LR4 optics 408 W at 25° C, two CFP MICs with LR4 optics
32x10GE MPC4E (see *32x10GE MPC4E*)	MX-MPC4E-3D-32XGE-SFPP	610 W **With MICs and optics:** 610 W at 55° C, two 40 W MICs 560 W at 40° C, two CFP MICs with LR4 optics 550 W at 25° C, two CFP MICs with LR4 optics
2x100GE + 8x10GE MPC4E (see *2x100GE + 8x10GE MPC4E*)	MX-MPC4E-2CGE-8XGE	610 W **With MICs and optics:** 610 W at 55° C, two 40 W MICs 550 W at 40° C, two CFP MICs with LR4 optics 530 W at 25° C, two CFP MICs with LR4 optics
6x40GE + 24x10GE MPC5E *6x40GE + 24x10GE MPC5EQ*	MPC5E-40G10G MPC5EQ-40G10G	**With optics:** 607 W at 55° C 541 W at 40° C 511 W at 25° C

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
2x100GE + 4x10GE MPC5E *2x100GE + 4x10GE MPC5EQ*	MPC5E-100G10G MPC5EQ-100G10G	**With optics:** 607 W at 55° C 541 W at 40° C 511 W at 25° C
MPC6E	MX2K-MPC6E	1088 W with MICs and optics
MPC7E-MRATE	MPC7E-MRATE	400 W (Typical) 545 W at 55° C 465 W at 40° C 440 W at 25° C
MPC8E (without MICs)	MX2K-MPC8E	688 W (Typical) 805 W at 55° C 720 W at 40° C 690 W at 25° C
MPC9E (without MICs)	MX2K-MPC9E	838 W (Typical) 1018 W at 55° C 870 W at 40° C 840 W at 25° C
MICs		
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	35 W
Gigabit Ethernet MIC with SFP	MIC-3D-20-GE-SFP	37 W

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
10-Gigabit Ethernet MIC with XFP	2-Port: MIC-3D-2XGE-XFP 4-Port: MIC-3D-4XGE-XFP	2-Port: 29 W 4-Port: 37 W
10-Gigabit Ethernet MIC with SFP+	MIC6-10G	74 W **With optics:** 53 W at 55° C, 40° C and 25° C with 10G BASE-SR and 10G BASE-LR optics 66 W at 55° C, 40° C and 25° C with 10G BASE-ER optics 74 W at 55° C, 40° C and 25° C with 10G BASE-ZR optics
10-Gigabit Ethernet DWDM OTN MIC	MIC6-10G-OTN	84 W **With optics:** 63 W at 55° C with 10G BASE-LR OTN optics 63 W at 40° C with 10G BASE-LR OTN optics 63 W at 25° C with 10G BASE-LR OTN optics
40-Gigabit Ethernet MIC with QSFPP	MIC3-3D-2X40GE-QSFPP	18 W
100-Gigabit Ethernet MIC with CFP	MIC3-3D-1X100GE-CFP	40 W
100-Gigabit Ethernet MIC with CXP	MIC3-3D-1X100GE-CXP	20 W

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
100-Gigabit Ethernet MIC with CFP2	MIC6-100G-CFP2	104 W **With optics:** 94 W at 55° C with 100G BASE-LR4 OTN optics 86 W at 40° C with 100G BASE-LR4 OTN optics 74 W at 25° C with 100G BASE-LR4 OTN optics
100-Gigabit Ethernet MIC with CXP	MIC6-100G-CXP	57 W 49 W at 55° C with CXP SR10 optics 49 W at 40° C with CXP SR10 optics 49 W at 25° C with CXP SR10 optics
100-Gigabit DWDM OTN MIC with CFP2	MIC3-100G-DWDM	**With optics:** 91 W at 55° C 83 W at 25° C
SONET/SDH OC3/STM1 Multi-Rate MIC	4-Port: MIC-3D-4OC3OC12-1OC48 8-Port: MIC-3D-8OC3OC12-4OC48	4-Port: 24 W at 55° C 22.75 W at 40° C 21.5 W at 25° C 8-Port: 29 W at 55° C 27.75 W at 40° C 26.5 W at 25° C

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
OC192/STM64 MIC with XFP	MIC-3D-1OC192-XFP	41 W at 55° C 38.5 W at 40° C 36 W at 25° C
Channelized SONET/SDH OC3/STM1 Multi-Rate MIC	4-Port: MIC-3D-4CHOC3-2CHOC12 8-Port: MIC-3D-8CHOC3-4CHOC12	4-Port: 41 W at 55° C 40 W at 40° C 39 W at 25° C 8-Port: 52 W at 55° C 50.5 W at 40° C 49 W at 25° C
Channelized OC48/STM16 MIC with SFP	MIC-3D-1CHOC48	56.5 W at 55° C 54.5 W at 40° C 53 W at 25° C
Tri-Rate MIC	MIC-3D-40GE-TX	41 W
MIC MRATE	MIC-MRATE	• When installed into MPC8E: 1.250 A @ 48 V (60 W) • When installed into MPC9E: 1.771 A @ 48 V (85 W)
DS3/E3 MIC	MIC-3D-8DS3-E3 MIC-3D-8CHDS3-E3-B	36 W at 55° C 35 W at 40° C 34 W at 25° C

Table 42: FRU DC Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1COC12-CE	33.96 W

SEE ALSO

MX2008 DC Power Distribution Description (-48 V)

Most sites distribute DC power through a main conduit that leads to frame-mounting DC power distribution panels, one of which might be located at a location near the rack that houses the router. A pair of cables (one input and one return) connects each set of PDM input terminal studs to the power distribution panel.

The PSMs can be connected to two separate feeds from different sources that are used for feed redundancy. There are two PDMs located in slots **PDM0/Input0** and **PDM1/Input1** that are capable of carrying seven to nine feeds each. Each feed is connected from one source to one PDM and feeds from the other source to the second PDM of the DC power system. This configuration balances power draw for the system by using the commonly deployed A/B feed redundancy.

Each system provides N+1 PSM redundancy along with N+N feed redundancy. If both DC feeds are available, operating power draws from the feed with higher voltage. These feeds are set by the input mode DIP switch located on the DC PSM (see "MX2008 DC Power Supply Module (-48 V) Description" on page 106). Each set of power cables powers a single DC PSM and is capable of delivering 2500 W of power if 80-A feeds are connected. If feeds that connect to one PDM fail in a redundant configuration, the other feed starts to provide full power.

shows a typical DC source cabling arrangement.

Figure 52: Typical DC Source Cabling to the Router

All DC PSMs in a subsystem share the load. If one PSM fails in a redundant configuration, the remaining PSMs provide power to FRUs. Up to nine PSMs might be required to supply power to a fully configured router. A portion of power from each zone is reserved to power critical FRUs. These FRUs allow the system to operate even if power to a complete zone fails.

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

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

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

SEE ALSO

Replacing an MX2000 DC Power Distribution Module (-48 V)

MX2008 DC Power Distribution Description (240 V China)

Most sites distribute DC power through a main conduit that leads to frame-mounting DC power distribution panels, one of which might be located at a location near the rack that houses the router. A pair of cables (one input and one return) connects each set of PDM input terminal studs to the power distribution panel.

The PSMs can be connected to two separate feeds from different sources that are used for feed redundancy. There are two PDMs located in slots **PDM0/Input0** and **PDM1/Input1** that are capable of carrying seven to nine feeds each. Each feed is connected from one source to one PDM and feeds from the other source to the second PDM of the DC power system. This configuration balances power draw for the system by using the commonly deployed A/B feed redundancy.

Each system provides N+1 PSM redundancy along with N+N feed redundancy. If both DC feeds are available, operating power draws from the feed with higher voltage. These feeds are set by the input mode DIP switch located on the DC PSM (see "MX2000 DC Power Supply Module (240 V China) Description" on page 109). Each set of power cables powers a single DC PSM and is capable of delivering 2500 W of power if 20 A 240 V source is connected. If feeds that connect to one PDM fail in a redundant configuration, the other feed starts to provide full power.

Figure 53 on page 124 shows a typical DC source cabling arrangement.

Figure 53: Typical DC Source Cabling to the Router

All DC PSMs in a subsystem share the load. If one PSM fails in a redundant configuration, the remaining PSMs provide power to FRUs. Up to nine PSMs might be required to supply power to a fully configured router. A portion of power from each zone is reserved to power critical FRUs. These FRUs allow the system to operate even if power to a complete zone fails.

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

> **CAUTION**: The two input sources must have similar grounding type because the PSM can see 480 V if one source has positive ground (-240 V), and the other source has negative ground (+240 V). This might damage the PSM.

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

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

MX2008 DC Power (-48 V) System Electrical Specifications

IN THIS SECTION

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

Table 43 on page 125 lists the DC power system electrical specifications.

Table 43: DC (-48 V) PSM Electrical Specifications per Input Configurations

Item	Specification
Maximum input current rating input voltage @ –40 VDC to –72 VDC	60 A (for 2100 W output) 73 A (for 2500 W output)
Maximum output power	2100 W @ 60 A 2500 W @ 73 A
Redundancy	N+1 PSM N+N feed redundancy
DC input voltage	–40 VDC to –72 VDC
DC nominal input current @ 48 VDC IN	49 A (for 2100 W output) 59 A (for 2500 W output)
Maximum DC output @ 52 VDC (upper and lower cage)	2500 W

Table 43: DC (-48 V) PSM Electrical Specifications per Input Configurations *(Continued)*

Item	Specification
DC standby output @ 5 VDC	30 W
Efficiency	91%

NOTE: This value is within load range 17–67% and nominal input voltage at 48 VDC.

DC Power Supply Input Fuses

The DC (-48 V) PSM has a power supply input fuse in the negative terminals of both INP0 and INP1. lists the electrical specification for this fuse.

Table 44: Electrical Specifications for the DC Power Supply Input Fuse

Electrical Characteristic	Value
Fuse	Littelfuse FUSE M P 80A 170VDC E, P/N TLS080LS
Voltage Rating	170 Vdc
Ampere Range	80 A
Interrupting Rating	100 kA
Approvals	UL Recognized (File: E71611)
Construction	Body: Glass melamine Caps: Silver-plated brass
Environmental	RoHS Compliant, Lead (Pb) Free

SEE ALSO

MX2008 Router DC (240 V China) System Electrical Specifications

IN THIS SECTION

lists the DC power system electrical specifications.

Table 45: DC PSM (240 V China) Electrical Specifications Per Input Configurations

Item	Specification
Maximum input current rating input voltage @ 190 - 290 VDC	16 A (for 2500 W output)
Maximum output power	2500 W @ 190 V/16 A
Redundancy	N+1 PSM N+N feed redundancy
DC input voltage	190 VDC to 290 VDC
DC nominal input current @ 240 VDC IN	14 A (for 2500 W output)
Maximum DC output @ 52 VDC (upper and lower cage)	2500 W

Table 45: DC PSM (240 V China) Electrical Specifications Per Input Configurations *(Continued)*

Item	Specification
DC standby output @ 5 VDC	30 W
Efficiency	91%

NOTE: This value is within load range 17-67% and nominal input voltage at 240 VDC.

DC Power Supply Input Fuses

The DC PSM has a power supply input fuse in the negative terminals of both INP0 and INP1. lists the electrical specification for this fuse.

Table 46: Electrical Specifications for the DC Power Supply (240 V China) Input Fuse

Electrical Characteristic	Value
Fuse	Fuse Walter MHP-20
Voltage Rating	500 Vdc
Ampere Range	20 A
Interrupting Rating	20 kA
Approvals	UL Recognized (File: E71611)
Construction	Body: Glass melamine Caps: Silver-plated brass
Environmental	RoHS Compliant, Lead (Pb) Free

DC Power (-48 V) Circuit Breaker Requirements for the MX2008 Router

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

To operate a maximally or minimally configured DC-powered router, you must use a dedicated circuit breaker for each input DC feed. The circuit breaker must have the following specifications:

- Breaker Type: Hydraulic Magnetic

- Voltage Rating: Up to 125VDC

- Current Rating: 80A DC

- Delay Feature: DC Short Delay

- Interrupting Rating : 5000A

- Number of Poles: Single

SEE ALSO

MX2008 Power System **| 54**

MX2008 DC Power Distribution Module (-48 V) Description **| 102**

MX2008 DC Power Supply Module (-48 V) Description **| 106**

Replacing an MX2000 DC Power Distribution Module (-48 V)

Replacing an MX2008 DC Power Supply Module (-48 V) **| 538**

DC Power (240 V China) Circuit Breaker Requirements for the MX2000 Router

For PDMs, if you plan to operate a maximally configured DC-powered router, we recommend that you provision at least 20 A @ 240 VDC (nominal) for each DC input to the system. Use a customer site 2 pole circuit breaker rated according to respective National Electrical Code and customer site internal standards to maintain proper level of protection for the current specified above.

If you plan to operate a DC-powered router at less than the maximum configuration, we recommend that you provision a 2 pole circuit breaker according to respective National Electrical Code and customer

site internal standards to maintain proper level of protection for the current specified above or each DC power supply rated for at least 125% of the continuous current that the system draws at 240 VDC.

DC Power Cable Specifications for the MX2008 Router

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

The cable lugs attach to the terminal studs of each PDM (see Figure 54 on page 130).

NOTE: The MX2008 supports 4-AWG DC power cable lugs for 80-A input and 60-A input.

Figure 54: 4-AWG DC Power Cable Lug
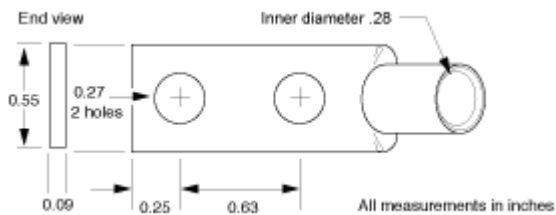
CAUTION: Before you install the router, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the router.

CAUTION: The router is installed in restricted access location. It has a separate protective earthing terminal (Metric [–M6] and English [–¼-20] screw ground lugs) provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earth terminal must be permanently connected to earth.

Table 47 on page 131 summarizes the specifications for the DC power cables, which you must supply.

Table 47: DC Power Cable Specifications

Cable Type	Quantity and Specification
Power	Eighteen pairs of 4-AWG (21.2 mm^2), used with 60-A or 80-A PDM. Minimum 75°C wire, or as required by the local code. You can select 60-A or 80-A input feed capacity on the DC PDM by setting the DIP switch on the PDM to the rated amperage of the DC power input feeds.

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

SEE ALSO

MX2008 High-Voltage Universal (HVAC/HVDC) Power System

IN THIS SECTION

MX2008 High-Voltage Universal (HVAC/HVDC) Power Distribution Module Description

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

In the high-voltage second-generation universal (HVAC/HVDC) power configuration, the MX2000 router contains two high-voltage universal (MX2K-PDM-HV) PDMs located at the rear of the chassis in slots **PDM0/Input0** and **PDM1/Input1** (bottom to top). A minimum of one PDM is required per system (two PDMs per chassis) for nonredundant power. The universal (HVAC/HVDC) PDMs provide power interface to nine power supply modules (PSMs).

Two PDMs provide full redundancy for the router. In a redundant configuration, a total of a total of eighteen (9-feed PDMs) are supported.

NOTE: The power backplane for a subsystem distributes regulated 52 VDC to all boards supplied by that subsystem.

Each high-voltage universal (HVAC/HVDC) PDM has nine (HVAC/HVDC) inputs, (see Figure 55 on page 133).

Figure 55: MX2000 High-Voltage Universal (HVAC/HVDC) PDM
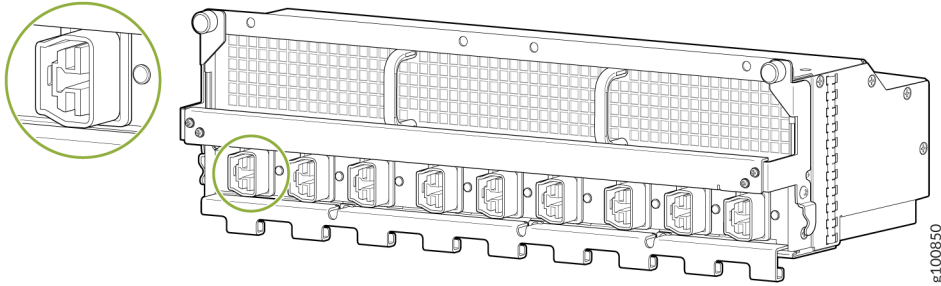
MX2000 Router Grounding Specifications

Site Electrical Wiring Guidelines for MX Series Routers

MX2008 High-Voltage Universal (HVAC/HVDC) Power Distribution Module LEDs

Each universal PDM faceplate contains one LED for each of the nine input power feeds, indicating the correct or incorrect polarity connection of each feed. See Table 48 on page 134 and Figure 56 on page 133 high-voltage universal (HVAC/HVDC) PDM LEDs.

Figure 56: High-Voltage Universal (HVAC/HVDC) Power Distribution Module LEDs
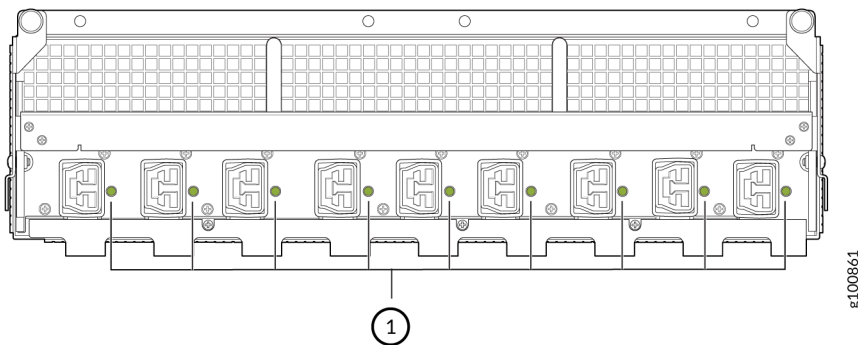
1– LED

Table 48: High-Voltage Universal (HVAC/HVDC) Power Distribution Module LEDs

Color	State	Description
Green	On	Positive and negative input feeds are connected. PDM is functioning normally.
–	Off	Positive input feed is not connected or present.
		Negative input feed is not connected or present.

SEE ALSO

MX2008 Component LEDs on the Craft Interface | 41

MX2000 High-Voltage Universal (HVAC/HVDC) Power Distribution Module Description

MX2008 High-Voltage Universal (HVAC/HVDC) Power Supply Module Description

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

The MX2008 supports a universal HVAC/HVDC power system. The HVAC/HVDC power system operates with nine feeds. A total of nine feeds are required to fully power the MX2010. Another nine feeds are required to provide feed redundancy (a total of 18 feeds In the HVAC/HVDC power configuration, the router contains up to nine HVAC/HVDC PSMs located at the rear of the chassis in slots **PSM0** through **PSM8**, (left to right). The HVAC/HVDC PSMs in slots **PSM0** through **PSM8** provide power to the all router components including MPCs in slot **0** through **9**, CB-REs in slot **0** and **1**, SFBs in slot **0** through **7**, and fan trays **0**, **1**, **2**, and **3**.

> **NOTE**: The MX2008 systems configured for universal (HVAC/HVDC) input power must use only universal PDMs and PSMs. AC, DC, 240 V China, and universal PSMs or PDMs must not be mixed within a single system.

Up to nine PSMs may be connected in parallel to increase available system power across MPCs as needed and provide redundancy. Figure 57 on page 135 shows the universal PSM.

Figure 57: High-Voltage Universal (HVAC/HVDC) Power Supply Module
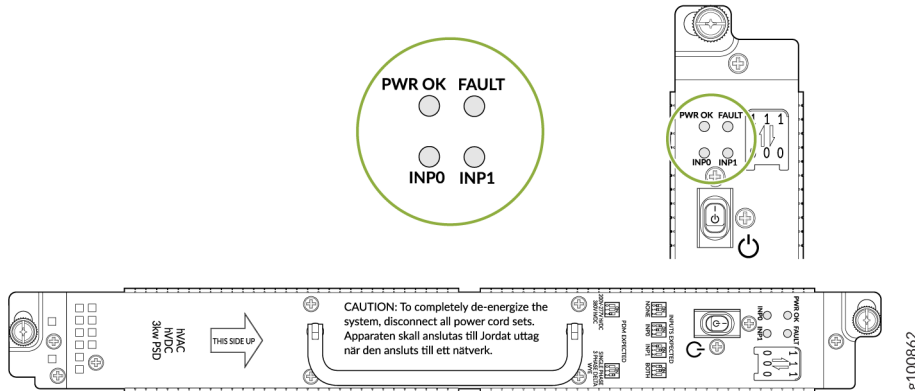
The HVAC/HVDC power system is feed redundant. Each universal PSM can be connected to two separate feeds from different sources that are used to provide feed redundancy. The PSM has two independent power trains connected in parallel at the output while each input is connected to its own feed. Power always is drawn from both feeds. There are two PDMs per power system capable of carrying nine feeds each. The bottom PDM in each power cage provides power to **INP0** of all PSMs installed in the cage, while top PDM in each power cage provides power to **INP1** of all PSMs installed in the cage. Feed connection to the PDMs should be done according to standard TIA-942 "Telecommunications Infrastructure Standard for Data" depending on tiering level. The primary input of the PSM is a dual-redundant feed, **INP0** and **INP1**. Both feeds are active during operation, and always carry current. Two dual-position DIP switches accessible from front panel indicate whether respective input **INP0** or **INP1** is expected to be connected or not. Set the input mode DIP switch to the on or off position to determine the power supply feeds (see Table 49 on page 135 and Figure 58 on page 136). In addition, a PSM failure triggers the alarm LED on the craft interface. Each PDM has an LED per feed indicating whether the feed is active or not, or whether the feed is connected properly. See "MX2008 High-Voltage Universal (HVAC/HVDC) Power Supply Module Description" on page 134.

Table 49: DIP Switch Positions on the Universal (HVAC/HVDC) PSM

Switch Location Left (Input 0)	Switch Location Middle (Input 1)	Input Source
Off	Off	None are expected to be connected.
On	Off	Only input (**0**) is expected to be connected.

Table 49: DIP Switch Positions on the Universal (HVAC/HVDC) PSM *(Continued)*

Switch Location Left (Input 0)	Switch Location Middle (Input 1)	Input Source
Off	On	Only input(**1**) is expected to be connected.
On	On	Both input **0** and input **1** are expected to be connected.

Figure 58: Selecting the Input Feed on the Universal (HVAC/HVDC) Power Supply Module
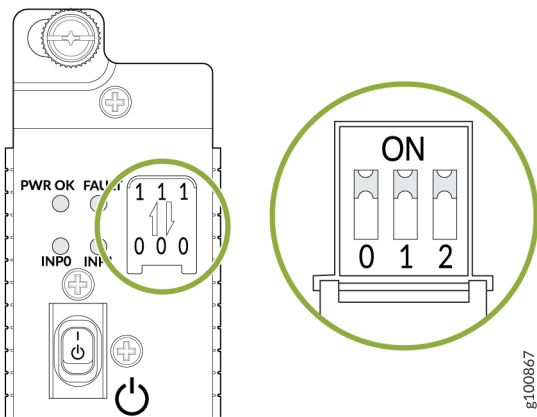
The universal HVAC/HVDC PSM has one more (third) DIP input switch accessible from the front panel, see Figure 58 on page 136. This switch indicates the system is using the universal (MX2K-PDM-HV) PDM that has 30 A rated power cord. This should be in the **ON** position.

Table 50:

Switch Location Right (Input 2)	Meaning
On. See Figure 58 on page 136.	PSM is using the universal HVAC/HVDC PDM that has 30 A-rated power cord.

SEE ALSO

MX2000 Router Grounding Specifications

MX2008 High-Voltage Universal Power Supply Module LEDs

Each high-voltage second-generation universal (HVAC/HVDC) PSM faceplate contains four LEDs. These LEDs are shown in Figure 59 on page 137 and Table 51 on page 137. Nine bicolor LEDs, labeled **0** through **8** for the nine PSMs, are located in the center of the craft interface.

The primary input of the PSM is a dual redundant feed, **INP0** and **INP1**. Both feeds are active during operation, and both feeds share the load current when present. In addition, a PSM failure triggers the alarm LED on the craft interface.

Figure 59: MX2000 High-Voltage Universal (HVAC/HVDC) Power Supply Module LEDs
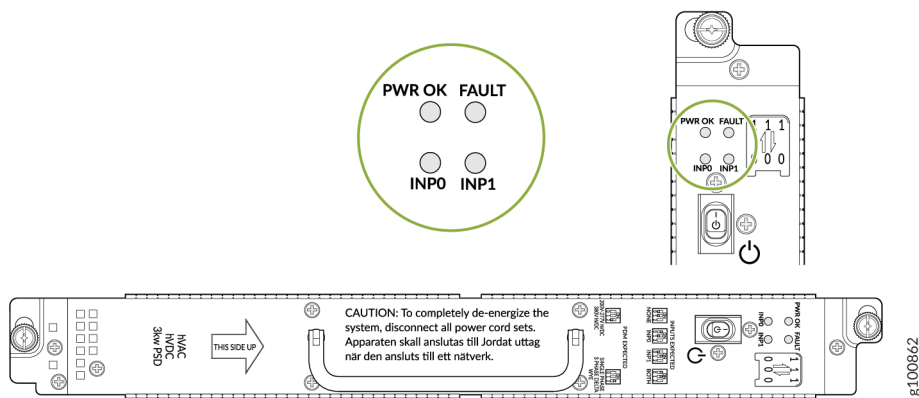
Table 51: MX2000 High-Voltage Universal (HVAC/HVDC) Power Supply Module LEDs

INP0 (V) AC or DC within range	INP1 (V) AC or DC within range	Dip 0	Dip 1	PSM Switch	INP0 LED	INP1 LED	PWR OK LED	FAULT LED	PWR OK	52V out	5V out
Yes	Yes	1	0	Off	Green	Off	Blinking amber	Off	Off	Off	Off

Table 51: MX2000 High-Voltage Universal (HVAC/HVDC) Power Supply Module LEDs *(Continued)*

INP0 (V) AC or DC within range	INP1 (V) AC or DC within range	Dip 0	Dip 1	PSM Switch	INP0 LED	INP1 LED	PWR OK LED	FAULT LED	PWR OK	52V out	5V out
Yes	0	1	0	On	Green	Off	Green	Off	On	On	On
0	Yes	0	1	Off	Off	Green	Blinking amber	Off	Off	Off	Off
0	Yes	1	1	On	Off	Green	Green	Off	On	On	On
Yes	Yes	1	1	Off	Green	Green	Blinking amber	Off	Off	Off	Off
Yes	Yes	1	1	On	Green	Green	Green	Off	On	On	On
Yes	Yes	0	0	Off	Green	Green	Blinking amber	Off	Off	Off	Off
Yes	Yes	0	0	On	Green	Green	Green	Off	On	On	On
Yes	0	0	1	Off	Green	Off	Blinking amber	Red	Off	On	Off
Yes	0	0	1	On	Green	Off	Green	Red	On	On	On
0	Yes	1	0	Off	Off	Green	Blinking amber	Red	Off	On	Off
0	Yes	1	0	On	Off	Green	Green	Red	On	On	On

MX2000 High-Voltage Universal (HVAC/HVDC) Power Supply Module Description

MX2008 High-Voltage Second-Generation Universal Power Requirements

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs).

Table 52 on page 139 lists the FRU power requirements for SFBs, RCBs, MPCs, and MICs. In addition, Table 52 on page 139 lists the MPC power requirements with MICs and optics at various operating temperatures.

Typical power represents power under certain temperatures and normal operating conditions.

> **NOTE**: The universal PDMs do not have a switch selection.

If you do not plan to provision as recommended above, you can use the information inTable 52 on page 139 to calculate the power consumption for your hardware configuration.

> **NOTE**: Unlike all the other MPCs, *MPC6E*, *MPC8E*, and *MPC9E* does not require an adapter card (ADC) to house the MPC in the MX2008 router.

Table 52: FRU Power Requirements

Component	Model Number	Maximum Power Requirement
Switch Fabric Boards (SFBs)		

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MX2008 SFB2	MX2008-SFB2	100 W (Typical)
		110 W at 55° C
		100 W at 40° C
		95 W at 25° C
Fan Trays		
Fan Trays	MX2000-FANTRAY-S	1500 W (Typical)
		1700 W at 55° C
		1500 W at 40° C
		350 W at 25° C
Adapter Cards		
ADC	MX2000-LC-ADAPTER	150 W
Routing Control Board (RCB)		
RCB	REMX2008-X8-64G	100 W (Typical)
		120 W at 55° C
		100 W at 40° C
		95 W at 25° C
MPCs		
16x10GE MPC (see *MPC-3D-16XGE-SFPP*)	MPC-3D-16XGE-SFPP	440 W at 55° C ambient

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MPC1 (see *MPC1*)	MX-MPC1-3D	165 W
	MX-MPC1E-3D	**With MICs and optics:**
		239 W at 55° C
		227 W at 40° C
		219 W at 25° C
MPC1 Q (see *MPC1 Q*)	MX-MPC1-3D-Q	175 W
	MX-MPC1E-3D-Q	**With MICs and optics:**
		249 W at 55° C
		237 W at 40° C
		228 W at 25° C
MPC2 (see *MPC2*)	MX-MPC2-3D	274 W
	MX-MPC2E-3D	**With MICs and optics:**
		348 W at 55° C
		329 W at 40° C
		315 W at 25° C
MPC2 Q (see *MPC2 Q*)	MX-MPC2-3D-Q	294 W
MPC2 EQ (see *MPC2 EQ*)	MX-MPC2-3D-EQ	**With MICs and optics:**
	MX-MPC2E-3D-Q	368 W at 55° C
	MX-MPC2E-3D-EQ	347 W at 40° C
		333 W at 25° C

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
MCP2E P (see *MPC2E P*)	MX-MPC2E-3D-P	294 W **With MICs and optics:** 368 W at 55° C 347 W at 40° C 333 W at 25° C
MPC3E (see *MPC3E*)	MX-MPC3E-3D	440 W **With MICs and optics:** 520 W at 55° C, two 40 W MICs 420 W at 40° C, two CFP MICs with LR4 optics 408 W at 25° C, two CFP MICs with LR4 optics
32x10GE MPC4E (see *32x10GE MPC4E*)	MX-MPC4E-3D-32XGE-SFPP	610 W **With MICs and optics:** 610 W at 55° C, two 40 W MICs 560 W at 40° C, two CFP MICs with LR4 optics 550 W at 25° C, two CFP MICs with LR4 optics
2x100GE + 8x10GE MPC4E (see *2x100GE + 8x10GE MPC4E*)	MX-MPC4E-2CGE-8XGE	610 W **With MICs and optics:** 610 W at 55° C, two 40 W MICs 550 W at 40° C, two CFP MICs with LR4 optics 530 W at 25° C, two CFP MICs with LR4 optics

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
6x40GE + 24x10GE MPC5E *6x40GE + 24x10GE MPC5EQ*	MPC5E-40G10G MPC5EQ-40G10G	**With optics:** 607 W at 55° C 541 W at 40° C 511 W at 25° C
2x100GE + 4x10GE MPC5E *2x100GE + 4x10GE MPC5EQ*	MPC5E-100G10G MPC5EQ-100G10G	**With optics:** 607 W at 55° C 541 W at 40° C 511 W at 25° C
MPC6E	MX2K-MPC6E	1088 W with MICs and optics
MPC7E-MRATE	MPC7E-MRATE	400 W (Typical) 545 W at 55° C 465 W at 40° C 440 W at 25° C
MPC8E (without MICs)	MX2K-MPC8E	688 W (Typical) 805 W at 55° C 720 W at 40° C 690 W at 25° C
MPC9E (without MICs)	MX2K-MPC9E	838 W (Typical) 1018 W at 55° C 870 W at 40° C 840 W at 25° C
MICs		

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	35 W
Gigabit Ethernet MIC with SFP	MIC-3D-20-GE-SFP	37 W
10-Gigabit Ethernet MIC with XFP	2-Port: MIC-3D-2XGE-XFP 4-Port: MIC-3D-4XGE-XFP	2-Port: 29 W 4-Port: 37 W
10-Gigabit Ethernet MIC with SFP+	MIC6-10G	74 W **With optics:** 53 W at 55° C, 40° C and 25° C with 10G BASE-SR and 10G BASE-LR optics 66 W at 55° C, 40° C and 25° C with 10G BASE-ER optics 74 W at 55° C, 40° C and 25° C with 10G BASE-ZR optics
10-Gigabit Ethernet DWDM OTN MIC	MIC6-10G-OTN	84 W **With optics:** 63 W at 55° C with 10G BASE-LR OTN optics 63 W at 40° C with 10G BASE-LR OTN optics 63 W at 25° C with 10G BASE-LR OTN optics
40-Gigabit Ethernet MIC with QSFPP	MIC3-3D-2X40GE-QSFPP	18 W
100-Gigabit Ethernet MIC with CFP	MIC3-3D-1X100GE-CFP	40 W

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
100-Gigabit Ethernet MIC with CXP	MIC3-3D-1X100GE-CXP	20 W
100-Gigabit Ethernet MIC with CFP2	MIC6-100G-CFP2	104 W **With optics:** 94 W at 55° C with 100G BASE-LR4 OTN optics 86 W at 40° C with 100G BASE-LR4 OTN optics 74 W at 25° C with 100G BASE-LR4 OTN optics
100-Gigabit Ethernet MIC with CXP	MIC6-100G-CXP	57 W 49 W at 55° C with CXP SR10 optics 49 W at 40° C with CXP SR10 optics 49 W at 25° C with CXP SR10 optics
100-Gigabit DWDM OTN MIC with CFP2	MIC3-100G-DWDM	**With optics:** 91 W at 55° C 83 W at 25° C

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
SONET/SDH OC3/STM1 Multi-Rate MIC	4-Port: MIC-3D-4OC3OC12-1OC48 8-Port: MIC-3D-8OC3OC12-4OC48	4-Port: 24 W at 55° C 22.75 W at 40° C 21.5 W at 25° C 8-Port: 29 W at 55° C 27.75 W at 40° C 26.5 W at 25° C
OC192/STM64 MIC with XFP	MIC-3D-1OC192-XFP	41 W at 55° C 38.5 W at 40° C 36 W at 25° C
Channelized SONET/SDH OC3/STM1 Multi-Rate MIC	4-Port: MIC-3D-4CHOC3-2CHOC12 8-Port: MIC-3D-8CHOC3-4CHOC12	4-Port: 41 W at 55° C 40 W at 40° C 39 W at 25° C 8-Port: 52 W at 55° C 50.5 W at 40° C 49 W at 25° C
Channelized OC48/STM16 MIC with SFP	MIC-3D-1CHOC48	56.5 W at 55° C 54.5 W at 40° C 53 W at 25° C

Table 52: FRU Power Requirements *(Continued)*

Component	Model Number	Maximum Power Requirement
Tri-Rate MIC	MIC-3D-40GE-TX	41 W
MIC MRATE	MIC-MRATE	• When installed into MPC8E: 1.250 A @ 48 V (60 W) • When installed into MPC9E: 1.771 A @ 48 V (85 W)
DS3/E3 MIC	MIC-3D-8DS3-E3 MIC-3D-8CHDS3-E3-B	36 W at 55° C 35 W at 40° C 34 W at 25° C
Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1COC12-CE	33.96 W

SEE ALSO

MX2000 Host Subsystem CB-RE Description

MX2020 Power Subsystem Description

Overview of Preparing the Site for the MX2020 Router

MX2000 High-Voltage Universal (HVAC/HVDC) Power Distribution Module Description

MX2000 High-Voltage Universal PDM (MX2K-PDM-HV) Power Cord Specifications

Table 53 on page 148 provides specifications and plug standards for the AC (20-input and 16-input) power cord applicable to the universal (HVAC/HVDC) PDMs.

Table 53: 20-A and 16-A Cabling Options

Spare Juniper Model Number	Locale	Cord Set Rating	Connector
CBL-JNP-SG4-C20	North America AC Power Cord	20 A, 250 VAC	C20 to Anderson 3-5958p4
CBL-JNP-SG4-JPL	Japan AC power cord	20 A, 250 VAC	SAF-D-Grid 400 to NEMAL6-20
CBL-JNP-SG4-C20-CH	Worldwide AC power cord	16A, 250 VAC	SAF-D-GRID 400 to IEC 60320 C20

Table 54 on page 148 provides specifications and connectors on the 30-A power cord provided for each country or region applicable to the universal (HVAC/HVDC) PDMs.

Table 54: 30-A Cabling Options

Spare Juniper Model Number	Locale	Cord Set Rating	Connector
CBL-PWR2-BARE See Figure 60 on page 149.	North America HVAC/HVDC power cord	30 A, 400 VAC	Anderson/straight to bare wire
CBL-PWR-SG4	North America HVAC/HVDC power cord	30-A, 400 VAC	SAF-D-GRID 400 right-angle (LH)
CBL-PWR2-L6-30P See Figure 61 on page 150.	North America AC Power Cord	30 A, 400 VAC	Anderson/straight to L6-30P
CBL-PWR2-332P6W-RA	Continental Europe AC power cord	30-A 250 VAC	Anderson/right-angle to IEC 332P6
CBL-PWR2-332P6W	Continental Europe AC power cord	30-A 250 VAC	Anderson/right-angle to IEC 332P6

Table 54: 30-A Cabling Options *(Continued)*

Spare Juniper Model Number	Locale	Cord Set Rating	Connector
CBL-PWR-SG4-RA	USA HVAC/HVDC power cord	30-A, 400 VAC	SAF-D-GRID 400 right-angle (LH)
CBL-PWR2-L6-30P-RA	North America AC power cord	30 A, 250 VAC	Anderson/right-angle to L6-30P
CBL-PWR2-330P6W-RA Figure 62 on page 150.	Continental Europe AC power cord	30 A, 250 VAC	Anderson/right-angle to IEC 330P6
CBL-PWR2-330P6W	North America AC power cord	30 A, 250 VAC	Anderson/right-angle to IEC 330P6

For the HVAC/HVDC power cord one end of the cable has an SAF-D-Grid 400 connector, the other end of the cable is bare wire. See Figure 60 on page 149 and Table 54 on page 148. These cables are separately orderable and are not shipped automatically with the MX2K-PDM-HV orders. An example of the bare wire cable and connector is shown in Figure 60 on page 149.

For connection to AC systems, Juniper provides a cable with either a NEMA 30-A connector (Figure 61 on page 150).

Figure 60: Bare Cable with Anderson Connector
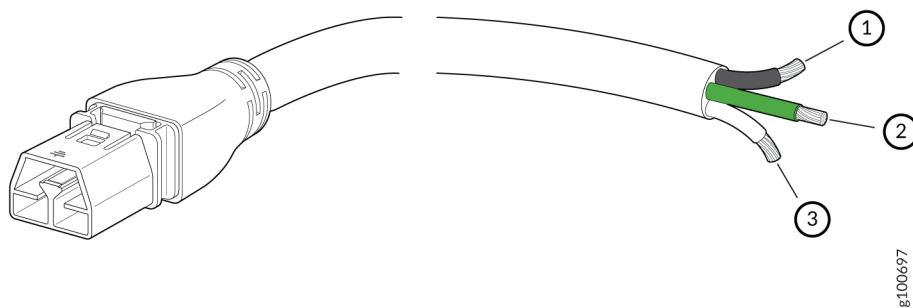
1– Black wire–Positive (+)	3– White wire–Negative

2− Green wire-Ground	

Figure 61: NEMA L6-P30 Connector
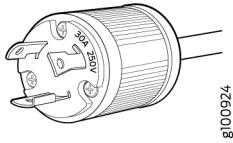
Figure 62: IEC 330P6W Connector
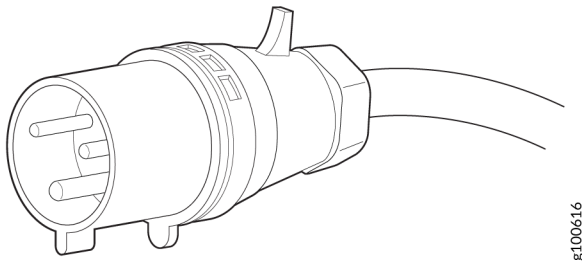
> ⚠ **WARNING**: The AC power cord for the router is intended for use with the router only and not for any other use.

> ⚠ **WARNING**:
>
> 注意
>
> 附属の電源コードセットはこの製品専用です。
> 他の電気機器には使用しないでください。
>
> Translation from Japanese: The attached power cable is only for this product. Do not use the cable for another product.

> **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). You can order AC power cords that are in compliance.

> **WARNING**: The router is installed in restricted access location. It has a separate protective earthing terminal (Metric [–M6] and English [–¼-20] screw ground lugs) provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earth terminal must be permanently connected to earth.

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

MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Subsystem Electrical Specifications

lists the high-voltage second-generation universal power subsystem electrical specifications.

Table 55: High-Voltage Universal PSM Electrical Specifications Per Input Configurations

Item	Specification
Maximum input current rating input voltage @ 190 VDC or 180 VAC	Maximum input current 30 A (for 3000 W)
Maximum output power	3400 W (dual feed) and 3000 W (single feed) @ 57.7 A
Redundancy	N+1 PSM N+N feed redundancy
DC input voltage	190 VDC to 410 VDC
DC nominal input current @ 380 VDC IN	10 A (3000 W for single feed)
Maximum output @ 52 VDC (upper and lower cage)	3400 W (dual feed) and 3000 W (single feed)

Table 55: High-Voltage Universal PSM Electrical Specifications Per Input Configurations *(Continued)*

Item	Specification
DC standby output @ 5 VDC	30 W
AC input voltage	Operating range: 180-305 VAC
Maximum AC feed PSM input power	3365 W for single input, 1910 W for each input with dual-input configuration.
AC input line frequency	47-63 Hz (+/-3Hz)
AC system current rating	19 A (single input) @ 180 VAC input voltage, 11 A for each input with dual-input configuration.
Efficiency	91% at full load

NOTE: This value is maximum load.

SEE ALSO

MX2000 High-Voltage Universal (HVAC/HVDC) Power Distribution Module Description

MX2000 High-Voltage Universal (HVAC/HVDC) Power Supply Module Description

High-Voltage Universal (HVAC/HVDC) Power Circuit Breaker Requirements for the MX2000 Router

The circuit breaker protection on all the power supplies should be designed according to National Electrical Code (NEC) of country of system installation or any similar local standard based on maximum drawn current of the power supply specified in this document.

Each high-voltage universal (HVAC/HVDC) PSM has dual feeds. The input AC or DC receptacle inlet is located on front panel of the PDM.

Each power cord feed should have dedicated circuit breakers. We recommend that size of the circuit breaker protection should be designed according to National Electrical Code (NEC) of country of system

installation or any similar local standard based on maximum drawn current of the power supply specified in this document.

> **CAUTION**: Use a 2-pole Circuit Breaker rated at minimum of 125% of the rated current per NEC or as local codes. Primary Overcurrent Protection by the Building Circuit Breaker. This breaker must protect against excess current, short circuit, and earth grounding fault in accordance with NEC which is ANSI/NFPA 70.

MX2008 Host Subsystem

IN THIS SECTION

MX2008 Host Subsystem Description

The host subsystem provides routing protocol processes, as well as software processes that control the router's interface, the chassis components, system management, and user access to the router. These routing processes run on top of a kernel that interacts with the Packet Forwarding Engine. The MX2008 host subsystem consists of two Routing and Control Boards, or RCBs. The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality. The Routing Engine performs all route-processing functions, whereas the CB performs chassis control and management plane functionality. The RCB provides control plane functions. You can install one or two RCBs on the router. Each RCB functions as a unit.

The MX2008 RCB is similar to the native CB-REs supported by MX2000 routers, with the only difference being that the MX2008 RCB is less than half the size of the MX2000 CB-RE.

> **NOTE**: Install two RCBs for redundant protection. If you install only one RCB, you can install it in slot **0** or slot **1**.

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

SEE ALSO

MX2008 Routing and Control Board (MX2008 RCB) Description

IN THIS SECTION

The MX2008 Routing and Control Board (MX2008 RCB) is an integrated board and a single FRU that provides Routing Engine and Control Board functionality.

The REMX2008-X8-128G RCB is equipped with a 8-Core 2.3 GHz processor, 128 GB memory, and two 200 GB SSDs and also supports Secure Boot for enhanced boot security.

The REMX2008-X8-64G-LT RCB is equipped with a 8-Core 2.3 GHz processor, 64 GB memory, and two 100 GB SSDs. The RCB is equipped with limited encryption support only.

Supported RCBs

The following are some key attributes of the MX2008 RCB:

- The RCB combined the Control Board and the Routing Engine in a single FRU.

- The RCB is hot-pluggable.

- The RCB is less than half the size of native MX2000 CB-RE.

The MX2008 router supports the following RCBs:

- REMX2008-X8-64G

- REMX2008-X8-64G-LT

- REMX2008-X8-128G

RCB Function

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

RCB Slots

The user can install one or two RCBs in the router. Each RCB is a combined Routing Engine and Control Board in one unit. A USB port on the RCB accepts a USB storage device that enables you to load Junos OS. You can install the RCBs into the front of the chassis in vertical slots labeled **0** and **1**. If two RCBs are installed, one functions as the primary and the other acts as the backup. If the primary RCB fails or is removed and the backup is configured appropriately, the backup takes over as the primary. If no RCB is installed in a slot, install a blank panel in the slot.

A minimum of one RCB must be installed in either slot **0** or slot **1** at all times.

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

RCB Front Panel

describes the Routing and Control Board (RCB).

Figure 63: RCB Front View
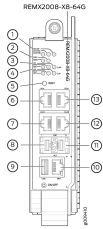
Figure 64: RCB (REMX2008– X8-64G-LT) Front View
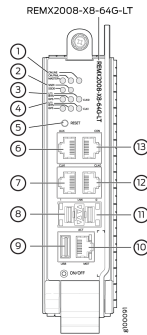
Figure 65: RCB (REMX20008– X8-128G) Front View
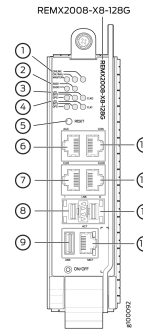
Table 56: Components on the RCB

Function No.	Label	Description
1	**ONLINE**, **MASTER**, and **OK/ FAIL**	There is one bicolor LED for each RCB control. The **ONLINE** LED indicates that the RCB is transitioning online and functioning properly. The **MASTER** LED indicates that this board is a primary RCB, and the **OK/FAIL** LED indicates the RCB has failed.
2	**SSD0** and **SSD1**	LEDs shows the state of the two solid-state drives (SSDs) in the RCB.
3 4	**GPS**, **UT1**, and **BITS**	These ports shows the external clocking interface status. There is one bicolor LED for each external clock interface—GPS, UTI and BITS.
5	**RESET**	This button used to reboot the RCB.

Table 56: Components on the RCB *(Continued)*

Function No.	Label	Description
6	**AUX**	This port is used to connect a laptop, modem, or other auxiliary unit.
7 12	**CLK0** and **CLK1**	Connects the RCB to two external clock interfaces for BITS and GPS function through a serial cable with an RJ-45 connector.
8 11	**LNK-0** and **LNK-1**	Two SFP+ ports connects the RCB through an Ethernet connection to support hardware diagnostics and JCS port testing. The port supports two 1–Gbps or 10-Gbps connections. The LED on these ports are associated with each of the SFP+ port (XGE-0 and XGE-1) and indicates the connection in use.
9	**USB**	This port is used to install a USB flash drive that contains Junos OS.
10	**MGT**	This port is a dedicated management channel for device maintenance. It is also used for system administrators to monitor and manage the MX2008 router remotely.
13	**CONSOLE**	This port is used to configure the MX2008 router.

RCB Interface Ports

Three ports, located on the RCB, connect the RCB to one or more external devices on which system administrators can issue Junos OS CLI commands to manage the router. In addition, four ports located on the RCB include, two 10-Gigabit Ethernet SFP+ interface connectors supporting hardware diagnostics (JCS port testing), and two external clock interfaces for BITS and GPS function.

The RCB interface ports with the indicated labels function as follows:

- **AUX**—Connects the RCB to a laptop, modem, or other auxiliary device through a serial cable with an RJ-45 connector.

- **CONSOLE**—Connects the RCB to a system console through a serial cable with an RJ-45 connector.

- **MGT**—Connects the RCB through an Ethernet connection to a management LAN (or any other device that plugs into an Ethernet connection) for out-of-band management. The port uses an autosensing RJ-45 connector to support 10-Mbps, 100-Mbps, or 1000-Mbps connections. Two small LEDs on the bottom of the port indicate the connection in use: the LED flashes yellow or green for a 10-Mbps, 100-Mbps, or 1000-Mbps connection, and the LED is lit green when traffic is passing through the port.

  The Control Board interface ports function as follows:

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

- **LNK-0** and **LNK-1**—Two SFP+ port connect the RCB through Ethernet to support two 1-Gbps or 10-Gbps connections to any external control box. Two small LEDs on the side of each SFP+ port indicate the connection in use: the LED flashes yellow when there is no link, flashes green when there is activity, or is lit green for a 1-Gbps or 10-Gbps connection.

- **CLK-0** and **CLK-1**—Connect the RCB to an external clock device through a serial cable with an RJ-45 connector.

SEE ALSO

> *RJ-45 Connector Pinouts for MX Series CB-RE or RCB Auxillary and Console Ports*
>
> *RJ-45 Connector Pinouts for an MX Series CB-RE or RCB Management Port*
>
> Replacing an MX2008 RCB | **481**
>
> MX2008 Host Subsystem Description | **153**
>
> *Supported Routing Engines by Router*
>
> *Routing Engine Specifications*

MX2008 RCB LEDs

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

Each Routing Engine part on the RCB has three LEDs that indicate its status. The LEDs, labeled **ONLINE**, **MASTER**, **OK/FAIL**, are located directly on the faceplate of the RCB. Table 57 on page 160 describes the

functions of the Routing Engine interface of the RCB. There are three LEDs on the craft interface for each Routing Engine (**RE0** and **RE1**). These LEDs are labeled **MASTER**, **ONLINE**, and **OFFLINE**.

> **NOTE**: The GPS LED is lit when the RCB is connected to an external clocking interface.

The Control Board, part of the host subsystem, has a set of bicolor LEDs that display its status. The LEDs, labeled **LINK**, **GPS**, and **BITS**, are located directly on the faceplate of the RCB. Table 57 on page 160 describes the functions of the Control Board interface of the RCB. There are two LEDs on the craft interface for each Control Board—one labeled **CB-RE0** (far left) and one labeled **CB-RE1** (far right). For more information about the RCB and Routing Engine LEDs on the craft interface, see "MX2008 Component LEDs on the Craft Interface" on page 41.

Figure 66: RCB LEDs
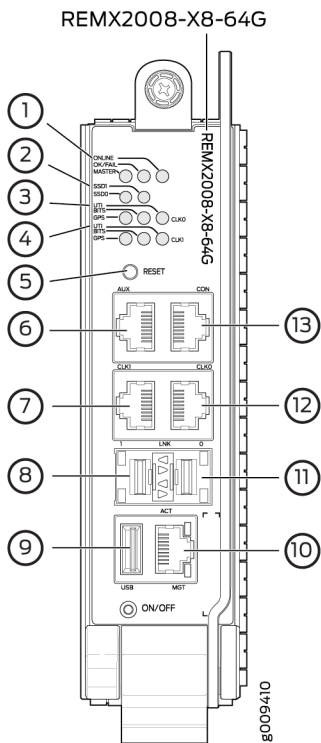
Table 57: RCB LEDs

Function No.	Label	Color	State	Description
1	ONLINE	Green	Blinking slow	RCB is starting BIOS.
			Blinking fast	RCB is starting Linux.
			On steadily	Both Junos OS and Linux are successfully loaded on the RCB.
		–	Off	RCB is offline.
	MASTER	Blue	On steadily	RCB is the primary.
	OK/FAIL	Yellow	On steadily	RCB has failed.
			Off	RCB is functioning normally.
2	SSD0	Green	Blinking	SSD0 is active.
	SSD1	Green	Blinking	SSD1 is active.
3	UT1	Green	On steadily	Universal Timing Interface (UTI) clocking interface is active.
		Red	On steadily	UTI clocking interface has failed.
		–	Off	UTI clocking interface is offline.
	BITS	Green	On steadily	Building-integrated timing supply (BITS) external clocking interface is active.
		Red	On steadily	BITS external clocking interface has failed.

Table 57: RCB LEDs *(Continued)*

Function No.	Label	Color	State	Description
		–	Off	BITS external clocking interface is offline.
	GPS	Green	On steadily	Global positioning system (GPS) external clocking interface is active.
		Red	On steadily	GPS external clocking interface has failed.
		–	Off	GPS external clocking interface is offline.

SEE ALSO

MX2008 Host Subsystem Description | **153**

Replacing an MX2008 RCB | **481**

Routing Engine Specifications

Table 58 on page 162 lists the current specifications for Routing Engines supported on M Series, MX Series, and T Series routers. Table 59 on page 167 lists the hardware specifications of the Routing Engines with VMHost support. Table 60 on page 169 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*.

Table 58: 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-A-1000-2048	1.0-GHz Pentium	2048 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.1	–
RE-A-2000-4096	2.0-GHz Pentium	4096 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.1	–
RE-S-1300-2048	1.3-GHz Pentium	2048 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.2	SCB, SCBE
RE-S-2000-4096	2.0-GHz Pentium	4096 MB	Gigabit Ethernet	40 GB hard disk	1 GB CompactFlash card	8.2	SCB, SCBE
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.

Table 58: Routing Engine Specifications *(Continued)*

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
	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	–

Table 58: Routing Engine Specifications *(Continued)*

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
RE-S-1800x2	1800-MHz	8 GB or 16 GB	Gigabit Ethernet	32 GB SSD	4 GB CompactFlash card	10.4	SCB, SCBE, SCBE2, SCBE3
RE-S-1800x4	1800-MHz	8GB or 16 GB	Gigabit Ethernet	32 GB SSD	4 GB CompactFlash card	10.4	SCB, SCBE, SCBE2, SCBE3
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	–
RE-MX2000-1800x4	1.8- GHz	16 GB	Gigabit Ethernet	32 GB SSD	4 GB Fixed Internal CompactFlash card	12.3R2	SFB
RE-S-1800X4-32G-S	1.8- Ghz	32 GB	Gigabit Ethernet	32 GB SSD	4 GB Fixed Internal CompactFlash card	• 12.3R4 • 13.2R1	SCB, SCBE, SCBE2, SCBE3
REMX2K-1800-32G-S	1.8- Ghz	32 GB	Gigabit Ethernet	32 GB SSD	4GB Fixed Internal CompactFlash card	• 12.3R4 • 13.2R1	–

Table 58: Routing Engine Specifications *(Continued)*

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
RE-S-X6-64G, RE-S-X6-64G-LT	2 Ghz	64 GB	Gigabit Ethernet	Two 50-GB SSDs	-	• 15.1F4 and 16.1 (RE-S-X6-64G) • 17.2R1 (RE-S-X6-64G-LT)	SCBE2, SCBE3
REMX2K-X8-64G	2 Ghz	64 GB	Gigabit Ethernet	Two 100-GB SSDs	-	15.1F5-S1, 16.1R2, and 16.2R1	–
REMX2K-X8-64G-LT	2 Ghz	64 GB	Gigabit Ethernet	Two 100-GB SSDs	-	17.2R1	–
REMX2008-X8-64G	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	–
REMX2008-X8-64G-LT	2.1 Ghz	64 GB	Gigabit Ethernet	Two 100-GB SSDs	-	17.2R1	-
REMX2008-X8-128G	2.3 Ghz	128 GB	Gigabit Ethernet	Two 200-GB SSDs	-	18.2R1	-

Table 58: Routing Engine Specifications *(Continued)*

Routing Engine	Processor	Memory	Connection to PFEs	Disk	Media	First Junos OS Support	Switch Control Board
RE-S-X6-128G	2.0 Ghz	128 GB	Gigabit Ethernet	Two 200-GB SSDs	-	18.1R1 (SCBE2) 18.4R1 (SCBE3)	SCBE2, SCBE3
RE-S-X6-128G-K	2.0 Ghz	128 GB	Gigabit Ethernet	Two 200-GB SSDs	-	22.2R1S2	SCBE2, SCBE3
REMX2K-X8-128G	REMX2K-X8-128G	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	-
JNP10003-RE1-LT	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-RE1-LT	2.3 GhZ	64 GB	Gigabit Ethernet	Two 200 GB SSDs	-	18.3R1	-
JNP10K-RE1-128	2.3 GhZ	128 GB	Gigabit Ethernet	Two 200 GB SSDs	-	18.3R1	-

> **NOTE**: Use **shielded** CAT5e, CAT6, or CAT7 cables for connecting the **AUX**, **CONSOLE**, and **MGMT** ports in RE-S-X6-64G, REMX2K-X8-64G, and REMX2008-X8-64G Routing Engines.

Table 59 on page 167 lists the hardware specifications of the Routing Engines with VMHost support.

Table 59: Hardware Specifications of the RE-MX-X6, RE-MX-X8, RE-PTX-X8, RCBPTX, RE-QFX10002-60C, and RE-PTX10002-60C Routing Engines

Model Number	Supported on Device	Specifications
RE-S-X6-64G	MX240, MX480, and MX960	• 6-core Haswell CPU • Wellsburg PCH-based Routing Engine with 64-GB DRAM and two 50-GB solid-state drives (SSDs)
RE-S-X6-128G	MX240, MX480, and MX960	• 6-core Haswell CPU • Wellsburg PCH-based Routing Engine with 128-GB DRAM and two 200-GB solid-state drives (SSDs)
REMX2K-X8-64G	MX2020 and MX2010	• 8-core Haswell CPU • Wellsburg PCH-based Routing Engine with 64-GB DRAM and two 100-GB SSDs
RE-PTX-X8-64G	PTX5000	• 8-core Haswell CPU • Wellsburg PCH-based Routing Engine with 64-GB DRAM and two 50-GB SSDs • New Control Board CB2-PTX
RCB-PTX-X6-32G	PTX3000	• Wellsburg PCH-based Routing Engine with 64-GB DRAM and two 100-GB SSDs • Multi-core Haswell CPU RCB combines the functionality of a Routing Engine, Control Board, and Centralized Clock Generator (CCG)

Table 59: Hardware Specifications of the RE-MX-X6, RE-MX-X8, RE-PTX-X8, RCBPTX, RE-QFX10002-60C, and RE-PTX10002-60C Routing Engines *(Continued)*

Model Number	Supported on Device	Specifications
RE-S-1600x8	MX10003	• High-performance 1.6-GHz Intel 8 Core X86 CPU • 64-GB DDR4 RAM • 100-GB SATA SSD
RE-S-1600x8	MX204	• High-performance 1.6-GHz Intel 8 Core X86 CPU • 32-GB DDR4 RAM • 100-GB SATA SSD
JNP304-RE-S	MX304	• 8-core, Intel Icelake Based Multicore Processor CPU • 128-GB of DRAM • Two 200-GB SATA SSD
RE-QFX10002-60C	QFX10002-60C	• High-performance 1.6-GHz Intel 8 Core X86 CPU • 32-GB DDR4 RAM • Two 50-GB SATA SSD
RE-PTX10002-60C	PTX10002-60C	• High-performance 1.6-GHz Intel 8 Core X86 CPU • 32-GB DDR4 RAM • Two 50-GB SATA SSD
RE-ACX-5448	ACX5448	• High-performance 1.6-GHz Intel 8 Core X86 CPU • 32-GB two DIMM DRAM • Two 100-GB SATA SSD

Table 59: Hardware Specifications of the RE-MX-X6, RE-MX-X8, RE-PTX-X8, RCBPTX, RE-QFX10002-60C, and RE-PTX10002-60C Routing Engines *(Continued)*

Model Number	Supported on Device	Specifications
RE-X10	MX10008	• High-performance 1.6-GHz Intel 10 Core X86 CPU • 64-GB DDR4 RAM • Two 200-GB SATA SSD

Table 60: 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 60: 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-M40-600-2048	600-MHz Pentium III	2048 MB	Fast Ethernet	30 GB hard disk	128 MB CompactFlash card	5.4	PSN-2004-11-020
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 58 on page 162 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.

SEE ALSO

Supported Routing Engines by Router

Supported Routing Engines by Router

IN THIS SECTION

- M7i Routing Engines | **172**
- M10i Routing Engines | **172**

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

Table 61 on page 172 lists the Routing Engines supported by the M7i router. The M7i router supports 32-bit Junos OS only.

Table 61: 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 62 on page 172 lists the Routing Engines supported by the M10i router. The M10i router supports 32-bit Junos OS only.

Table 62: 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
RE-850-1536 (EOL details: TSB15553)	RE-850	7.2	fxp0	fxp1 fxp2

Table 62: M10i Routing Engines *(Continued)*

Model Number	Name in CLI Output	First Supported 32-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
RE-B-1800X1-4G	`RE-B-1800x1`	11.4R4 12.1R2	fxp0	em0

M40e Routing Engines

Table 63 on page 173 lists the Routing Engines supported by the M40e router.

Table 63: 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 64 on page 173 lists the Routing Engines supported by the M120 router.

Table 64: 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

Table 64: 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-2000-4096	`RE-A-2000`	8.0R2	–	fxp0	em0 bcm0
RE-A-1800X2-8G	`RE-A-1800x2`	• 11.4R5 • 12.1R3	10.4	fxp0	fxp1 fxp2
RE-A-1800X2-16G	`RE-A-1800x2`	• 11.4R5 • 12.1R3	10.4	fxp0	fxp1 fxp2
RE-A-1800X4-16G	`RE-A-1800x4`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1

M320 Routing Engines

lists the Routing Engines supported by the M320 router.

Table 65: 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

Table 65: M320 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-1800X2-8G	RE-A-1800x2	• 11.4R5 • 12.1R3	10.4	fxp0	em0 bcm0
RE-A-1800X2-16G	RE-A-1800x2	• 11.4R5 • 12.1R3	10.4	fxp0	em0 bcm0
RE-A-1800X4-8G	RE-A-1800X4	• 11.4R5 • 12.1R3 • 12.2	10.4	fxp0	em0 em1

MX5, MX10, MX40, and MX80 Routing Engine

lists the Routing Engines supported by the MX5, MX10, MX40, and MX80 routers.

Table 66: 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 **NOTE**: em1 is used to communicate with the MS-MIC when it is inserted.

MX104 Routing Engines

lists the Routing Engines supported by MX104 routers.

Table 67: 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	em0 em1

MX204 Routing Engine

lists the Routing Engines supported by the MX204 router.

Table 68: MX204 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	RE-S-1600x8	-	17.4	fxp0	em2 em3 em4

MX304 Routing Engine

lists the Routing Engines supported by the MX304 router.

Table 69: MX304 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
JNP304-RE-S	`RE 2700 8C 128G`	-	22.2R	fxp0	fxp0

MX240 Routing Engines

lists the Routing Engines supported by MX240 routers.

Table 70: 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`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800x2-16G (EOL details: TSB16556	`RE-S-1800x2`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1

Table 70: 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`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-16G	`RE-S-1800x4`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-32G-S	`RE-S-1800X4`	• 12.3R4 • 13.2R1	• 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

Table 70: MX240 Supported Routing Engines *(Continued)*

RE-S-X6-128G	`RE-S-2X00x6-128`	–	18.1R1	fxp0	ixlv0, igb0 em0
RE-S-X6-128G-K	RE-S-X6-128G-K	-	22.2R1S2	fxp0	ixlv0, igb0, em0
RE-S-X6-128G-LT	RE-S-X6-128G-LT	-	24.2R1	fxp0	ixlv0, igb0, em0

MX480 Routing Engines

lists the Routing Engines supported by MX480 routers.

Table 71: 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	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X2-16G (EOL details: TSB16556	RE-S-1800x2	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-8G	RE-S-1800X4	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-16G	RE-S-1800x4	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-32G-S	RE-S-1800X4	• 12.3R4 • 13.2R1	• 12.3R4 • 13.2R1	fxp0	em0 em1

Table 71: 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-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
RE-S-X6-128G-K	RE-S-X6-128G-K	-	22.2R1S2	fxp0	ixlv0, igb0, em0
RE-S-X6-128G-LT	RE-S-X6-128G-LT	-	24.2R1	fxp0	ixlv0, igb0, em0

MX960 Routing Engines

lists the Routing Engines supported by MX960 routers.

Table 72: 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

Table 72: 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-2000-4096 (EOL details: TSB16735	`RE-S-2000`	8.2	–	fxp0	fxp1 fxp2
RE-S-1800X2-8G (EOL details: TSB16556	`RE-S-1800x2`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X2-16G (EOL details: TSB16556	`RE-S-1800x2`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-8G	`RE-S-1800x4`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-16G	`RE-S-1800x4`	• 11.4R5 • 12.1R3	10.4	fxp0	em0 em1
RE-S-1800X4-32G-S	`RE-S-1800x4`	• 12.3R4 • 13.2R1	• 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`	–	17.2R1	fxp0	ixlv0, igb0

Table 72: 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-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
RE-S-X6-128G-K	RE-S-X6-128G-K	-	22.2R1S2	fxp0	ixlv0, igb0, em0
RE-S-X6-128G-LT	RE-S-X6-128G-LT	-	24.2R1	fxp0	ixlv0, igb0, em0

MX2008 Routing Engines

lists the Routing Engines supported by MX2008 routers.

Table 73: 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	`REMX2008-X8-64G-LT`	17.2R1	fxp0	ixlv0 ixlv1

Table 73: MX2008 Supported Routing Engines *(Continued)*

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

MX2010 Routing Engines

lists the Routing Engines supported by MX2010 routers.

Table 74: 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	• 12.3R4 • 13.2R1	fxp0	em0 em1
REMX2K-X8-64G	RE-S-2X00x8	• 15.1F5-S1 • 16.1R2 • 16.2R1	fxp0	ixlv0 ixlv1 em0
REMX2K-X8-64G-LT	RE-S-2X00x8	17.2R1	fxp0	ixlv0 ixlv1 em0

Table 74: MX2010 Supported Routing Engines *(Continued)*

Model Number	Name in CLI Output	First Supported 64-bit Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
REMX2K-X8-128G	`RE-MX200X8-128G`	18.1R1	fxp0	ixlv0 ixlv1

MX2020 Supported Routing Engines

lists the Routing Engines supported by MX2020 routers.

Table 75: 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`	• 12.3R4 • 13.2R1	fxp0	em0 em1
REMX2K-X8-64G	`RE-S-2X00x8`	• 15.1F5-S1 • 16.1R2 • 16.2R1	fxp0	ixlv0 ixlv1 em0
REMX2K-X8-64G-LT	`RE-S-2X00x8`	17.2R1	fxp0	ixlv0 ixlv1 em0

Table 75: 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-X8-128G	`RE-MX200X8-128G`	18.1R1	fxp0	ixlv0 ixlv1 em0

MX10003 Routing Engines

lists the Routing Engines supported by MX10003 routers.

Table 76: 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-1600x8`	17.3R1	fxp0	em3 em4
JNP10003-RE1-LT	`RE-S-1600x8`	18.1R1	fxp0	em3 em4

MX10008 Routing Engines

lists the Routing Engines supported on the MX10008 router.

Table 77: 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

PTX1000 Routing Engines

lists the Routing Engine supported on the PTX1000.

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

Table 78: 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`	• 16.1X65-D30 • 17.2R1	em0 em2	bme0 em1

PTX3000 Routing Engines

lists the Routing Engines supported on the PTX3000.

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

Table 79: 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

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 80: 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 12.3 13.2 **NOTE**: The PTX5000 does not support Junos OS Releases 12.1, 12.2, or 13.1.	em0	ixgbe0 ixgbe1
RE-PTX-X8-64G	RE-PTX-2X00x8	15.1F4 16.1R1	em0	ixlv0 ixlv1 em1
RE-PTX-X8-128G	RE-PTX-2X00x8-128G	18.1R1	em0	ixlv0 ixlv1 em1

PTX10008 and PTX10016 Routing Engines

lists the Routing Engines supported on the PTX10008 and PTX10016 routers.

Table 81: 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

Table 81: PTX10008 and PTX10016 Routing Engines *(Continued)*

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
JNP10K-RE1 (on PTX10008)	`RE X10`	18.2R1	em0 em1	bme0 bme1

PTX10001 Routing Engine

lists the Routing Engine supported on the PTX10001 router (JNP10001-20C).

Table 82: PTX10001 Routing Engine

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
Built-in Routing Engine	`RE-PTX10001-20C`	18.4R1	em0, em2	em1 bme0

PTX10002-60 Routing Engine

lists the Routing Engine supported on the PTX10002-60 router.

Table 83: PTX10002-60 Routing Engine

Model Number	Name in CLI Output	First Supported Junos OS Release	Management Ethernet Interface	Internal Ethernet Interface
Built-in Routing Engine	`RE-PTX10002-60C`	18.2R1	em0, em2	em1 bme0

T320 Routing Engines

lists the Routing Engines supported by the T320 router.

Table 84: 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 85 on page 190 lists the Routing Engines supported by the T640 router.

Table 85: 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

Table 85: T640 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-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

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 86: 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
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 87 on page 193 lists the Routing Engines supported by the T4000 router.

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

Table 87: 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 88 on page 193 lists the Routing Engines supported by the TX Matrix router.

Table 88: 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

Table 88: TX Matrix 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)`	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

lists the Routing Engines supported by the TX Matrix Plus router.

Table 89: 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

lists the Routing Engines supported by the TX Matrix Plus router with 3D SIBs.

Table 90: 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

SEE ALSO

| *Understanding Internal Ethernet Interfaces*

MX2008 Switch Fabric Boards

IN THIS SECTION

- MX2008 Enhanced Switch Fabric Board (MX2008 SFB2) Description **| 195**
- MX2008 SFB LED **| 197**

MX2008 Enhanced Switch Fabric Board (MX2008 SFB2) Description

IN THIS SECTION

- MX2008 SFB2 Slots **| 196**
- MX2008 SFB2 Redundancy **| 197**

The MX2008 Enhanced Switch Fabric Board (MX2008 SFB2; model number: MX2008-SFB2) connects to the signal backplane (see Figure 67 on page 196). The MX2008 SFB2 and the native MX2000 SFB2 are exactly the same except that the native MX2000 SFB2 has two PF fabric chips per card whereas MX2008 SFB2 has only one PF fabric chip per card, and that MX2008 SFB2 is less than half the size of the native MX2000 SFB2.

Figure 67: MX2008 SFB2
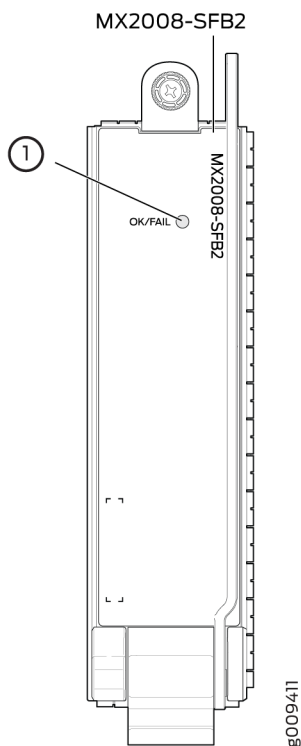
1— **OK/FAIL** LED showing the SFB2 status

MX2008 SFB2 Slots

You can install up to eight SFB2 boards in the MX2008 router. The MX2008 SFB2 boards install vertically into the front of the chassis in the slots labeled **0** through **7**. If any slots are empty, you must install a blank panel.

> ⚠️ **CAUTION**: If one of the MX2008 SFB2s fails, do not remove the failed SFB2 until you have a replacement or blank panel to install.

MX2008 SFB2 Redundancy

Seven out of eight MX2008 SFB2 boards are required for line-rate operation. The system can continue operating with fewer than seven SFB2s, but forwarding performance is impacted.

MX2008 SFB2 Components

Each MX2008 SFB2 consists of the following components:

- One PF fabric chip per card

- PCIe control of one PF ASIC

- I2C bus logic interface, used for component management and monitoring of temperature, and voltage

- Switch fabric—Provides the switching functions for the MPCs

- Fabric capacity—MX2008 SFB2 supports 2000 Gbps per slot throughput without redundancy

- Circuits for chassis management and control

- Power circuits for the MX2008 SFB2

- LED—Provides status of the MX2008 SFB2

SEE ALSO

Replacing an MX2008 SFB | **478**

MX2008 SFB LED

One bicolor LED on the MX2008 SFB2 indicates the status of the SFB. The LED, labeled **OK/FAIL**, is located directly on the SFB. Table 91 on page 198 describes the functions of the MX2008 SFB2 LED.

Figure 68: MX2008 SFB2 LED
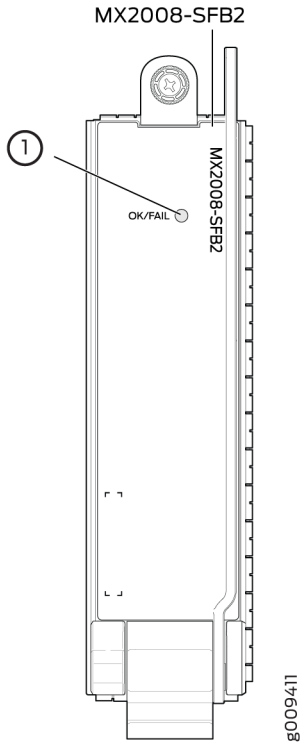
Table 91: MX2008 Switch Fabric Board LED

Function No.	Label	Color	State	Description
1	**OK/FAIL**	Green	Slow blinking when being initialized. Fast blinking when SFB is being identified by software. **NOTE**: The blinking of the LED is used to guide the operator to correct any action needed on the SFB.	SFB is online.
		Red	On steadily	SFB has failed.
		–	Off	SFB is offline.

Each SFB also has a set of bicolor LEDs on the craft interface that indicate its status. The SFB LED, labeled **0** through **7**, are located along the bottom center of the craft interface. For more information about the SFB LEDs on the craft interface, see "MX2008 Component LEDs on the Craft Interface" on page 41.

SEE ALSO

Replacing an MX2008 SFB | 478

MX2008 Interface Modules

IN THIS SECTION

MX2000 Adapter Card (ADC) Description

The MX2000 routers are compatible with all Trio-based MPC line cards; However, because the MX2000 routers use a newer-generation Switch Fabric Board (SFB) with faster bandwidth, smaller form-factor MPCs must use a special Line Card Adapter (ADC). The ADC is merely a shell that accepts line cards in the front and converts power and switch fabric in the rear. ADCs install vertically in the front of the router.

The following MPCs require an ADC:

- MPC1E

- MPC2E

- MPC3E

- MPC5E

- MPC7E

> **NOTE**: When a slot is not occupied by a combined ADC and MPC, you must insert a blank panel to fill the empty slot and ensure proper cooling of the system.

ADCs are hot-removable and hot-insertable. Figure 69 on page 200 shows the ADC supported on MX2000 routers.

Figure 69: ADC for the MX2000 Routers
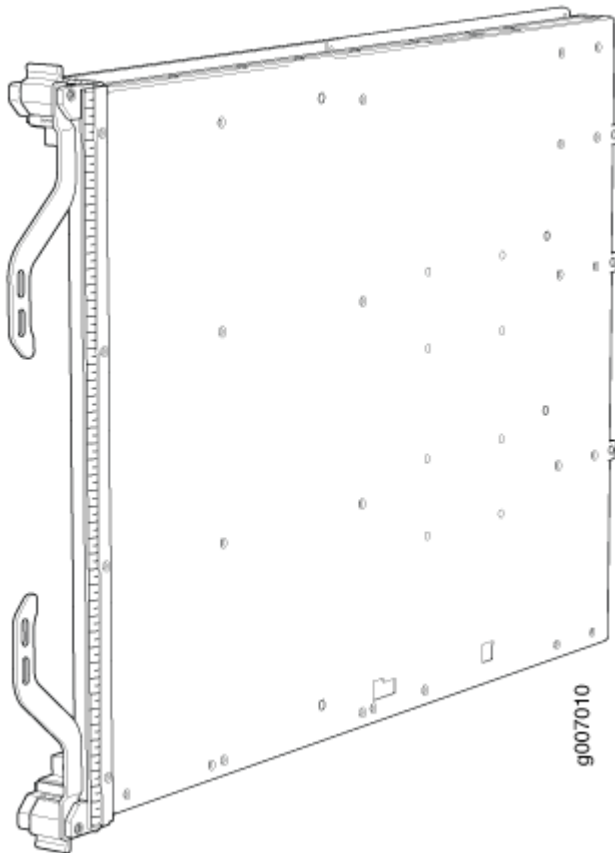
Maintaining MX2020 Adapter Cards

MX2008 Modular Port Concentrator Description

IN THIS SECTION

- MPC Components | **203**

The Modular Port Concentrators (MPCs) provide packet forwarding services. An MPC installs into an adapter card, which in turn connects to the backplane. Modular Interface Cards (MICs) provide the physical interfaces and install into the MPCs. The user can install up to two MICs of different media types on the same MPC as long as the MPC supports those MICs.

An adapter card is required only for those MPCs that support adapter card. Not all the MPCs require an adapter card.

> **NOTE**: The MX2008 router also supports fixed-port MPCs.

MICs receive incoming packets from the network and transmit outgoing packets to the network. During this process, each MIC performs framing and high-speed signaling for its media type. Each MPC is equipped with up to four Junos Trio chipsets, which perform control functions tailored to the MPC's media type.

The MX2008 router supports up to 10 MPCs. For power requirements, see "Calculating AC Power Requirements for MX2008 Routers" on page 263 and "Calculating DC Power Requirements for MX2008 Routers" on page 267.

The router has 10 dedicated line-card slots for MPCs. MPCs install vertically in the front of the router. The dedicated slots are numbered **0** though **9** (left to right). An MPC can be installed in any line-card slot. The user can install any combination of MPC types in the router.

When an MPC slot is not occupied by an MPC or an adapter card with MPC, a blank MPC panel needs to be installed.

MPCs are hot-removable and hot-insertable. When the user installs an MPC in an operating router, the RCB downloads the MPC software, the MPC runs its diagnostics, and enables the Packet Forwarding Engines housed on the MPC. Forwarding on other MPCs continues uninterrupted during this process.

Figure 70 on page 202 shows a typical MPC supported on the MX2008 router. Figure 71 on page 203 shows an MPC installed vertically in the MX2008 router. For more information about MPCs, see the *MX Series Interface Module Reference*.

Figure 70: Typical MPC Supported on the MX2008 Router
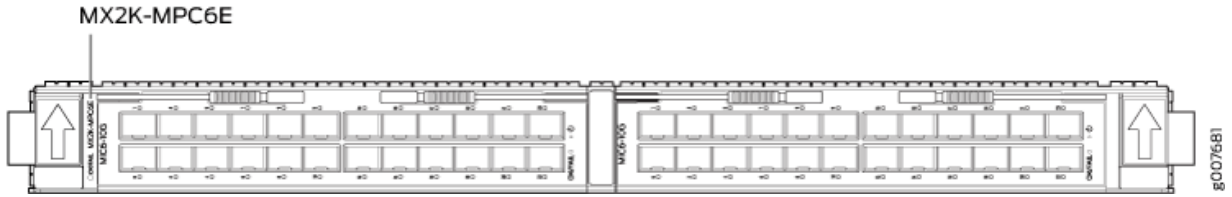
Figure 71: MPC Installed in the MX2008 Router
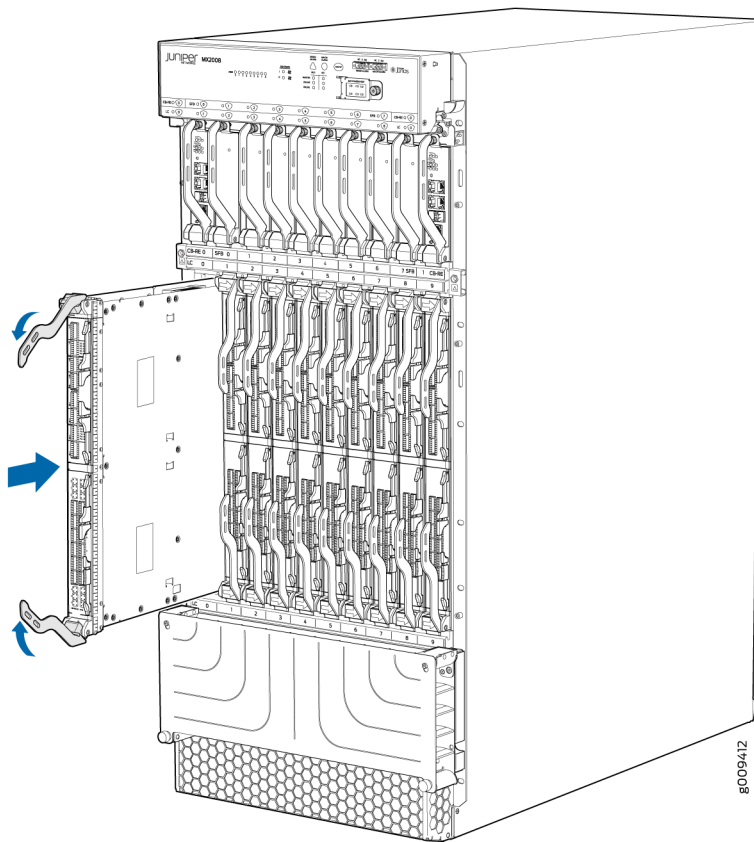
MPC Components

Each MPC consists of the following components:

- MIC card carrier, which includes two MIC slots (excludes the fixed-configuration MPC).

- Fabric interfaces.

- Two Gigabit Ethernet interfaces that allow control information, route information, and statistics to be sent between the Routing Engine and the CPU on the MPCs.

- Up to four Junos Trio chipsets, which perform control functions tailored to the MPC's media type.

- Backplane connectors and power circuitry.

- Online button located on the craft interface, which takes the MPC online or offline when pressed.

- **OK/FAIL** LED on the MPC faceplate. For more information about LEDs on the MPC faceplate, see the *MX Series Interface Module Reference*.

SEE ALSO

MX2008 Field-Replaceable Units | **30**

Maintaining Cables That Connect to MX2008 MPCs or MICs | **575**

Replacing an MX2008 MPC | **462**

Troubleshooting the MX2008 MPCs | **596**

MX2000 Adapter Card (ADC) Description | **199**

MX2008 Modular Port Concentrator LEDs

One bicolor LED located on the craft interface above the MPC, displays the status of the MPC. For more information about the MPC LEDs on the craft interface, see "MX2008 Component LEDs on the Craft Interface" on page 41.

Each MPC also has LEDs located on the faceplate. For more information about LEDs on the MPC faceplate, see the "LEDs" section for each MPC in the *MX Series Interface Module Reference*.

SEE ALSO

Replacing an MX2008 MPC | **462**

Troubleshooting the MX2008 MPCs | **596**

MICs Supported by MX Series Routers | **213**

MPCs Supported by MX Series Routers

Table 92 on page 205 lists the MPCs and their first supported Junos OS release on MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 routers.

Table 92: MPCs Supported by MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 Routers

MPC Name	MPC Model Number	First Junos OS Release on MX240, MX480, and MX960 Routers	First Junos OS Release on MX2008 Routers	First Junos OS Release on MX2010 Routers	First Junos OS Release on MX2020 Routers	First Junos OS Release on MX10003 Routers	First Junos OS Release on MX10008 Routers
Fixed Configuration MPCs							
MPC-3D-16X GE-SFPP	MPC-3D-16XGE-SFP	10.0R2	15.1F7	12.3	12.3	–	–
Multiservices MPC	MS-MPC	13.2R4	15.1F7	15.1	15.1	–	–
32x10GE MPC4E	MPC4E-3D-32XGE-SFPP	12.3R2	15.1F7	12.3R2	12.3R2	–	–
2x100GE + 8x10GE MPC4E	MPC4E-3D-2CGE-8XGE	12.3R2	15.1F7	12.3R2	12.3R2	–	–
6x40GE + 24x10GE MPC5E	MPC5E-40G10G	13.3R2	15.1F7	13.3R2	13.3R2	–	–
6x40GE + 24x10GE MPC5EQ	MPC5EQ-40G10G	13.3R2	15.1F7	13.3R2	13.3R2	–	–
2x100GE + 4x10GE MPC5E	MPC5E-100G10G	13.3R3	15.1F7	13.3R3	13.3R3	–	–

Table 92: MPCs Supported by MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 Routers *(Continued)*

MPC Name	MPC Model Number	First Junos OS Release on MX240, MX480, and MX960 Routers	First Junos OS Release on MX2008 Routers	First Junos OS Release on MX2010 Routers	First Junos OS Release on MX2020 Routers	First Junos OS Release on MX10003 Routers	First Junos OS Release on MX10008 Routers
2x100GE + 4x10GE MPC5EQ	MPC5EQ-100G10G	13.3R3	15.1F7	13.3R3	13.3R3	–	–
MPC7E-MRATE	MPC7E-MRATE	• 15.1F4 with Junos Continuity • 16.1R1 and later	15.1F7	• 15.1F4 with Junos Continuity • 16.1R1 and later	• 15.1F4 with Junos Continuity • 16.1R1 and later	–	–
MPC7E-10G	MPC7E-10G	• 15.1F5 with Junos Continuity • 16.1R1 and later	15.1F7	• 15.1F5 with Junos Continuity • 16.1R1 and later	• 15.1F5 with Junos Continuity • 16.1R1 and later	–	–
MPC10E-10C -MRATE	MPC10E-10C -MRATE	19.2R1	–	–	–	–	–
MPC10E-15C -MRATE	MPC10E-15C -MRATE	19.1R1	–	–	–	–	–

Table 92: MPCs Supported by MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 Routers *(Continued)*

MPC Name	MPC Model Number	First Junos OS Release on MX240, MX480, and MX960 Routers	First Junos OS Release on MX2008 Routers	First Junos OS Release on MX2010 Routers	First Junos OS Release on MX2020 Routers	First Junos OS Release on MX10003 Routers	First Junos OS Release on MX10008 Routers
MX2K-MPC11E Modular Port Concentrator	MX2K-MPC11E	-	-	• 19.3R2 and later 19.3 releases • 20.1R1 **NOTE**: The MX2K-MPC11E MPC is not supported in any 19.4 releases.	• 19.3R2 and later 19.3 releases • 20.1R1 **NOTE**: The MX2K-MPC11E MPC is not supported in any 19.4 releases.	-	-
MPCs							
MPC1	MX-MPC1-3D	10.2	15.1F7	12.3	12.3	–	–
MPC1E	MX-MPC1E-3D	11.2R4	15.1F7	12.3	12.3	–	–
MPC1 Q	MX-MPC1-3D-Q	10.2	15.1F7	12.3	12.3	–	–

Table 92: MPCs Supported by MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 Routers *(Continued)*

MPC Name	MPC Model Number	First Junos OS Release on MX240, MX480, and MX960 Routers	First Junos OS Release on MX2008 Routers	First Junos OS Release on MX2010 Routers	First Junos OS Release on MX2020 Routers	First Junos OS Release on MX10003 Routers	First Junos OS Release on MX10008 Routers
MPC1E Q	MX-MPC1E-3D-Q	11.2R4	15.1F7	12.3	12.3	–	–
MPC2	MX-MPC2-3D	10.1	15.1F7	12.3	12.3	–	–
MPC2E	MX-MPC2E-3D	11.2R4	15.1F7	12.3	12.3	–	
MPC2 Q	MX-MPC2-3D-Q	10.1	15.1F7	12.3	12.3	–	–
MPC2E Q	MX-MPC2E-3D-Q	11.2R4	15.1F7	12.3	12.3	–	–
MPC2 EQ	MX-MPC2-3D-EQ	10.1	15.1F7	12.3	12.3	–	–
MPC2E EQ	MX-MPC2E-3D-EQ	11.2R4	15.1F7	12.3	12.3	–	–
MPC2E P	MX-MPC2E-3D-P	12.2	15.1F7	12.3	12.3	–	–

Table 92: MPCs Supported by MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 Routers *(Continued)*

MPC Name	MPC Model Number	First Junos OS Release on MX240, MX480, and MX960 Routers	First Junos OS Release on MX2008 Routers	First Junos OS Release on MX2010 Routers	First Junos OS Release on MX2020 Routers	First Junos OS Release on MX10003 Routers	First Junos OS Release on MX10008 Routers
MPC2E NG	MX-MPC2E-3D-NG	14.1R4, 14.2R3 and Junos Continuity 15.1	15.1F7	14.1R4, 14.2R3 and Junos Continuity 15.1	14.1R4, 14.2R3 and Junos Continuity 15.1	–	–
MPC2E NG Q	MX-MPC2E-3D-NG-Q	14.1R4, 14.2R3 and Junos Continuity 15.1	15.1F7	14.1R4, 14.2R3 and Junos Continuity 15.1	14.1R4, 14.2R3 and Junos Continuity 15.1	–	–
MPC3E	MX-MPC3E-3D	12.1	15.1F7	12.3	12.3	–	–
MPC3E-3D-NG	MX-MPC3E-3D-NG	14.1R4, 14.2R3 and Junos Continuity 15.1	15.1F7	14.1R4, 14.2R3 and Junos Continuity 15.1	14.1R4, 14.2R3 and Junos Continuity 15.1	–	–
MPC3E-3D-NG-Q	MX-MPC3E-3D-NG-Q	14.1R4, 14.2R3 and Junos Continuity 15.1	15.1F7	14.1R4, 14.2R3 and Junos Continuity 15.1	14.1R4, 14.2R3 and Junos Continuity 15.1	–	–

Table 92: MPCs Supported by MX240, MX480, MX960, MX2008, MX2010, MX2020, and MX10003 Routers *(Continued)*

MPC Name	MPC Model Number	First Junos OS Release on MX240, MX480, and MX960 Routers	First Junos OS Release on MX2008 Routers	First Junos OS Release on MX2010 Routers	First Junos OS Release on MX2020 Routers	First Junos OS Release on MX10003 Routers	First Junos OS Release on MX10008 Routers
MPC6E	MX2K-MPC6E	–	15.1F7	13.3R2	13.3R2	–	–
MPC8E	MX2K-MPC8E	–	15.1F7	• 15.1F5 with Junos Continuity • 16.1R1 and later	• 15.1F5 with Junos Continuity • 16.1R1 and later	–	–
MPC9E	MX2K-MPC9E	–	15.1F7	• 15.1F5 with Junos Continuity • 16.1R1 and later	• 15.1F5 with Junos Continuity • 16.1R1 and later	–	–
MX10003 MPC (Multi-Rate)	MX10003-LC2103	–	–	–	–	17.3	
MX10003 MPC (Multi-Rate)	MX10003-LC2103-V2	–	–	–	–	21.3R1	

SEE ALSO

MX Series MPC Overview

MX Series MPC Overview

MX Series MIC Overview

MICs Supported by MX Series Routers

MIC/MPC Compatibility

Pathfinder: Hardware Supported by Junos Continuity Software

MX2008 MPC Terminology

Regardless of whether you are holding an MPC vertically or horizontally, this information uses the same terms for all four edges of the MPC (see):

- Faceplate—Edge of the MPC that has connectors into which you insert the SFP or XFP transceivers

- Connector edge—Edge opposite the faceplate; this edge has the connectors that attach to the midplane

- Top edge—Edge at the top of the MPC when it is vertical

- Bottom edge—Edge at the bottom of the MPC when it is vertical

Figure 72: MPC Edges
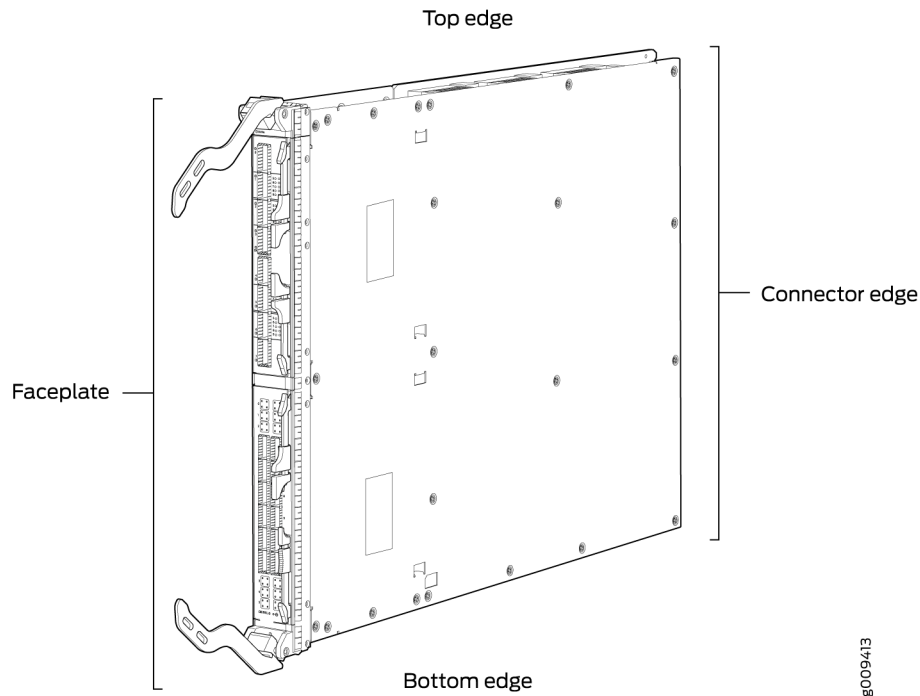
MX2008 Modular Interface Card Description

The Modular Interface Cards (MICs) install into the Modular Port Concentrators (MPCs) and provide the physical connections to various network media types. MICs allow different physical interfaces to be supported on a single MPC. You can install MICs of different media types on the same MPC as long as the MPC supports those MICs.

MICs receive incoming packets from the network and transmit outgoing packets to the network. During this process, each MIC performs framing and high-speed signaling for its media type.

MICs are hot-removable and hot-insertable. The user can install up to two MICs in each MPC.

SEE ALSO

MICs Supported by MX Series Routers

The following tables list the first supported Junos OS release for the MX Series.

- lists the first supported Junos OS release for MICs on MX240, MX480, MX960, and MX2008 routers.

- lists the first supported Junos OS release for MICs on MX2010 and MX2020 routers.

- list the first supported Junos OS release for MICs on MX5, MX10, and MX40 routers.

- lists the first supported Junos OS release for MICs on MX80 and MX104 routers.

- lists the first supported Junos OS release for MICs on MX10003 router.

Table 93: MICs Supported by MX240, MX480, MX960, and MX2008 Routers

MIC Name	MIC Model Number	Ports	MX240, MX480, and MX960 Routers	MX2008 Routers
ATM				
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	8	12.1	15.1F7
DS3/E3				
DS3/E3 MIC	MIC-3D-8DS3-E3, MIC-3D-8CHDS3-E3-B	8	11.4	15.1F7

Table 93: MICs Supported by MX240, MX480, MX960, and MX2008 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX240, MX480, and MX960 Routers	MX2008 Routers
Circuit Emulation				
Channelized E1/T1 Circuit Emulation MIC	MIC-3D-16CHE1-T1-CE	16	12.3	15.1F7
Gigabit Ethernet				
Gigabit Ethernet MIC with SFP	MIC-3D-20GE-SFP	20	10.1	15.1F7
Gigabit Ethernet MIC with SFP (E)	MIC-3D-20GE-SFP-E	20	13.3	15.1F7
Gigabit Ethernet MIC with 256b-AES MACsec	MIC-MACSEC-20GE	20	18.3	—
10-Gigabit Ethernet				
10-Gigabit Ethernet MICs with XFP	MIC-3D-2XGE-XFP	2	10.2	15.1F7
10-Gigabit Ethernet MICs with XFP	MIC-3D-4XGE-XFP	4	10.1	15.1F7
No Link Title	MIC-3D-10GE-SFP-E	10	24.2	—
10-Gigabit Ethernet MIC with SFP+ (10 Ports)	MIC3-3D-10XGE-SFPP	10	12.3	15.1F7

Table 93: MICs Supported by MX240, MX480, MX960, and MX2008 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX240, MX480, and MX960 Routers	MX2008 Routers
10-Gigabit Ethernet MIC with SFP+ (24 Ports)	MIC6-10G	24	–	15.1F7
10-Gigabit Ethernet OTN MIC with SFP+ (24 Ports)	MIC6-10G-OTN	24	–	15.1F7
40-Gigabit Ethernet				
40-Gigabit Ethernet MIC with QSFP+	MIC3-3D-2X40GE-QSFPP	2	12.2	15.1F7
100-Gigabit Ethernet				
100-Gigabit Ethernet MIC with CFP	MIC3-3D-1X100GE-CFP	1	12.1	15.1F7
100-Gigabit Ethernet MIC with CXP	MIC3-3D-1X100GE-CXP	1	12.2	15.1F7
100-Gigabit Ethernet MIC with CXP (4 Ports)	MIC6-100G-CXP	4	–	15.1F7
100-Gigabit Ethernet MIC with CFP2	MIC6-100G-CFP2	2	–	15.1F7
100-Gigabit DWDM OTN				

Table 93: MICs Supported by MX240, MX480, MX960, and MX2008 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX240, MX480, and MX960 Routers	MX2008 Routers
100-Gigabit DWDM OTN MIC with CFP2-ACO	MIC3-100G-DWDM	1	15.1F5 15.1F6 17.1R1	15.1F7
Multi-Rate				
SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-4OC3OC12-1OC48	4	11.2	15.1F7
SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-8OC3OC12-4OC48	8	11.2	15.1F7
Channelized SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-4CHOC3-2CHOC12	4	11.4	15.1F7
Channelized SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-8CHOC3-4CHOC12	8	11.4	15.1F7
Channelized OC3/ STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1COC12-CE	4	12.2	15.1F7
MIC MRATE (12-Port Multi-Rate MIC with QSFP+)	MIC-MRATE	12	—	15.1F7

Table 93: MICs Supported by MX240, MX480, MX960, and MX2008 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX240, MX480, and MX960 Routers	MX2008 Routers
Multi-Rate Ethernet MIC (12-Port Multi-Rate MACsec MIC with QSFP+)	MIC-MACSEC-MRATE	12	—	17.4
Tri-Rate				
Tri-Rate MIC	MIC-3D-40GE-TX	40	10.2	15.1F7
Services				
Multiservices MIC	MS-MIC-16G	0	13.2	15.1F7
SONET/SDH				
SONET/SDH OC192/STM64 MIC with XFP	MIC-3D-1OC192-XFP	1	12.2	15.1F7

Table 94: MICs Supported by MX2010 and MX2020 Routers

MIC Name	MIC Model Number	Ports	MX2010 Routers	MX2020 Routers
ATM				
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	8	12.3	12.3
DS3/E3				
DS3/E3 MIC	MIC-3D-8DS3-E3, MIC-3D-8CHDS3-E3-B	8	12.3	12.3

Table 94: MICs Supported by MX2010 and MX2020 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX2010 Routers	MX2020 Routers
Circuit Emulation				
Channelized E1/T1 Circuit Emulation MIC	MIC-3D-16CHE1-T1-CE	16	—	—
Gigabit Ethernet				
Gigabit Ethernet MIC with SFP	MIC-3D-20GE-SFP	20	12.3	12.3
Gigabit Ethernet MIC with SFP (E)	MIC-3D-20GE-SFP-E	20	13.3	13.3
10-Gigabit Ethernet				
10-Gigabit Ethernet MICs with XFP	MIC-3D-2XGE-XFP	2	12.3	12.3
10-Gigabit Ethernet MICs with XFP	MIC-3D-4XGE-XFP	4	12.3	12.3
No Link Title	MIC-3D-10GE-SFP-E	10	24.2	24.2
10-Gigabit Ethernet MIC with SFP+ (10 Ports)	MIC3-3D-10XGE-SFPP	10	12.3	12.3
10-Gigabit Ethernet MIC with SFP+ (24 Ports)	MIC6-10G	24	13.3R2	13.3R2
10-Gigabit Ethernet OTN MIC with SFP+ (24 Ports)	MIC6-10G-OTN	24	13.3R3	13.3R3

Table 94: MICs Supported by MX2010 and MX2020 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX2010 Routers	MX2020 Routers
40-Gigabit Ethernet				
40-Gigabit Ethernet MIC with QSFP+	MIC3-3D-2X40GE-QSFPP	2	12.3	12.3
100-Gigabit Ethernet				
100-Gigabit Ethernet MIC with CFP	MIC3-3D-1X100GE-CFP	1	12.3	12.3
100-Gigabit Ethernet MIC with CXP	MIC3-3D-1X100GE-CXP	1	12.3	12.3
100-Gigabit Ethernet MIC with CXP (4 Ports)	MIC6-100G-CXP	4	13.3R2	13.3R2
100-Gigabit Ethernet MIC with CFP2	MIC6-100G-CFP2	2	13.3R3	13.3R3
100-Gigabit DWDM OTN				
100-Gigabit DWDM OTN MIC with CFP2-ACO	MIC3-100G-DWDM	1	15.1F515.1F617.1R1	15.1F515.1F617.1R1
Multi-Rate				
SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-4OC3OC12-1OC48	4	12.3	12.3
SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-8OC3OC12-4OC48	8	12.3	12.3

Table 94: MICs Supported by MX2010 and MX2020 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX2010 Routers	MX2020 Routers
Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-4CHOC3 -2CHOC12	4	12.3	12.3
Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-8CHOC3 -4CHOC12	8	12.3	12.3
Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1 COC12-CE	4	12.3	12.3
MIC MRATE (12-Port Multi-Rate MIC with QSFP +)	MIC-MRATE	12	15.1F5 with Junos Continuity 16.1R1 and later	15.1F5 with Junos Continuity 16.1R1 and later
Multi-Rate Ethernet MIC (12-Port Multi-Rate MACsec MIC with QSFP+)	MIC-MACSEC- MRATE	12	17.4	17.4
Tri-Rate				
Tri-Rate MIC	MIC-3D-40GE-TX	40	12.3	12.3
Services				
Multiservices MIC	MS-MIC-16G	0	13.2	13.2
SONET/SDH				
SONET/SDH OC192/ STM64 MIC with XFP	MIC-3D-1OC192- XFP	1	12.3	12.3

Table 95: MICs Supported by MX5, MX10, and MX40 Routers

MIC Name	MIC Model Number	Ports	MX5	MX10	MX40
ATM					
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	8	12.1	12.1	12.1
DS3/E3					
DS3/E3 MIC	MIC-3D-8DS3-E3, MIC-3D-8CHDS3-E3-B	8	11.4	11.4	11.4
Circuit Emulation					
Channelized E1/T1 Circuit Emulation MIC	MIC-3D-16CHE1-T1-CE	16	13.2R2	13.2R2	13.2R2
Channelized E1/T1 Circuit Emulation MIC (H)	MIC-3D-16CHE1-T1-CE-H	16	—	—	—
Gigabit Ethernet					
Gigabit Ethernet MIC with SFP	MIC-3D-20GE-SFP	20	11.2R4	11.2R4	11.2R4
Gigabit Ethernet MIC with SFP (E)	MIC-3D-20GE-SFP-E	20	13.2R2	13.2R2	13.2R2

Table 95: MICs Supported by MX5, MX10, and MX40 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX5	MX10	MX40
Gigabit Ethernet MIC with SFP (EH)	MIC-3D-20GE-SFP-EH	20	—	—	—
10-Gigabit Ethernet					
10-Gigabit Ethernet MICs with XFP	MIC-3D-2XGE-XFP	2	11.2R4	11.2R4	11.2R4
Multi-Rate					
SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-4OC3 OC12-1OC48	4	11.2R4	11.2R4	11.2R4
SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-8OC3 OC12-4OC48	8	11.2R4	11.2R4	11.2R4
Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-4CHO C3-2CHOC12	4	11.4	11.4	11.4
Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP	MIC-3D-8CHO C3-4CHOC12	8	11.4	11.4	11.4

Table 95: MICs Supported by MX5, MX10, and MX40 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX5	MX10	MX40
Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1COC12-CE	4	12.2	12.2	12.2
Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP (H)	MIC-4COC3-1COC12-CE-H	—	—	—	—
Tri-Rate					
Tri-Rate MIC	MIC-3D-40GE-TX	40	—	11.2R4	11.2R4
Services					
Multiservices MIC	MS-MIC-16G	0	13.2 Rear slot only.	13.2 Rear slot only.	13.2 Rear slot only.
SONET/SDH OC192/STM64 MIC with XFP	MIC-3D-1OC192-XFP	1	12.2	12.2	12.2

Table 96: MICs Supported by MX80 and MX104 Routers

MIC Name	MIC Model Number	Ports	MX80	MX104
ATM				

Table 96: MICs Supported by MX80 and MX104 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX80	MX104
ATM MIC with SFP	MIC-3D-8OC3-2OC12-ATM	8	12.1	13.3
DS3/E3				
DS3/E3 MIC	MIC-3D-8DS3-E3, MIC-3D-8CHDS3-E3-B	8	11.4	13.3
Circuit Emulation				
Channelized E1/T1 Circuit Emulation MIC	MIC-3D-16CHE1-T1-CE	16	13.2R2	13.2R2
Channelized E1/T1 Circuit Emulation MIC (H)	MIC-3D-16CHE1-T1-CE-H	16	—	13.2R2
Gigabit Ethernet				
Gigabit Ethernet MIC with SFP	MIC-3D-20GE-SFP	20	10.2	13.2R2
Gigabit Ethernet MIC with SFP (E)	MIC-3D-20GE-SFP-E	20	13.2R2	13.2R2
Gigabit Ethernet MIC with SFP (EH)	MIC-3D-20GE-SFP-EH	20	—	13.2R2
Gigabit Ethernet MIC with 256b-AES MACsec	MIC-MACSEC-20GE	20	18.3	18.3

Table 96: MICs Supported by MX80 and MX104 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX80	MX104
10-Gigabit Ethernet MICs with XFP	MIC-3D-2XGE-XFP	2	10.2	13.2R2
Multi-Rate				
SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-4OC3OC1 2-1OC48	4	11.2	13.3
SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-8OC3OC1 2-4OC48	8	11.2	13.3
Channelized SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-4CHOC3-2 CHOC12	4	11.4	13.3
Channelized SONET/SDH OC3/ STM1 (Multi-Rate) MICs with SFP	MIC-3D-8CHOC3-4 CHOC12	8	11.4	13.3
Channelized OC3/ STM1 (Multi-Rate) Circuit Emulation MIC with SFP	MIC-3D-4COC3-1C OC12-CE	4	12.2	13.2R2
Channelized OC3/ STM1 (Multi-Rate) Circuit Emulation MIC with SFP (H)	MIC-4COC3-1COC 12-CE-H	—	—	13.2R2
Tri-Rate				

Table 96: MICs Supported by MX80 and MX104 Routers *(Continued)*

MIC Name	MIC Model Number	Ports	MX80	MX104
Tri-Rate MIC	MIC-3D-40GE-TX	40	10.2	13.2R2
Services				
Multiservices MIC	MS-MIC-16G	0	13.2 Rear slot only. Supported on the modular MX80 and fixed MX80-48T	13.3R2 **NOTE**: Starting From Junos OS 13.3R3, 14.1R2, and 14.2R1, MX104 supports only two Multiservices MICs.
SONET/SDH				
SONET/SDH OC192/STM64 MIC with XFP	MIC-3D-1OC192-XFP	1	12.2	13.3

Table 97: MICs Supported by MX10003 Router

MIC Name	MIC Model Number	Ports	MX10003
Multi-Rate			
Multi-Rate Ethernet MIC (12-Port Multi-Rate MIC with QSFP+)	JNP-MIC1	12	17.3
Multi-Rate Ethernet MIC (12-Port Multi-Rate MACsec MIC with QSFP+)	JNP-MIC1-MACSEC	12	17.3R2

MX2008 Modular Interface Card LEDs

Each MIC has LEDs located on the faceplate. For more information about LEDs on the MIC faceplate, see the "LEDs" section for each MIC in the *MX Series Interface Module Reference*.

MX2008 Ports and Interfaces

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

type-fpc/pic/port

- *type*—Media type, which identifies the network device. For example:

  - ge—Gigabit Ethernet interface

  - so—SONET/SDH interface

  - xe—10-Gigabit Ethernet interface

  For a complete list of media types, see *Interface Naming Overview*.

- *fpc*—Slot in which the MPC is installed. On the MX2008 router, the MPCs are represented in the CLI as `FPC 0` through `FPC 9`.

- *pic*—Logical PIC on the *MIC*. The number of logical PICs varies depending on the type of MIC.

- *port*—Port number.

> **NOTE**: The MIC number is not included in the interface name.

The MX2008 supports up to ten MPCs that install vertically and are numbered from left to right.

The following sample CLI output displays an MPC (**MPCE Type 2 3D**) installed in MPC slot **9**.

```
user@host> show chassis hardware

...
FPC 0            REV 22   750-063414   CAFF1148        MPC9E 3D
  CPU            REV 16   750-057177   CAFF9310        SMPC PMB
  MIC 0          REV 11   750-055992   CAFJ9396        MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 0                 BUILTIN      BUILTIN          MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0     REV 01   740-064669   1622            QSFP28-LPBK
      Xcvr 1     REV 01   740-064669   1657            QSFP28-LPBK
      Xcvr 2     REV 01   740-064669   1634            QSFP28-LPBK
      Xcvr 3     REV 01   740-064669   1617            QSFP28-LPBK
      Xcvr 6     REV 01   740-064669   1627            QSFP28-LPBK
      Xcvr 7     REV 01   740-064669   1653            QSFP28-LPBK
      Xcvr 8     REV 01   740-064669   1630            QSFP28-LPBK
      Xcvr 9     REV 01   740-064669   1607            QSFP28-LPBK
  MIC 1          REV 11   750-055992   CAFM8048        MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 1                 BUILTIN      BUILTIN          MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0     REV 01   740-064669   1463            QSFP28-LPBK
      Xcvr 1     REV 01   740-064669   1444            QSFP28-LPBK
      Xcvr 2     REV 01   740-064669   1452            QSFP28-LPBK
      Xcvr 3     REV 01   740-064669   1462            QSFP28-LPBK
      Xcvr 6     REV 01   740-064669   1647            QSFP28-LPBK
      Xcvr 7     REV 01   740-064669   1448            QSFP28-LPBK
      Xcvr 8     REV 01   740-064669   1460            QSFP28-LPBK
      Xcvr 9     REV 01   740-064669   1454            QSFP28-LPBK
...
```

There is one MIC MRATE (**MRATE-12xQSFPP-XGE-XLGE-CGE**) installed into the MPC, **MIC 0** (top slot), and one MIC MRATE (**MRATE-12xQSFPP-XGE-XLGE-CGE**) installed into the MPC, **MIC 1** (bottom slot). Each MIC is logically divided into two PICs in the CLI.

The port numbers on the MICs correspond to the port number in the interface. See the *MX Series Interface Module Reference* for more information about specific MICs.

The sample `show interfaces terse` command below shows the MIC interfaces details.

```
user@host>show interfaces terse
...
lc-0/0/0                up    up
lc-0/0/0.32769          up    up    vpls
pfe-0/0/0               up    up
pfe-0/0/0.16383         up    up    inet
                                    inet6
pfh-0/0/0               up    up
pfh-0/0/0.16383         up    up    inet
pfh-0/0/0.16384         up    up    inet
et-0/0/1                up    up
et-0/0/1.0              up    up    inet     100.0.1.1/24
                                    multiservice
et-0/0/2                up    up
et-0/0/2.0              up    up    inet     100.0.2.1/24
                                    multiservice
et-0/0/3                up    up
et-0/0/3.0              up    up    inet     100.0.3.1/24
                                    multiservice
et-0/0/6                up    up
et-0/0/6.0              up    up    inet     100.0.6.1/24
                                    multiservice
et-0/0/7                up    up
et-0/0/7.0              up    up    inet     100.0.7.1/24
                                    multiservice
et-0/0/8                up    up
et-0/0/8.0              up    up    inet     100.0.8.1/24
                                    multiservice
et-0/0/9                up    up
et-0/0/9.0              up    up    inet     100.0.9.1/24
                                    multiservice
et-0/1/0                up    up
et-0/1/0.0              up    up    inet     100.1.0.1/24
                                    multiservice
lc-0/1/0                up    up
lc-0/1/0.32769          up    up    vpls
pfe-0/1/0               up    up
pfe-0/1/0.16383         up    up    inet
                                    inet6
et-0/1/1                up    up
```

```
et-0/1/1.0              up    up    inet    100.1.1.1/24
                                    multiservice
et-0/1/2                up    up
et-0/1/2.0              up    up    inet    100.1.2.1/24
                                    multiservice
et-0/1/3                up    up
et-0/1/3.0              up    up    inet    100.1.3.1/24
                                    multiservice
et-0/1/6                up    up
et-0/1/6.0              up    up    inet    100.1.6.1/24
                                    multiservice
et-0/1/7                up    up
et-0/1/7.0              up    up    inet    100.1.7.1/24
                                    multiservice
et-0/1/8                up    up
et-0/1/8.0              up    up    inet    100.1.8.1/24
                                    multiservice
et-0/1/9                up    up
et-0/1/9.0              up    up    inet    100.1.9.1/24
                                    multiservice
...
```

SEE ALSO

3
CHAPTER

Site Planning, Preparation, and Specifications

MX2008 Site Guidelines and Requirements

MX2008 Router Transport Kit Moving Requirements and Guidelines

Router Transport Kit Turning Radius

The MX2008 requires a minimum 42 in. (106.7 cm) diameter of space to turn the chassis on the router transport kit (see).

NOTE: The router transport kit does not come with the router. You need to purchase the router transport kit from Juniper Networks. Using the router mounting kit for installing the MX2008 is optional.

NOTE: The router transport kit handles can be removed to accommodate aisle width.

Figure 73: Turning Diameter of Router Transport Kit
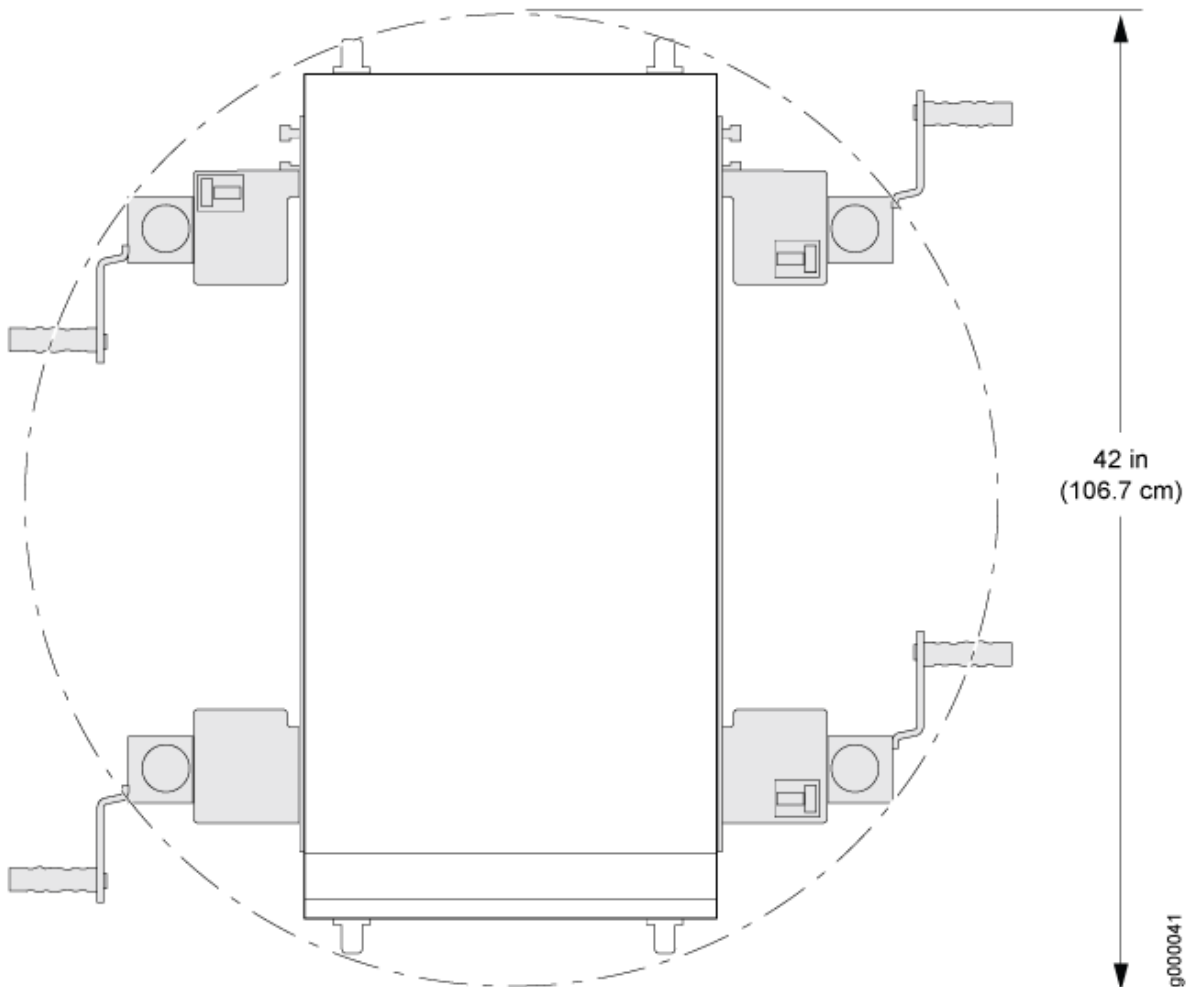
The weight of the router transport kit is 138.5 lb (63 kg). The maximum recommended height the MX2008 should be lifted from the floor by using the router transport kit is 1.5 in. (3.8 cm).

Router Transport Kit Requirements

Viewed from the side, the MX2008 router with the router transport kit installed measures 42 in. (106.68 cm) high, 36.20 in. (91.95 cm) wide, with the transport kit measuring 23.40 in. (59.4 cm) high (see Figure 74 on page 234).

Figure 74: Measurements of the Router Transport Kit Installed on the MX2008 (Side View)
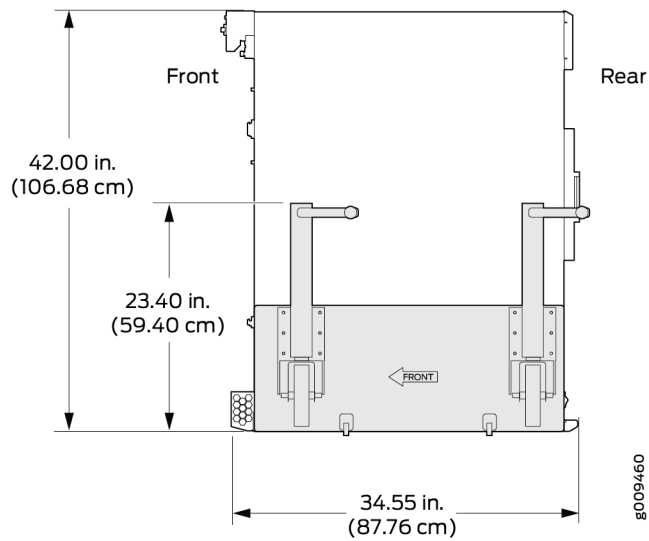
Viewed from the front, the MX2008 router with the router transport kit installed measures 30.78 in. (78.2 cm) wide, with the router measuring 19 in. (48.3 cm) wide (see Figure 75 on page 235).

Figure 75: Measurements of the Router Transport Kit Installed on the MX2008 (Front View)
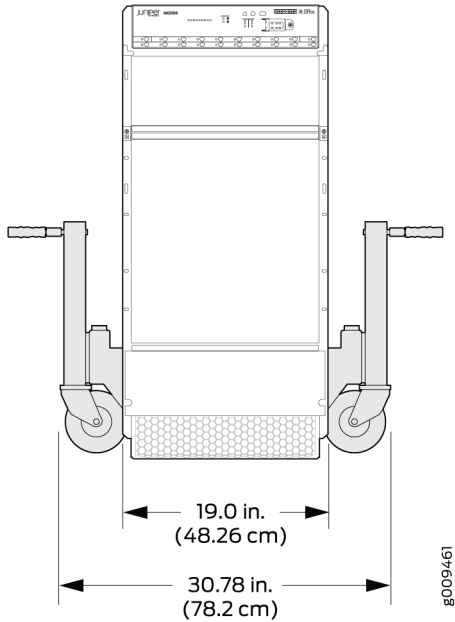
SEE ALSO

MX2008 Cabinet Airflow Requirements

Before you install the router in a cabinet, you must ensure that ventilation through the cabinet is sufficient to prevent overheating. Consider the following requirements to when planning for chassis cooling:

- Ensure that the cool air supply you provide through the cabinet can adequately dissipate the thermal output of the router.

- Ensure that the cabinet allows the chassis hot exhaust air to exit from the cabinet without recirculating into the router. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust. For an illustration of chassis airflow, see .

- Install the router as close as possible to the front of the cabinet so that the cable manager just clears the inside of the front door. This maximizes the clearance in the rear of the cabinet for critical airflow.

- Route and dress all cables to minimize the blockage of airflow to and from the chassis.

Figure 76: Airflow Through Chassis
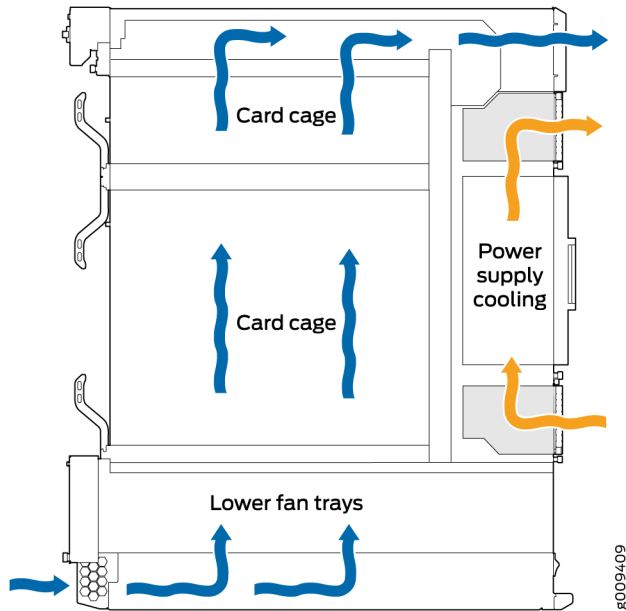
MX2008 Cabinet Size and Clearance Requirements

The minimum size cabinet that can accommodate the router is 23.62 in. (60 cm) wide, and 39.37 in. (100 cm) deep. A cabinet larger than the minimum requirement provides better airflow and reduces the chance of overheating. To accommodate a single router, the cabinet must be at least 24 U high that has

a clearance of 36.20 in. (91.95 cm) to accommodate the cable managers installed or 40.15 in. (102 cm) to accommodate the extended cable managers.

The minimum front and rear clearance requirements depends on the mounting configuration you choose. The minimum total clearance inside the cabinet is 36.20 in. (91.95 cm) between the inside of the front door and the inside of the rear door.

> **NOTE**: If you are installing the MX2008 router into a network cabinet, make sure that no hardware, device, rack, or cabinet component obstructs the 34-U rack space from access during installation.

SEE ALSO

Clearance Requirements for Airflow and Hardware Maintenance for the MX2008 Router **| 253**

MX2008 Rack-Mounting Hardware **| 50**

MX2008 Chassis Moving Guidelines

The fully configured chassis with the cable managers weighs up to 742.2 lb (336.66 kg) for the AC chassis, 664.8 lb (301.55 kg) for the DC chassis, and 261 lb (118.39 kg) with components removed. Observe the following guidelines for moving the router:

- Before moving the router, read the Preparing the Site for the MX2008 Router Overview to verify that the intended site meets the specified power, environmental, and clearance requirements.

- Do not attempt to move a fully-configured router by yourself. Use a pallet jack with the attachment and a four-person team to maneuver the router into a rack.

- Before moving the router, disconnect all external cables.

  To move routing devices and components, use the following guidelines:

  - 1 person to lift or move up to 39.7 lb (18.0 kg)

  - 2 people to lift or move up to 70.5 lb (32.0 kg)

  - 3 people to lift or move up to 220 lb (99.8 kg)

  - 4 people to lift or move over 300 lb (136.0 kg)

As when moving 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.

SEE ALSO

| General Safety Guidelines for Juniper Networks Devices **| 624**
| General Safety Warnings for Juniper Networks Devices **| 625**

MX2008 Physical Specifications

Table 98 on page 238 and Table 99 on page 239 summarize the physical specifications for the router chassis and the components.

Table 98: MX2008 Shipping Weight Specifications

Item	Shipping Weight
Shipping crate and pallet	358 lb (162.4 kg)
Unpopulated MX2008	261 lb (118.39 kg)
Unpopulated MX2008 with shipping crate and pallet	619 lb (280.79 kg)
Fully populated MX2008	- AC chassis: 742.2 lb (336.66 kg) - DC chassis: 664.8 lb (301.55 kg)
Fully populated MX2008 with shipping crate and pallet	1319.88 lb (598.69 kg)

Table 99: Physical Specifications

Description	Weight	Width	Depth	Height
Chassis dimensions	Chassis with components removed: 261 lb (118.39 kg)	19 in. (48.26 cm) (including the mounting flanges or center-mounting brackets)	• With standard cable manager: 36.20 in. (91.95 cm) • With extended cable manager: 40.15 in. (102 cm)	42 lb (106.68 cm)
	Chassis with maximum configuration: – AC chassis: 742.2 lb (336.66 kg) – DC chassis: 664.8 lb (301.55 kg) – Chassis with midplane and air filters only: 235.5 lb (106.82 kg)	19 in. (48.26 cm) (including the mounting flanges or center-mounting brackets)	• With standard cable manager: 36.20 in. (91.95 cm) • With extended cable manager: 40.15 in. (102 cm)	42 lb (106.68 cm)
Craft interface (with brackets)	1.5 lb (0.68 kg)	19.5 in. (49.53 cm)	4.75 in. (12.065 cm)	4.0 in. (10.16 cm)
ADC	15 lb (6.80 kg) Fully populated with 10 total: 150 lb (68.0 kg)	1.7 in. (4.31 cm)	• 23.6 in. (59.94 cm) • With ejector handle: 26.14 in. (66.39 cm)	17.71 in. (44.98 cm)

Table 99: Physical Specifications *(Continued)*

Description	Weight	Width	Depth	Height
MPC	MPC without MICs: 23.8 lb (10.79 kg) MPC with MICs: 25 lb (11.34 kg) Fully populated with 10 total: 250 lb (113.39 kg)	1.25 in. (3.17 cm)	21.25 in (53.97 cm)	15.5 in (39.37 cm)
Blank MPC panel	5.4 lb (2.45 kg)	1.25 in. (3.17 cm)	22.8 in (57.91 cm)	15.5 in (39.37 cm)
MIC	1.2 lb (0.54 kg)	1.25 in. (3.17 cm)	6.25 in (15.9 cm)	6.8 in (17.3 cm)
AC PSM	7.0 lb (3.17 kg) Fully populated with 9 total: 63 lb (28.57 kg)	1.65 in. (4.19 cm)	7.224 in. (18.34 cm)	15.10 in. (38.35 cm)
AC PDM	12 lb (5.44 kg) Fully populated with 2 total: 24 lb (10.88 kg)	17.1 in. (43.43 cm)	4.76 in. (12.09 cm)	7.361 in. (18.69 cm)
DC PSM (-48 V)	7.0 lb (3.17 kg) Fully populated with 9 total: 63 lb (28.57 kg)	1.65 in. (4.19 cm)	7.224 in. (18.34 cm)	15.10 in. (38.35 cm)
DC PSM (240 V China)	8.2 lb (3.71 kg) Fully populated with 9 total: 73.8 lb (33.39 kg)	1.65 in. (4.19 cm)	7.224 in. (18.34 cm)	15.10 in. (38.35 cm)

Table 99: Physical Specifications *(Continued)*

Description	Weight	Width	Depth	Height
Universal (HVAC/HVDC) PSM	8 lb (3.63 kg) Fully populated with 9 total: 72 lb (32.67 kg)	1.65 in. (4.19 cm)	7.224 in. (18.34 cm)	15.10 in. (38.35 cm)
DC PDM (-48 V)	8.0 lb (3.62 kg) Fully populated with 2 total: 16 lb (7.25 kg)	16.8 in. (42.67 cm)	5.2 in. (13.20 cm)	4.2 in. (10.66 cm)
DC PDM (240 V China)	9.2 lb (4.17 kg) Fully populated with 2 total: 18.40 lb (8.34 kg)	16.7 in. (42.4 cm)	5.2 in. (13.20 cm)	5.12 in. (13.00 cm)
Universal (HVAC/HVDC) PDM	8.8 lb (3.98 kg) Fully populated with 2 total: 17.6 lb (7.96 kg)	16.7 in. (42.4 cm)	5.2 in. (13.20 cm)	5.12 in. (13.00 cm)
Air filter (lower)	1 lb (0.45 kg)	16.7 in. (42.4 cm)	19.7 in. (50 cm)	0.43 in. (1.1 cm)
PSM air filter	0.5 lb (0.23 kg)	16.0 in. (40.64 cm)	5.75 in. (14.60 cm)	0.3 in. (0.76 cm)
MX2008 SFB2	6.9 lb (kg) Fully populated with 8 total: 55.2 lb (kg)	1.7 in. (4.31 cm)	• 23.6 in. (59.94 cm) • With ejector handle: 26.14 in. (66.39 cm)	16.23 in. (41.21 cm)

Table 99: Physical Specifications *(Continued)*

Description	Weight	Width	Depth	Height
MX2008 Routing Control Board (MX2008 RCB)	6.9 lb (kg) Fully populated with 2 total: 13.8 lb (kg)	1.7 in. (4.31 cm)	• 23.6 in. (59.94 cm) • With ejector handle: 26.14 in. (66.39 cm)	16.225 in. (41.21 cm)
Fan tray	25 lb (11.34 kg) Fully populated with 2 total: 50 lb (22.68 kg)	16.70 in. (42.41 cm)	28.16 in. (71.52 cm)	2.62 in. (6.65 cm)
Standard cable manager (bottom)	7.0 lb (3.17 kg)	18.99 in. (48.23 cm)	2.80 in. (7.11 cm)	7.428 in. (18.86 cm)
Standard DC cable manager (rear)	1.2 lb (0.54 kg) Fully populated with 2 total: 2.4 lb (1.08 kg)	16.85 in. (42.79 cm)	2.93 in. (7.44 cm)	2.73 in. (6.93 cm)
Extended cable manager (bottom)	10.2 lb (4.62 kg)	18.98 in. (48.20 cm)	3.95 in. (10.03 cm)	7.55 in. (19.17 cm)
Extended DC cable manager (rear)	0.7 lb (0.32 kg) Fully populated with 2 total: 1.4 lb (1.8 kg)	16.78 in. (42.62 cm)	2.93 in. (7.44 cm)	2.72 in. (6.90 cm)
Standard EMI cover	7.2 lb (3.3 kg)	17.45 in. (44.32 cm)	3.50 in. (8.9 cm)	18.86 in. (47.9 cm)
Extended EMI cover	9.65 lb (4.4 kg)	17.45 in. (44.32 cm)	5.40 in. (13.7 cm)	18.86 in. (47.9 cm)

MX2008 Rack Requirements

IN THIS SECTION

- Rack Size and Strength | 243
- Spacing of Mounting Bracket and Flange Holes | 246
- Connection to the Building Structure | 246

Rack Size and Strength

The MX2008 router is designed for installation in a rack that complies with either of the following standards:

- 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/).

- A 600-mm 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). The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the mounting brackets, which measure 19.2 in. (48.8 cm) from the outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required.

- A 23-in. rack using appropriate 23-in. to 19-in. rack adapters and an appropriate installation shelf that supports the chassis at the correct vertical position to properly line up the rack mount holes. Juniper Networks does not supply this hardware, but consideration for the size and weight of the chassis is important for a safe installation.

The rack rails must be spaced widely enough to accommodate the chassis's external dimensions: 59.50 in. (151.1 cm) high, 36.20 in. (91.95 cm) deep, and 19 in. (48.3 cm) wide. The outer edges of the front-mounting flanges extend the width to 19.2 in. (48.8 cm), The spacing of rails and adjacent racks must also allow for the clearances around the chassis and rack that are specified in "Clearance

Requirements for Airflow and Hardware Maintenance for the MX2008 Router" on page 253. The cable manager and EMI cover on the front of the chassis is 36.20 in. (91.95 cm) deep. An extended cable manager extends the depth to 40.15 in. (102 cm).

In an open-frame rack, center-mounting is required because the more even distribution of weight provides greater stability. For center-mounting, you use the mounting brackets attached to the center of the chassis for rack mounting (see Figure 78 on page 246).

For instructions about installing the mounting hardware, see "Installing the MX2008 Mounting Hardware for a Four-Post Rack or Cabinet" on page 292.

The weight and depth of the router depends on the type of cable manager installed.

With the standard or extended cable manager installed, use these guidelines:

- The rack must have sufficient vertical usable space to accommodate the height of the router: 59.50 in. (151.1 cm). You can install one chassis in a rack. A typical four-post rack measures 84 in. (213.4 cm) high, 24 in. (61 cm) through 30 in. (76.2 cm) deep, and 19 in. (48.3 cm) wide (see Figure 77 on page 245). A typical open-frame rack measures 84 in. (213.4 cm) high and 19 in. (48.3 cm) wide.

  NOTE: A **U** is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association (http://www.eia.org).

- The location of the rack must provide sufficient space to accommodate the depth of the router. The chassis with the standard cable manager is 36.20 in. (91.95 cm) deep.

- The chassis with the extended cable manager is 40.15 in. (102 cm) deep.

The rack must be strong enough to support the weight of the fully configured router, up to 742.2 lb (336.66 kg).

  NOTE: For a complete list of chassis configuration and individual line card and component weights and measurements, see "MX2008 Physical Specifications" on page 238.

Figure 77: Typical Four-Post Rack

84 in
(213.4 cm)

19 in
(48.3 cm)

24 in (61cm) to
30 in (76.2 cm)

g007110
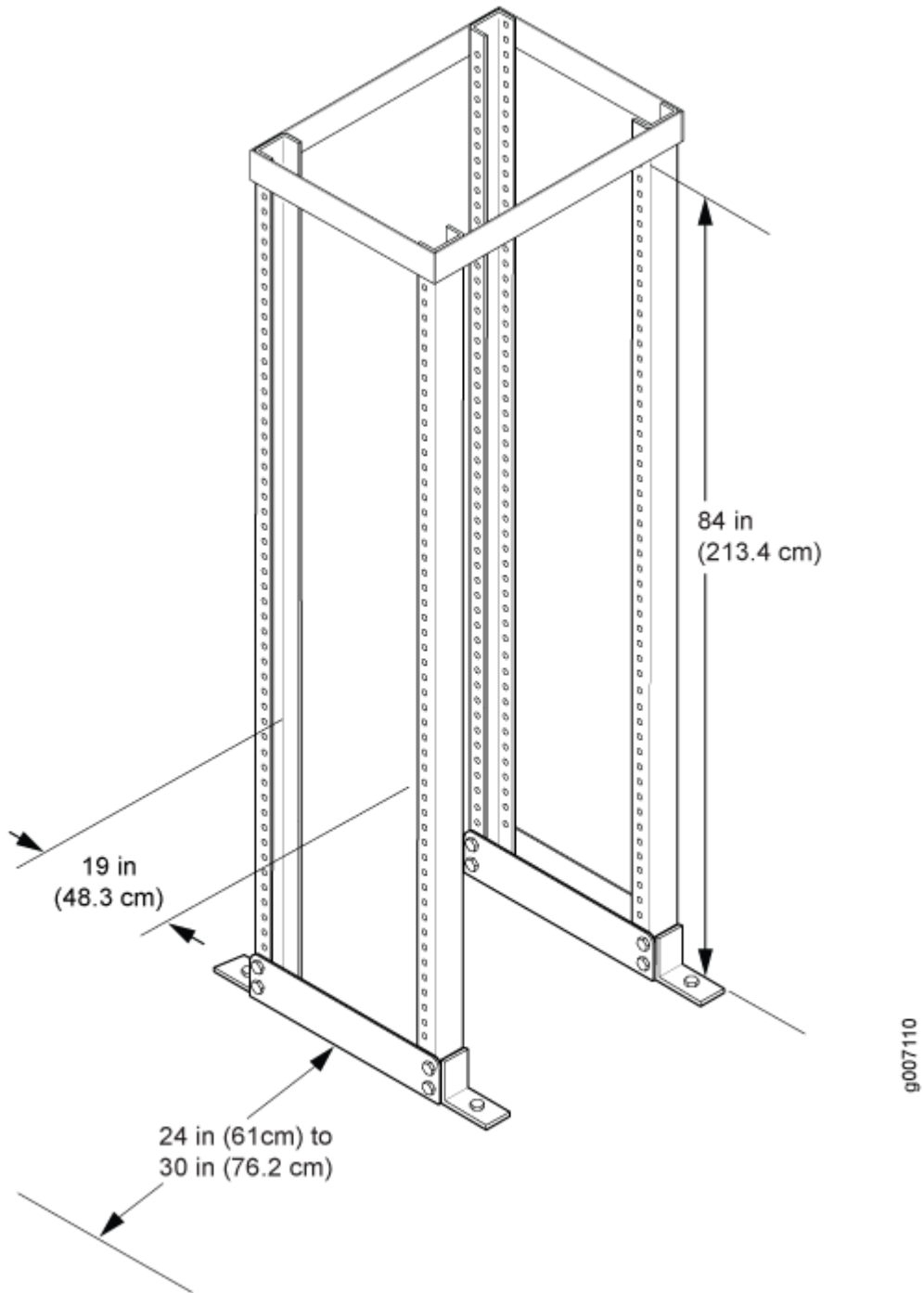
> **NOTE**: There must be a minimum of 24-U of usable rack space when installing the MX2008 router.

Spacing of Mounting Bracket and Flange Holes

The holes in the mounting brackets and front-mount-flanges used to attach the chassis to a rack are spaced at 1 U (1.75 in.). The router can be mounted in any rack that provides holes spaced at those distances. Figure 78 on page 246 shows the chassis center-mounting brackets.

Figure 78: Center-Mounting Brackets
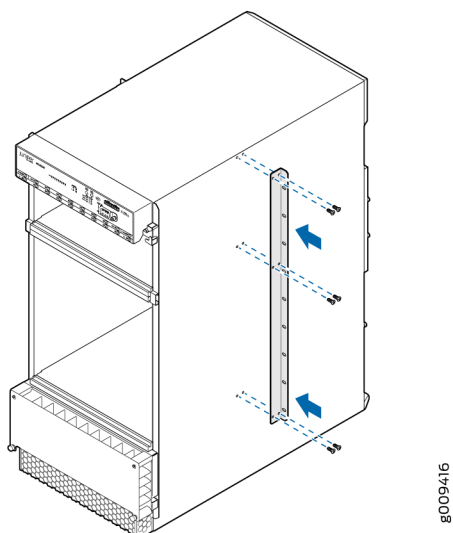
Connection to the Building Structure

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.

SEE ALSO

Clearance Requirements for Airflow and Hardware Maintenance for the MX2008 Router | **253**

MX2008 Rack-Mounting Hardware | **50**

MX2008 Cabinet Size and Clearance Requirements | **236**

MX2008 Cabinet Airflow Requirements | **235**

MX2008 Router Environmental Specifications

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

Table 100: Router Environmental Specifications

Description	Value
Relative humidity	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing
Temperature	Normal operation ensured in temperature range of 32°F (0°C) through 104°F (40°C) Nonoperating storage temperature in shipping container: –40°F (–40°C) through 158°F (70°C)
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements
Maximum thermal output	AC input power: 129,280 BTU/hour DC input power: 129,280 BTU/hour

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

SEE ALSO

MX2008 Router Grounding Specifications

MX2008 Chassis Grounding Points Specifications

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the router must be adequately grounded before power is connected. To ground AC-powered or DC-powered routers, you must connect a grounding cable to earth ground and then attach it to the chassis grounding points by using the two screws provided (see Figure 79 on page 248).

You must install the MX2008 router in a restricted-access location and ensure that the chassis is always properly grounded. The MX2008 router has a two-hole protective grounding terminal provided on the chassis. See Figure 79 on page 248. Under all circumstances, use this grounding connection to ground the chassis. For AC-powered systems, you must also use the grounding wire in the AC power cord along with the two-hole grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

Figure 79: Connecting Chassis Grounding Points on the MX2008 Router
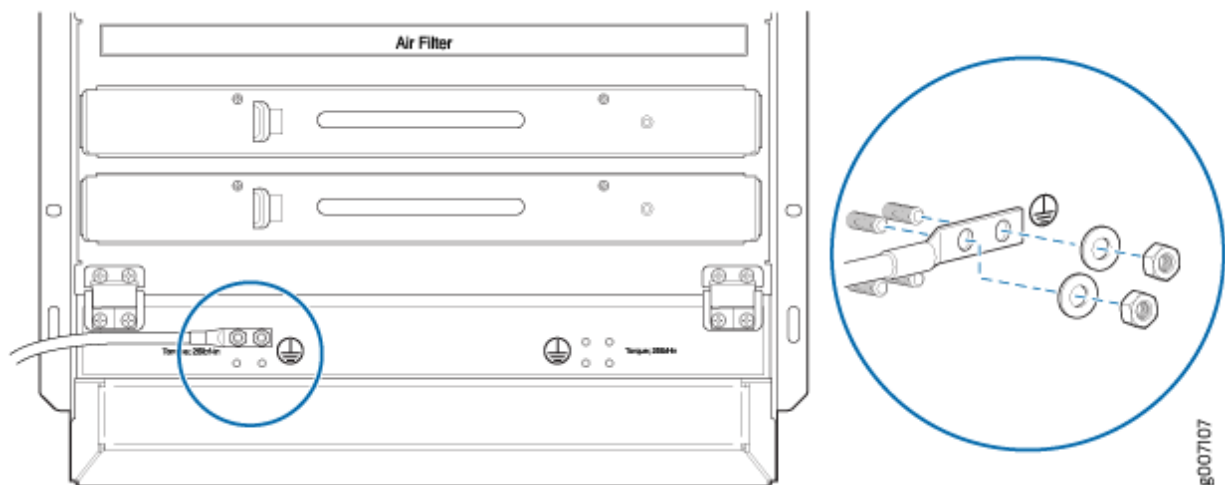
MX2008 Router Grounding Cable Lug Specifications

To ground AC–powered or DC–powered routers, connect a grounding cable to earth ground and then attach it to the chassis grounding points by using two washers and nuts. The top pair of grounding points fits UNC 1/4–20 nuts (American), and the lower pair fits M6 nuts (European). The grounding points are spaced at 0.625-in. (15.86-mm) centers. The cable lugs get attached to the grounding cable, and the two UNC 1/4–20 nuts and washers are used to secure the grounding cable to the top pair of grounding points.

NOTE: The MX2008 supports 4-AWG DC power cable lugs for 80-A input and 60-A input (see Figure 80 on page 249).

Figure 80: 4-AWG DC Power Cable Lugs for 80-A Input
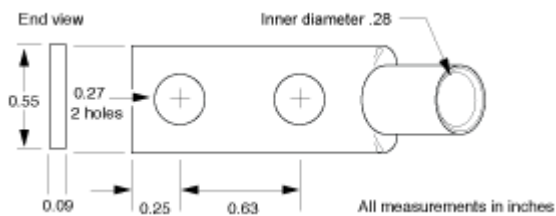
Table 101 on page 250 summarizes the specifications for the power cables, which you must supply.

Table 101: DC Power Cable Specifications

Cable Type	Quantity and Specification
Power	Eighteen pairs of 4-AWG (21.2 mm^2), used with 60-A or 80-A PDM. Minimum 90°C wire, or as required by the local code. You can select 60-A or 80-A input feed capacity on the DC PDM by setting the DIP switch on the PDM to the rated amperage of the DC power input feeds.

MX2008 Router Grounding Cable Specifications

The grounding cable must be minimum 4 AWG, or as required by the local code.

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

CAUTION: To comply with intrabuilding lightning and surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.

WARNING: The router is installed in a restricted-access location. It has a separate protective earthing terminal (Metric [–M6] and English [–¼-20] screw ground lugs) provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earth terminal must be permanently connected to earth.

SEE ALSO

MX2008 Site Preparation Checklist

summarizes the tasks you must perform when preparing a site for router installation.

Table 102: MX2008 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.	"MX2008 Router Environmental Specifications" on page 247		
Power			
Measure distance between external power sources and router installation site.	"MX2008 DC Power Distribution Module (-48 V) Description" on page 102 "MX2000 DC Power Distribution Module (240 V China) Description" on page 103 "MX2008 High-Voltage Universal (HVAC/HVDC) Power Distribution Module Description" on page 132		
Locate sites for connection of system grounding.	"MX2008 Router Grounding Specifications" on page 248		
Calculate the power consumption and requirements.	"MX2008 AC Power Requirements" on page 76 "MX2008 DC Power Requirements" on page 113 "MX2008 High-Voltage Second-Generation Universal Power Requirements" on page 139		
Rack			

Table 102: MX2008 Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Verify that your rack meets the minimum requirements for the installation of the router.	"MX2008 Rack Requirements" on page 243 "MX2008 Cabinet Size and Clearance Requirements" on page 236		
Plan rack or cabinet location, including required space clearances. **NOTE**: If you are installing the MX2008 router into a network cabinet, make sure that no hardware, device, rack, or cabinet component obstructs the 24-U rack space from access during installation.	"MX2008 Cabinet Size and Clearance Requirements" on page 236 "MX2008 Rack Requirements" on page 243 "Clearance Requirements for Airflow and Hardware Maintenance for the MX2008 Router" on page 253		
If a rack is used, secure rack to floor and building structure.	"MX2008 Rack Requirements" on page 243		
Cables and Transceivers			
Acquire cables and transceivers: • 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.	*Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion* *Calculating Power Budget and Power Margin for Fiber-Optic Cables*		

Table 102: MX2008 Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Plan the cable routing and management.	"Maintaining Cables That Connect to MX2008 MPCs or MICs" on page 575		

SEE ALSO

Clearance Requirements for Airflow and Hardware Maintenance for the MX2008 Router

When planning the installation site, you need to allow sufficient clearance around the rack (see Figure 81 on page 254 and Figure 82 on page 254):

- For the cooling system to function properly, the airflow around the chassis must be unrestricted.

- For service personnel to remove and install hardware components, there must be adequate space at the front and back of the router. At least 36 in. (91.44 cm) is required both in front of and behind the router.

  Airflow must always be from front to back with respect to the rack to ensure that fresh air from the front of the rack is supplied to the inlets, and exhaust exits the rear of the rack. Care must also be taken around cables to ensure that no leakage of air in situations where recirculation may result.

  > **NOTE**: There are no additional clearance requirements to accommodate the depth of the MX2008 power distribution modules (PDMs) and power supply modules (PSMs); they are within specification.

- An MX2008 router with an extended cable manager requires extra clearance to accommodate the depth of 40.15 in. (102 cm).

Figure 81: Chassis Dimensions and Clearance Requirements for the MX2008 Router with the Standard Cable Manager
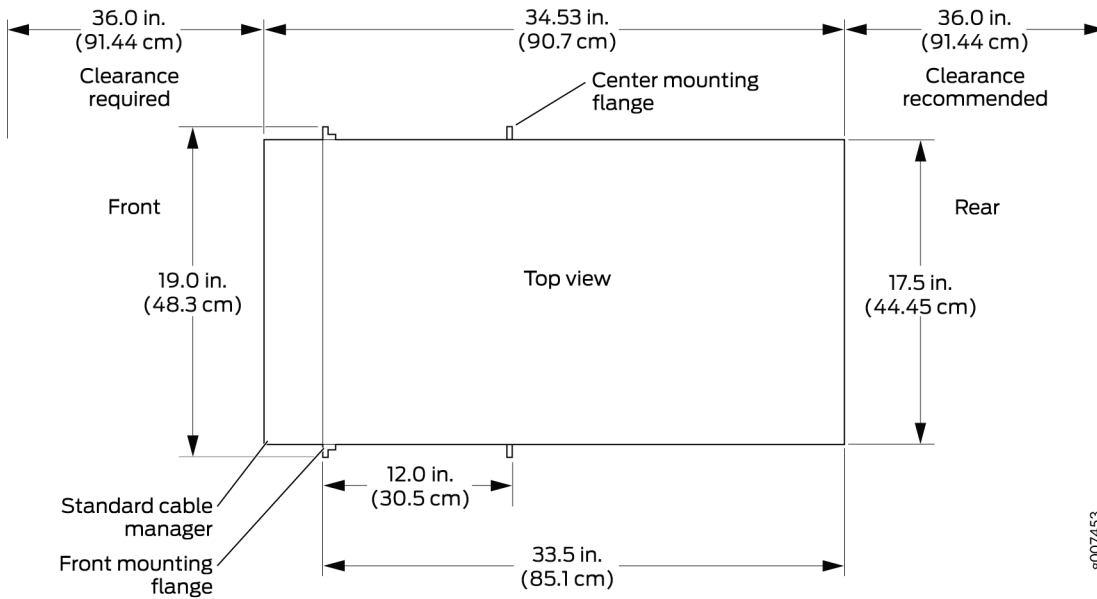
Figure 82: Chassis Dimensions and Clearance Requirements for the MX2008 Router with the Extended Cable Manager

> **NOTE**: There must be a minimum of 24-U of usable rack space when you install the MX2008 router.

SEE ALSO

MX2008 Network Cable and Transceiver Planning

IN THIS SECTION

Calculating Power Budget and Power Margin for Fiber-Optic Cables

IN THIS SECTION

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

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

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

Calculate Power Budget for Fiber-Optic Cables

To ensure that fiber-optic connections have sufficient power for correct operation, you need to calculate the link's power budget (P_B), 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 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):

$P_B = P_T - P_R$

$P_B = -15$ dBm $- (-28$ dBm$)$

$P_B = 13$ dB

How to Calculate Power Margin for Fiber-Optic Cables

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

$P_M = P_B - LL$

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

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. Table 103 on page 257 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 103: 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
Faulty connector	0.5 dB
Splice	0.5 dB
Fiber attenuation	Single mode—0.5 dB/km Multimode—1 dB/km

The following sample calculation for a 2-km-long multimode link with a P_B of 13 dB uses the estimated values from Table 103 on page 257. This example calculates LL as the sum of fiber attenuation (2 km @ 1 dB/km, or 2 dB) and loss for five connectors (0.5 dB per connector, or 2.5 dB) and two splices (0.5 dB per splice, or 1 dB) as well as higher-order mode losses (0.5 dB). The P_M is calculated as follows:

$P_M = P_B - LL$

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

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

$P_M = $ 7 dB

The following sample calculation for an 8-km-long single-mode link with a P_B of 13 dB uses the estimated values from Table 103 on page 257. This example calculates 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 pP_M is calculated as follows:

$P_M = P_B - LL$

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

$P_M = $ 13 dB − 4 dB − 3.5 dB

P_M = 5.5 dB

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

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

lists the specifications for the cables that connect to management ports and the wires that connect to the alarm relay contacts.

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

Table 104: Cable and Wire Specifications for Routing Engine and RCB Management and Alarm Interfaces

Port	Cable Specification	Maximum Length	Router Receptacle
Routing Engine console or auxiliary interface	RS-232 (EIA-232) serial cable	1.83 m	RJ-45 socket
Routing Engine Ethernet interface	Category 5 cable or equivalent suitable for 100Base-T operation	100 m	RJ-45 autosensing
Alarm relay contacts	Wire with gauge between 28-AWG and 14-AWG (0.08 and 2.08 mm^2)	None	—

NOTE: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

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

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

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

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

Attenuation and Dispersion in Fiber-Optic Cable

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

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

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

- Modal dispersion—Spreading of the signal over time, resulting from the different propagation modes in the fiber.

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

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

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

MX2008 Management and Console Port Specifications and Pinouts

IN THIS SECTION

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

The ports–labeled—**AUX** and **CONSOLE**—on the Control Board and Routing Engine (CB-RE) or the Routing and Control Board (RCB) are asynchronous serial interfaces that accept an RJ-45 connector. The ports connect the Routing Engine to an auxiliary or console management device. Table 105 on page 261 describes the RJ-45 connector pinout.

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

Table 105: RJ-45 Connector Pinout for the AUX and CONSOLE Ports

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

Table 105: RJ-45 Connector Pinout for the AUX and CONSOLE Ports *(Continued)*

Pin	Signal	Description
8	CTS	Clear to Send

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

The port on the Control Board and Routing Engine (CB-RE; Routing and Control Board (RCB)) labeled **MGMT** is an autosensing 10/100/1000-Mbps Ethernet RJ-45 receptacle that accepts an Ethernet cable for connecting the Routing Engine to a management LAN (or other device that supports out-of-band management).

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

describes the RJ-45 connector pinout.

Table 106: RJ-45 Management Port Connector Pinouts for the CB-RE or RCB MGMT Port

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

Table 106: RJ-45 Management Port Connector Pinouts for the CB-RE or RCB MGMT Port *(Continued)*

Pin	Signal	Description
6	TRP2–	Transmit/receive data pair 2
7	TRP4+	Transmit/receive data pair 4
8	TRP4–	Transmit/receive data pair 4

MX2008 Power Planning

IN THIS SECTION

Calculating AC Power Requirements for MX2008 Routers

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

The information in this topic helps you determine which of the two input ratings for the PSM is suitable for various configurations. You determine suitability by subtracting the total power draw from the maximum output of the PSMs. Afterward, you calculate the required input current. Finally, you calculate the thermal output.

We recommend that you provision power according to the maximum input current listed in the power system electrical specifications.

Use the following procedures to calculate the power requirement:

1. Calculate the power requirement.

2. Evaluate the power budget.

3. Calculate input power.

4. Calculate thermal output (BTUs) for cooling requirements.

To calculate the AC power requirements:

1. Calculate the power (usage) using the values (see "MX2008 AC Power Requirements" on page 76).

2. Evaluate the power budget, including the budget for each configuration if applicable, and check the required power against the maximum output power of available PDM options.

   Table 107 on page 264 lists the three-phase delta and wye feed requirements, maximum input and output power per PSM, and power efficiency.

   Table 107: Calculating AC Power Budget

Power Distribution Module	Typical Input Power per PSM	Maximum Input Power per PSM	Maximum Output Power per PSM	Power Supply Module Efficiency
Three-phase delta AC PDM (2 per system)—50 A feed (input #1), and 25 A feed (input #2)	2142 W	2800 W	2500 W	91%
Three-phase wye AC PDM (2 per system)—30 A feed (input #1), and 15 A feed (input #2)	2142 W	2800 W	2500 W	91%

3. To calculate necessary input power for three-phase delta AC PDM, follow the procedure below (see Figure 83 on page 265).

Figure 83: AC PDM Three-Phase Delta Input Power
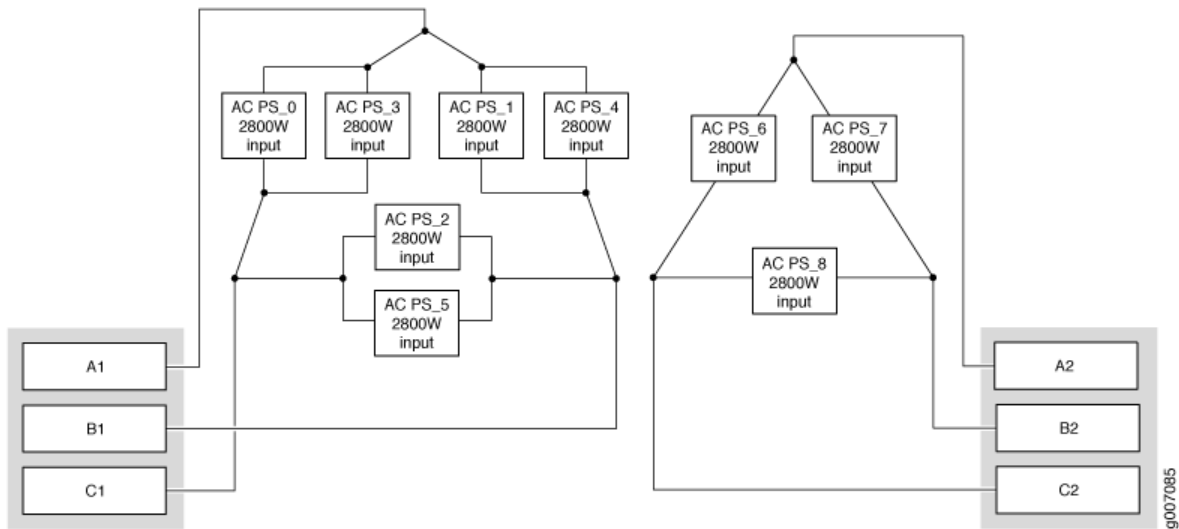
AC PSM VIN=200-240 single phase:

a. Two AC PSMs are connected in parallel between two lines.

b. Nominal value of input current for one AC PSM is 2800 W / 200 V = 14 A.

c. Nominal input current for two AC PSMs is 2 * 14 A = 28 A.

d. Nominal value of line current is 28 A * $\sqrt{3}$ = 48.5 A.

e. Current rating for input 1 is 50 A.

f. Only one AC PSM is connected between two lines.

g. Nominal value of input current for one AC PSM is 2800 W / 200 V = 14 A.

h. Nominal value of line current is 14 A * $\sqrt{3}$ = 24.5 A.

i. Current rating for input 2 is 25 A.

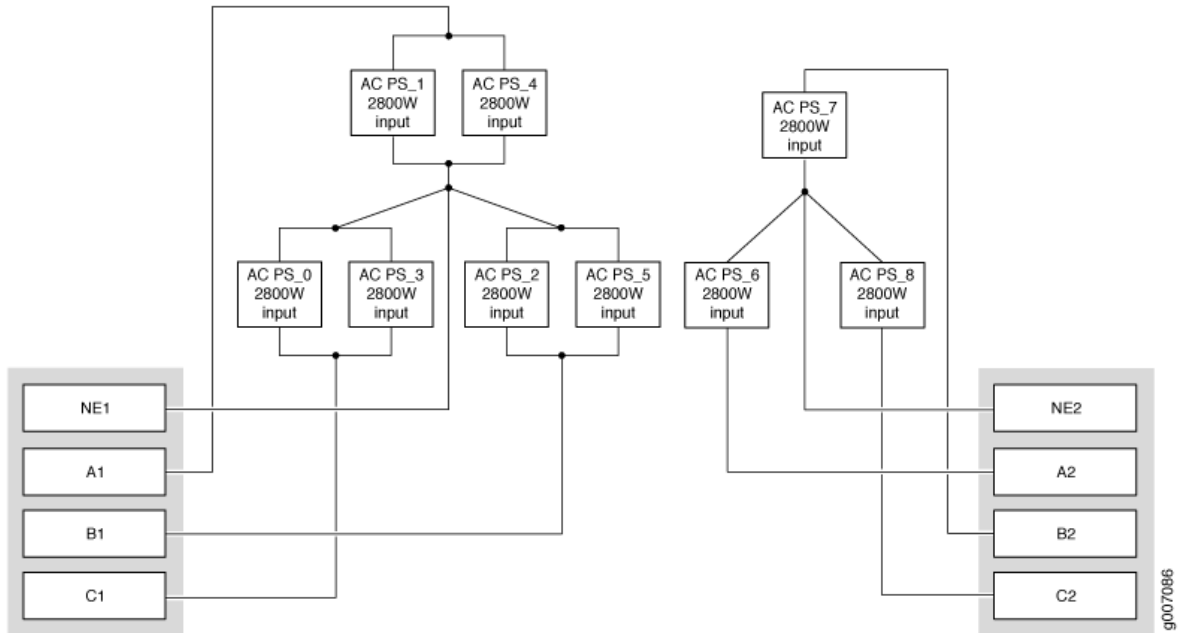4. To calculate necessary input power for three-phase wye AC PDM, follow the procedure below (see).

Figure 84: AC PDM Three-Phase Wye Input Power

AC PSM VIN=200-240 single phase:

a. Two AC PSMs are connected in parallel between two lines and neutral.

b. Nominal value of input current for one AC PSM is 2800 W / 200 V = 14 A.

c. Nominal input current for two AC PSMs is 2 * 14 A = 28 A.

d. Nominal value of line current is 28 A.

e. Current rating for input 1 is 28 A.

f. Only one AC PSM is connected between two lines and neutral.

g. Nominal value of input current for one AC PSM is 2800 W / 200 V = 14 A.

h. Nominal value of line current is 14 A.

i. Current rating for input 2 is 14 A.

5. Calculate thermal output (BTUs). Multiply the input power requirement (in watts) by 3.41 as shown in .

Table 108: Calculating AC Thermal Output

Power Distribution Module	Thermal Output (BTUs per hour)
MX2000 three-phase delta AC PDM	Maximum power divided by 0.91 * 3.41 = BTU/hr. Input power = Maximum power divided by 0.91 See "MX2008 AC Power Requirements" on page 76 to calculate maximum power, which is dependent on configuration and temperature.
MX2000 three-phase wye AC PDM	Maximum power divided by 0.91 * 3.41 = BTU/hr. Input power = Maximum power divided by 0.91 See "MX2008 AC Power Requirements" on page 76 to calculate maximum power, which is dependent on configuration and temperature.

SEE ALSO

Calculating DC Power Requirements for MX2008 Routers

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules (AC/DC PSMs and AC/DC PDMs).

The information in this topic helps you determine which PSMs are suitable for various configurations, as well as which PSMs are not suitable because output power is exceeded. You determine suitability by subtracting the total power draw from the maximum output of the PSMs. Afterward, you calculate the required input current. Finally, you calculate the thermal output. A sample configuration is provided in Table 109 on page 268.

We recommend that you provision power according to the maximum input current listed in the power system electrical specifications (see "MX2008 DC Power (-48 V) System Electrical Specifications" on page 125 and "DC Power (240 V China) Circuit Breaker Requirements for the MX2000 Router" on page 129).

Use the following procedures to calculate the power requirement:

1. Calculate the power requirement.

2. Evaluate the power budget.

3. Calculate input power.

4. Calculate thermal output (BTUs) for cooling requirements."DC Power (240 V China) Circuit Breaker Requirements for the MX2000 Router" on page 129.

The MX2008 DC power system provides power to the FRUs in the chassis (see Table 109 on page 268 for information about power). Each power system is made up of two DC PDMs, nine PSMs, ten MPCs, two fan trays, eight SFBs, and two RCBs.

When calculating power requirements, be sure that there is adequate power for the system.

Table 109: MX2008 DC Power System Sample Configuration

Chassis Power Configuration	Power Distribution Modules (PDMs)	Power Supply Modules (PSMs)	Description
2 PSMs, 2 RCBs, 8 SFBs, and 2 fan trays (no line cards installed)	PDM 0 and 1	2 PSMs	The power consumed by RCBs and SFBs is 100 W each. The power consumed by 2 RCBs and 8 SFBs is 1 KW. The power consumed by fan trays **0** and **1** is 1.5 KW each. The total Kilowatts of power consumed is 4.0 KW.
10 Line cards	PDM 0 and 1	5 PSMs	Each line card consumes up to 1 KW. One PSM is needed for every set of 2 line cards.

Table 109: MX2008 DC Power System Sample Configuration *(Continued)*

Chassis Power Configuration	Power Distribution Modules (PDMs)	Power Supply Modules (PSMs)	Description
N+1 redundant system with *N*+*N* redundancy for SFBs, RCBs, and 1 out of 2 fan trays.	PDM 0 and 1	9 PSMs	This provides *N*+*N* redundnacy for critical FRUs (RCBs, SFBs, and fan trays) and *N*+1 redundancy for line cards.

1. Calculate the power requirements (usage) using the values in as shown in .

Table 110: Typical DC Power Requirements for MX2008 Router

Component	Model Number	Power Requirement (Watts) with 91% Efficiency
Base chassis	CHAS-MX2008-BB	–
Fan trays	MX2000-FANTRAY-BB	1500 * 2 W = 3000 W
MPC	MPC-3D-16XGE-SFPP	440 W * 10 = 4400 W
ADC	ADC	150 W * 10 = 1500 W
RCB	REMX2008-X8-64G	100 W * 2 = 200 W
SFB—slots 0 through 7	MX2008-SFB2	100 W * 8 = 800 W
MX2000 DC power system (60 A feeds to each PDM input) MX2000 DC power system (80 A feeds to each PDM input)		2100 W * 8 PSMs=16,800 W (+ 1 PSM@2100 W redundant capacity) 2500 W * 8 PSMs=20,000 W (+ 1 PSM@2500 W redundant capacity)

2. Evaluate the power budget, including the budget for each configuration if applicable, and check the required power against the maximum output power of available PDM options.

lists the PSMs, their maximum output power, and unused power (or a power deficit).

Table 111: Calculating DC Power Budget

Power Supply Module	Maximum Output Power of Power Supply Module (Watt)	Maximum Output Power for System (Watt)—Including Redundant Capacity
MX2000 DC PSM 60 A (feed to each input)	2100	18,900
MX2000 DC PSM 80 A or DC PSM (240 V China) (feed to each input)	2500	22,500

3. Calculate input power. Divide the total output requirement by the efficiency of the PSM as shown in .

Table 112: Calculating DC Input Power

Power Supply Module	Power Supply Module Efficiency	Output Power Requirement (Watt) —per PSM	Input Power Requirement (Watt)—per PSM
MX2000 DC PSM 60 A	91%	2100	2307
MX2000 DC PSM 80 A or DC PSM (240 V China)	91%	2500	2747

4. Calculate thermal output (BTUs). Multiply the input power requirement (in watts) by 3.41 as shown in .

Table 113: Calculating DC Thermal Output

Power Distribution Module	Thermal Output (BTUs per hour)
MX2000 DC PDM	34.5 KW divided by 0.91 * 3.41 = 129,280 BTU/hr. 34.5 KW of output power consumed by the chassis. This is the maximum output the chassis can consume in a redundant configuration. The input power is 16.5 divided by 0.91 = 37.9 KW.

SEE ALSO

Calculating High-Voltage Second-Generation Universal Power Requirements for MX2008 Routers

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules AC, DC, 240 V China, and universal PSMs and PDMs.

The information in this topic helps you determine which PSMs are suitable for various configurations, as well as which PSMs are not suitable because output power is exceeded. You determine suitability by subtracting the total power draw from the maximum output of the PSMs. Afterward, you calculate the required input current. Finally, you calculate the thermal output. A sample configuration is provided in .

We recommend that you provision power according to the maximum input current listed in the power system electrical specifications (see "MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Subsystem Electrical Specifications" on page 151 and "High-Voltage Universal (HVAC/HVDC) Power Circuit Breaker Requirements for the MX2000 Router" on page 152).

Use the following procedures to calculate the power requirement:

1. Calculate the power requirement.

2. Evaluate the power budget.

3. Calculate input power.

4. Calculate thermal output (BTUs) for cooling requirements. "High-Voltage Universal (HVAC/HVDC) Power Circuit Breaker Requirements for the MX2000 Router" on page 152.

The MX2008 DC power system provides power to the FRUs in the chassis (see Table 114 on page 272 for information about power). Each power system is made up of two DC PDMs, nine PSMs, ten MPCs, two fan trays, eight SFBs, and two RCBs.

When calculating power requirements, be sure that there is adequate power for the system.

Table 114: MX2008 Power System Sample Configuration

Chassis Power Configuration	Power Distribution Modules (PDMs)	Power Supply Modules (PSMs)	Description
2 PSMs, 2 RCBs, 8 SFBs, and 2 fan trays (no line cards installed)	PDM 0 and 1	2 PSMs	The power consumed by RCBs and SFBs is 100 W each. The power consumed by 2 RCBs and 8 SFBs is 1 KW. The power consumed by fan trays **0** and **1** is 1.5 KW each. The total Kilowatts of power consumed is 4.0 KW.
10 Line cards	PDM 0 and 1	5 PSMs	Each line card consumes up to 1 KW. One PSM is needed for every set of 2 line cards.

Table 114: MX2008 Power System Sample Configuration *(Continued)*

Chassis Power Configuration	Power Distribution Modules (PDMs)	Power Supply Modules (PSMs)	Description
N+1 redundant system with *N*+*N* redundancy for SFBs, RCBs, and 1 out of 2 fan trays.	PDM 0 and 1	9 PSMs	This provides *N*+*N* redundnacy for critical FRUs (RCBs, SFBs, and fan trays) and *N*+1 redundancy for line cards.

1. Calculate the power requirements (usage) using the values in as shown in .

Table 115: Typical HVAC/HVDC Power Requirements for MX2008 Router

Component	Model Number	Power Requirement (Watts) with 91% Efficiency
Base chassis	CHAS-MX2008-BB	–
Fan trays	MX2000-FANTRAY-BB	1500 * 2 W = 3000 W
MPC	MPC-3D-16XGE-SFPP	440 W * 10 = 4400 W
ADC	ADC	150 W * 10 = 1500 W
RCB	REMX2008-X8-64G	100 W * 2 = 200 W
SFB—slots 0 through 7	MX2008-SFB2	100 W * 8 = 800 W
MX2010 HVAC/HVDC power system (upper and lower half of chassis, 19 A feeds to each PDM input)		3000 W * 8 PSMs=24,000 W (+ 1 PSM@3000 W redundant capacity)

2. Evaluate the power budget, including the budget for each configuration if applicable, and check the required power against the maximum output power of available PDM options.

lists the PSMs, their maximum output power, and unused power (or a power deficit).

Table 116: Calculating HVAC/HVDC Power Budget

Power Supply Module	Maximum Output Power of Power Supply Module (Watt)	Maximum Output Power for System (Watt)—Including Redundant Capacity
MX2008 Universal (HVAC/HVDC) PSM	3000 W for single feed 3400 W for dual feed	3000 * 8 PSM = 24,000 W (single feed) 3400 * 8 PSM = 27,200 W (dual feed)

3. Calculate input power. Divide the total output requirement by the efficiency of the PSM as shown in .

Table 117: Calculating HVAC/HVDC Input Power

Power Supply Module	Power Supply Module Efficiency	Input Power Requirement (Watt)—per PSM
MX2008 Universal (HVAC/HVDC) PSM	91%	3300 W for single feed, 3800 W for dual feed

4. Calculate thermal output (BTUs). Multiply the input power requirement (in watts) by 3.41 as shown in .

Table 118: Calculating HVAC/HVDC Input Power

Loaded Chassis Heat Load	Thermal Output (BTUs per hour)
Loaded chassis configuration	34.5 KW divided by 0.91 * 3.41 = 129,280 BTU/hr. 34.5 KW of output power consumed by the chassis. This is the maximum output the chassis can consume in a redundant configuration. The input power is 16.5 divided by 0.91 = 37.9 KW.

MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Subsystem Electrical Specifications | **151**

High-Voltage Universal (HVAC/HVDC) Power Circuit Breaker Requirements for the MX2000 Router | **152**

Powering MX2008 On and Off

IN THIS SECTION

- Powering Off the DC-Powered MX2008 Router | **275**

Powering Off the DC-Powered MX2008 Router

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

To power off the router:

1. On the external management device connected to the RCB, issue the **request vmhost power-off** operational mode command individually on both the RCBs. The command shuts down the RCB cleanly, so the state information is preserved.

   ```
   user@host> request vmhost power-off
   ```

2. Wait until a message appears on the console confirming that the operating system has halted. For more information about the command, see the *Junos OS System Basics and Services Command Reference*.

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. Move the DC power switch on the DC PSM faceplate for each DC PSM to the off (**O**) position, and move the DC circuit breaker from the power source input for each DC PDM to the (**OFF**) position.

SEE ALSO

4

CHAPTER

Initial Installation and Configuration

Installing an MX2008 Router Overview

To install the MX2008 router:

1. Prepare your installation site. See:

   - Preparing the Site for the MX2008 Router Overview

2. Review the safety guidelines. See:

   - *General Safety Guidelines for Juniper Networks Devices*

3. Unpack the router and verify the parts. See:

   - "Unpacking the MX2008 Router" on page 281

   - "Verifying the MX2008 Parts Received" on page 285

   - "Unpacking the MX2008 Router Transport Kit" on page 288

4. Install the mounting hardware. See:

   - "Installing the MX2008 Mounting Hardware for a Four-Post Rack or Cabinet" on page 292

5. Remove all components. See:

   - "Removing Components from the MX2008 Router Chassis Before Installing It in a Rack" on page 297

6. Install the router into the rack. See:

   - "Installing an MX2008 Router Using a Pallet Jack Overview" on page 313

   - "Installing an MX2008 Router Using a Router Transport Kit Overview" on page 319

7. Ground the router. See "Grounding an MX2008 Router" on page 354.

Grounding an MX2000 Router

"Grounding an MX2008 Router" on page 354

8. Reinstall all components. See:

   - "Reinstalling Components in the MX2008 Router After Initially Installing the Router in a Rack" on page 337

9. Connect cables to the network and external devices. See:

   - Connecting the MX2008 Router to Management and Alarm Devices.

10. Connect the AC power cord, DC power cables, 240 V China power cables, or the universal (HVAC/HVDC) power cables. See:

    - "Connecting AC Power to an MX2000 Router with Three-Phase Wye AC Power Distribution Modules" on page 367

"Connecting AC Power to an MX2008 Router with Three-Phase Delta AC Power Distribution Modules" on page 363

- *Connecting AC Power to an MX2000 Router with Three-Phase Delta AC Power Distribution Modules*

"Connecting Power to a DC-Powered MX2008 Router with Power Distribution Modules (-48 V)" on page 384

- "Connecting Power to a DC-Powered MX2000 Router with DC Power Distribution Modules (240 V China)" on page 389

- "Connecting Power to a High Voltage-Powered MX2000 Router with Power Distribution Modules" on page 398

- *Connecting an MX2000 DC Router Power Distribution Module (240 V China) Cable*

- *Installing MX2000 Router AC Power Supply Modules*

- *Installing MX2000 Router DC Power Supply Modules (-48 V)*

- *Installing MX2000 Router DC Power Supply Modules (240 V China) or High-Voltage Universal (HVAC/HVDC) Power Supply Modules*

- "Installing MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Supply Modules" on page 395

11. Power on the router. See:

- "Powering On the DC-Powered (-48 V) MX2008 Router" on page 392

- "Powering On the DC-Powered (240 V China) MX2000 Router" on page 393

- "Powering On the High-Voltage Powered Universal (HVAC/HVDC) MX2000 Router" on page 400

- "Powering On a Three-Phase AC-Powered MX2000 Router" on page 373

12. Perform the initial system configuration. See:

- "Initially Configuring the MX2008 Router" on page 406

RELATED DOCUMENTATION

Unpacking the MX2008

Unpacking the MX2008 Router Overview

To unpack the router:

1. Gather the tools required to unpack the router. See:

    - "Tools and Parts Required to Unpack the MX2008 Router" on page 280

2. Remove the router, accessory box, and all parts from the shipping crate. See:

    - "Unpacking the MX2008 Router" on page 281

3. Unpack the router transport kit, if ordered. See:

    - "Unpacking the MX2008 Router Transport Kit" on page 288

4. Verify that all parts have been received. See:

    - "Verifying the MX2008 Parts Received" on page 285

Tools and Parts Required to Unpack the MX2008 Router

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

- Phillips (+) screwdriver, number 1, 2, and 3

- 1/2-in. or 13-mm open-end or socket wrench to remove bracket bolts from the shipping pallet

- Blank panels to cover any slots not occupied by a component

SEE ALSO

Unpacking the MX2008 Router

The router is shipped in a wooden crate. A wooden pallet forms the base of the crate. The router chassis is bolted to this pallet. Metal latches secure the top and bottom in place. Quick Start installation instructions, a rack mount tray (for four-post or open-frame rack mounting), a pallet jack attachment, an EMI cover, and a cardboard accessory box are also included in the shipping crate. The total weight of the container including the router, FRUs, and accessories is 1343 lb (609.18 kg).

NOTE: Depending on your configuration, the MX2008 might be shipped with additional components already installed.

NOTE: The MX2008 can be ordered with extended EMI covers and extended cable managers.

There are two styles of shipping crates for the MX2008. Figure 85 on page 282 shows the smaller crate that measures 66.25 in. (168.3 cm) high, 42.0 in. (106.7 cm) wide, and 48.0 in. (121.9 cm) deep. Figure 86 on page 283 shows the larger crate that measures 68.4 in. (173.7 cm) high, 44.4 in. (112.8 cm) wide, and 51.6 in. (131.1 cm) deep. If you are not sure which crate you have, plan for the larger crate.

The total weight of the shipping crate with router and accessories varies depending on your configuration. See "MX2008 Physical Specifications" on page 238 for more details.

Figure 85: MX2008 Shipping Crate Dimensions (Smaller)
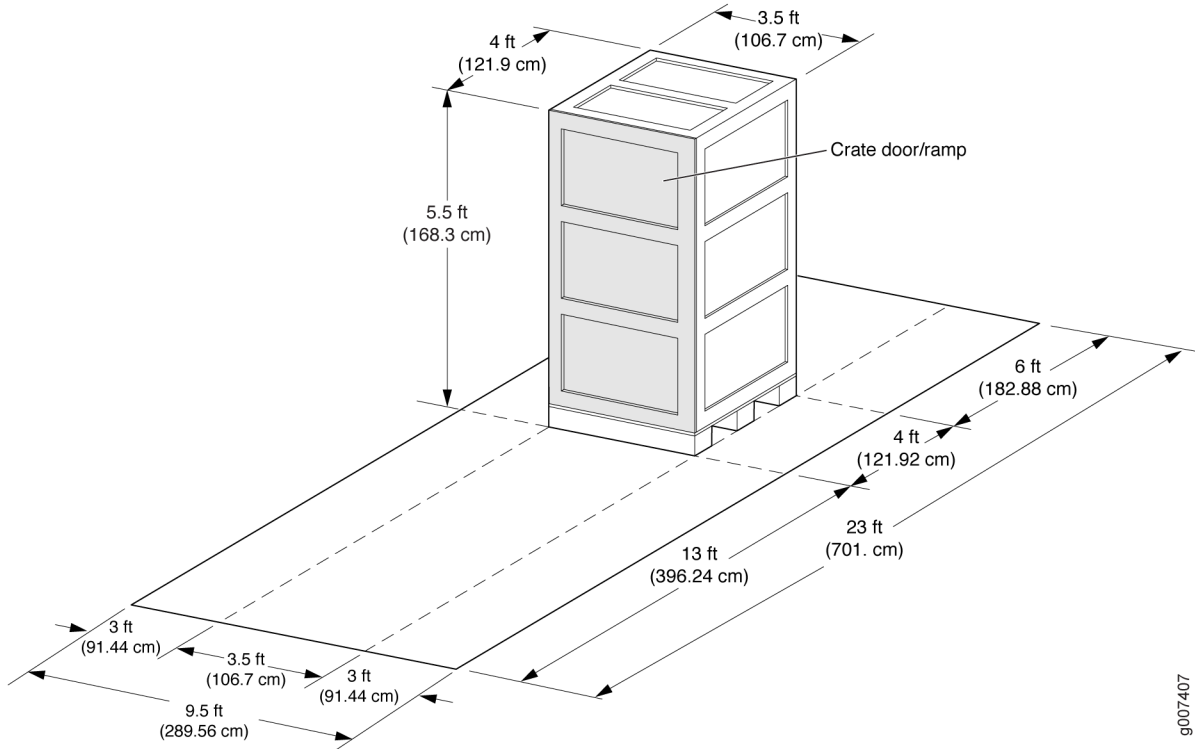
Figure 86: MX2008 Shipping Crate Dimensions (Larger)
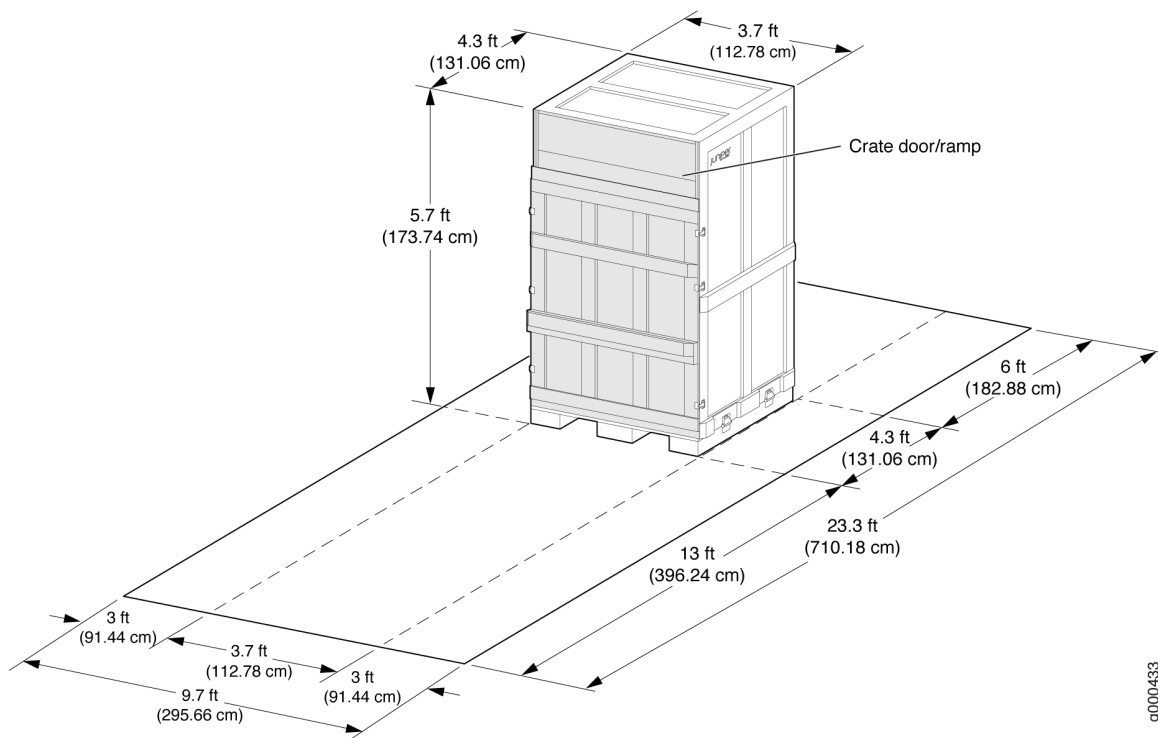
> **NOTE**: The router is maximally protected inside the shipping crate. Do not unpack it until you are ready to begin installation.

To unpack the router:

1. Move the shipping crate to an electrostatic discharge (ESD) approved staging area as close to the installation site as possible, where you have enough room to remove the components from the chassis. While the chassis is bolted to the shipping pallet, you can use a forklift or pallet jack to move it.

2. Position the shipping crate with the arrows pointing up.

3. Open all the latches on the shipping crate.

4. Remove the front door of the shipping crate and set it aside (see).

5. Using a two-person team, slide the remainder of the shipping crate off the pallet.

6. Remove the foam covering the top of the router.

7. Remove the large mounting tray, pallet jack attachment, accessory box, and the Quick Start installation instructions.

> **NOTE**: If you ordered a router transport kit, see "Unpacking the MX2008 Router Transport Kit" on page 288.

Figure 87: Unpacking the MX2008
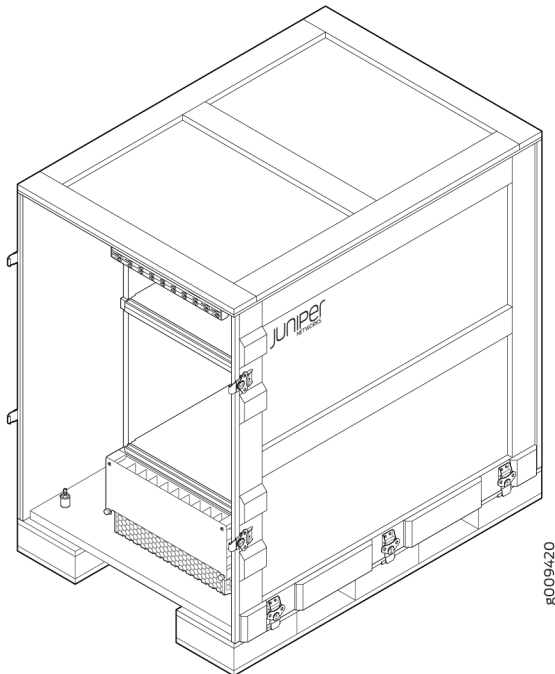
8. Verify the parts received against the list.

9. Remove the vapor corrosion inhibitor (VCI) packs attached to the pallet, being careful not to break the VCI packs open.

10. To remove the brackets holding the chassis to the pallet, use a 9/16-in (14 mm) socket wrench, and use a number 2 Phillips screwdriver to remove the bolts and screws from the brackets.

11. Set the shipping brackets aside for later use to secure the router to the pallet jack attachment.

> **NOTE**: If you ordered a router transport kit, see "Unpacking the MX2008 Router Transport Kit" on page 288 for instructions on how to unpack and install the router transport kit.

12. Save the shipping crate cover, pallet, and packing materials in case you need to move or ship the router at a later time.

Verifying the MX2008 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 119 on page 285, and an accessory box, which contains the parts listed in Table 120 on page 286. The parts shipped with your router can vary depending on the configuration you ordered.

Table 119: Parts List for a Fully Configured MX2008 Router

Component	Quantity
Chassis, including backplane, and craft interface.	1
EMI cover	1
Four-post mounting shelf	1
Open-frame mounting shelf (optional)	1
MPCs	Up to 10
Adapter cards	Up to 10
MICs	Up to 20
SFBs	Up to 8
Routing and Control Board (RCBs)	1 or 2

Table 119: Parts List for a Fully Configured MX2008 Router *(Continued)*

Component	Quantity
Power distribution modules (PDMs)	Up to 2
Power supply modules (PSMs)	Up to 9
Fan trays	2
PSM air filter	1
Air filter (lower)	1
Card-cage cable manager and air filter	1
Cable manager (lower)	1
DC cable manager (rear)	2
Quick Start installation instructions	1
Blank panels for slots without components installed	One blank panel for each slot not occupied by a component.

Table 120: Accessory Box Parts List

Part	Quantity
Screws to mount chassis	14
Terminal block plug, 3 pole, 5.08 mm spacing, 12 A, to connect the router alarms	2
Label, accessories contents, MX2008	1

Table 120: Accessory Box Parts List *(Continued)*

Part	Quantity
USB flash drive with Junos OS	1
Read me first document	1
Affidavit for T1 connection	1
Juniper Networks Product Warranty	1
End User License Agreement	1
Document sleeve	1
3" x 5" pink bag	2
9" x 12" pink bag, ESD	2
Accessory box, 19 x 12 x 3"	1
ESD wrist strap with cable	1

NOTE: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

> If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

SEE ALSO

Unpacking the MX2008 Router Transport Kit

The router transport kit is shipped in a wooden crate. A wooden pallet forms the base of the crate. Metal clips secure the top and front of the crate in place.

The router transport kit shipping container measures 36 in. (91.4 cm) high, 32 in. (81.3 cm) wide, and 44.5 in. (113 cm) deep (see Figure 88 on page 289). The total weight of the container containing the router transport kit is 200 lb (90.71 kg).

Figure 88: Router Transport Kit Crate Dimensions
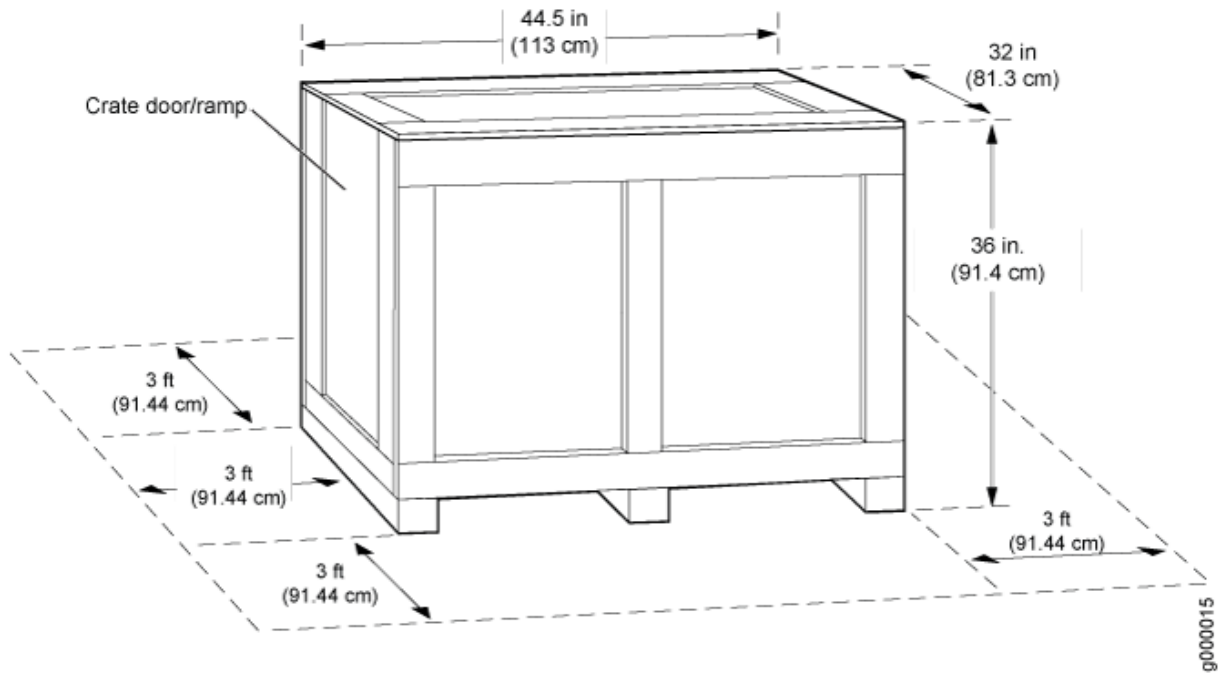
> NOTE: The router transport kit is maximally protected inside the shipping crate. Do not unpack it until you are ready to begin installation.

To unpack the router transport kit:

1. Move the router transport kit shipping crate to an ESD-approved staging area, where you have enough room to remove the kit for assembly.
2. Position the shipping crate with the arrows pointing up.
3. Remove the metal clips on the shipping crate that secure the top and front to the crate (see).

Figure 89: Open Router Transport Kit Shipping Crate
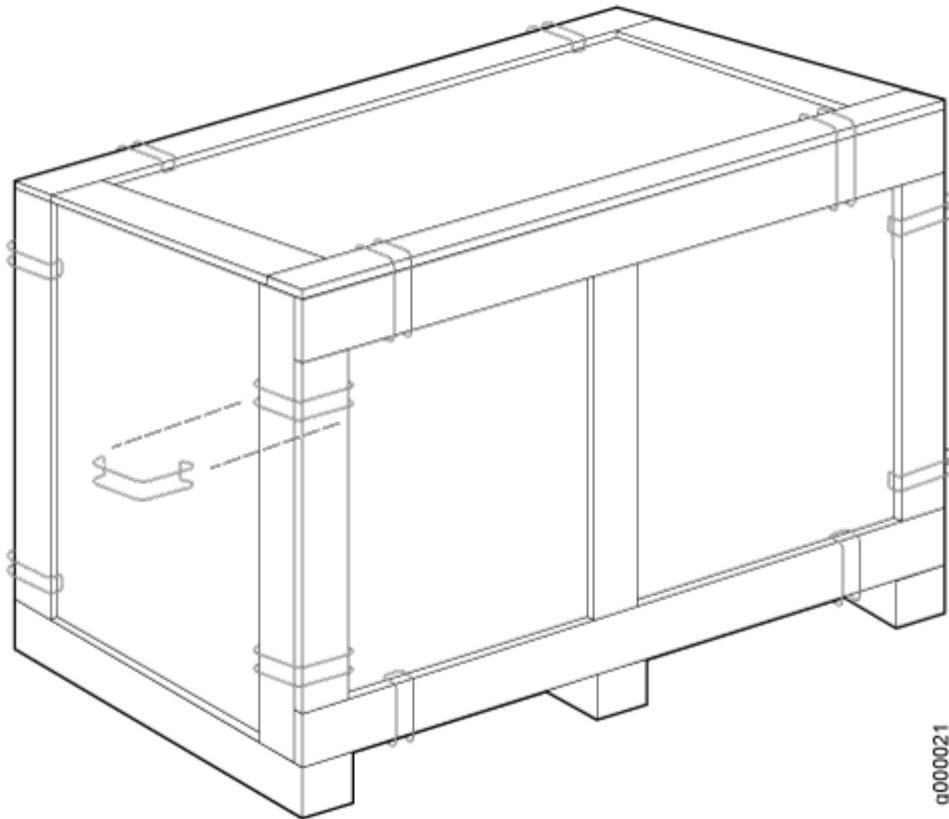
4. Remove the top and front of the shipping crate, and set them aside.

5. Remove the two wing nuts that secure the wooden brace to the shipping crate platform, and set them aside.

6. Align the crate door with the shipping crate platform, and secure the door to the platform by using the attached velcro straps (see).

Figure 90: Router Transport Kit Shipping Crate Door

Crate door/ramp
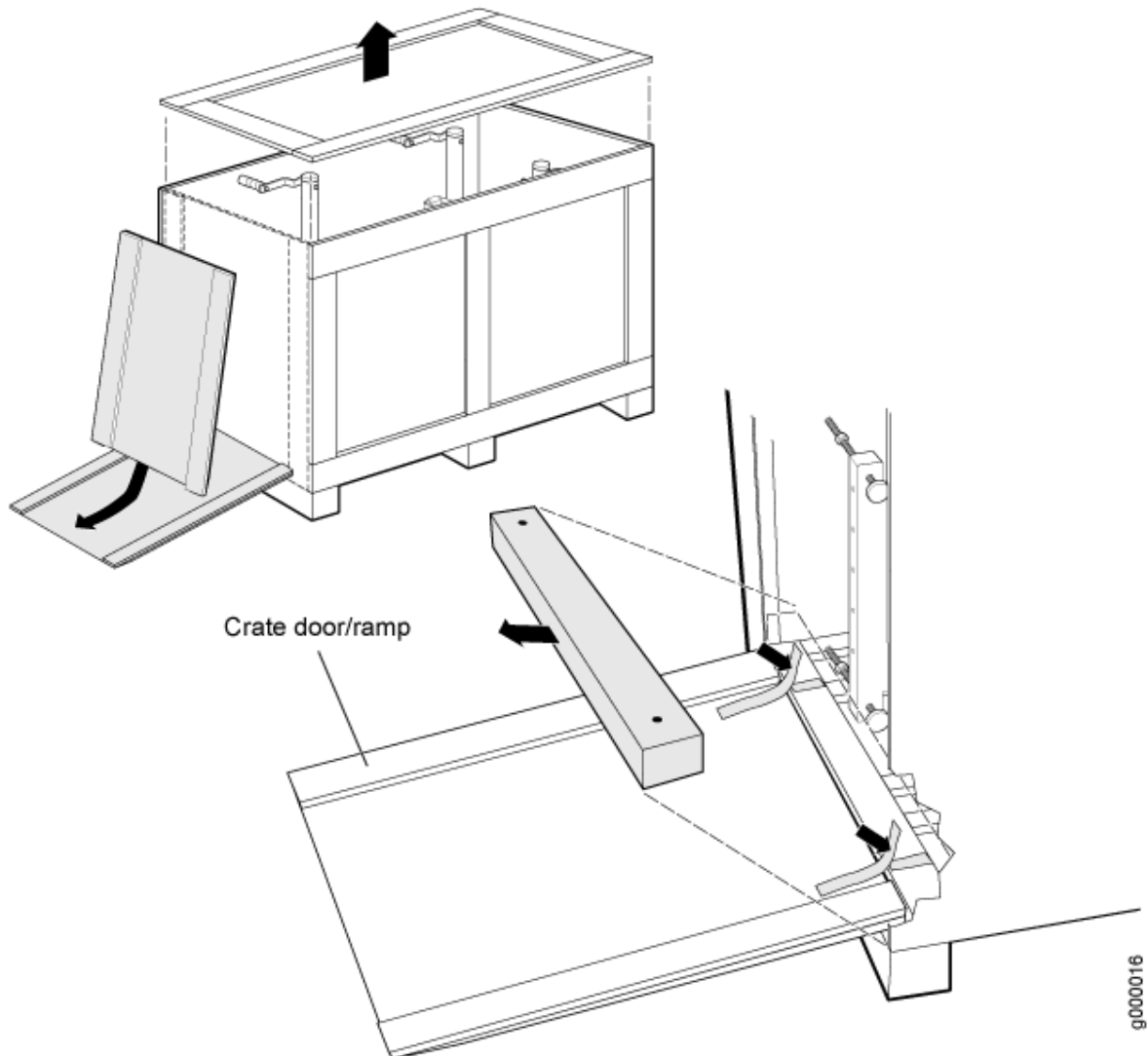
7. Remove the router transport kit from the shipping container.

8. Remove the vapor corrosion inhibitor (VCI) packs attached to the pallet, being careful not to break the VCI packs open.

9. Save the shipping crate cover, pallet, and packing materials in case you need to move or ship the router transport kit at a later time.

SEE ALSO

Installing the MX2008

Installing the MX2008 Mounting Hardware for a Four-Post Rack or Cabinet

Installing Cage Nuts, If Needed

Insert cage nuts, if needed, into the holes listed in Table 1 and Table 2. The hole distances are relative to the standard U division on the rack that is aligned with the bottom of the mounting shelf.

To install cage nuts in a four-post rack:

1. On the rear side of both rack rails, insert cage nuts in the holes specified for the four-post mounting shelf. Install the cage nuts in the front of the front rail (see Table 1).

2. On the front side of both rack rails, insert cage nuts in the holes specified for mounting the chassis. Install the cage nuts in the front of the front rail (see Table 1).

Table 121: Mounting Hole Locations for Installing the Four-Post Mounting Shelf

Hole	Distance Above U Division	
6	3.25 in. (8.3 cm)	1.86 U
5	2.63 in. (6.7 cm)	1.5 U
4	2.00 in. (5.1 cm)	1.14 U
3	1.50 in. (3.8 cm)	0.86 U
2	0.88 in. (2.2 cm)	0.50 U
1	0.25 in. (0.6 cm)	0.14 U

Table 122: Mounting Hole Locations for Installing a MX2008 Chassis in a Four-Post Rack or Cabinet

Hole	Distance Above U Division	
110	63.88 in. (162.2 cm)	36.50 U
101	58.63 in. (148.9 cm)	33.50 U
92	53.38 in. (135.6 cm)	30.50 U
83	48.13 in. (122.2 cm)	27.50 U

Table 122: Mounting Hole Locations for Installing a MX2008 Chassis in a Four-Post Rack or Cabinet *(Continued)*

Hole	Distance Above U Division	
74	42.88 in. (108.9 cm)	24.50 U
65	37.63 in. (95.6 cm)	21.50 U
56	32.38 in. (82.2 cm)	18.50 U
47	27.13 in. (68.9 cm)	15.50 U
38	21.88 in. (55.6 cm)	12.50 U
29	16.63 in. (42.2 cm)	9.50 U
20	11.38 in. (28.9 cm)	6.50 U
11	6.13 in. (15.6 cm)	3.50 U

The holes in the front-mounting flanges are spaced at 3 U (5.25 in. (13.3 cm)).

Installing the Four-Post Mounting Shelf

A mounting shelf is required for installing the router in a four-post rack or cabinet. The shelf is not required for installing the router in an open-frame rack.

To install the four-post mounting shelf (see):

1. Slide the shelf between the rack rails, resting the bottom of the shelf on the rack rail supports. The shelf installs on the front of the rear rails, extending toward the front of the rack.
2. Partially insert screws into the open holes in the rear flanges of the four-post mounting shelf.

   NOTE: Depending on the type of rack or cabinet you have, cage nuts might be required.

3. Tighten all the screws completely.
4. On the front of each front rack rail, partially insert a mounting screw into the holes in each ear of the four-post mounting shelf.

5. Tighten all the screws completely.

Figure 91: Installing the Mounting Hardware for a Four-Post Rack or Cabinet
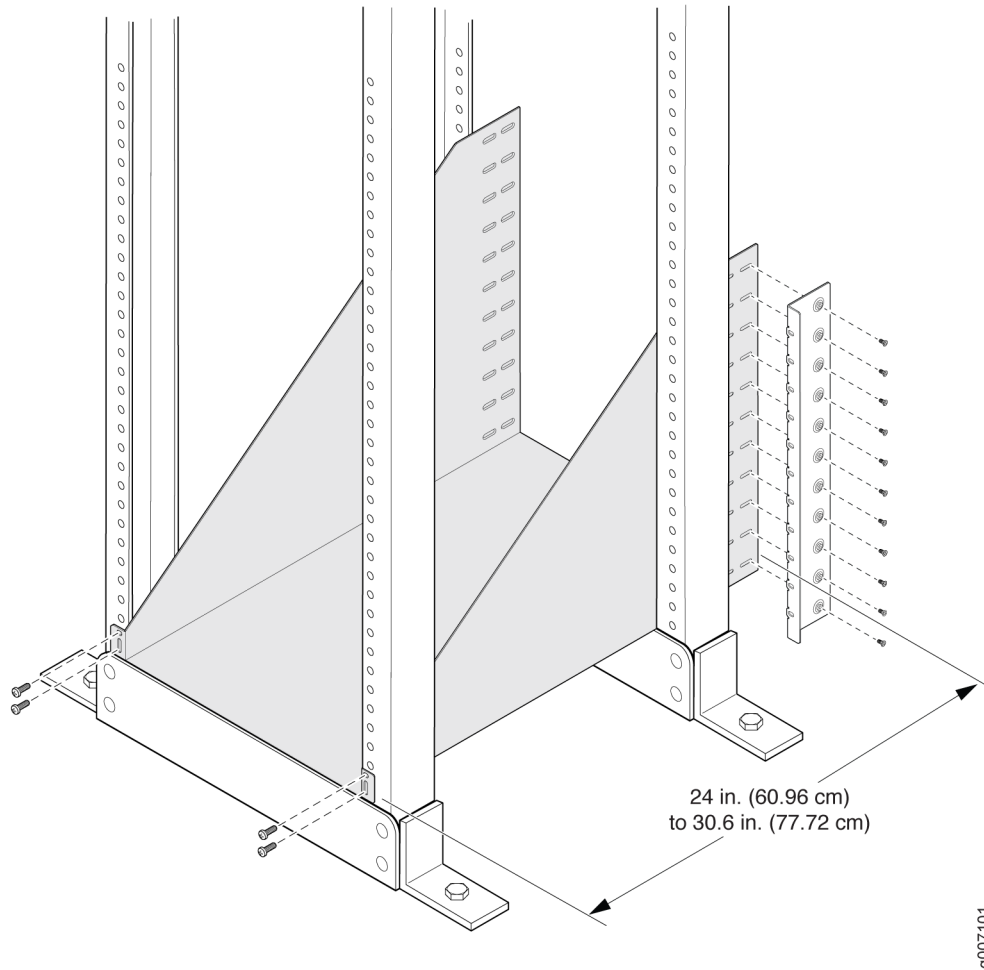
24 in. (60.96 cm)
to 30.6 in. (77.72 cm)

g007101

NOTE:

- The two rear flanges on the four-post mounting shelf are adjustable from 24 in. (60.96 cm) through 30 in. (76.2 cm) to accommodate different types of racks rails.

- There must be a minimum of 24-U unobstructed front-to-back usable rack space when installing the MX2008 router into a four-post rack or cabinet.

Installing the Router Transport Kit on the MX2010 Router

Installing the MX2010 Router Using a Pallet Jack with Attachment

Removing the Center-Mounting Brackets

The center-mounting brackets are not used for a four-post rack, and must be removed from the chassis.

To remove the center-mounting brackets from the chassis:

1. Loosen the screws from each bracket (see Figure 92 on page 296).
2. Remove each bracket.

Figure 92: Center-Mounting Bracket Removal
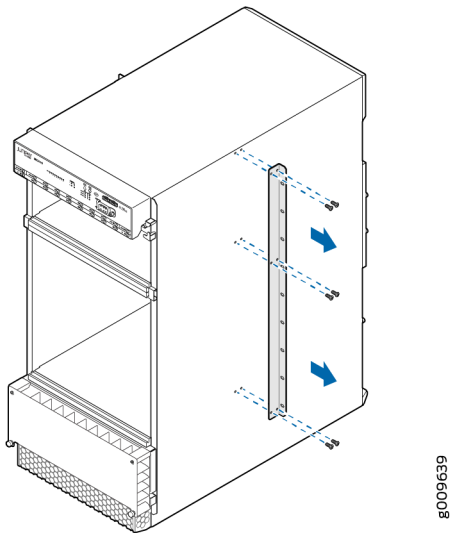
RELATED DOCUMENTATION

MX2008 Rack-Mounting Hardware | 50

MX2008 Rack Requirements | 243

Removing Components from the MX2008 Router Chassis Before Installing It in a Rack

Before installing the router with a pallet jack, you must first remove shipping covers and components from the chassis. With components removed, the chassis weighs approximately 324 lb (146.96 kg).

⚠ **CAUTION**: The shipping covers help guide the chassis into the rack. Applying force to any other part of the chassis can cause damage.

Removing the Power Distribution Modules Before Installing an MX2000 Router with a Pallet Jack

Remove the topmost PDM (**PDM1**) first, and then work your way downward. To remove an AC, DC, 240 V China, or universal (HVAC/HVDC) PDM (see Figure 3, Figure 4 Figure 5, and Figure 6).

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. On an AC-powered router, move the AC circuit breaker from the power source to the off (**O**) position. On a DC-powered router, move the DC circuit breaker from the power source to the off (**O**) position.

   We recommend this precaution even though the PDMs are not connected to power sources.

3. Loosen the two captive screws on the PDM faceplate. Pull the two spring-loaded locking levers away from the chassis until it stops.

> **NOTE**: **PDM1** locking levers are pulled down to release from chassis, and **PDM0** locking levers are pulled up to release from chassis.
>
> The PDM is extended slightly away from the chassis.

4. With both hands, grasp the two handles and gently pull the PDM straight out of the chassis.

> ⚠️ **CAUTION**: Do not touch the power connector in the back of the PDM. They can get damaged.

> ⚠️ **CAUTION**: Do not stack PDMs on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 93: Removing an AC Power Distribution Module Before Installing the MX2000 Router

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Figure 94: Removing a DC Power Distribution Module (-48 V) Before Installing the MX2000 Router

g007431
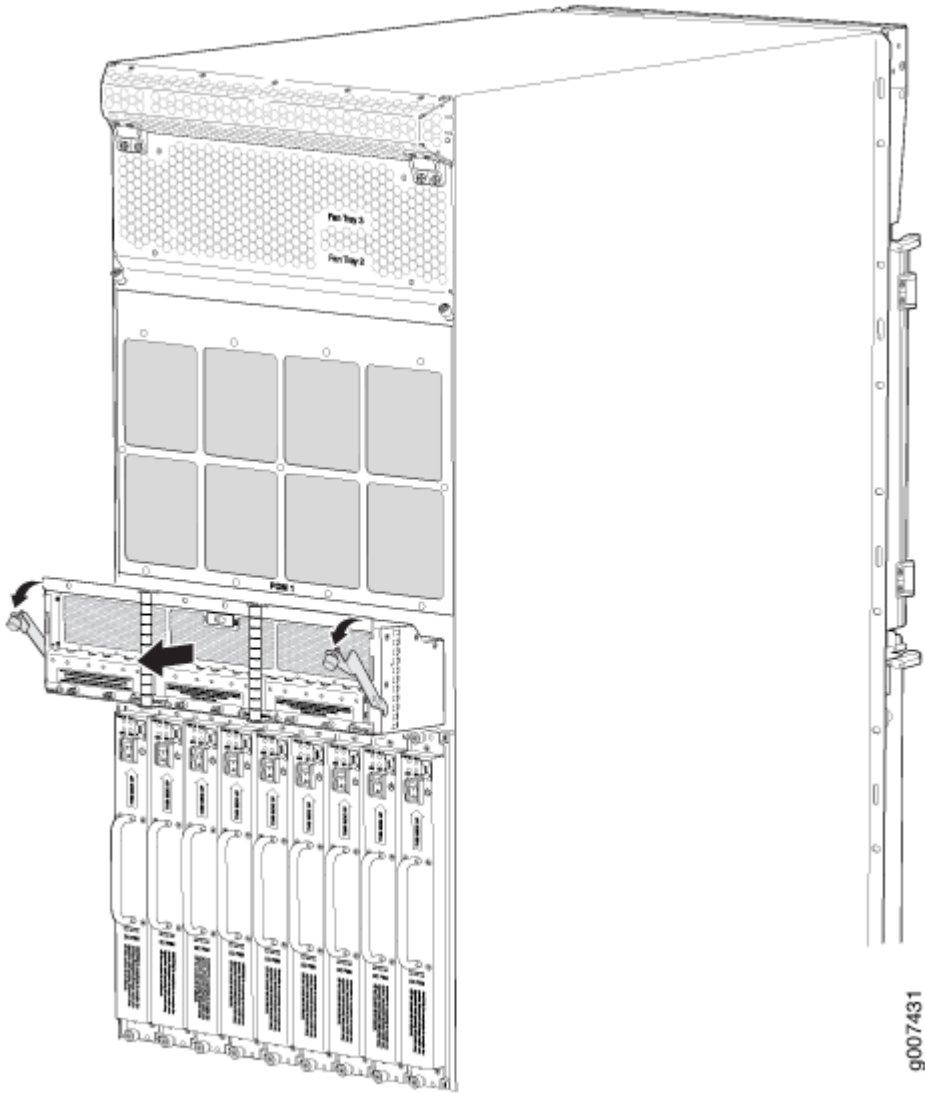
Figure 95: Removing a DC Power Distribution Module (240 V China) Before Installing the MX2000 Router
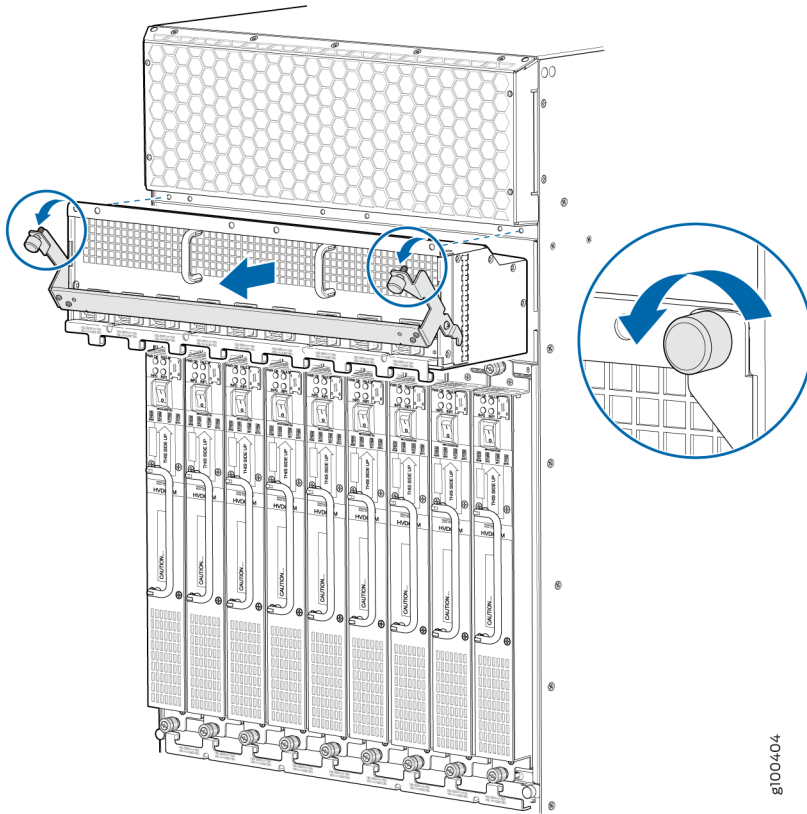
Figure 96: Removing a High-Voltage Universal (HVAC/HVDC) Power Distribution Module Before Installing the MX2000 Router
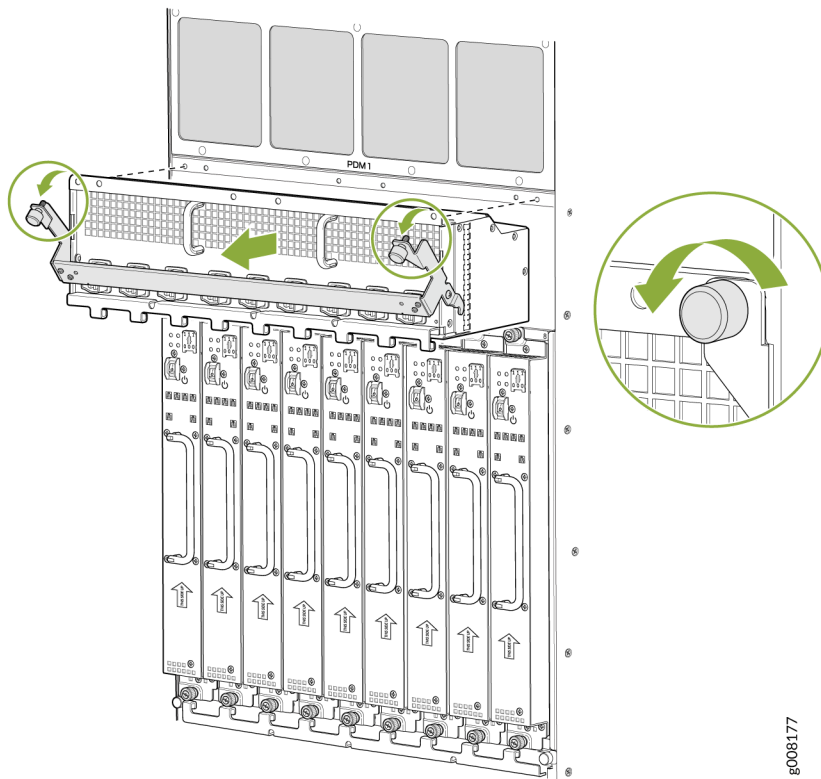
SEE ALSO

Removing the Power Supply Modules Before Installing an MX2000 Router

To remove the AC, DC, 240 V China, universal (HVAC/HVDC) PSMs (see Figure 7, Figure 8, Figure 9, and Figure 10):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. On an AC-powered router, move the AC power switch on each PSM to the off (**O**) position. On a DC-powered router, move the DC power switch on each PSM to the off (**O**) position.

   We recommend this even though the PSMs are not connected to power sources.

3. Loosen the two captive screws that secure the PSM to the chassis. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the PSM.

4. Pull the PSM straight out of the chassis.

> ⚠️ **CAUTION**: Do not touch the power connector on the back of the PSM. It can get damaged.

> ⚠️ **CAUTION**: Do not stack PSMs on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 97: Removing a AC Power Supply Module Before Installing the MX2000 Router

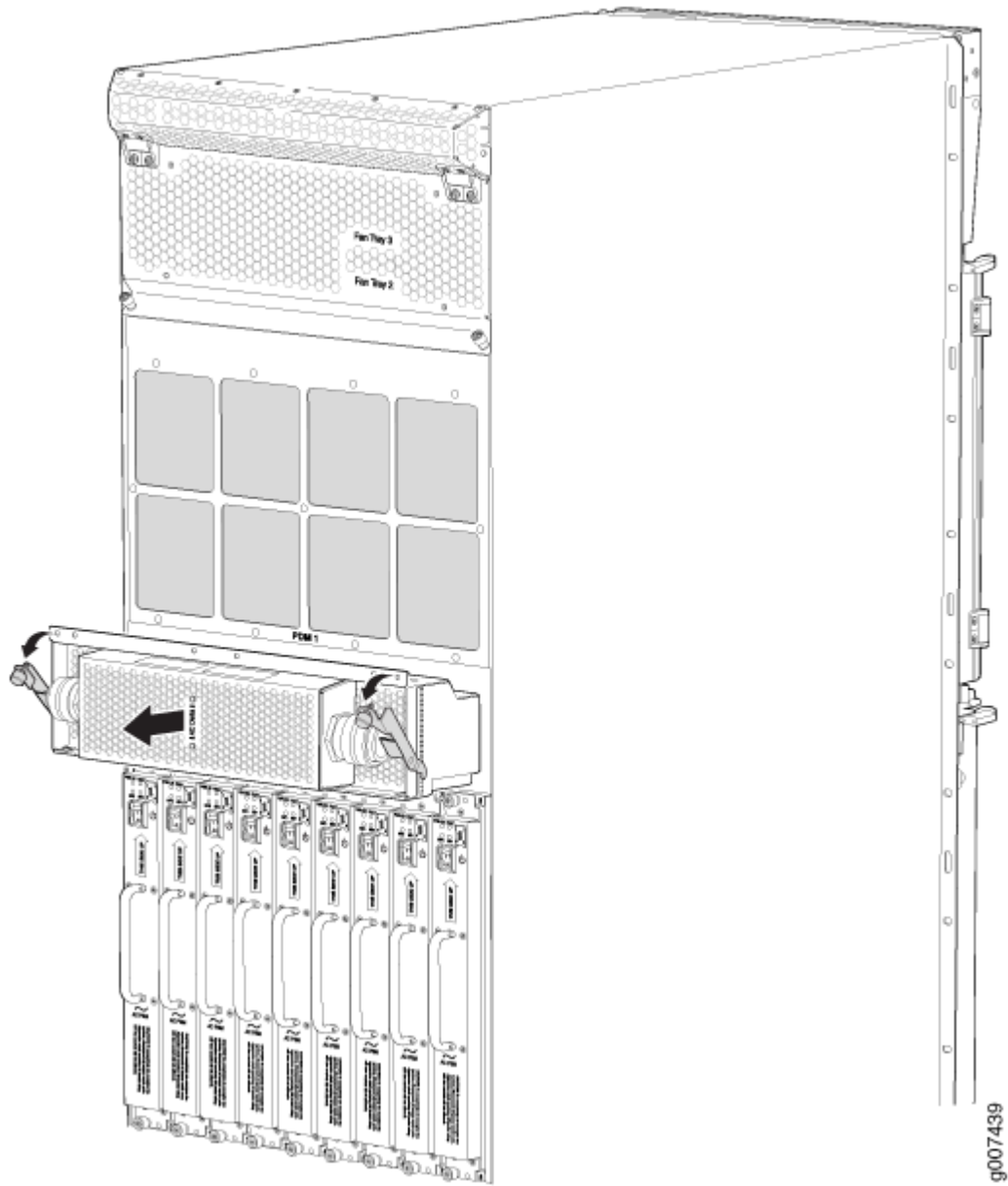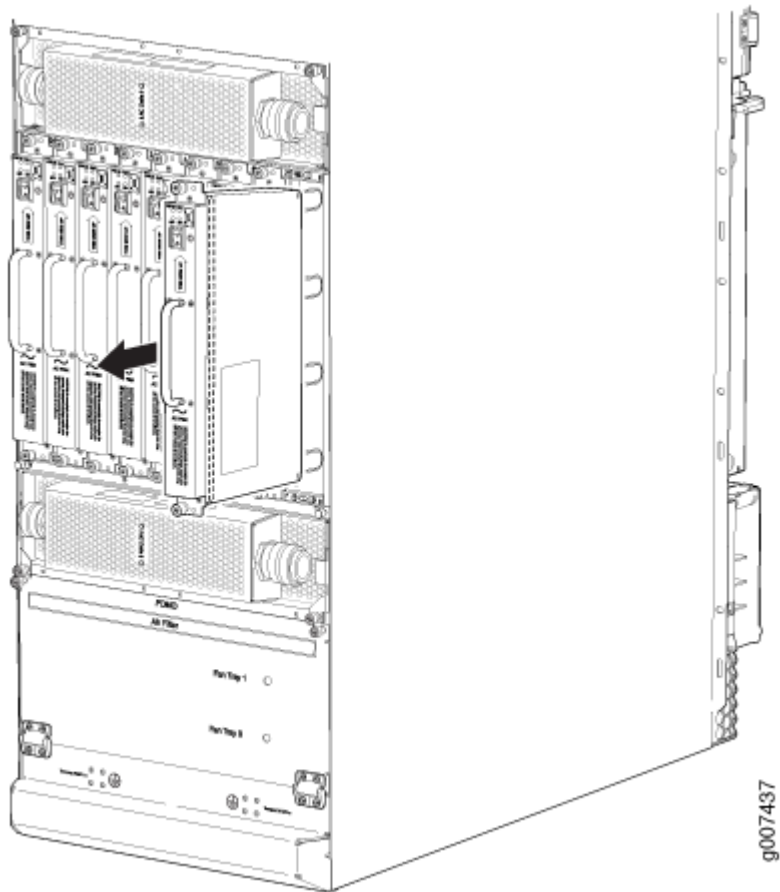**Figure 98: Removing a DC Power Supply Module (-48 V) Before Installing the MX2000 Router**

g007429
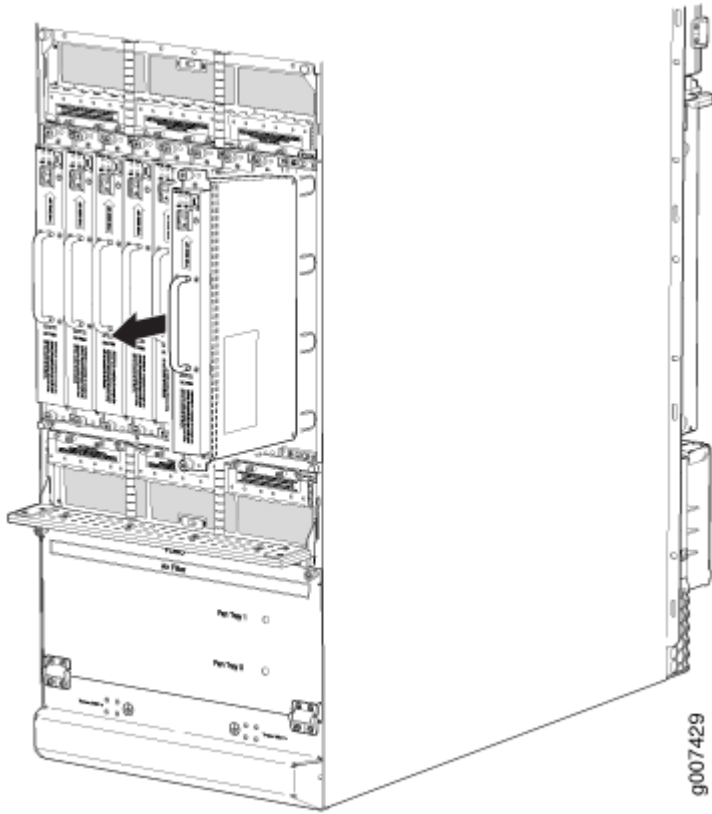
Figure 99: Removing a DC Power Supply Module (240 V China) Before Installing the MX2000 Router
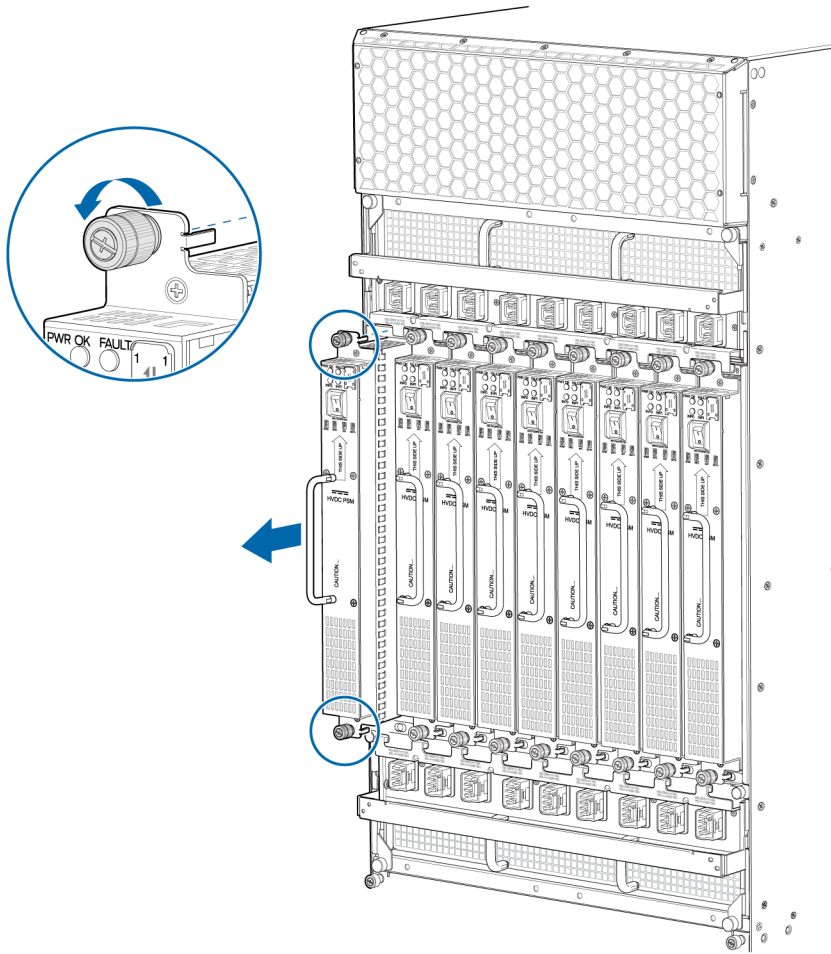
g1004O9

Figure 100: Removing a High-Voltage Universal (HVAC/HVDC) Power Supply Module Before Installing the MX2000 Router
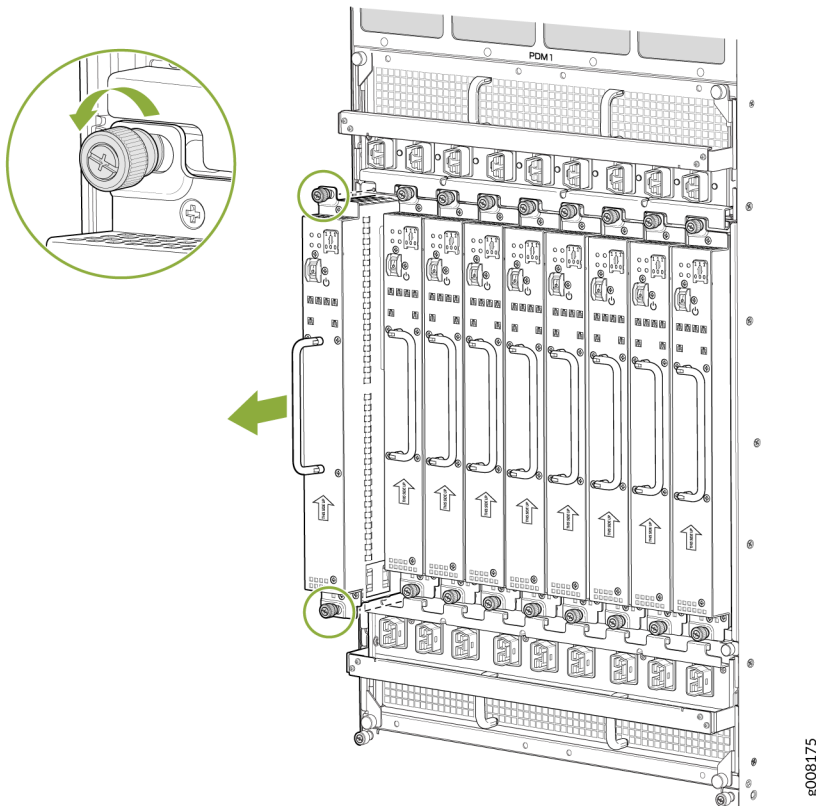
SEE ALSO

Reinstalling Components in the MX2008 Router After Initially Installing the Router in a Rack | 337

Removing the Fan Trays Before Installing an MX2010 Router with a Pallet Jack

To remove the upper and lower fan tray (see Figure 11 and Figure 12):

NOTE: The fan trays are interchangeable and are hot-insertable and hot-removable.

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. Loosen the two captive screws on each side of the fan tray access panel and open.

3. Loosen the two captive screws on the fan tray faceplate.

4. While grasping the handle, press and hold the latch until the status LED turns off. Pull the fan tray out approximately 1 to 3 in.

5. Press and hold the latch a second time to disengage fan operation. Place one hand under the fan tray for support, while pulling the fan tray completely out of the router.

> **NOTE**: The double latch system is a safety mechanism, so you cannot pull the fan tray out in one motion.

> ⚠ **CAUTION**: Do not stack fan trays on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 101: Removing Upper Fan Trays
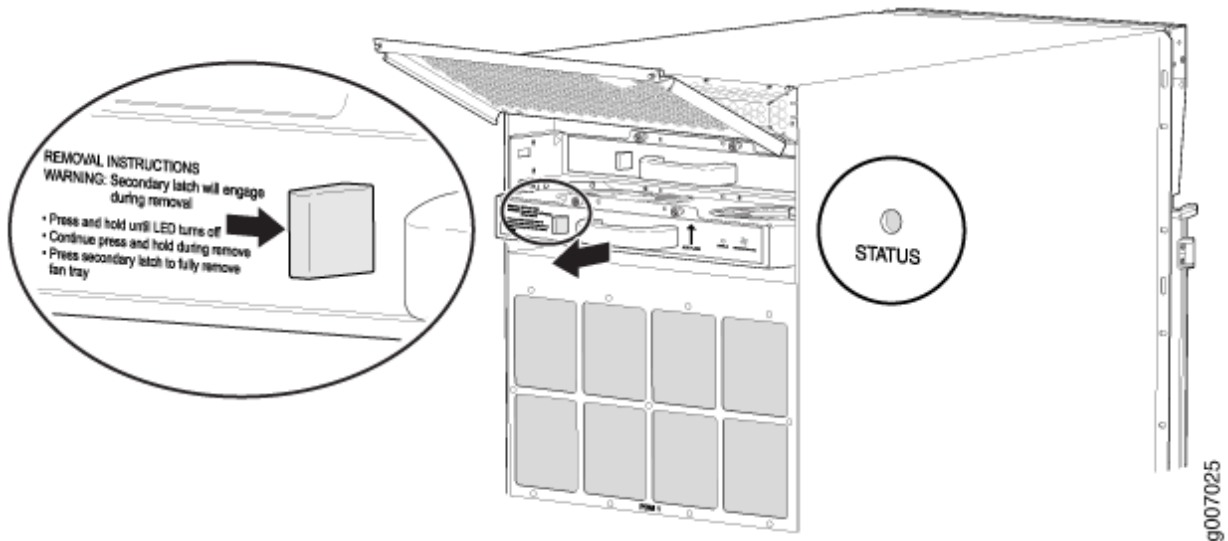
> ⚡ **WARNING**: Before removing a fan tray, make sure the fan blades have stopped completely.

Figure 102: Removing Lower Fan Trays
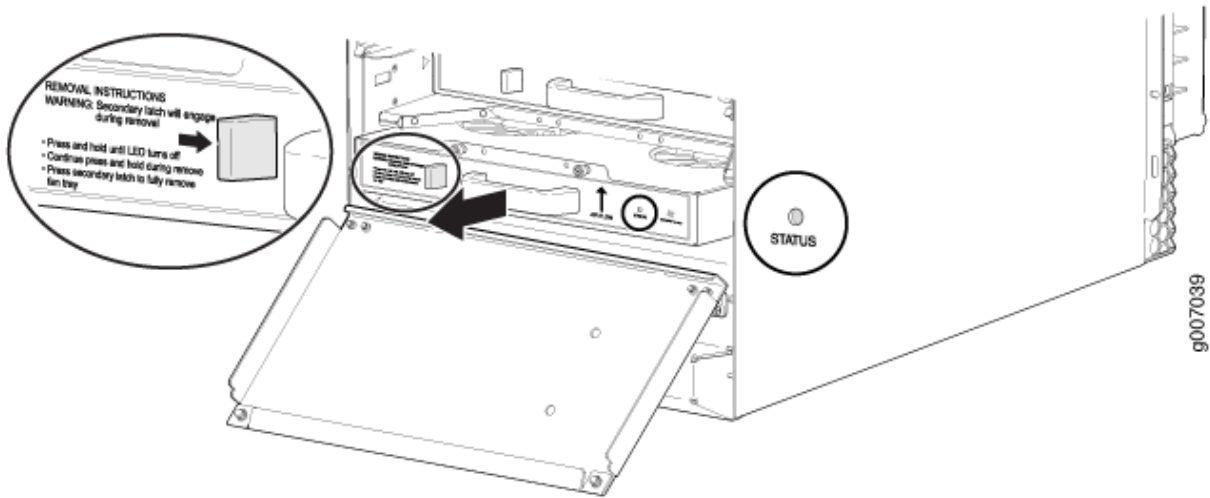
Removing the SFBs Before Installing an MX2010 Router with a Pallet Jack

To remove the SFBs (see Figure 13):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.
3. Open the ejector handles outward simultaneously to unseat the SFB.
4. Grasp the ejector handles, and slide the SFB about halfway out of the chassis.
5. Place one hand underneath the SFB to support it, and slide it completely out of the chassis. Place it on the antistatic mat.

> ⚠️ **CAUTION**: The weight of the SFB is concentrated in the back end. Be prepared to accept the full weight—up to 12 lb (5.45 kg)—as you slide the SFB out of the chassis.

> ⚠️ **CAUTION**: Do not stack hardware components on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

6. Repeat the procedure for each SFB.

Figure 103: Removing an SFB
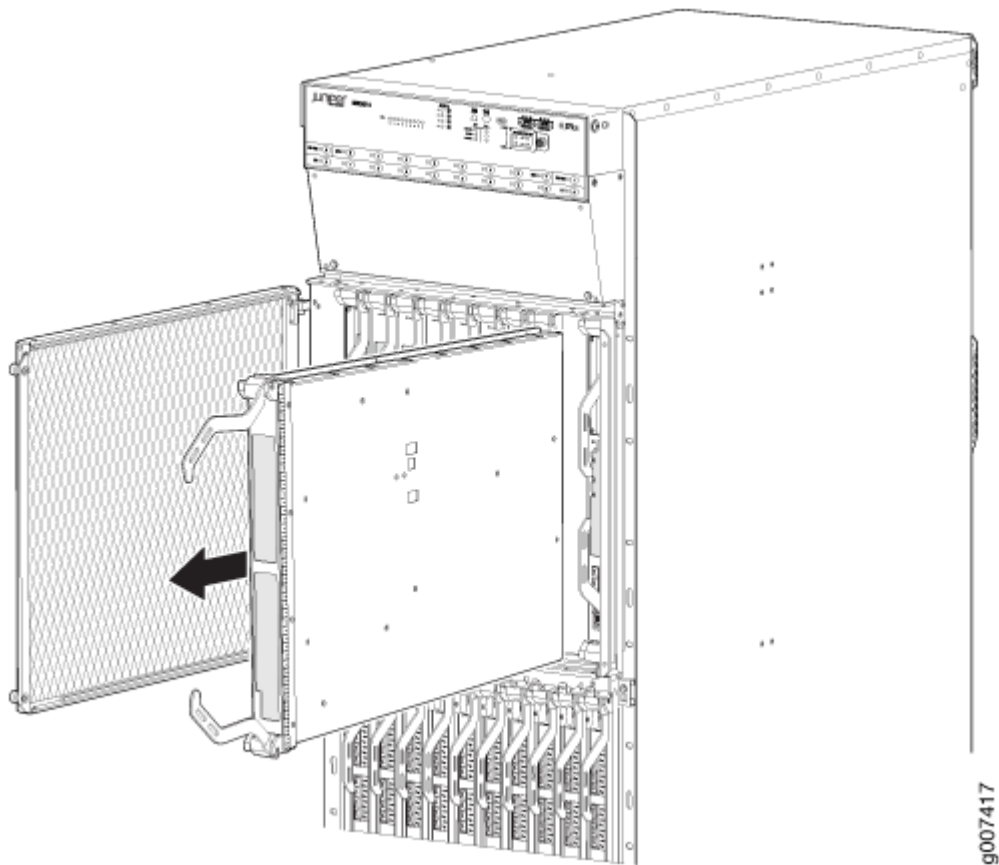
Removing the MPCs with Adapter Card Before Installing an MX2010 Router with a Pallet Jack

To remove an MPC with an adapter card (ADC):

1. Have ready an antistatic mat for the MPC with an ADC. Also have ready rubber safety caps for each MPC using an optical interface on the MPC that you are removing.

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

3. Open both the ejector handles simultaneously to unseat the both the MPC and the ADC.

4. Grasp the handles, and slide the MPC along with the ADC straight out of the card cage halfway.

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

> ⚠ **CAUTION**: The weight of the MPC with the ADC is concentrated in the back end. Be prepared to accept the full weight—up to 25 lb (11.34 kg)—as you slide the MPC along with the ADC out of the chassis.
>
> When the MPC along with the ADC is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.
>
> Do not stack MPCs with the ADCs on top of one another after removal. Place each one individually in an electrostatic bag or on its own antistatic mat on a flat, stable surface.

SEE ALSO

Reinstalling Components in the MX2008 Router After Initially Installing the Router in a Rack | **337**

Reinstalling Components in the MX2008 Router After Initially Installing the Router in a Rack | **337**

Removing the MPCs without an Adapter Card Before Installing an MX2010 Router with a Pallet Jack

To remove an MPC without an ADC (see Figure 14):

1. Have ready an antistatic mat for the MPC. Also have ready rubber safety caps for each MPC that uses an optical interface on the MPC that you are removing.

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

3. Simultaneously turn both the knobs counterclockwise to unseat the MPC from the ADC.

4. Grasp both knobs, and slide the MPC straight out of the ADC.

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

> ⚠ **CAUTION**: The weight of the MPC is concentrated in the back end. Be prepared to accept the full weight—up to 18.35 lb (8.32 kg)—as you slide the MPC out of the ADC.
>
> When the MPC is out of the ADC, do not hold it by the knobs, bus bars, or edge connectors. They cannot support its weight.

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

Figure 104: Removing an MPC without the ADC
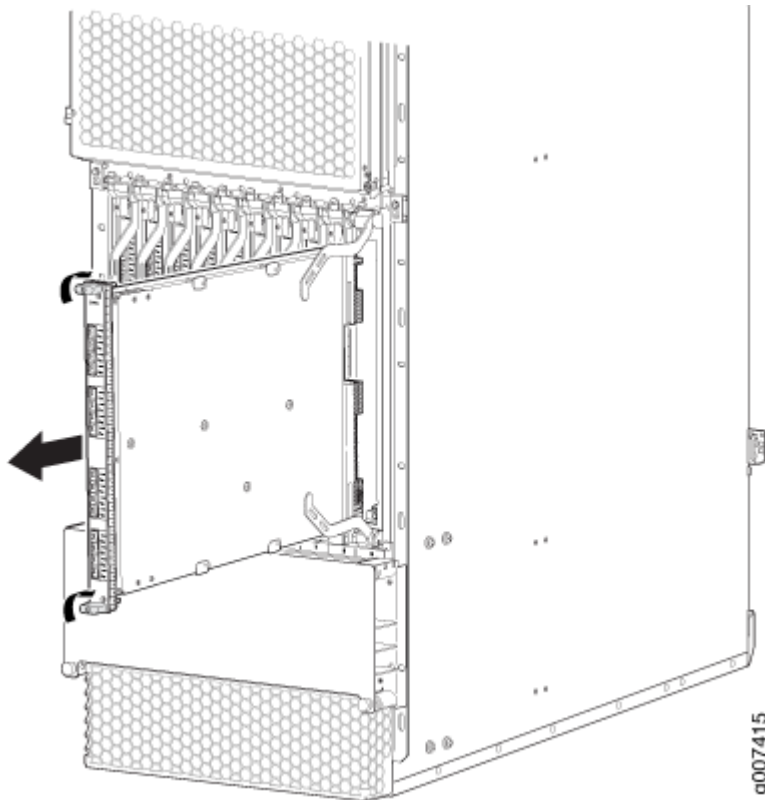
SEE ALSO

Removing the CB-REs Before Installing the MX2010 Router with a Pallet Jack

To remove a CB-RE (see Figure 15):

1. Have ready an antistatic mat for the CB-RE. Also have ready rubber safety caps for each SFP that uses an optical interface on the CB-RE that you are removing.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.
3. Open both ejector handles simultaneously to unseat the CB-RE.
4. Grasp the handles, and slide the CB-RE straight out of the card cage halfway.

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

> ⚠ **CAUTION**: The weight of the CB-RE is concentrated in the back end. Be prepared to accept the full weight—up to 15 lb (6.8 kg)—as you slide the CB-RE out of the chassis.
>
> When the CB-RE is out of the chassis, do not hold it by the ejector handles, bus bars, or edge connectors. They cannot support its weight.

> ⚠ **CAUTION**: Do not stack CB-REs on one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 105: Removing a CB-RE

RELATED DOCUMENTATION

Installing an MX2008 Router Using a Pallet Jack Overview

1. Gather the tools required to install the router. See:

2. Install the pallet jack attachment. See:

3. Install the MX2008. See:

Tools Required to Install the MX2008 Router Using a Pallet Jack

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

- Standard pallet jack (not provided)

- Pallet jack attachment—MX2000-PLLT-JCK-ADPTR

- Front component shipping covers

- Rear component shipping covers

- Phillips (+) screwdrivers, numbers 1, 2, and 3

- 9/16-in. or 14-mm open-end or socket wrench to remove bracket bolts from the shipping pallet

- ESD wrist strap

- Antistatic mat

SEE ALSO

Installing the Pallet Jack Attachment

To install the pallet jack attachment to the pallet jack:

1. Remove the pallet jack attachment from the shipping crate.
2. Place the pallet jack attachment across both pallet jack legs.
3. Using a 9/16-in. (14 mm) socket wrench, loosen and remove the eight shipping bracket support torque fasteners that are located on the top of the pallet jack attachment platform.
4. Using a 9/16-in. (14 mm) socket wrench, loosen the torque fasteners that are located on the four adjustable pallet jack attachment brackets.
5. Adjust the four pallet jack attachment brackets until they fit under the pallet jack legs.
6. Tighten the torque fasteners by using a 9/16-in. (14 mm) socket wrench to secure the brackets on the pallet jack attachment to the pallet jack (see Figure 106 on page 315).

Figure 106: Installing Pallet Jack Attachment onto Pallet Jack
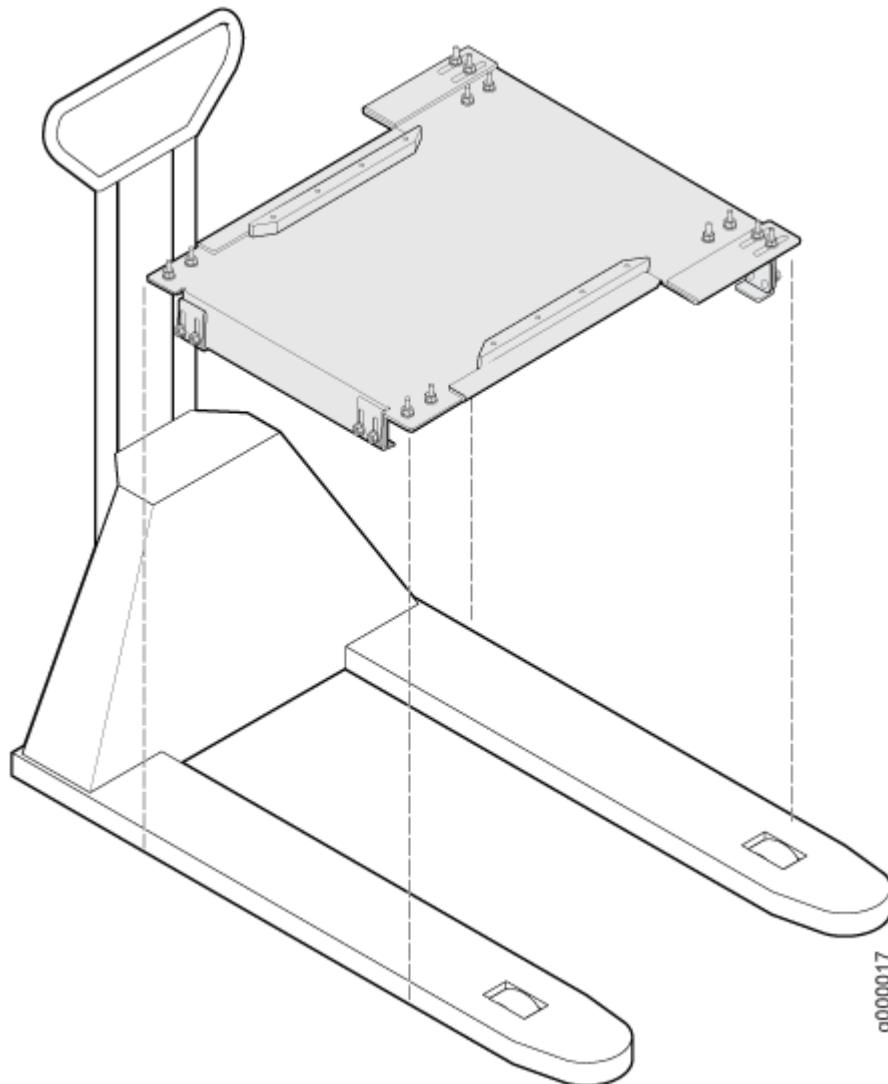
Installing the MX2008 Router Using a Pallet Jack with Attachment

Before installing the router, you must remove all components (see "Removing Components from the MX2008 Router Chassis Before Installing It in a Rack" on page 297).

To install the router by using a pallet jack with attachment:

1. Ensure that the rack is in its permanent location and is secured to the building. Ensure that the installation site allows adequate clearance for both airflow and maintenance. See "Clearance Requirements for Airflow and Hardware Maintenance for the MX2008 Router" on page 253.

2. Reattach the front and rear shipping covers to the chassis to help move the router. The handles on the shipping covers are used to guide the chassis during installation.

> ⚠ **CAUTION**: Do not lift the router by using the handles on the shipping covers. Use these handles only to help position the router.

3. Place the pallet jack attachment across both legs and secure the attachment to the pallet jack.

4. Using a four-person team to load the router onto the pallet jack, make sure it rests securely on the pallet jack attachment platform.

Figure 107: Loading the MX2008 Router onto the Pallet Jack
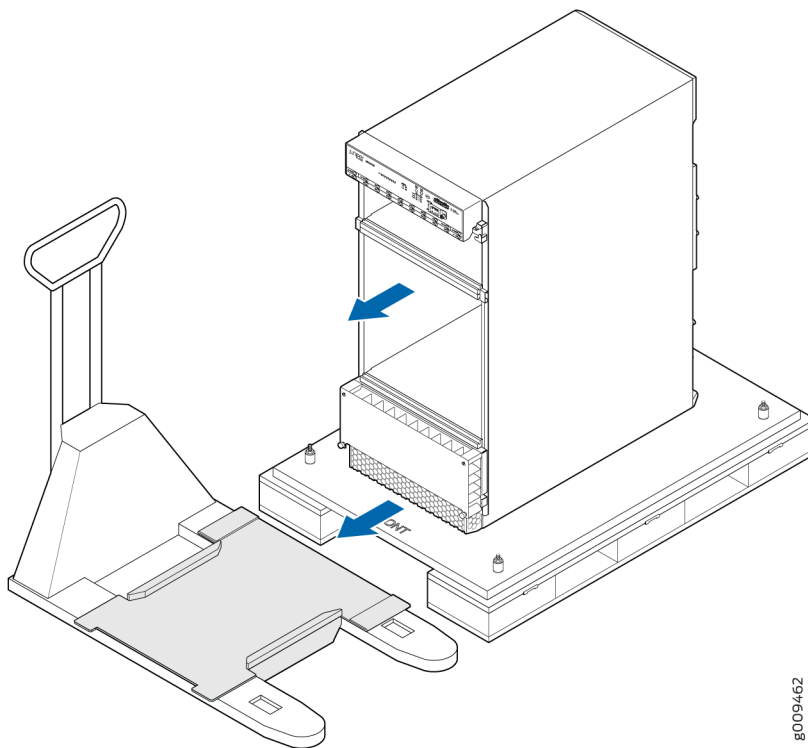
> ⚠ **CAUTION**: Applying force to any other parts of the chassis other than the shipping covers can damage the chassis.

5. Attach the shipping brackets to the pallet jack attachment by using existing bracket screws.

6. On each of the shipping brackets, partially insert screws into the hole to secure the brackets to the chassis. Tighten all screws. These brackets will prevent the chassis from tilting.

> **NOTE**: There must be a minimum of 24 U of usable rack space when installing the MX2008 routing into a 24-U rack.

7. Lower the pallet jack before moving the chassis. This will help distribute the weight evenly and reduce the risk of tilting or damage to the chassis.

8. Using the pallet jack, position the router in front of the rack or cabinet, centering it in front of the rack.

> **NOTE**: If you are installing the MX2008 router into a network cabinet, make sure that no hardware, device, rack, or cabinet component obstructs the 24-U rack space from access during installation.

9. Using the pallet jack, lift the chassis approximately 0.75 in. (1.9 cm) above the surface of the mounting shelf (four-post rack) or bottom opening of the rack (open-frame rack), and position it as close as possible.

> **NOTE**: Due to the short lift capability of the pallet jack, we recommended that you install the router on the bottom of the rack.

10. Remove the shipping brackets that are attached to the pallet jack attachment and chassis, and set them aside.

11. Grasp the handles on the shipping covers and carefully slide the router into the rack (see and Figure 108 on page 318 and Figure 109 on page 319). If you are installing the router into a four-post rack, continue sliding the router onto the mounting shelf so that the bottom of the chassis and the mounting shelf overlap by approximately 2 inches.

Figure 108: Loading the MX2008 Router into the Rack

g009463
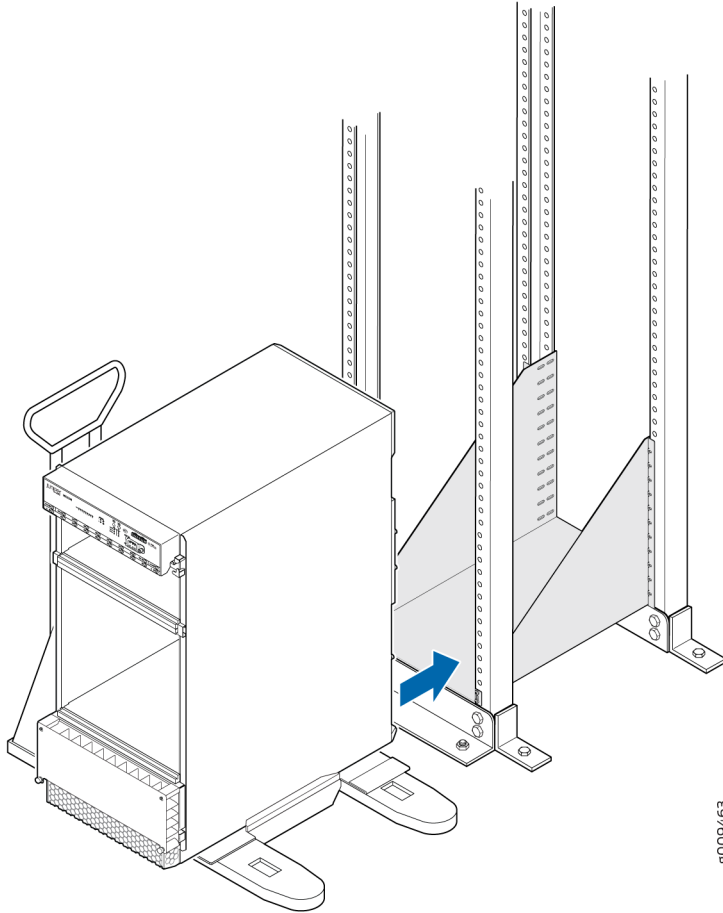
Figure 109: Installing the MX2008 Router on an Open-Frame Rack
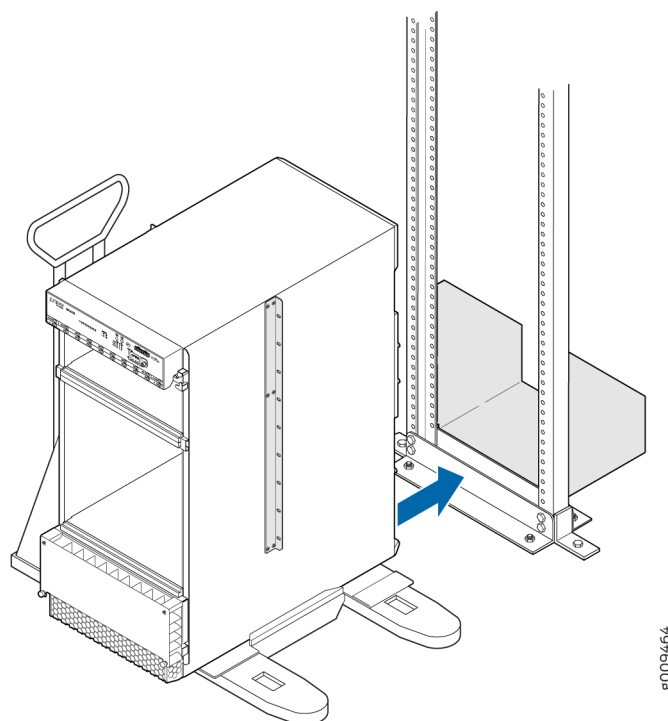
12. With four people pushing on the front-mounting flanges, slide the router until the center-mounting brackets (open-frame racks) or front-mounting flanges (four-post racks) contact the rack rails. In a four-post rack, the mounting shelf ensures that the holes in the front-mounting flanges of the chassis align with the holes in the rack rails.

13. Move the pallet jack away from the rack.

14. Insert twelve mounting screws (six on each side) into the mounting holes to secure the router to the rack.

15. Visually inspect the alignment of the router. If the router is installed properly in the rack, all the mounting screws on one side of the rack should be aligned with the mounting screws on the opposite side, and the router should be level.

Installing an MX2008 Router Using a Router Transport Kit Overview

1. Gather the tools required to install the router. See:

   "Tools Required to Install the MX2008 Router Using a Router Transport Kit" on page 320

2. Install the router transport kit. See:

3. Secure the router to the router transport platform. See:

4. Install the router using the router transport kit. See either:

SEE ALSO

Tools Required to Install the MX2008 Router Using a Router Transport Kit

To install the router by using a router transport kit, you need the following tools and equipment:

- Router transport kit (model number MX2K-TRNSPRT-KIT)

- Front component shipping cover

- Rear component shipping cover

- Phillips (+) screwdrivers, numbers 1, 2, and 3

- 1/2-in. (12.7 mm) drive ratchet

- 1/4-in. (6.35 mm) torque-controlled driver or socket wrench to tighten the nuts on the router transport kit

- 1-1/8-in. (28.57 mm) torque-controlled driver or socket wrench to tighten the router transport kit winch mechanism

- 9/16-in. or 14-mm open-end or socket wrench with extension to remove bracket bolts from the shipping pallet

- Electrostatic discharge wrist strap

- Antistatic mat

> **NOTE**: The router transport kit does not come with the router. You need to purchase the router transport kit from Juniper Networks. Using the router mounting kit for installing the MX2008 is optional.

SEE ALSO

MX2008 Chassis Description **| 17**

MX2008 Field-Replaceable Units **| 30**

Unpacking the MX2008 Router Overview **| 280**

Installing the Router Transport Kit

> **NOTE**: The router transport kit is optional and can be purchased from Juniper Networks.

The router transport kit includes the following components:

- Router transport platform

- Router transport left and right mounting plates with adjustable wheel assembly

- Router winch mount with winch strap plate

To install the router transport kit:

1. Remove the router transport kit from the shipping crate (see "Unpacking the MX2008 Router Transport Kit" on page 288).

   > **NOTE**: The router transport kit weighs approximately 138.5 lb (62.82 kg).

2. Remove the winch strap plate that is secured to the winch mount by using a 9/16-in. (14 mm) socket wrench, and set the plate aside.

3. Using a number 3 Phillips screwdriver, loosen the captive screws that secure the winch mount to the router transport kit, and set the mount aside.

4. Using a number 3 Phillips screwdriver, loosen the captive screws that secure the router transport mounting plate and wheel assembly (left and right) to the router transport platform, and set them aside (see Figure 110 on page 322).

Figure 110: Preparing the Router Transport Kit for Installation
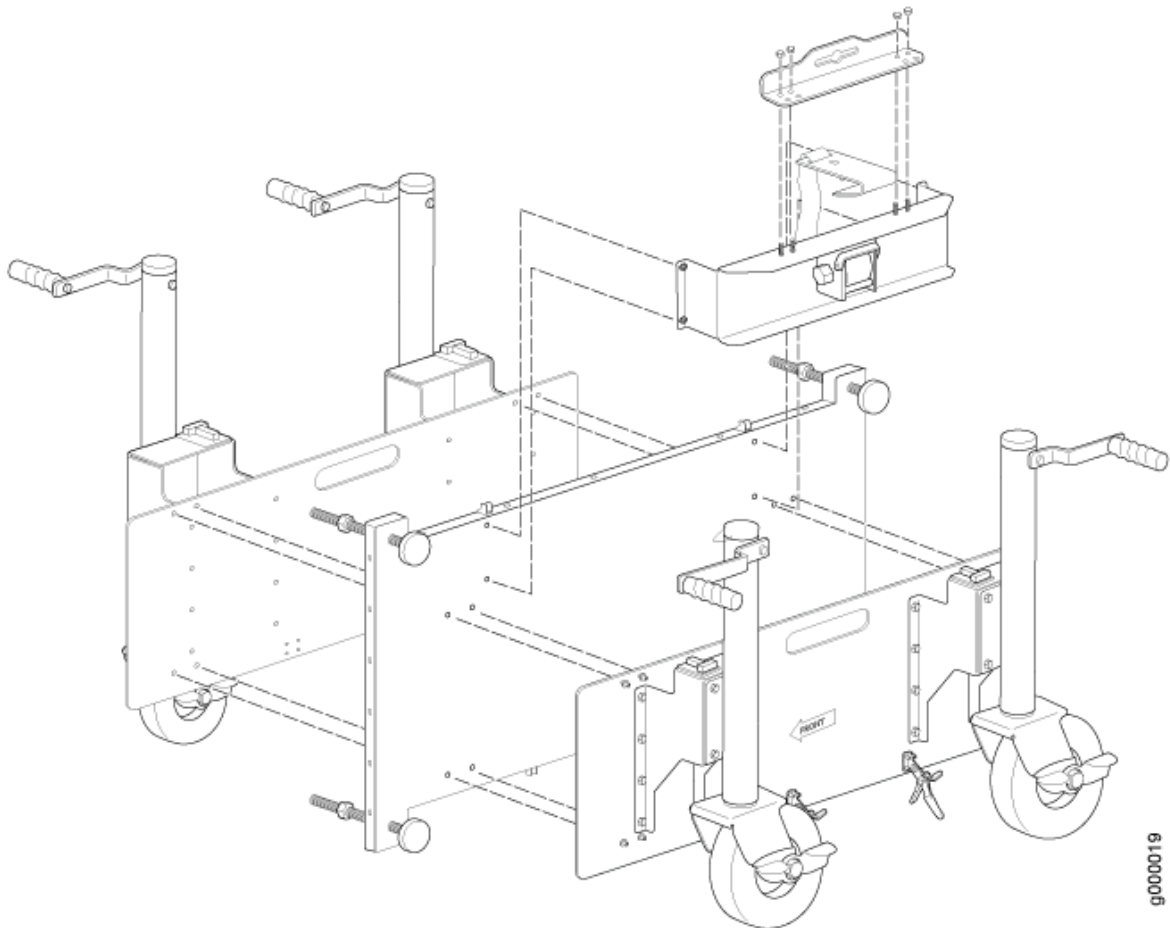
5. Remove the four shipping brackets that secure the router to the shipping crate platform using a 9/16-in. (14 mm) socket wrench, and a number 2 Phillips screwdriver, and set the brackets aside.

6. Align the left router transport mounting plate and wheel assembly (indicated by left arrow) with the holes on the left side of the chassis (see Figure 111 on page 323).

7. Using a number 3 Phillips screwdriver, tighten the captive screws to secure the router transport mounting plate and wheel assembly to the chassis.

8. Align the right router transport mounting plate and wheel assembly (indicated by right arrow) with the holes on the right side of the chassis (see Figure 111 on page 323).

9. Using a number 3 Phillips screwdriver, tighten the captive screws to secure the router transport mounting plate and wheel assembly to the chassis.

Figure 111: Installing the Router Transport Kit onto the MX2008 Router

g009465
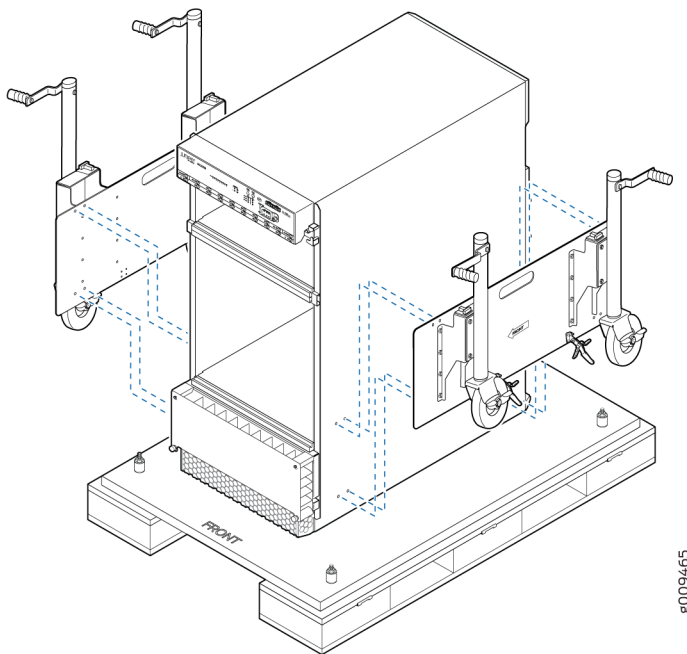
Securing the Router to the Router Transport Platform

To secure the router to the router transport platform:

1. Ensure that the rack is in its permanent location and is secured to the building. Ensure that the installation site allows adequate clearance for router transport kit turn ratios, airflow, and maintenance.

2. Using a two-person team on either side of the chassis, turn the handles on the router transport four or five times until the chassis is raised approximately 1 in. (2.54 cm), making sure that the chassis is level (see).

> **NOTE**: An empty MX2008 weighs approximately 324 lb (146.96 kg).

Figure 112: Securing the Crate Door to the Shipping Crate Platform
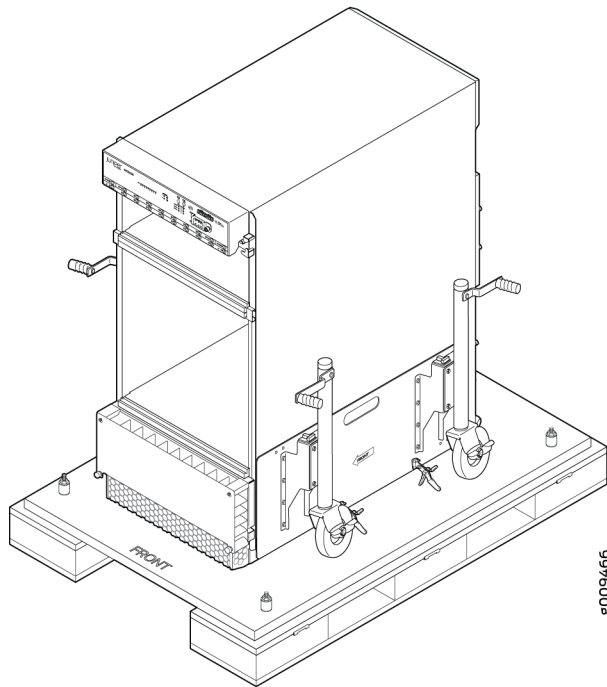
NOTE: The router transport kit is equipped with four T-shaped levels on top of each of the four router transport mounting brackets. Make sure the bubbles within the T-shaped levels are between the lines, indicating the chassis is level.

CAUTION: Do not raise the chassis above 1 in. (2.54 cm). This ensures that the router will not tilt when transporting, which can result in injury or damage to the router.

3. Turn the four wheels on the router transport kit toward the rear of the chassis.

4. Grasping the handles on the shipping covers, carefully guide the chassis down the crate ramp to the rack location.

WARNING: Do not push or pull the router fast during transporting. Using excessive speed can cause the wheels to turn abruptly and tilt the router over.

> ⚠️ **CAUTION**: Do not lift the router by using the handles on the shipping covers. Use these handles only to help position the router.

5. Position the router transport platform directly under the router, aligning the router transport platform with the bottom of the chassis by adjusting the four leveling mounts.

> **NOTE**: The router transport platform height can be adjusted between 0.25 in. (0.6 cm) and a maximum of 4 in. (10.16 cm).

6. Secure the router transport platform to the router transport mounting plates by using the four latch locks (see Figure 113 on page 325).

Figure 113: Securing the Router Transport Platform
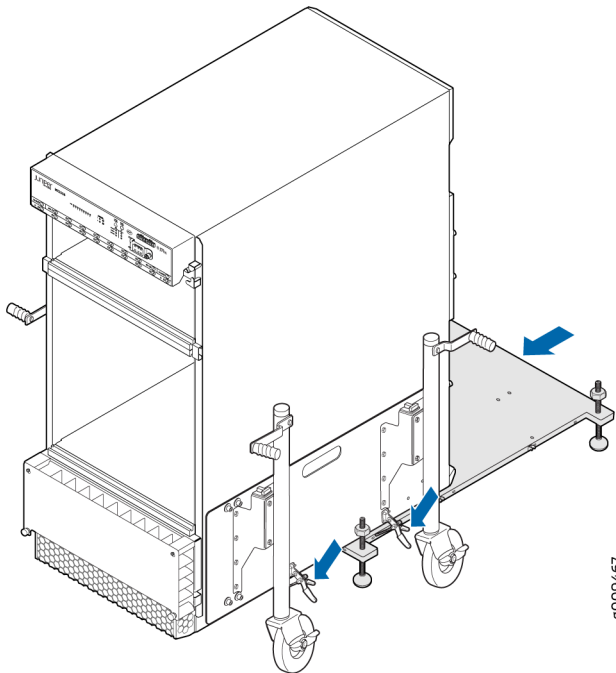
Using the Router Transport Kit to Install the Router in a Four-Post Rack

Because of the router's size and weight—up to 985 lb (446.79 kg) depending on the configuration—we recommend that you use a router transport kit to install the router. The router transport kit does not

come with the router. You need to purchase the router transport kit from Juniper Networks. Using the router mounting kit for installing the MX2008 is optional.

> **NOTE**: Four people are needed to install the router into a rack.

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

To install the router in a four-post rack by using the router transport kit:

1. Install the winch strap plate to the rear of the router by tightening the four captive screws (see Figure 114 on page 326).

Figure 114: Installing Winch Strap Plate (Four-Post Rack)
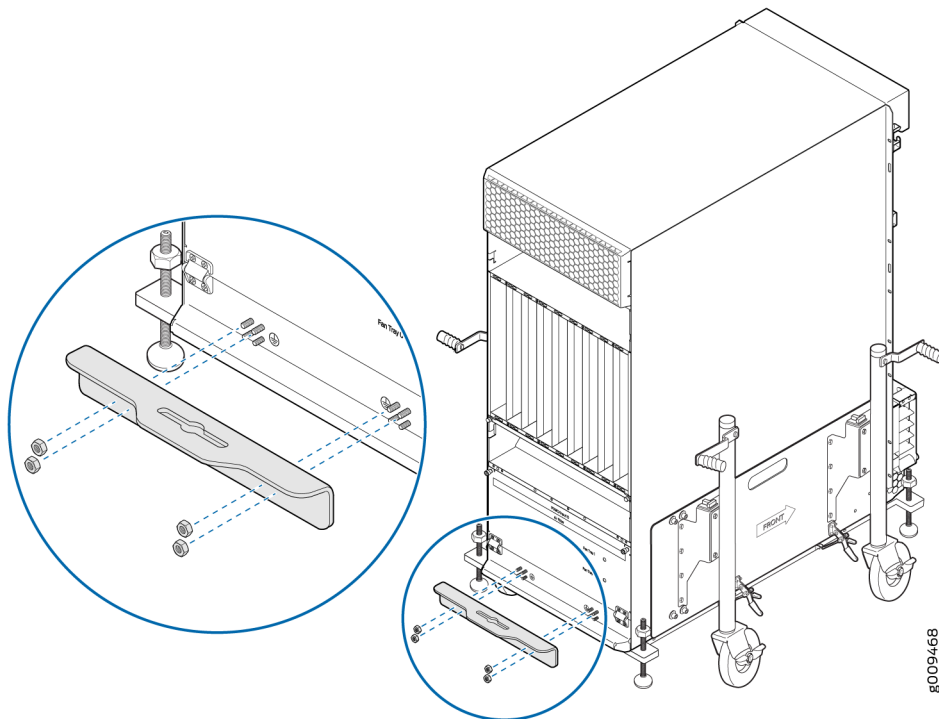
2. Using a four-person team, transport the router to the rack installation location and center it in front of the mounting shelf.

> **NOTE**:
>
> - A minimum of 38 in. (96.5 cm) of clearance is required to roll the chassis sideways.
>
> - A minimum of 42 in. (106.7 cm) of circular space is required to rotate the chassis.
>
> - The router transport kit handles can be removed to accommodate aisle width.

3. Install the winch mount bracket to the rear rack rails by using the six captive screws, and tighten the screws (see Figure 115 on page 327).

Figure 115: Installing Winch Mount Bracket to Rack Rails
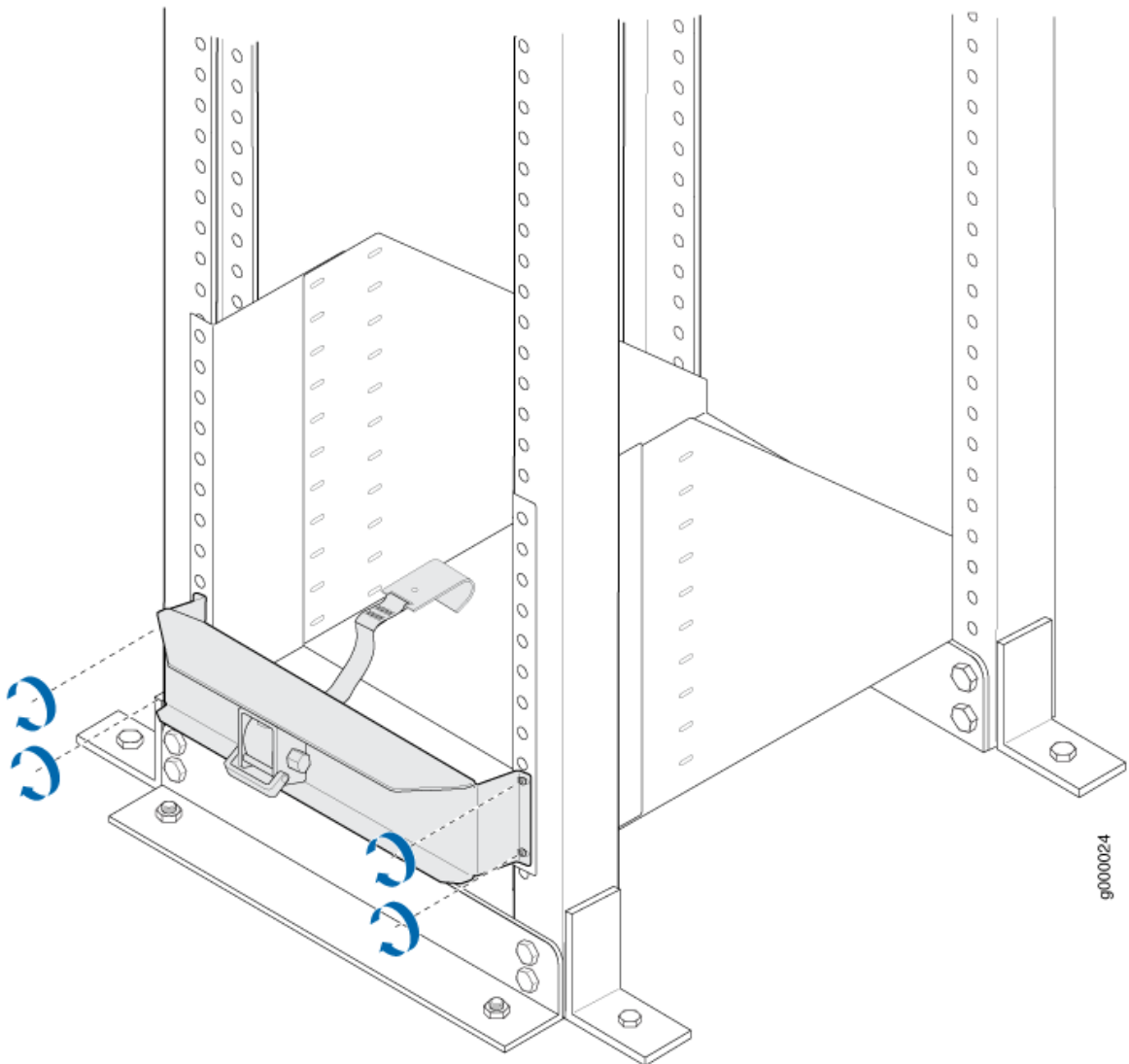
4. Adjust the height of the router by turning the handles clockwise until the router transport platform is aligned with the surface of the mounting shelf and slightly higher than the mounting shelf (see Figure 116 on page 328).

> **NOTE**: Make sure the bubbles within the T-shaped levels are between the lines, indicating that the router is level.

5. Adjust the four leveling mounts on the router transport platform until all four leveling mounts rest firmly on the ground (see Figure 116 on page 328).

Figure 116: Align the MX2008 Router with Rack Mounting Shelf
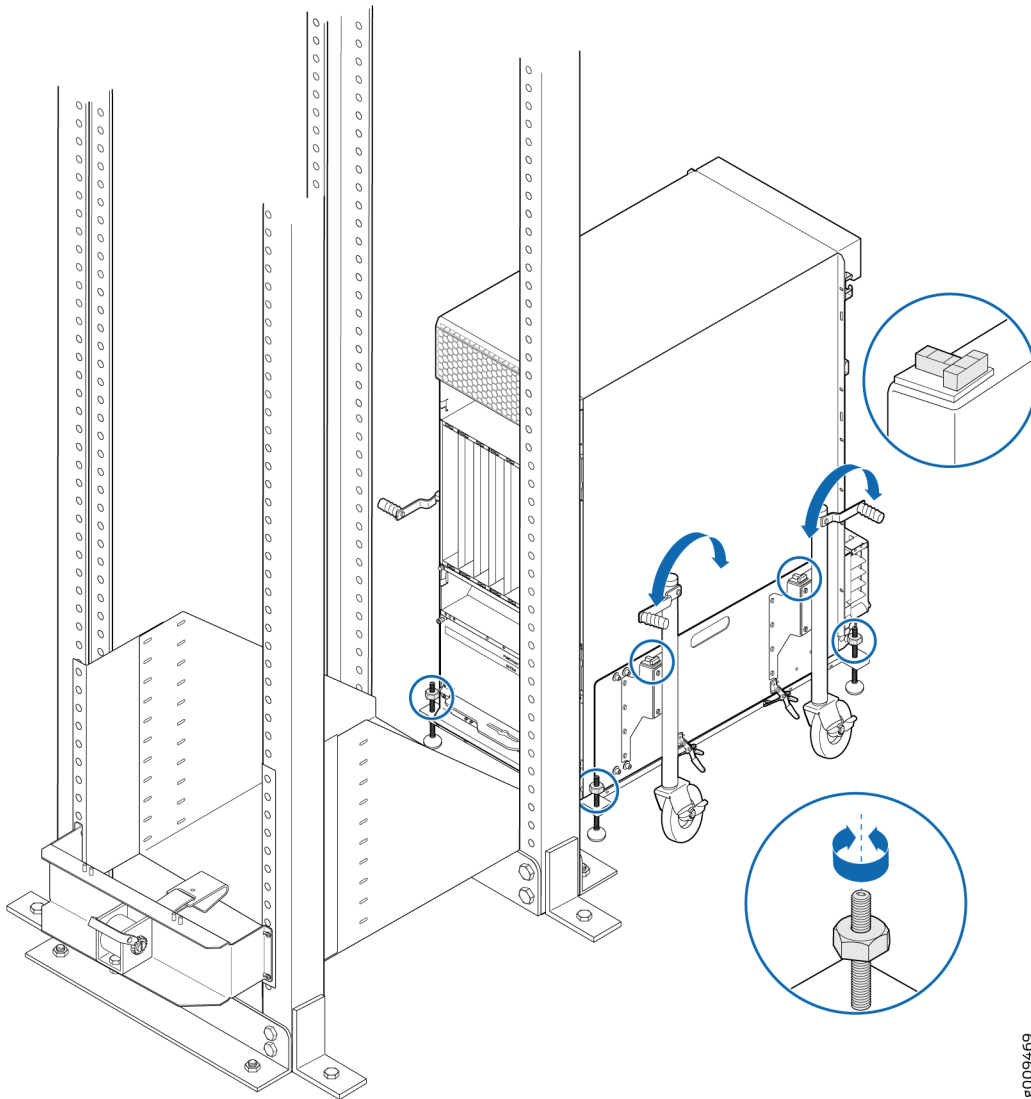
6. Unlock the four toggle latches that secure the router transport platform to the router transport mounting plate and wheel assembly.

7. Lift the wheels up by turning the handles counterclockwise so that the weight of the router is on the router transport platform.

8. Using a number 3 Phillips screwdriver, loosen the captive screws that secure the router transport mounting plates and wheel assembly to the chassis, and set them aside (see Figure 117 on page 329).

Figure 117: Remove Router Transport Mounting Plate and Wheel Assembly
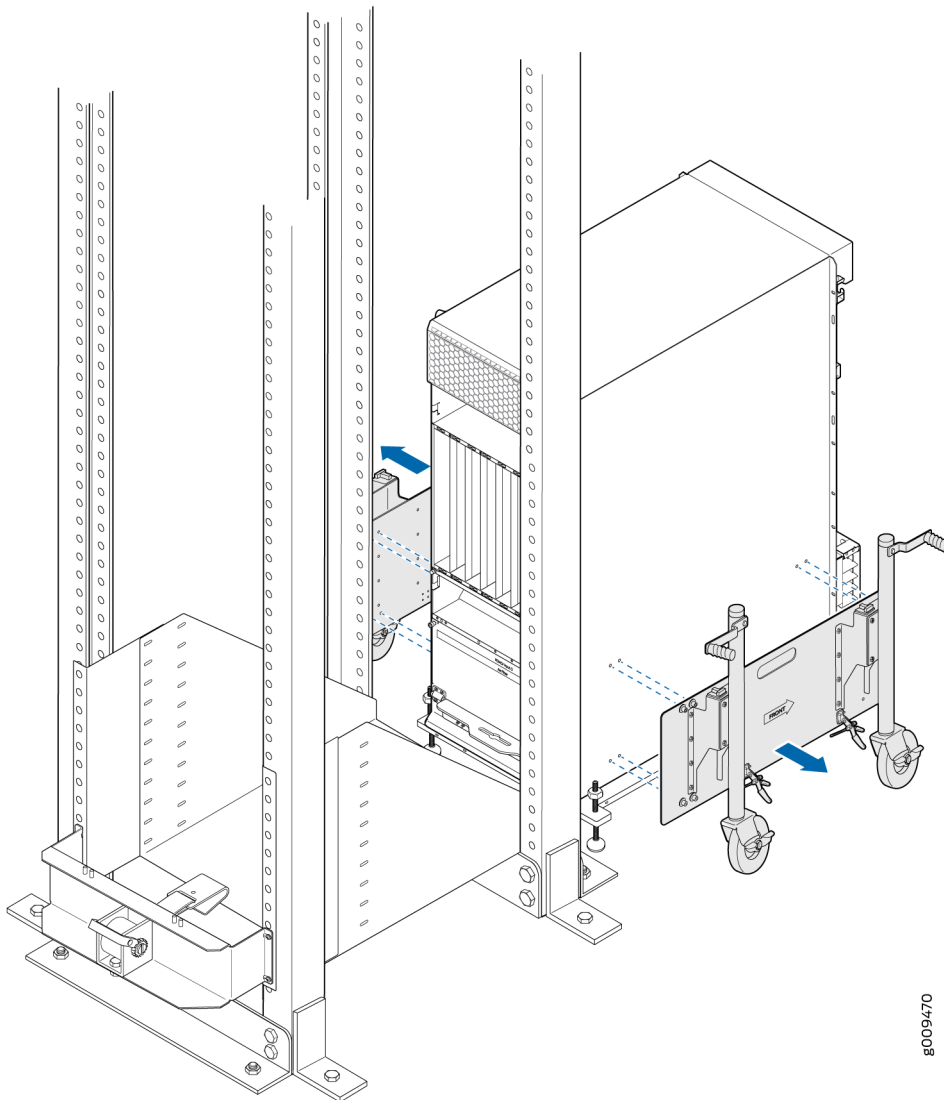
9. Attach the winch strap to the winch strap plate at the rear of the router (see Figure 118 on page 330).

Figure 118: Attaching Winch Strap to Winch Strap Plate
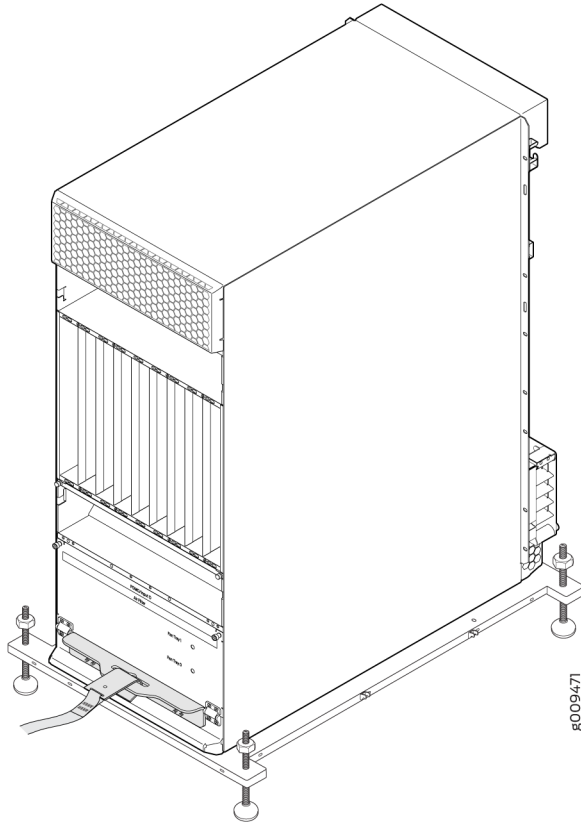
10. Attach a 1-1/8 in. (28.57 mm) socket wrench to the winch mechanism and turn clockwise to start pulling the chassis into the rack (see Figure 119 on page 331).

Figure 119: Pulling the MX2008 into the Rack
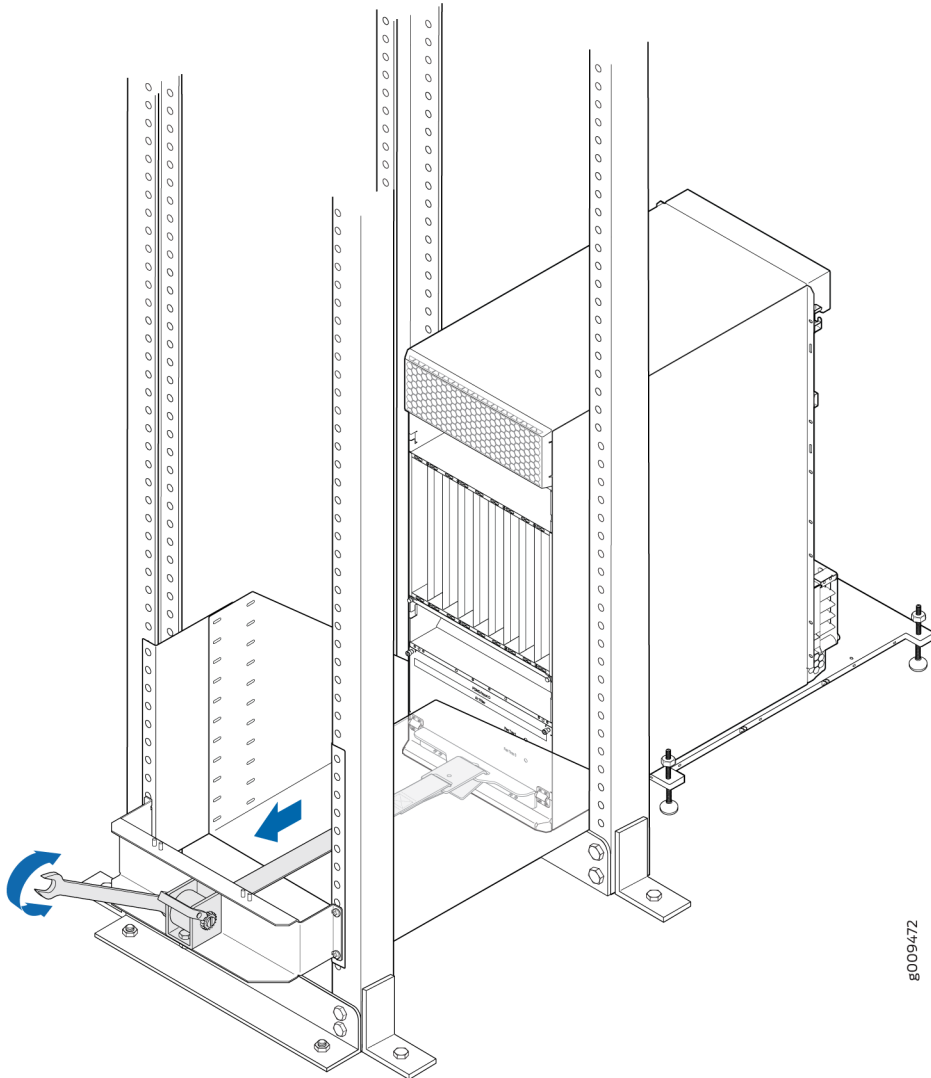
g009472

> **NOTE**:
>
> - A four-person team is needed to carefully guide the router into the rack while operating the winch.
>
> - If the router is not pulled all the way into the rack by the winch mechanism, grasp the handles on the shipping covers and carefully slide the router onto the mounting shelf until the front-mounting flanges contact the rack rails. You must remove the winch bracket to perform this procedure.

- There must be a minimum of 24-U of usable rack space when installing the MX2008 into a 24-U rack.

11. Remove the router transport platform, and set the platform aside.

12. Remove the winch mount and winch strap plate, and set them aside.

13. Insert twelve mounting screws (six on each side) into the mounting holes to secure the router to the rack.

14. Visually inspect the alignment of the router. To verify that the router is installed properly in the rack, see that all the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side and the router is level.

15. Reassemble the router transport kit, and set it aside.

Using the Router Transport Kit to Install the MX2008 Router in an Open-Frame Rack

NOTE: Four persons are needed to install the router into a rack.

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

To install the MX2008 in an open-frame rack by using a router transport kit:

1. Using the router transport platform, position the router in front of the rack or cabinet, centering it in front of the rack.

2. Using a four-person team, transport the router to the rack installation location and center it in front of the rack.

   NOTE:

   - A minimum of 38 in. (96.5 cm) of clearance is required to roll the chassis sideways.

   - A minimum of 42 in. (106.7 cm) of circular space is required to rotate the chassis.

   - The router transport kit handles can be removed to accommodate aisle width.

3. Adjust the height of the router by turning the handles clockwise until the router transport platform is approximately 0.75 in. above the bottom of the rack opening (see Figure 120 on page 334).

> **NOTE**:
>
> - Because of the short lift capability of the router transport kit, we recommend that you install the router on the bottom of the rack.
>
> - Make sure that the bubbles within the T-shaped levels are between the lines, indicating that the router is level.

4. Adjust the four leveling mounts on the router transport platform until all four leveling mounts rest firmly on the ground (see Figure 120 on page 334).

Figure 120: Aligning the MX2008 Router with the Rack
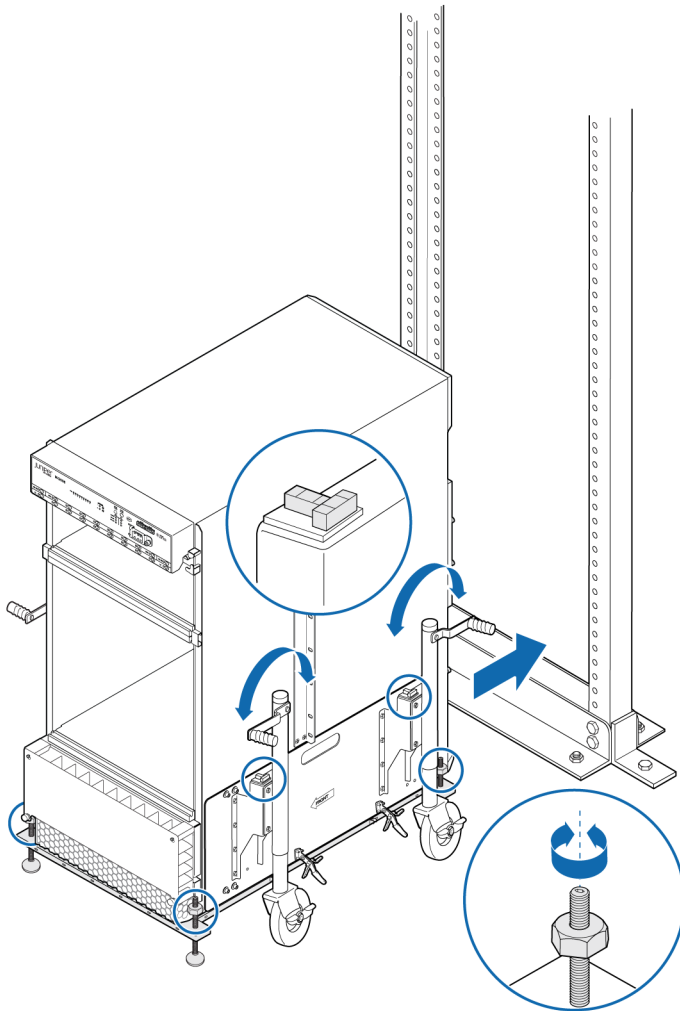
5. Unlock the four toggle latches that secure the router transport platform to the router transport mounting plate and wheel assembly.

6. Lift the wheels up by turning the handles counterclockwise so that the weight of the router is on the router transport platform.

7. Using a number 3 Phillips screwdriver, loosen the captive screws that secure the router transport mounting plates and wheel assembly to the chassis, and set them aside (see).

Figure 121: Removing Router Transport Mounting Plate and Wheel Assembly
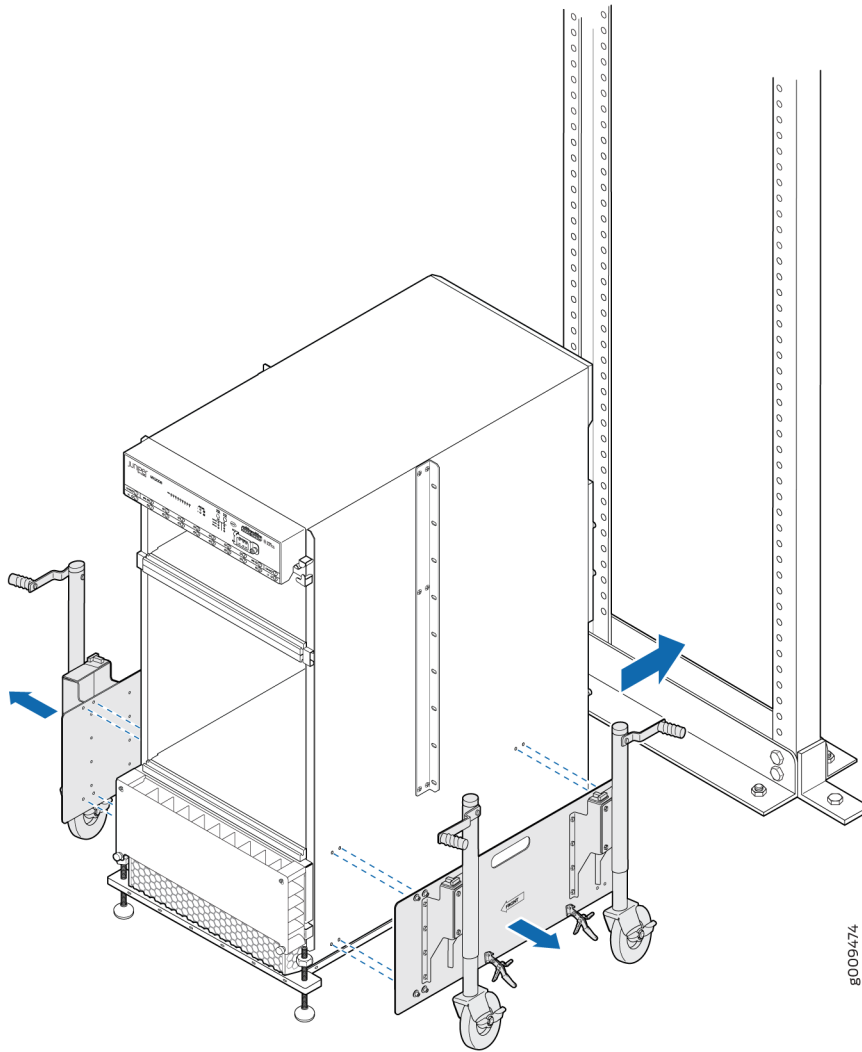
8. Grasping the handles on the shipping covers, carefully slide the router into the rack until the center-mounting brackets contact the rack rails (see Figure 122 on page 336).

Figure 122: Sliding the MX2008 into the Open-Frame Rack
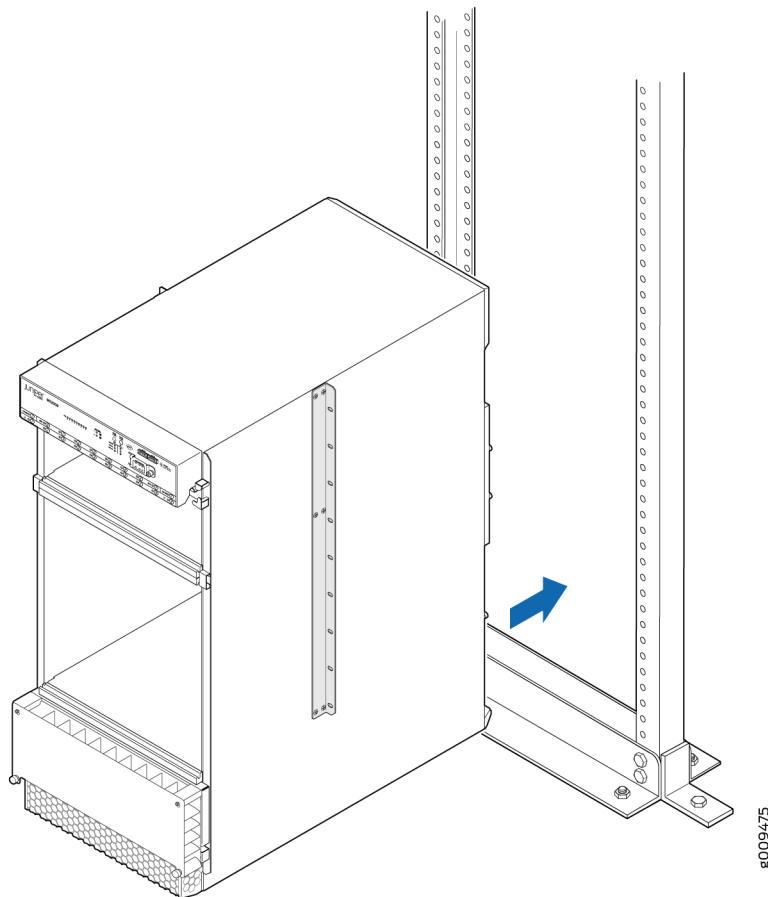
NOTE:

- A four-person team is needed to carefully guide the router into the rack.

- There must be a minimum of 24-U of usable rack space when installing the MX2008 into a 24-U rack.

9. Remove the router transport platform, and set the platform aside.

10. Insert twelve mounting screws (six on each side) into the mounting holes to secure the router to the rack.

11. Visually inspect the alignment of the router. To verify that the router is installed properly in the rack, see that all the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side and the router is level.

12. Reassemble the router transport kit, and set aside for future use.

Reinstalling Components in the MX2008 Router After Initially Installing the Router in a Rack

IN THIS SECTION

- Reinstalling the Power Distribution Modules After Installing the MX2000 Router with a Pallet Jack | **337**
- Reinstalling the Power Supply Modules After Installing the MX2000 Router with a Pallet Jack | **342**
- Reinstalling the Fan Trays After Installing the MX2000 Router with a Pallet Jack | **346**
- Reinstalling the SFBs After Installing the MX2010 Router with a Pallet Jack | **348**
- Reinstalling the Adapter Card After Installing the MX2010 Router with a Pallet Jack | **349**
- Reinstalling the MPCs After Installing the MX2010 Router with a Pallet Jack | **351**
- Reinstalling the CB-REs After Installing the MX2010 Router with a Pallet Jack | **352**

After the router is installed in the rack, remove the shipping covers, and reinstall the removed components before booting and configuring the router. You reinstall components first in the rear of the chassis, and then in the front:

Reinstalling the Power Distribution Modules After Installing the MX2000 Router with a Pallet Jack

To reinstall the AC, DC, 240 V China, or universal PDMs, follow this procedure for each PDM (see Figure 33 and Figure 34):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. For a AC-powered router, move the AC circuit breaker on the power source to the off (**O**) position. For a DC-powered router, move the DC circuit breaker on the power source to the off (**O**) position. We recommend this precaution even though the PDMs are not connected to power sources.

3. Take each PDM to be installed out of its electrostatic bag, and identify the slot on the PDM where it will be connected.

4. Turn the DC power switch to the off (**O**) position on all PSMs that are associated with the PDM being reinstalled.

5. Using both hands, grasp the two handles and slide the PDM partway into the chassis.

6. Align both locking levers with the openings in the chassis, and simultaneously close them to fully seat the PDM.

7. Tighten both captive screws on the locking levers.

> **NOTE**: The three-phase delta or wye AC PDM terminal blocks will be flipped depending on which slot the PDMs gets plugged into.

Figure 123: Reinstalling an AC Power Distribution Module
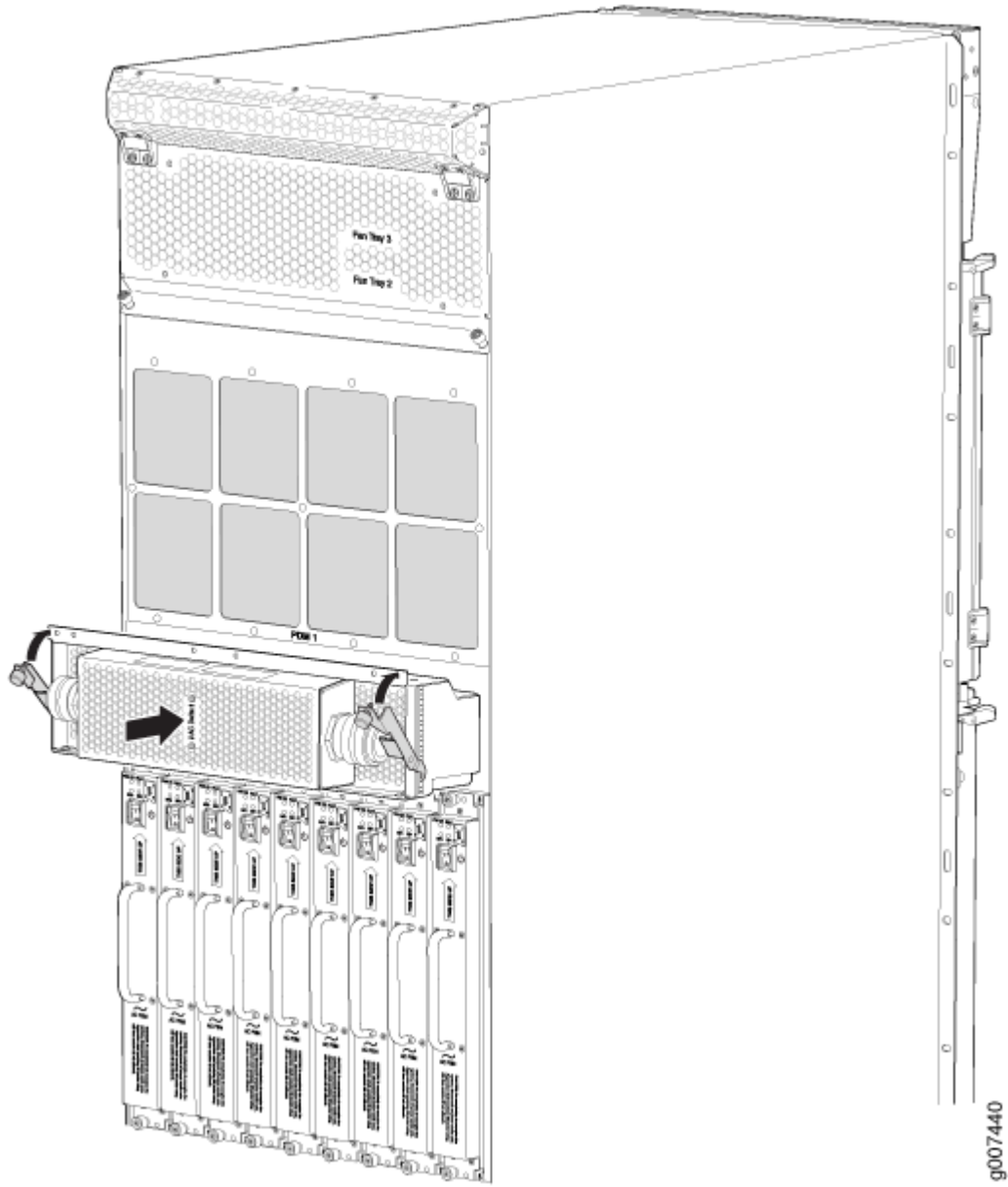
Figure 124: Reinstalling a DC Power Distribution Module (-48 V)
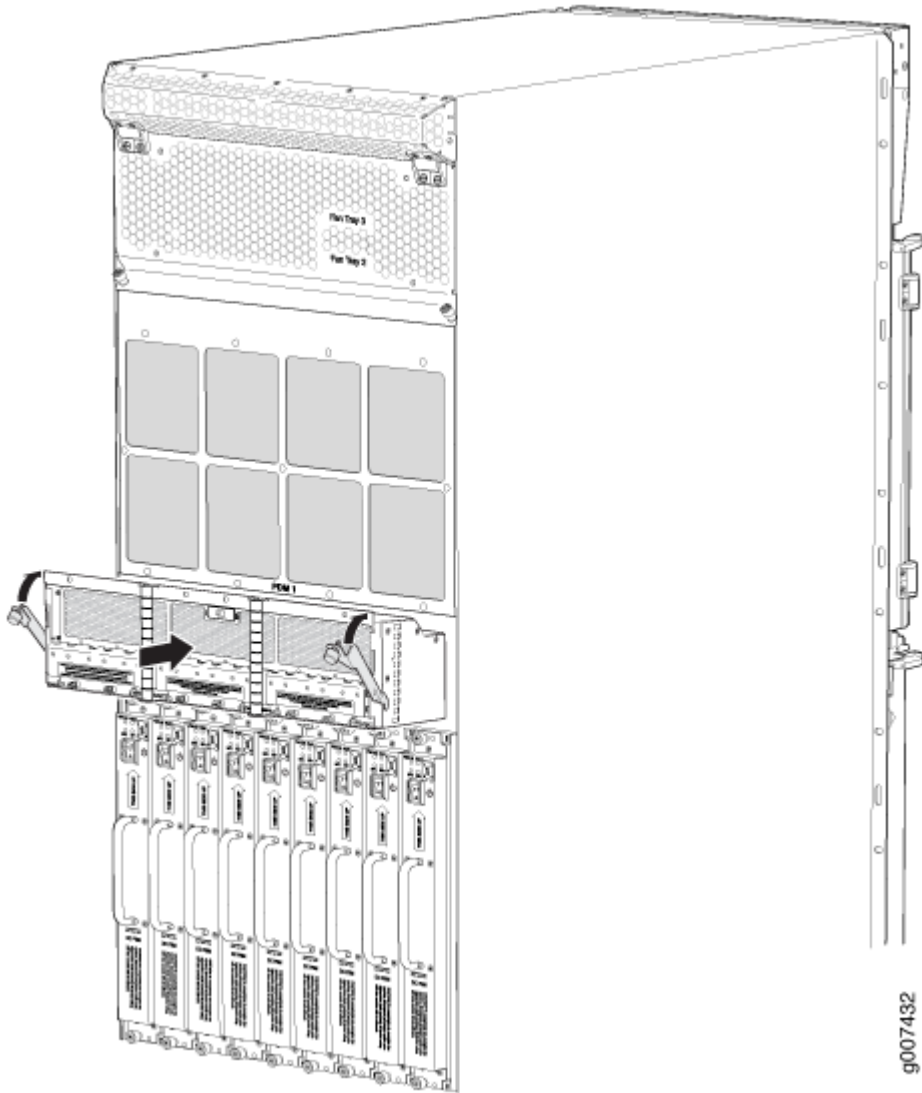
> **NOTE**: For the DC-powered router, make sure the switch is set to 60 A, or 80 A to match the DC circuit input feed.

Figure 125: Reinstalling a DC Power Distribution Module (240 V China)
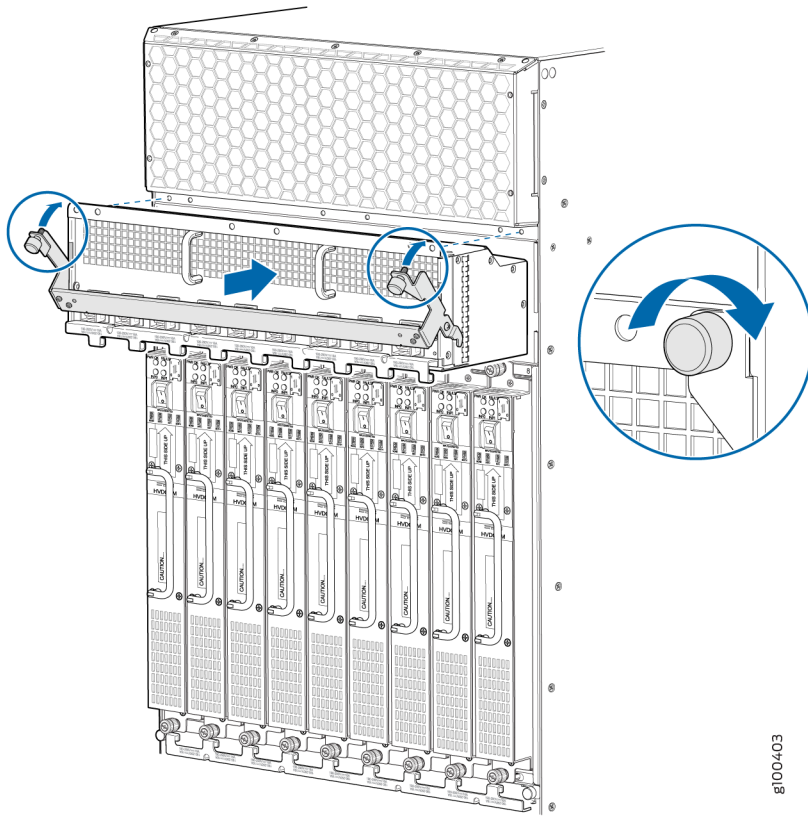
g100403

Figure 126: Reinstalling a High-Voltage Universal (HVAC/HVDC) Power Distribution Module
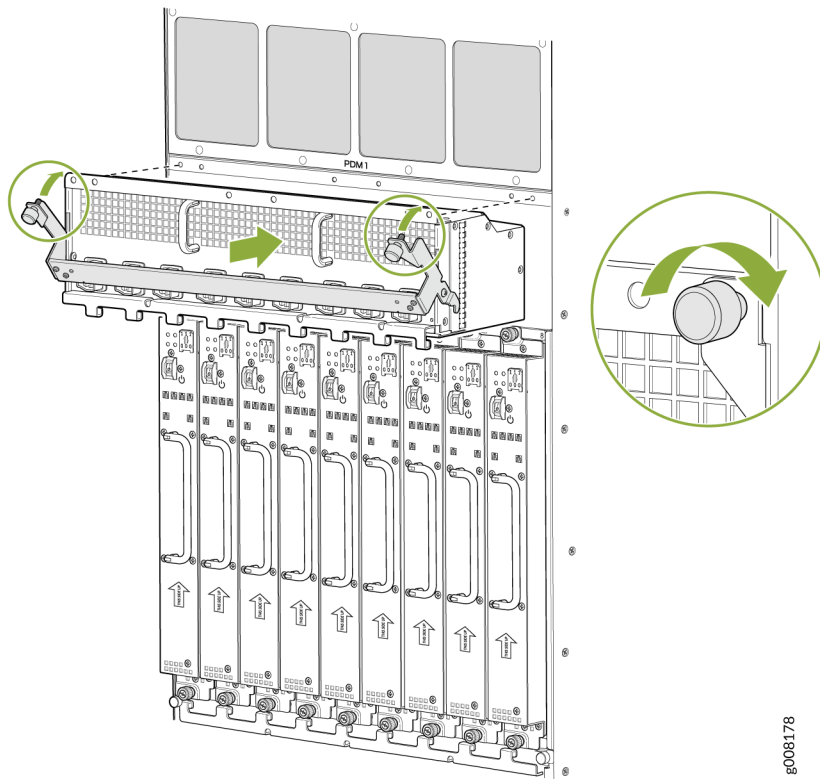
Removing Components from the MX2008 Router Chassis Before Installing It in a Rack | 297

Reinstalling the Power Supply Modules After Installing the MX2000 Router with a Pallet Jack

To reinstall the AC, DC, 240 V China, or universal PDMs, follow this procedure for each PSM (see Figure 37 and Figure 38) which shows the installation of the AC or DC PSM.

1. Remove the PSM to be installed out of the ESD bag, and identify the slot where it will be installed; **0** through **8** .

   > **NOTE**: The MX2000 PSMs can be installed in any order in the chassis.

2. For an AC-powered router, move the AC power switch on the PSMs to the off (**O**) position. For a DC-powered router, move the DC power switch on the PSMs to the off (**O**) position.

3. While holding the handle, using both hands, slide the PSM straight in until the PSM is fully seated into the chassis slot.

4. The PSM faceplate should be flush with adjacent PSMs.

Figure 127: Reinstalling an AC Power Supply Module
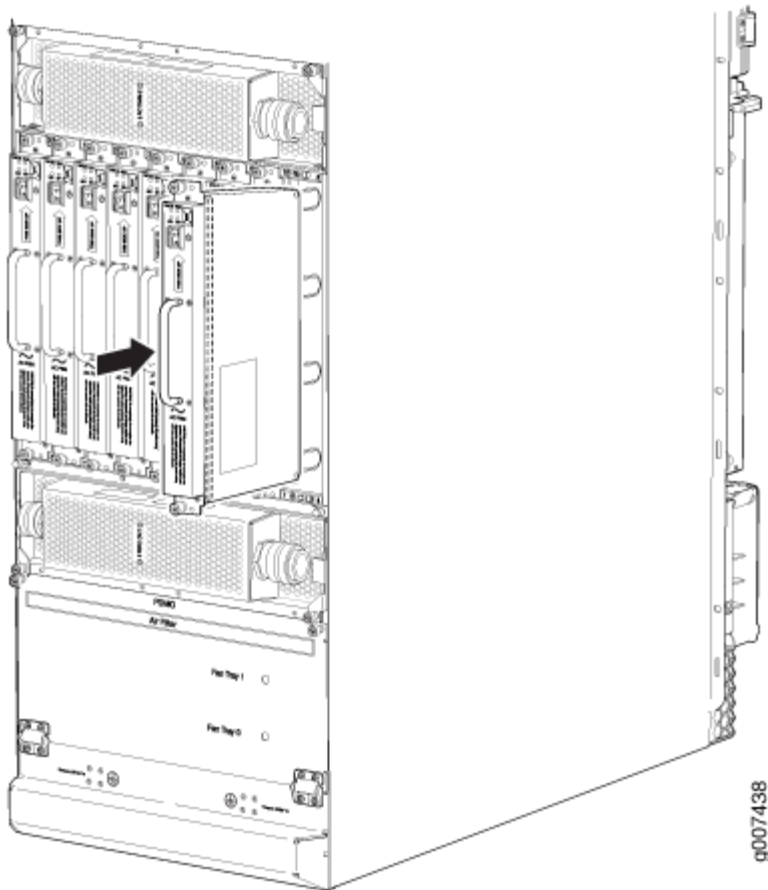
Figure 128: Reinstalling a DC Power Supply Module (-48 V)
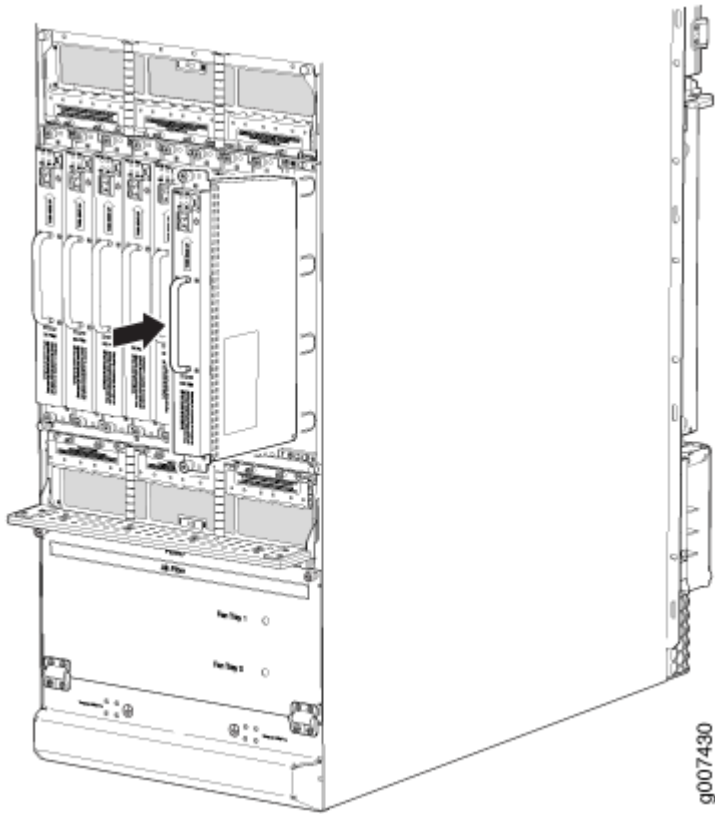
Figure 129: Reinstalling a DC Power Supply Module (240 V China)
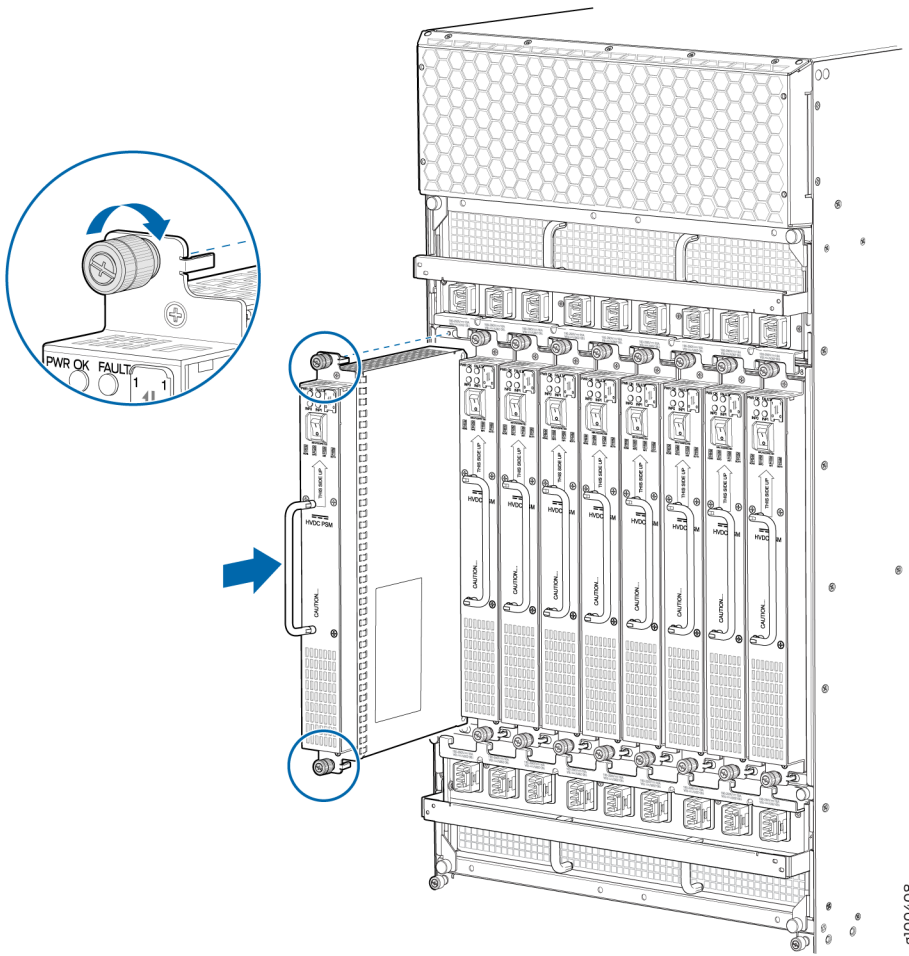
Figure 130: Reinstalling a High-Voltage Universal (HVAC/HVDC)

Reinstalling the Fan Trays After Installing the MX2000 Router with a Pallet Jack

To reinstall the upper or lower fan trays, (see Figure 41 and Figure 42):

1. Loosen the two captive screws on each side of the fan tray access panel, and open.
2. Take each fan tray to be installed out of its electrostatic bag, and identify the slot on the fan tray where it will be connected.
3. While grasping the handle, place one hand under the fan tray for support, and align it into the slot.
4. Press and hold the latch while guiding the fan tray half way in until it stops.

   NOTE: The fan tray has a safety mechanism so that the fan tray cannot be removed in one motion.

5. Press and hold the latch a second time while inserting the fan tray completely into the router.

6. Tighten the two captive screws on the fan tray faceplate.

7. Close the fan tray access panel, and tighten the captive screws to secure it in place.

8. Reinstall the remaining components into the router.

Figure 131: Installing Upper Fan Trays
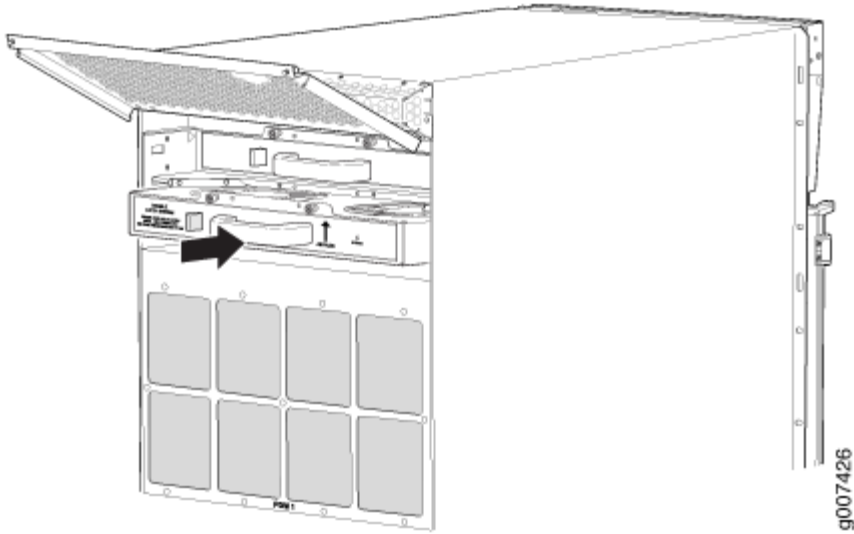
Figure 132: Installing Lower Fan Trays
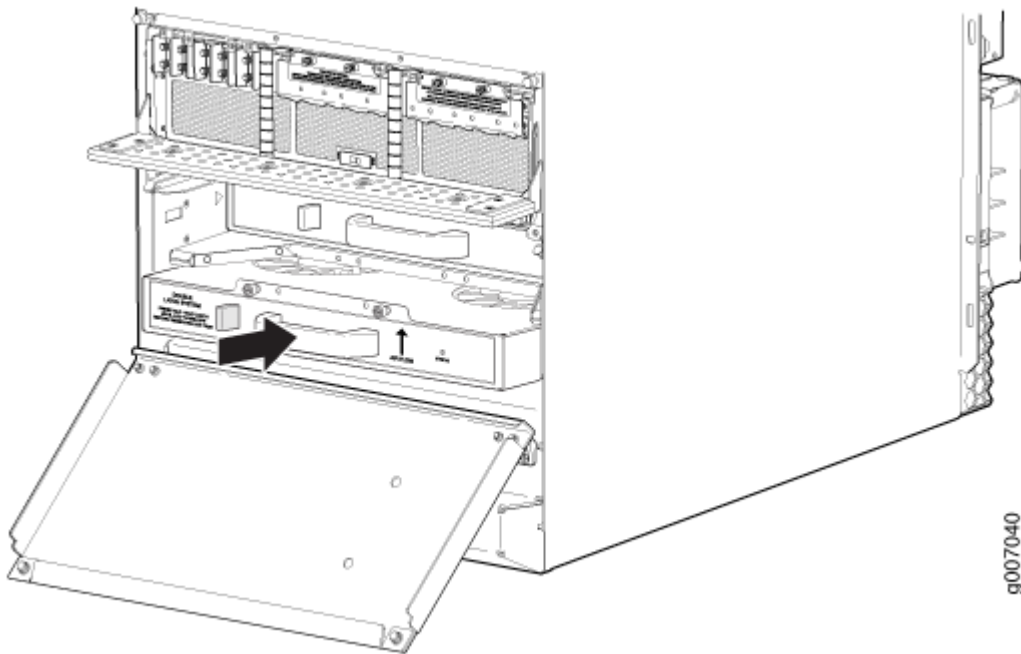
Reinstalling the SFBs After Installing the MX2010 Router with a Pallet Jack

To reinstall an SFB (see Figure 43):

> ⚠️ **CAUTION**: Before removing or replacing an SFB, ensure that the ejector handles are stored horizontally and pressed toward the center of the SFB.

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

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

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

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

5. Grasp both ejector handles, and gently close them inward simultaneously until the SFB is fully seated.

6. Place the ejector handles in their proper position, vertically and toward the center of the board.

> ⚠ **CAUTION**: If one of the SFBs fails, do not remove the failed SFB until you have a replacement or blank panel to install.

Figure 133: Reinstalling an SFB
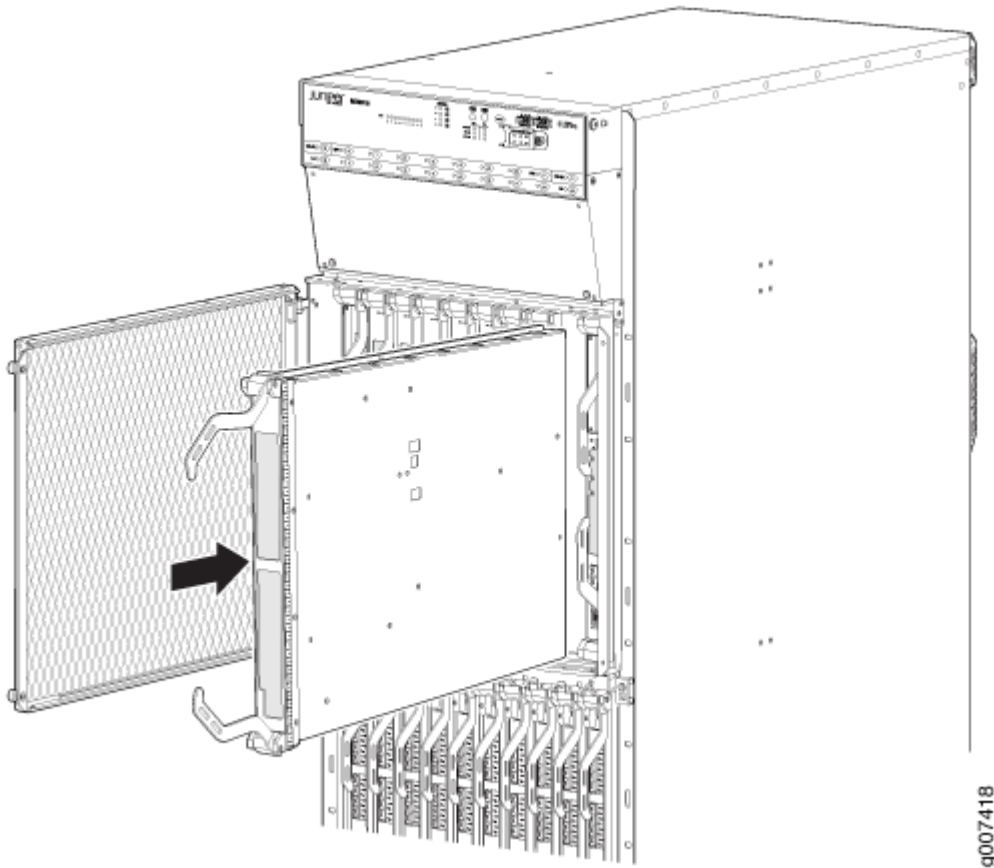
SEE ALSO

Reinstalling the Adapter Card After Installing the MX2010 Router with a Pallet Jack

To reinstall an ADC (see Figure 44):

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

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

3. Locate the slot in the card cage in which you plan to install the ADC.

4. Ensure that the ADC is right-side up, with the text on the faceplate facing upward.

5. Lift the ADC into place, and carefully align first the bottom, then the top of the ADC with the guides inside the card cage.

6. Slide the ADC all the way into the card cage until you feel resistance.

7. Grasp both ejector handles, and gently close them inward simultaneously until the ADC is fully seated.

Figure 134: Reinstalling an ADC
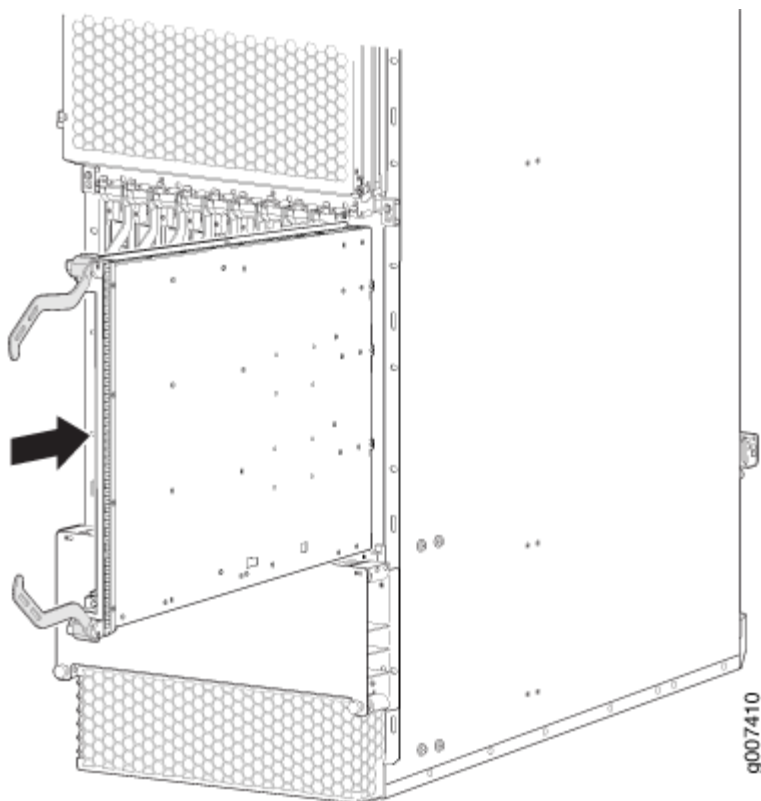
SEE ALSO

Reinstalling the MPCs After Installing the MX2010 Router with a Pallet Jack

To reinstall an MPC (see Figure 45):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Take each MPC to be installed out of its electrostatic bag, and identify the slot where it will be connected.
3. Verify that each fiber-optic MPC has a rubber safety cap covering the transceiver. If it does not, cover the transceiver with a safety cap.
4. Locate the slot in the ADC in which you plan to install the MPC.
5. Ensure that the MPC is right-side up, with the text on the faceplate facing upward.
6. Lift the MPC into place, and carefully align first the bottom, then the top of the MPC with the guides inside the ADC.
7. Slide the MPC all the way into the ADC until you feel resistance.
8. Turn both knobs and rotate them simultaneously clockwise until the MPC is fully seated into the ADC.

Figure 135: Reinstalling an MPC
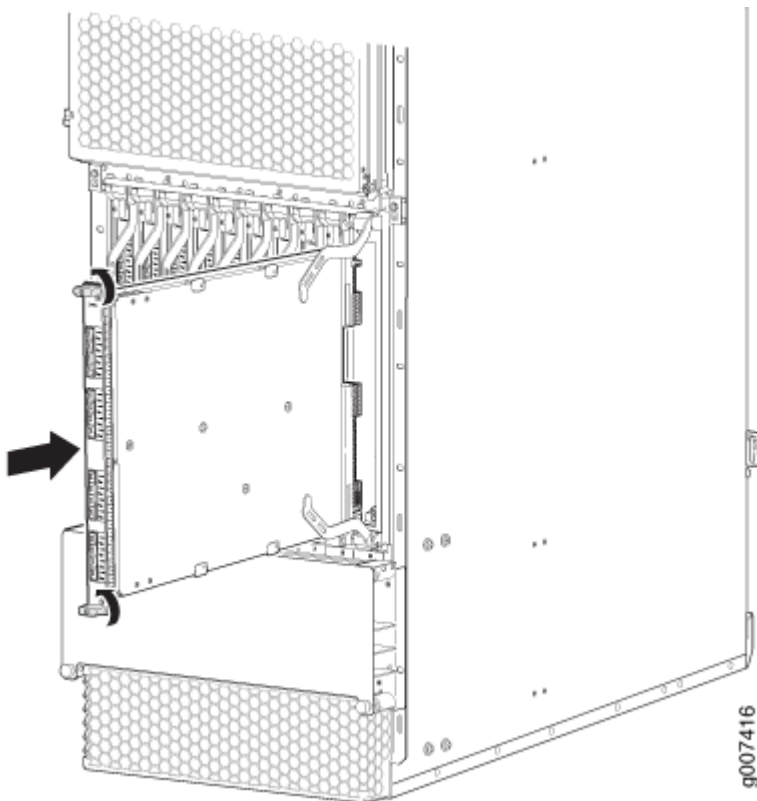
Reinstalling the CB-REs After Installing the MX2010 Router with a Pallet Jack

To reinstall a CB-RE (see Figure 46):

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

2. Take each CB-RE to be installed out of its electrostatic bag, and identify the slot on the CB-RE where it will be connected.

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

4. Locate the slot in the CB-RE card cage in which you plan to install the CB-RE.

5. Ensure that the CB-RE is right-side up, with the text on the faceplate of the CB-RE facing upward.

6. Lift the CB-RE into place, and carefully align first the bottom, then the top of the CB-RE with the guides inside the card cage.

7. Slide the CB-RE all the way into the card cage until you feel resistance.

8. Grasp both ejector handles, and gently close them inward simultaneously until the CB-RE is fully seated.

Figure 136: Reinstalling a CB-RE
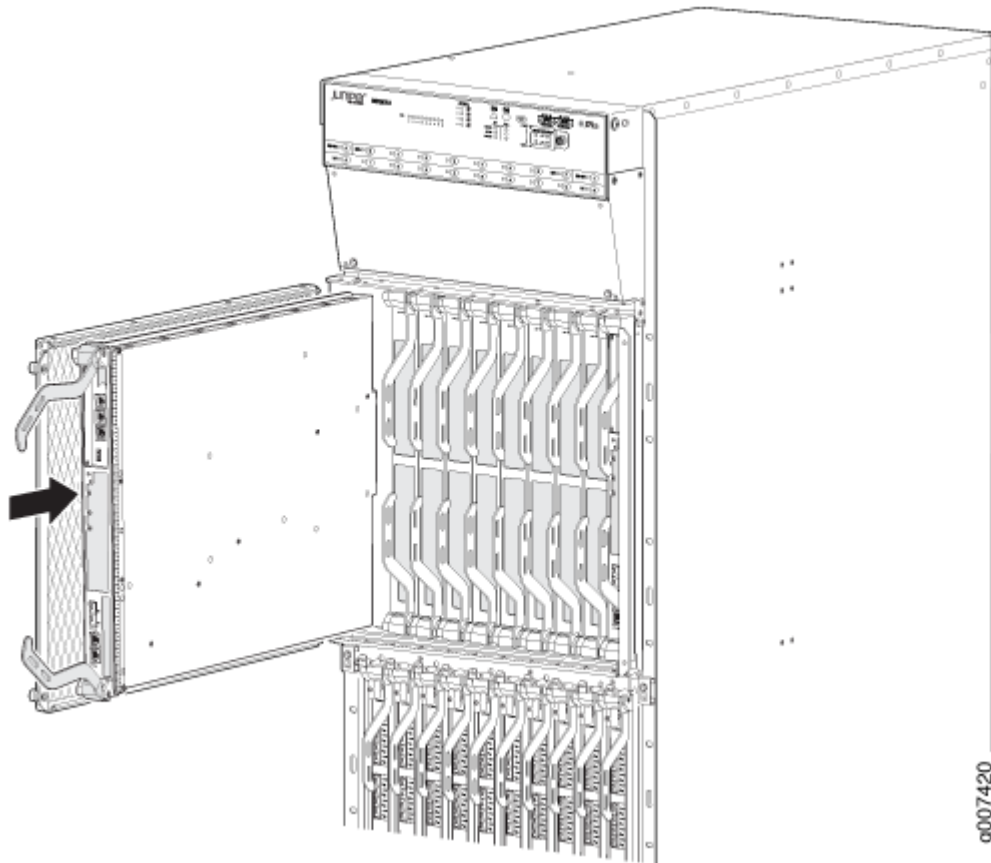
Connecting the MX2008 to Earth Ground

IN THIS SECTION

Tools and Parts Required for Connecting the MX2008 Router to Power

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

- Phillips (+) screwdrivers, numbers 1 and 2

- 2.5 mm flat-blade (−) screwdriver

- 7/16-in. (11 mm) hexagonal-head external drive socket wrench, or nut driver, with a torque range between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm), for tightening nuts to terminal studs on each power distribution module (PDM).

- The terminal block connections on the AC delta and wye PDM use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

- Wire cutters

- Electrostatic discharge (ESD) grounding wrist strap

> ⚠ **CAUTION**: The maximum torque rating of the terminal studs on the DC PDM is 25 lb-in. (33.89 Nm). The terminal studs might be damaged if excessive torque is applied. Use only a torque-controlled driver or socket wrench to tighten nuts on the DC PDM terminal studs. Use an appropriately sized driver or socket wrench. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You might want to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

SEE ALSO

Connect the Grounding Cable

You ground the router by connecting a grounding cable to earth ground and then attaching it to the chassis grounding points by using two screws. To connect the grounding cable (see Figure 137 on page 355):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. Ensure that all grounding surfaces are clean and brought to a bright finish before you make grounding connections.

3. Connect the grounding cable to a proper earth ground.

4. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.

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

6. Place the grounding cable lug over one of the grounding points on the rear of the chassis. The upper pair is sized for UNC 1/4-20 nuts, and the lower pair is sized for M6 nuts.

7. Secure the grounding cable lug to the grounding points, first with the washers, and then with the nuts.

8. Verify that the grounding cabling is correct, that the grounding cable does not touch or block access to router components, and that it does not drape where people could trip on it.

Figure 137: Connecting the Grounding Cable

Connecting the MX2008 to AC Power

Installing an MX2008 Three-Phase Wye AC Power Cord

To install a three-phase wye AC power cord:

1. Switch off the customer site circuit breakers to the PDM being removed. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.

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 all the power switches on the PSM faceplates to the off (**O**) position.

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

4. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

5. Remove the cover of the metal AC wiring compartment.

6. Unscrew the retaining nut from the AC power cord.

7. Place the retaining nut inside the metal wiring compartment.

8. Put the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

9. Put the wires of the AC power cord through the hole of the metal wiring compartment.

10. Connect the wires to the AC terminal block on the three-phase delta AC PDM (see Figure 138 on page 357). Loosen each of the input terminal or grounding point screws, and insert the wire into the grounding point or input terminal, and tighten the screw (see Table 123 on page 359 for approved AC wire gauge).

To insert wires into the terminal block that serves six PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

e. Insert the wire labeled **N** into the input terminal labeled **N1**.

Figure 138: Connecting Power to a Three-Phase Wye AC Power Distribution Module

NOTE: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

NOTE: The color of each AC power wire might vary. The MX2008 chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

CAUTION: Wire label configuration is for Juniper Networks supplied cable only. If using your own cable, make sure you use the proper connections.

To insert wires into the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

e. Insert the wire labeled **N** into the input terminal labeled **N2**.

NOTE: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

WARNING: To protect power supplies from input voltage that may be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment apply AC voltage to the PDM (with disengaged PSM) to make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-N1, B1-N1, C1-N1, A2-N2, B2-N2, and C2-N2 for three-phase wye PDM is not more than 264 VAC when measured with a DVM. Then turn off the AC breaker de-energizing the PDM and install the metal cover and engage all AC PSMs.

> **NOTE**: Three-phase wye AC wire assembly kits can be purchased from Juniper Networks.

Table 123: Supported Three-Phase Wye AC Wire Gauge

Wire Gauge	Description
5 x 10-AWG or equivalent	5 conductor wires, each wire is 10-AWG

> **NOTE**: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring will result in the cable clamps not tightening properly.

> ⚡ **WARNING**: Power connections must be performed by a licensed electrician only.

11. Verify that the power cord wire connections are correct.

12. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

13. Reinstall the metal PDM wiring cover, and using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

14. Verify that the AC power cord is not touching or blocking access to router components, and that it does not drape where people could trip on it.

15. Remove the ESD grounding strap from the ESD points on the chassis. Connect the strap to an approved site ESD ground point. See the instructions for your site.

16. Connect the AC power cord plug to the power source.

17. Switch on the customer site circuit breakers to provide voltage to the AC power cord.

18. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

19. Verify the LED on the PDM faceplate is lit steadily, indicating that the AC terminal block is receiving power.

20. Switch the power switch on the PSM to the on position (|) to provide power to the router components.

> **NOTE**: After a PDM is powered on, it can take up to 60 seconds for status indicators—such as the LEDs on the PDM, the command output displays, and messages on the LED display

on the craft interface—to indicate that the PDM is functioning normally. Ignore error
indicators that appear during the first 60 seconds.

SEE ALSO

| Connect the Grounding Cable | **354**

Installing MX2008 AC Power Supply Modules

To install an MX2008 AC PSM:

1. Verify that the power switch on the PSM is in the off (**O**) position.
2. On the PSM, slide the plastic cover away from the input mode switch to expose the dual DIP
   switches. Move the input mode DIP switch to the on or off position for the desired power supply
   feed configuration (see Figure 139 on page 361). For available switch positions on the AC PSM, see
   MX2000 AC Power Supply Module Description.

   NOTE: The DIP switches are used only to indicate presence of a feed. If both feeds are
   present, power is always drawn from feed **0**. Power will be drawn from feed **1** only if feed **0**
   fails. A PSM failure triggers the alarm LED on the craft interface.

Figure 139: Selecting AC Power System Feed Redundancy
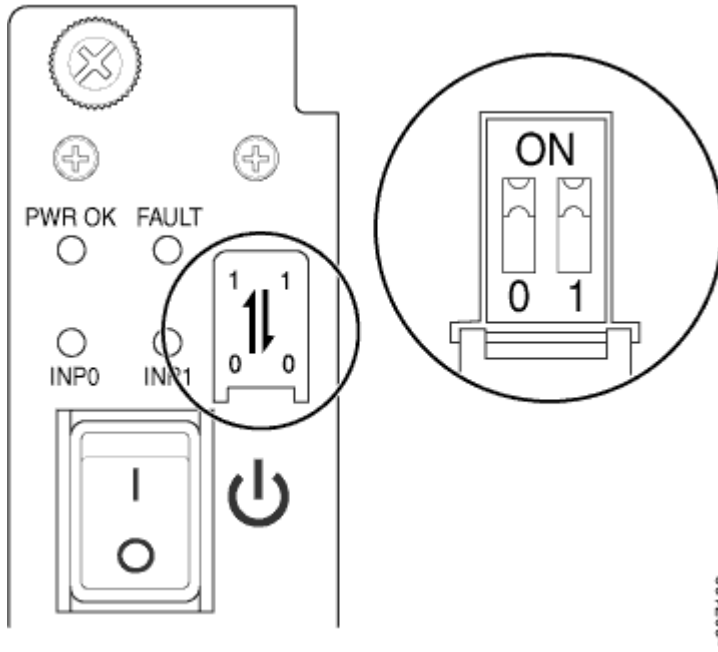
3. Using both hands, grasp the handle and slide the PSM straight into the chassis until the PSM is fully seated in the chassis slot. Tighten the two captive screws (see Figure 140 on page 362).

Figure 140: MX2008 Router with AC Power Supply Modules Installed
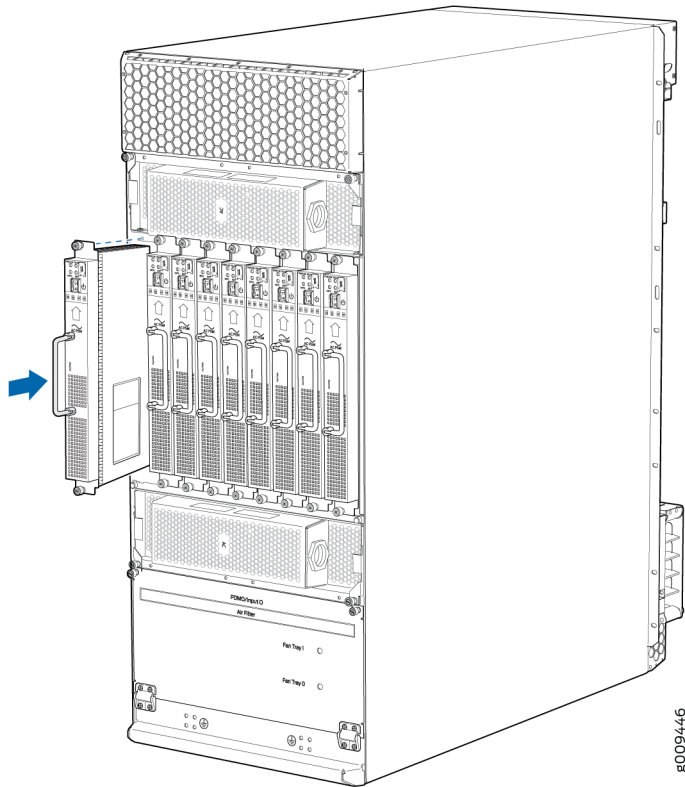
4. Verify that the **INP0** and/or **INP1** LEDs on the PSM are lit green steadily (see Figure 141 on page 363).

> **NOTE**: If you are connecting two feeds, **INP0** and **INP1**, both LEDs on the PSM will be lit green steadily.

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

6. Move the switch to the on (|) position.

7. Verify that the **PWR OK** LED is lit green steadily. See "MX2008 AC Power Supply Module LEDs" on page 65 for information about MX2008 AC PSM LEDs.

8. Repeat Steps 1 through 7 for installing PSMs in slots **0**, **1**, and **2**, where required.

Figure 141: MX2008 AC Power Supply Module Front View
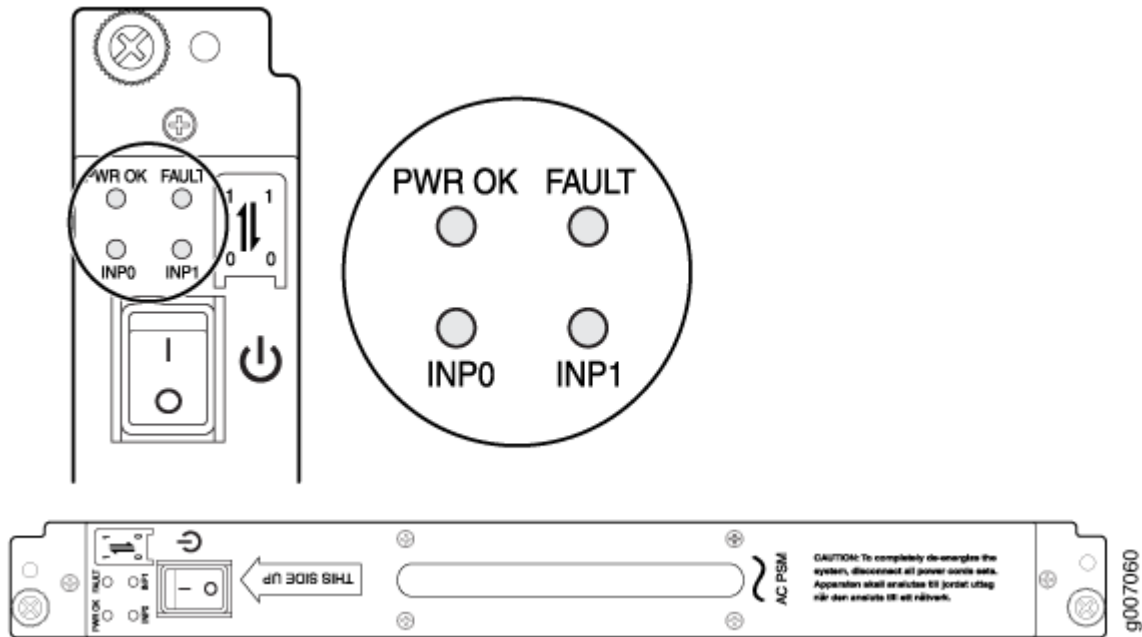
> **NOTE**: Each PSM slot not occupied by a AC PSM must be covered by a PSM blank panel.

Connect AC Power to an MX2008 Router with Three-Phase Delta AC Power Distribution Modules

⚠ **CAUTION**: Do not mix AC and DC power modules within the same router.

⚠ **WARNING**: Power connections must be performed by a licensed electrician only.

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules (AC/DC PSMs and AC/DC PDMs).

You connect AC power to the router with three-phase delta AC power distribution modules (PDMs) by connecting the AC power cord from an AC PDM to an AC power source.

To connect an AC power cord to an AC power source:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

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

3. Detach the ESD grounding strap from the approved site ESD grounding point, and connect the strap to one of the ESD points on the chassis.

4. Move the power switches on all the power supply module (PSM) faceplates to the off (**O**) position.

5. Verify that the correct three-phase delta PDMs are installed and secured in the chassis before connecting power cables.

> **NOTE**: The power cables must be uninstalled and removed from the three-phase delta PDM before removal of the PDM from the chassis.

6. Using a number 2 Phillips (+) screwdriver, unscrew the four captive screws located on either side of the metal AC wiring compartment (four screws total per PDM).

7. Remove the metal cover of the metal AC wiring compartment.

8. Unscrew the retaining nut from the AC power cord.

9. Place the retaining nut inside the metal wiring compartment.

10. Insert the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

11. Insert the wires of the AC power cord through the hole of the metal wiring compartment.

12. Connect the wires to the AC terminal block on the three-phase delta AC PDM (see Figure 142 on page 365). Loosen the input terminal or grounding point screw, insert each wire into the grounding point input terminal, and tighten the screw (see Table 124 on page 366 for approved AC wire gauge).

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

To connect wires to the terminal block that serves six PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

Figure 142: Connecting Power to a Three-Phase Delta AC Power Distribution Module

NOTE: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

NOTE: The color of each AC power wire might vary. The MX2008 chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

⚠️ CAUTION: Wire label configuration is for Juniper Networks supplied cable only. If you are using your own cable, make sure you use the proper connections.

To connect wires to the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

> ⚠ **WARNING**: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment apply AC voltage to the PDM (with disengaged PSM) make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-B1, B1-C1, C1-A1, A2-B2, B2-C2, and C2-A2 for three-phase delta PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker, de-energizing the PDM, and install the metal cover and engage all AC PSMs.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws

> **NOTE**: Three-phase delta AC wire assembly kits can be purchased from Juniper Networks.

Table 124: Supported Three-Phase Delta AC Wire Gauge

Wire Gauge	Description
4 x 6-AWG or equivalent	4 conductor wires, each wire is 6-AWG

> **NOTE**: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring results in the cable clamps not tightening properly.

> ⚠️ **WARNING**: Power connections must be performed by a licensed electrician only.

13. Verify that the power cable connections are correct.

14. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

15. Reinstall the metal PDM wiring cover, and using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

16. Use the provided plastic cable tie to fasten the AC power cord to the PDM.

17. Verify that the AC power cord does not touch or block access to router components, and that it does not drape where people could trip on it.

18. Repeat the procedure for the other three-phase delta AC PDMs.

Connecting AC Power to an MX2000 Router with Three-Phase Wye AC Power Distribution Modules

> ⚠️ **CAUTION**: Do not mix AC and DC power modules within the same router.

> ⚠️ **WARNING**: Power connections must be performed by a licensed electrician only.

To connect an AC power cord to an AC power source:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

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

3. Detach the ESD grounding strap from the approved site ESD grounding point, and connect the strap to one of the ESD points on the chassis.

4. Move the power switches on all the power supply module (PSM) faceplates to the off (**O**) position.

5. Verify that the correct three-phase wye PDMs are installed and secured in the chassis before connecting power cables.

> **NOTE**: The power cables must be uninstalled and removed from the three-phase wye PDM before removal of the PDM from the chassis.

6. Using a number 2 Phillips (+) screwdriver, unscrew the four captive screws located on the either side of the metal AC wiring compartment (four screws total on each PDM).

7. Remove the metal cover of the metal AC wiring compartment.

8. Unscrew the retaining nut from the AC power cord.

9. Insert the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

10. Insert the wires of the AC power cord through the hole of the metal compartment.

11. Connect the wires to the AC terminal block on the three-phase wye AC PDM (see Figure 143 on page 369). Loosen the input terminal or grounding point screw, insert each wire into the grounding point or input terminal, and tighten the screw (see Table 125 on page 370 for approved AC wire gauge).

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

To connect wires to the terminal block that serves six PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

e. Insert the wire labeled **N** into the input terminal labeled **N1**.

Figure 143: Connecting Power to a Three-Phase Wye AC Power Distribution Module
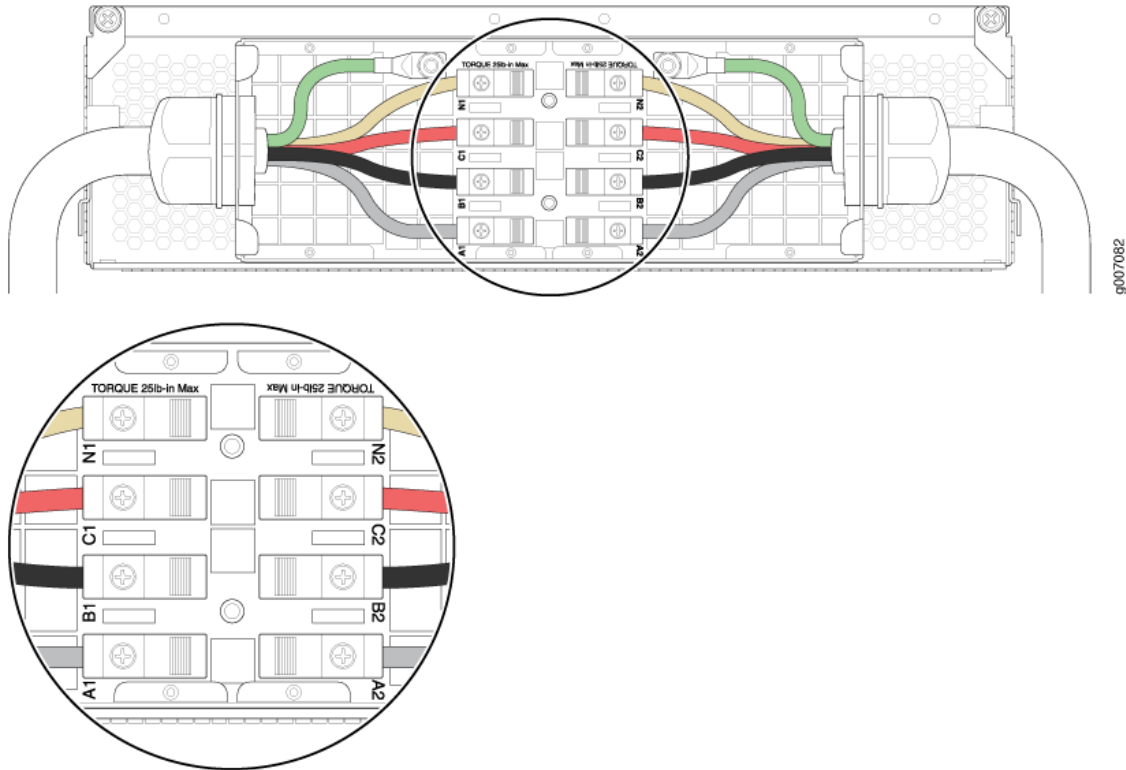
> **NOTE**: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

> **NOTE**: The color of each AC power wire might vary. The MX2000 series chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

> ⚠ **CAUTION**: Wire label configuration is for Juniper Networks supplied cable only. If using your own cable, make sure you use the proper connections.

To connect wires to the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

e. Insert the wire labeled **N** into the input terminal labeled **N2**.

⚡ **WARNING**: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment, apply AC voltage to the PDM (with disengaged PSM) and make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-N1, B1-N1, C1-N1, A2-N2, B2-N2, and C2-N2 for three-phase wye PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker, de-energizing the PDM, and install the metal cover and engage all AC PSMs.

NOTE: Three-phase wye AC wire assembly kits can be purchased from Juniper Networks.

Table 125: Supported Three-Phase Wye AC Wire Gauge

Wire Gauge	Description
5 x 10-AWG or equivalent	5 conductor wires, each wire is 10-AWG

NOTE: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring will result in the cable clamps not tightening properly.

⚡ **WARNING**: Power connections must be performed by a licensed electrician only.

12. Verify that the power cable connections are correct.

13. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

14. Reinstall the metal PDM wiring cover, and using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Avoid overtightening the screws.

15. Use the provided plastic cable tie to fasten the AC power cord to the PDM.

16. Verify that the AC power cord is not touching or blocking access to router components, and that it does not drape where people could trip on it.

17. Repeat the procedure for the other three-phase wye AC PDMs.

Connecting Power to an MX2000 Single-Phase AC Power Distribution Module

⚠️ **CAUTION**: Do not mix AC and DC power distribution modules (PDMs) within the same router.

NOTE: The MX2008, MX2010, and MX2020 routers support the same power modules (AC/DC PSMs and AC/DC PDMs).

To connect an AC power cord to a single-phase seven-feed or nine-feed AC power distribution module (PDM):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

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

3. Detach the ESD grounding strap from the approved site ESD grounding point, and connect the strap to one of the ESD points on the chassis.

4. Move the power switch to the off (**O**) position on the PSM(s) that will be powered by the AC PDM.

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

5. If a power cord retainer is installed on the PDM, remove the two thumb screws holding it in place and remove the power cord retainer.

6. Plug the power cords into the power sockets on the PDM. see Figure 144 on page 372. Apply slight pressure so that the power cords are firmly seated in the power socket. As you plug in each power cord, the power LED for the socket lights up green.

Figure 144: Plugging into the MX2008 Single-Phase AC Power Distribution Module
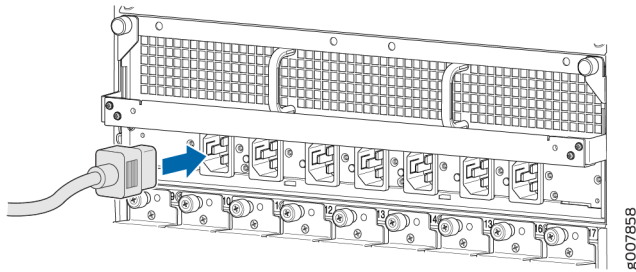
7. Replace the power cord retainer, making sure the power cords do not touch or block access to router components.

8. Flip the power switch on each PSM to the on (|) position to provide power to the router components.

9. Verify that the LEDs on the PDM faceplate are lit steadily green, indicating that the AC terminal block is receiving power.

10. Remove the ESD grounding strap from the ESD points on the chassis. Connect the strap to an approved site ESD grounding point. See the instructions for your site.

> **WARNING**: Do not touch the power connectors on the PDM. They can contain dangerous voltages.

SEE ALSO

MX2008 AC Power Cord Specifications | 86

MX2008 AC Power System Electrical Specifications | 89

Connect Power to a Single-Phase Seven-Feed AC Power Distribution Module

> **CAUTION**: Do not mix AC and DC power distribution modules (PDMs) within the same router.

To connect an AC power cord to an AC power source:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

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

3. Detach the ESD grounding strap from the approved site ESD grounding point, and connect the strap to one of the ESD points on the chassis.

4. Switch off (**O**) the AC power supply modules (PSMs) and disengage all AC PSMs.

5. Move the safety retention bar downwards and tight the captive retention screws.

6. Connect the powers cords to the AC PDM.

7. Verify that the power cords are not touching or blocking access to router components, and that it does not drape where people could trip on it.

> ⚡ **WARNING**: Do not touch the power connectors on the PDM. They can contain dangerous voltages.

Powering On a Three-Phase AC-Powered MX2000 Router

You can use this procedure for a router with either a three-phase delta AC power distribution module (PDM) or a three-phase wye AC PDM.

1. Verify that the power supply modules (PSMs) are fully inserted in the chassis and that the captive screws on their faceplates are tightened.

2. Verify that the PDMs are fully inserted in the chassis and that the captive screws on their faceplates are tightened.

3. Verify that each AC power cable is properly connected.

4. Verify that an external management device is connected to one of the Routing Engine ports on the CB-RE (**AUX**, **CONSOLE**, or **MGMT**).

> **NOTE**: The management Ethernet port is not functional until you have completed the initial configuration.

5. Turn on power to the external management device.

6. Switch on the dedicated customer-site circuit breakers to provide power to the AC power cables. Follow your site's procedures.

7. Verify that the LEDs on both PDM and PSM light green steadily.

If any of the status LEDs indicates that the PDM is not functioning normally, repeat the installation and cabling procedures.

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

9. Move the power switch on one of the PSMs to the on (|) position. The **OK** LED blinks momentarily, then lights steadily.

> **NOTE**: After a PSM and a PDM are powered on, it can take up to 60 seconds for status indicators—such as the output status LEDs on the PSM, and the command output on the craft interface—to indicate that the PSM and PDM are functioning normally. Ignore error indicators that appear during the first 60 seconds.

10. Verify that the **PWR OK** LED on the AC PSM faceplate is lit steadily, indicating that PDM is correctly installed, functioning properly, and providing power to the AC outputs.

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

12. Verify that the router powers up and goes through the system initialization process.

SEE ALSO

Initially Configuring the MX2010 Router

Maintaining and Verifying the Status of the MX2010 Router Components

Initially Configuring the MX2020 Router

Maintaining and Verifying the Status of the MX2020 Router Components

MX2000 Three-Phase Delta AC Power Distribution Module Description

MX2000 Three-Phase Wye AC Power Distribution Module Description

Connecting the MX2000 Series Router to a Console or Auxiliary Device

Connecting AC Power to an MX2000 Router with Three-Phase Delta AC Power Distribution Modules

Mapping Input Power from AC Power Distribution Modules to AC Power Supply Modules on MX2000 Routers

Preventing Electrostatic Discharge Damage to an MX2010 Router

Preventing Electrostatic Discharge Damage to an MX2020 Router

Connecting the MX2008 to DC Power

Installing MX2008 DC Power Supply Modules (-48 V)

To install an MX2008 DC PSM:

1. Verify that the power switches on all PSMs are in the off (**O**) position.

2. On the PSM, slide the plastic cover away from the input mode switch to expose the dual DIP switches. Move the input mode DIP switch **0** (left switch) to the **ON** position for the bottom feed **INP0** (expected to be connected), and DIP switch **1** (right switch) to the **ON** position for the top feed **INP1** (expected to be connected). If both DIP switches **0** and **1** are turned to the **ON** position, then both top and bottom feeds are expected to be connected (see).

    > **NOTE**: The DIP switches are used only to indicate presence of a feed. If both feeds are present, power is always drawn from feed **0**. Power will be drawn from feed **1** only if feed **0** fails. A PSM failure triggers the alarm LED on the craft interface.

Figure 145: Selecting DC Power System Feed Redundancy
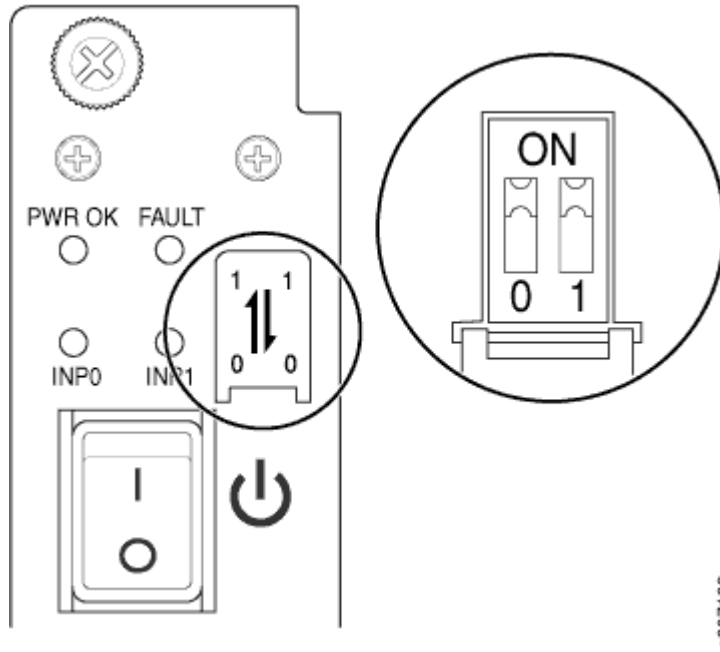
3. Using both hands, grasp the handle and slide the PSM straight into the chassis until the PSM is fully seated in the chassis slot. Tighten the two captive screws (see Figure 146 on page 377).

Figure 146: MX2008 Router with DC Power Supply Modules Installed
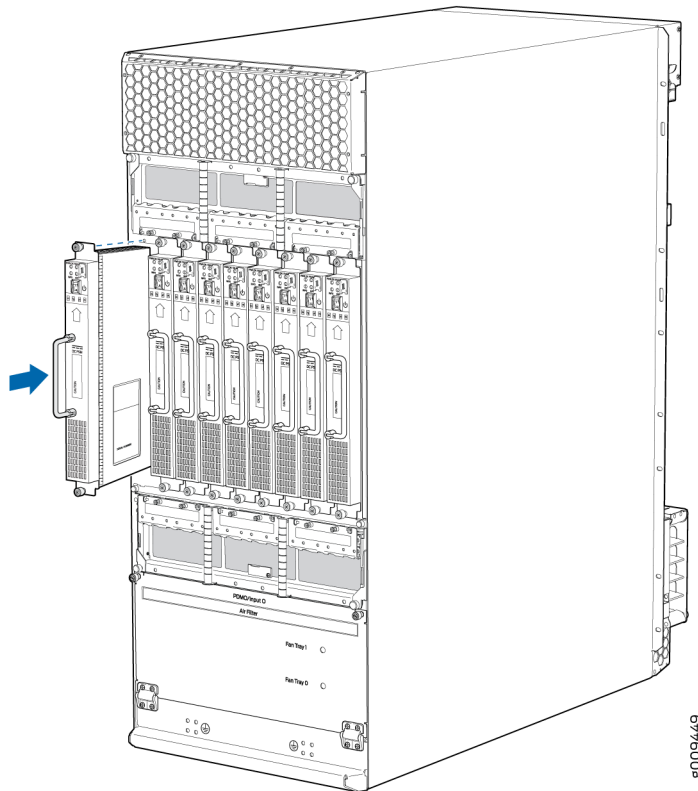
4. Verify that the **INP0** and/or **INP1** LEDs on the PSM are lit green steadily (see) .

> ◤
> **NOTE**: If you are connecting two feeds, **INP0** and **INP1**, both LEDs on the PSM are lit green steadily.

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

6. Move the switch to the on (|) position.

7. Verify that the **PWR OK** LED is lit green steadily. See "MX2008 DC Power Supply Module LEDs" on page 111 for information about MX2008 DC PSM LEDs.

8. Repeat Steps 1 through 7 for installing PSMs in slots **0**, **1**, and **2**, where required.

Figure 147: MX2008 DC Power Supply Module Front View
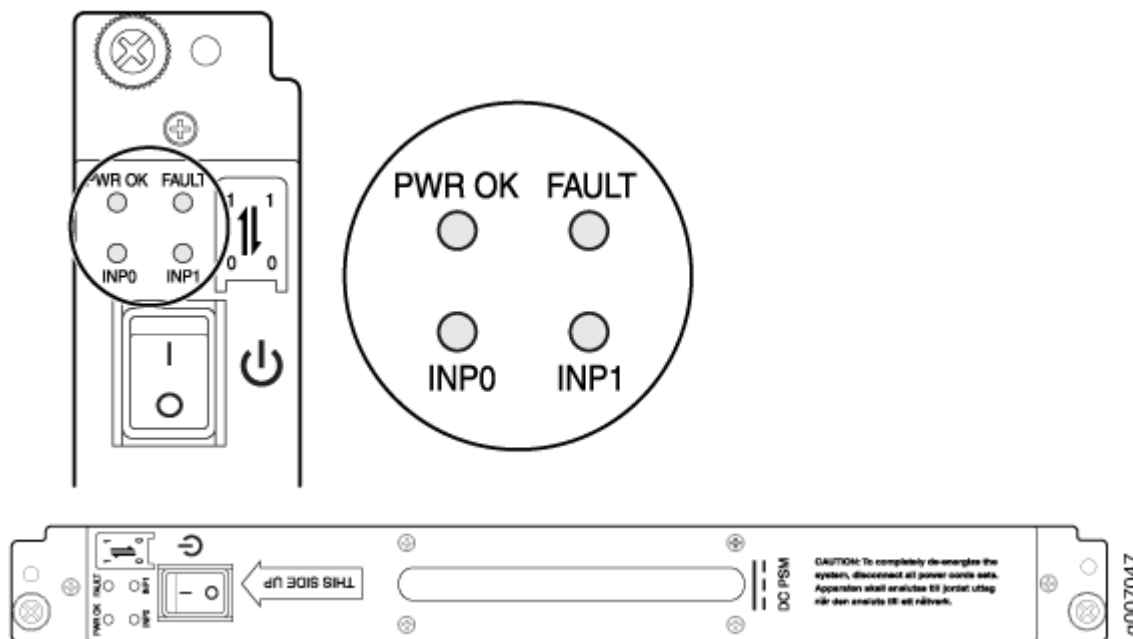
> **NOTE**: Each PSM slot not occupied by a DC PSM must be covered by a PSM blank panel.

SEE ALSO

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Powering On the DC-Powered (-48 V) MX2008 Router | **392**

Installing MX2000 Router DC Power Supply Modules (240 V China)

To install an MX2000 DC PSM (240 V China):

1. Verify that the power switches on all PSMs are in the off (**O**) position.
2. On the PSM, slide the plastic cover away from the input mode switch to expose the dual DIP switches. Move the input mode DIP switch **0** (left switch) to the **ON** position for the bottom feed **INP0** (expected to be connected), and DIP switch **1** (right switch) to the **ON** position for the top feed **INP1** (expected to be connected). If both DIP switches **0** and **1** are turned to the **ON** position, then both top and bottom feeds are expected to be connected, (see Figure 148 on page 379).

   In addition, a PSM failure triggers the alarm LED on the craft interface.

> **NOTE**: The DIP switches are only used to indicate presence of a feed. If both feeds are present, power is always drawn from feed **0**. Power will be drawn from feed **1** only if feed **0** fails.

Figure 148: Selecting DC Power (240 V China) Subsystem Feed Redundancy
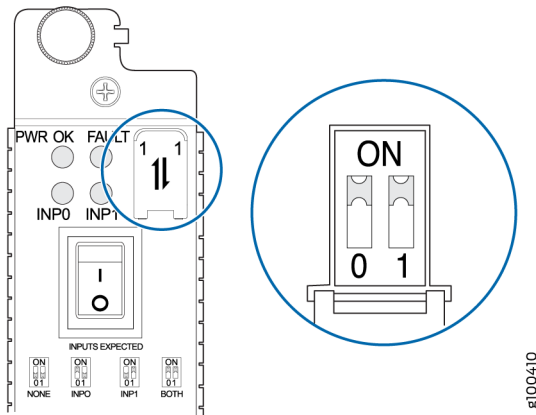
3. Using both hands, grasp the handle and slide the PSM straight into the chassis until the PSM is fully seated in the chassis slot. Tighten the two captive screws (see Figure 149 on page 380). Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.

Figure 149: Installing an MX2020, MX2010, MX2008 Router DC Power Supply Module (240 V China)
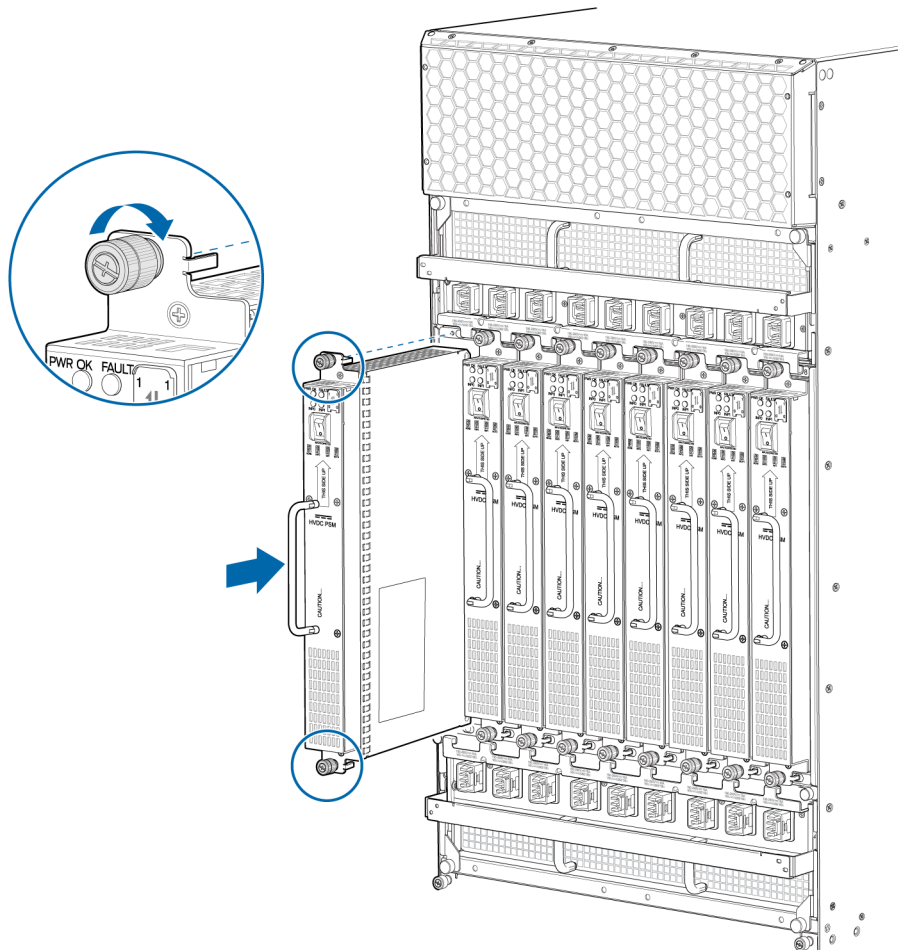
4. Verify that the **INP0** and/or **INP1** LEDs on the PSM are lit green steadily (see Figure 150 on page 381).

> ◣ **NOTE**: If you are connecting two feeds, **INP0** and **INP1**, both LEDs on the PSM will be lit green steadily.

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

6. Move the switch to the on (|) position.

7. Verify that the **PWR OK** LED is lit green steadily. See *MX2020 DC Power Supply Module LEDs*, *MX2010 DC Power Supply Module LEDs*, or "MX2008 DC Power Supply Module LEDs" on page 111 for information on PSM LED behavior.

8. Repeat Steps "Installing MX2008 DC Power Supply Modules (-48 V)" on page 375 through 7 for installing PSMs in slots 0, 1, and 2, where required.

Figure 150: MX2000 DC Power Supply Module Front View (240 V China)
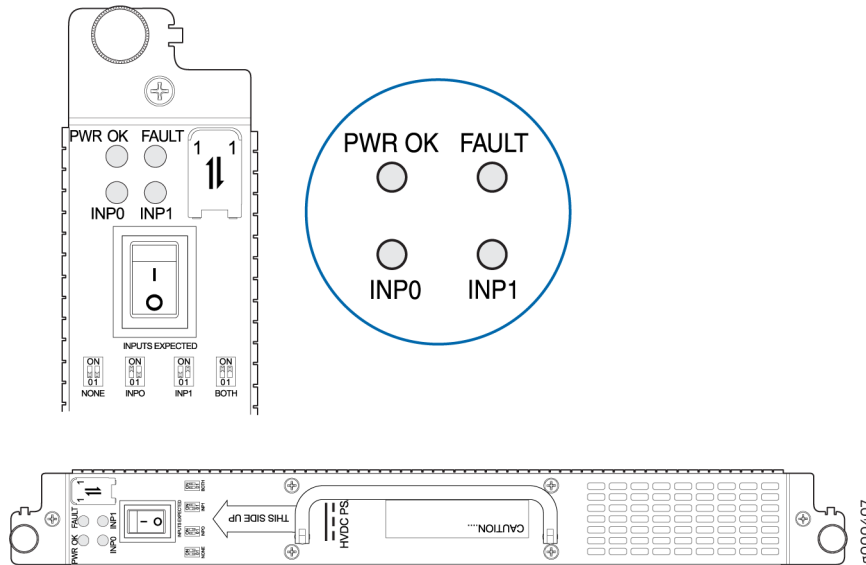
> **NOTE**: Each PSM slot not occupied by a (240 V China) DC PSM must be covered by a PSM blank panel.

Connecting an MX2008 DC Power Distribution Module (-48 V) Cable

> ⚡ **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

To connect a power cable for a DC PDM:

1. Locate a replacement power cable that meets the specifications defined in "MX2008 DC Power (-48 V) System Electrical Specifications" on page 125.
2. Verify that a licensed electrician has attached a cable lug to the replacement power cable.

3. Verify that the **–48V** LED is off.

4. Secure the power cable lug to the terminal studs, first with the flat washer, then with the split washer, and finally with the nut. Apply between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) of torque to each nut (see). Do not overtighten the nut. (Use a 7/16-in. [11 mm)] torque-controlled driver or socket wrench.)

> ⚠ **CAUTION**: Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the nuts. Ensure that each nut is properly threaded onto the terminal stud. The nut should be able to spin freely with your fingers when it is first placed onto the terminal stud. Applying installation torque to the nut when the nut is improperly threaded might result in damage to the terminal stud.

> ⚠ **CAUTION**: The maximum torque rating of the terminal studs on the DC PDM is 25 lb-in. (33.89 Nm). The terminal studs might be damaged if excessive torque is applied. Use only a torque-controlled driver or socket wrench to tighten nuts on the DC PDM terminal studs.

Figure 151: Connecting Power Cables to the DC Power Distribution Module

5. Route the positive and negative DC power cables through the plastic cable restraint cover. Make sure that the cable does not touch or obstruct any router components.

6. Verify that the DC power 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.

7. Attach the power cable to the DC power source.

8. Turn on the dedicated customer-site circuit breaker to the PDM.

9. Verify that the **–48V** LED on the PDM is lit steadily.

10. On each of the DC power input sources, switch the DC circuit breaker to the center position before moving it to the **ON** position.

> **NOTE**: The circuit breaker might bounce back to the **OFF** position if you move the breaker too quickly.

Observe the status LEDs on the PDM faceplate. If the PDM is correctly installed and functioning normally, the **–48V** LEDs light green steadily.

Connecting Power to a DC-Powered MX2008 Router with Power Distribution Modules (-48 V)

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

You connect DC power to the router by attaching power cables from the external DC power sources to the terminal studs on the PDM faceplates. You must provide the power cables (the cable lugs are not supplied with the router).

To connect the DC source power cables to the router:

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

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

    > **NOTE**: If the PSMs are installed in the router, make sure that the power switches on all PSMs are turned to the off (**O**) position.

3. Move the DC circuit feed switch on the PDM faceplate to match the current rating amperage—**60 A** or **80 A**—for each feed.

> **NOTE**: The switch position applies to all inputs of this PDM. Selecting the 60 A position might reduce power output capacity available from each PSM.

> **NOTE**: The type of feed that you use on the DC PDM (60 A or 80 A) depends on the distribution scheme and distribution equipment. With a 60-A feed, the maximum power supply output power is limited to 2100 W while the maximum power supply input power is limited to 2400 W. With an 80-A feed, the maximum power supply output is limited to 2500 W while maximum power supply input power is limited to 2800 W. The system power management software calculates the available and used power based on DIP switch positions in the PDM.

4. Loosen the captive screws on the plastic cable restraint on the lower edge of the power faceplate. The cable restraint is set on hinges that hold the cover in place during cable installation.

> **NOTE**: You can remove the plastic cover for DC power cable installation by bending the plastic cable restraint cover until the two plastic pins on both sides of the housing unhinge.

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

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

   - The cable with very low resistance (indicating a closed circuit) to chassis ground is **RTN**.

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

6. Install heat-shrink tubing insulation around the power cables at the connection point of the DC power supply terminal.

   To install heat-shrink tubing:

   a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

b. Shrink the tubing with a heat gun. Ensure that you heat all sides of the tubing evenly so that it shrinks around the cable tightly.

Figure 152 on page 386 is a representational diagram that shows the steps to install heat-shrink tubing.

> **NOTE**: Do not overheat the tubing.

Figure 152: How to Install Heat-Shrink Tubing
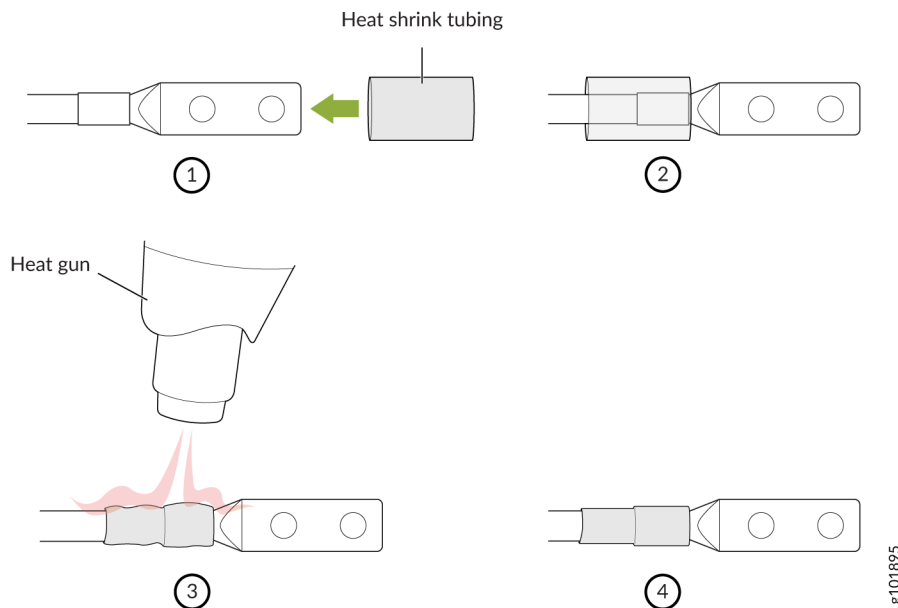
7. Remove the cover protecting the terminal studs on the faceplate.

8. Remove the nut and washers from each of the terminal studs. (Use a 7/16-in. [11 mm] nut driver or socket wrench.)

9. Secure each power cable lug to the terminal studs, first with the flat washer, then with the split washer, and then with the nut (see Figure 153 on page 388). Apply between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) of torque to each nut. Do not overtighten the nut. (Use a 7/16-in. [11 mm] torque-controlled driver or socket wrench.)

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

b. Secure each negative (–) DC source power cable lug to the **–48V** (input) terminal.
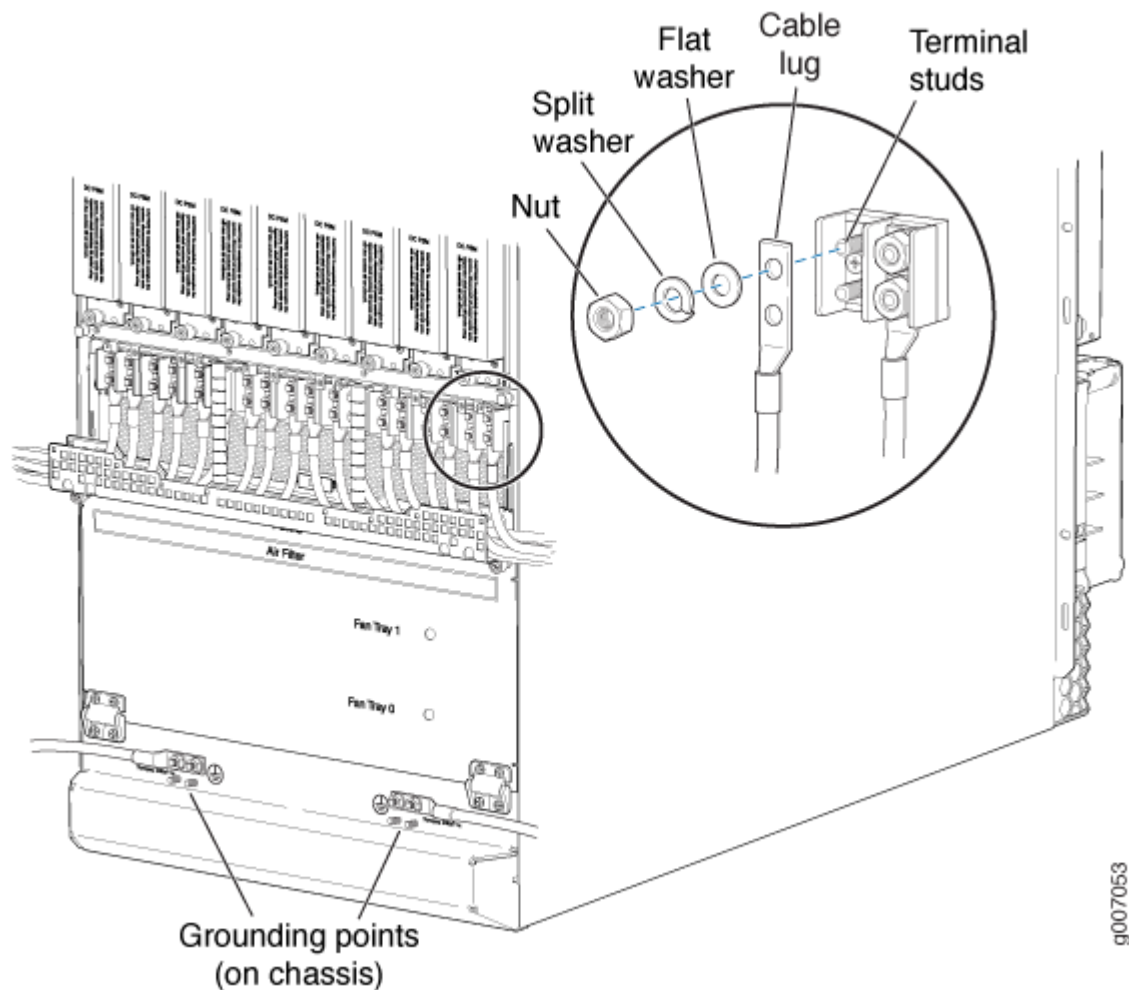
⚠️ **CAUTION**: Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the nuts. Ensure that each nut is properly threaded onto the terminal stud. The nut should be able to spin freely with your fingers when it is first placed onto the terminal stud. Applying installation torque to the nut when the nut is improperly threaded might result in damage to the terminal stud.

⚠️ **CAUTION**: The maximum torque rating of the terminal studs on the DC PDM is 25 lb-in. (33.89 Nm). The terminal studs might be damaged if excessive torque is applied. Use only a torque-controlled driver or socket wrench to tighten nuts on the DC PDM terminal studs.

NOTE: The DC PDMs in slots **PDM0/Input0** and **PDM1/Input1** can be powered by dedicated power feeds derived from feed **A** or feed **B**. This configuration provides the commonly deployed **A/B** feed redundancy for the system to balance the power draw.

10. Close the plastic cable restraint cover over the terminal studs on the faceplate.
11. Route the positive and negative DC power cables through the left and right sides of the cable restraint.
12. Tighten the cable restraint captive screw to hold the power cables in place.

⚠️ **CAUTION**: The maximum torque rating of the cable restraint screws on the DC PDM is 25 lb-in. (33.89 Nm). Use only a torque-controlled screwdriver to tighten screws on the DC PDM cable restraint.

13. Verify that the power cables are connected correctly, that they are not touching or blocking access to router components, and that they do not drape where people could trip on them.
14. Repeat Steps 3 through 13 for the remaining PDMs.

Figure 153: Connecting DC Power to the MX2008 Router
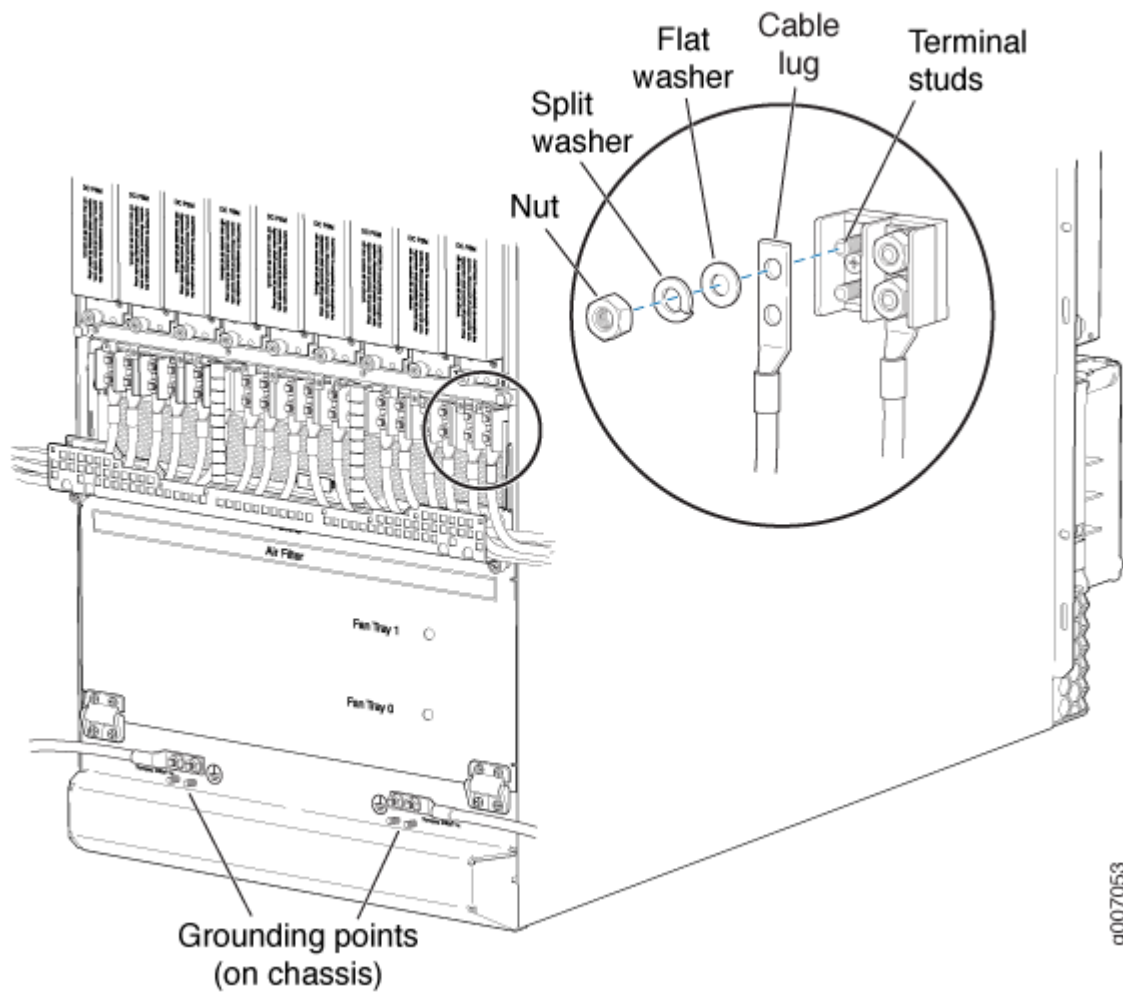
> ⚠️ **CAUTION**: The MX2008 router has more than one connection to power after it is fully connected. Disconnect all power sources before servicing the PSMs or PDMs to avoid electrical shock.

SEE ALSO

DC Power Cable Specifications for the MX2008 Router | **130**

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Connecting Power to a DC-Powered MX2000 Router with DC Power Distribution Modules (240 V China)

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

You connect DC (240 V China) power to the router by attaching power cables from the external DC power sources to the DC power cable that is connected to the PDM. The power cables are orderable (CBL-PWR-240V-CH).

To connect the DC (240 V China) source power cables (CBL-PWR-240V-CH) to the router:

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

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

> **NOTE**: If the DC PSMs (240 V China) are installed in the router, make sure the power switches on all PSMs are turned to the off (**O**) position.

3. Plug the power cord into the power sockets on the DC PDM (240 V China). Refer to Figure 1. Apply slight pressure so that the power cord is firmly seated in the power socket until you feel it engage. As you plug in each power cord, the power LED for the socket lights up green.

Figure 154: Connecting Power
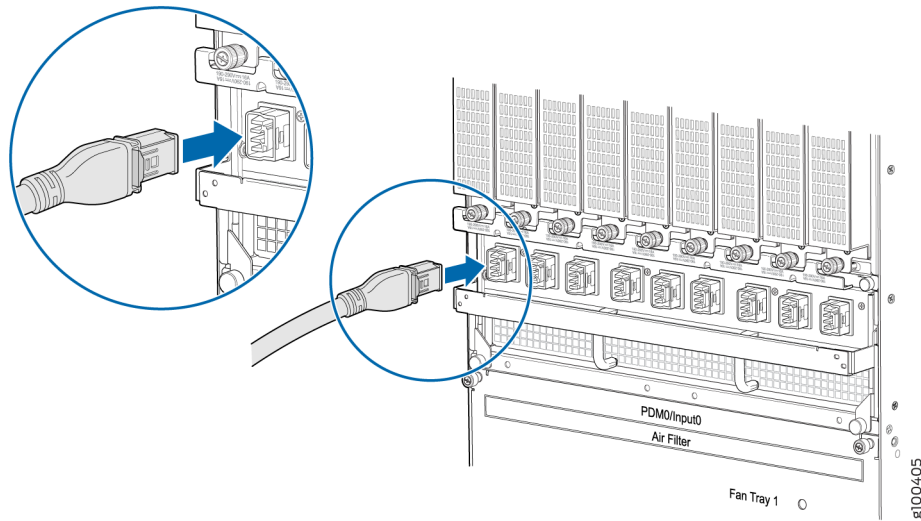
4. Connect the power cords for the remaining PDMs.

Connecting an MX2000 DC Router Power Distribution Module (240 V China) Cable

> ⚠️ **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is **OFF**, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

To connect the DC (240 V China) source power cables (CBL-PWR-240V-CH) to the router:

1. Switch off the dedicated customer site circuit breakers. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.

> **NOTE**: If the DC PSMs (240 V China) are installed in the router, make sure the power switches on all PSMs are turned to the off (**O**) position.

3. Plug the power cord into the power sockets on the DC PDM (240 V China). Refer to Figure 1. Press the latch on the side of the power cable before pushing it in. Apply slight pressure so that the power cord is firmly seated in the power socket until you feel it engage. As you plug in each power cord, the power LED for the socket lights up green.

Figure 155: Connecting Power
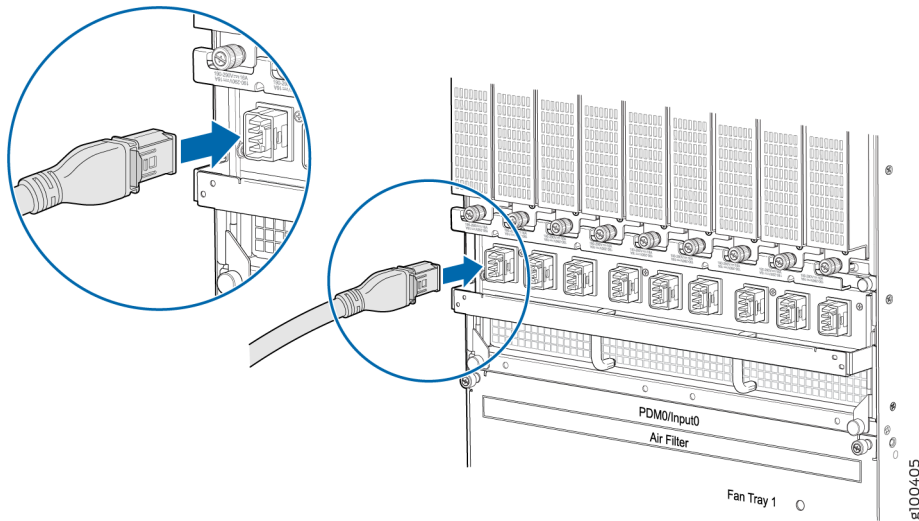
Figure 156: Unplugging the 240 V China Power Cord an MX2000 Router

4. Connect the power cords for the remaining PDMs.

5. Connect the power cable (CBL-PWR-240V-CH) to the DC power source. See .

Figure 157: 240 V China Power Cable
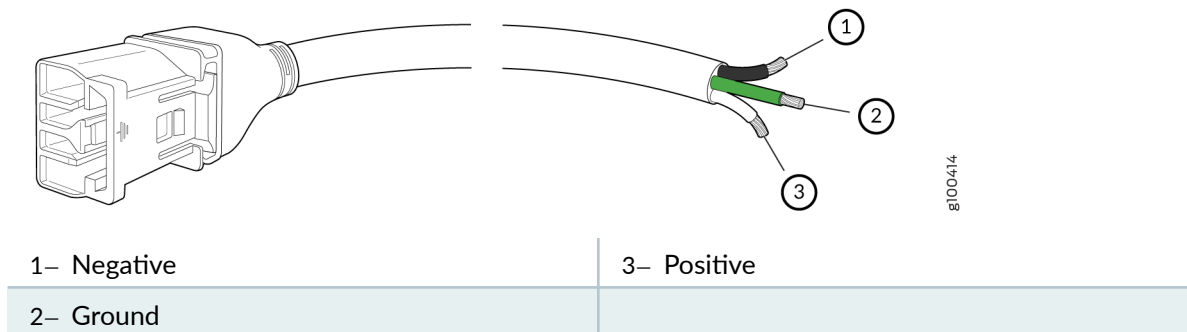
1– Negative	3– Positive
2– Ground	

6. Switch on the dedicated customer site circuit breaker.

7. On each of the DC power input sources, switch the DC circuit breaker to the center position before moving it to the **ON** position.

> **NOTE**: The circuit breaker may bounce back to the off position if you move the breaker too quickly.

8. Observe the status LEDs on the PDM faceplate. If the PDM is correctly installed and functioning normally, the LEDs light green steadily.

9. On each of the DC PSMs, move the switch to the on (|) position.

Powering On the DC-Powered (-48 V) MX2008 Router

To power on a DC-powered MX2008 router:

1. Verify that an external management device is connected to one of the Routing Engine ports on the Routing and Control Board (RCB) (**AUX**, **CONSOLE**, or **MGMT**).

2. Turn on power to the external management device.

3. Verify that the PDMs are fully inserted in the chassis.

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

5. Switch on the dedicated customer-site circuit breakers to provide power to the DC power cables. Follow your site's procedures.

6. Check that the input labeled (**−48V**) LEDs are lit green steadily, indicating that the PDMs are installed and functioning normally.

> **NOTE**: Nine input LEDs indicate proper voltage level and polarity of input feeds.

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

8. For each of the DC PDMs installed, move the DC circuit breaker at the power source to the (**ON**) position.

9. On each of the DC PSMs, move the switch to the on (|) position.

10. Verify that the **PWR OK** LED is lit green steadily, indicating that the PSM is correctly installed and functioning normally.

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

If any of the status LEDs indicates that the PSM is not functioning normally, repeat the installation and cabling procedures.

11. Verify that the **INP0** or **INP1** LEDs on the PSM are lit green steadily if using two feeds.

> **NOTE**: The DIP switches **0** and **1** must be set to the ON position for a two-feed installation.

12. On the external management device connected to the RCB, monitor the startup process to verify that the system has booted properly.

> **NOTE**: If the system is completely powered off when you power on the PSM, the Routing Engine boots as the PSM completes its startup sequence. Normally, the router boots from the Junos OS on the CompactFlash card.
>
> To power off the system after the Routing Engine finishes booting, see "Powering Off the DC-Powered MX2008 Router" on page 275.

13. Verify the MX2008 router power up, system initialization, and status (see "Initially Configuring the MX2008 Router" on page 406).

SEE ALSO

Connecting the MX2008 Router to Management and Alarm Devices

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Replacing an MX2008 DC Power Supply Module (-48 V) | **538**

Replacing an MX2000 DC Power Distribution Module (-48 V)

Powering On the DC-Powered (240 V China) MX2000 Router

To power on a DC-powered router:

1. Verify that an external management device is connected to one of the Routing Engine ports on the Control Board and Routing Engine (CB-RE) (**AUX**, **CONSOLE**, or **MGMT**).

2. Turn on the power to the external management device.

3. Verify that the PDMs are fully inserted in the chassis.

4. Verify that the source power cables are connected to the PDM power cable.

5. Switch on the dedicated customer site circuit breakers to provide power to the DC power cables. Follow your site's procedures.

6. Check that the input labeled LEDs are lit green steadily, indicating the PDMs are installed and functioning normally.

> **NOTE**: Nine input LEDs indicate proper voltage level and polarity of input feeds.

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

8. For each of the DC PDMs installed, switch the DC circuit breaker at the power source, moving it to the (**ON**) position.

9. On each of the DC PSMs, move the switch to the on (**|**) position.

10. Verify that the **PWR OK** LED is lit green steadily, indicating the PSM is correctly installed and functioning normally.

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

If any of the status LEDs indicates that the PSM is not functioning normally, repeat the installation and cabling procedures.

11. Verify that the **INP0** or **INP1** LEDs on the PSM are lit green steadily if using two feeds.

> **NOTE**: The DIP switches **0** and **1** must be set to the **ON** position for a two feed installation.

12. On the external management device connected to the Control Board and Routing Engine (CB-RE), monitor the startup process to verify that the system has booted properly.

> **NOTE**: If the system is completely powered off when you power on the PSM, the Routing Engine boots as the PSM completes its startup sequence. Normally, the router boots from the Junos OS on the CompactFlash card.
>
> To power off the system after the Routing Engine finishes booting, see *Powering Off the DC-Powered or DC-Powered (240 V China) MX2000 Router*.

13. Verify the MX2008 router power up, system initialization, and status, see "Initially Configuring the MX2008 Router" on page 406.

SEE ALSO

Connecting the MX2008 to High-Voltage Power

IN THIS SECTION

Installing MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Supply Modules

To install an MX2000 high-voltage second-generation universal (HVAC/HVDC) PSM:

1. Verify that the power switches on all PSMs are in the off (**O**) position.
2. On the PSM, slide the plastic cover away from the input mode switch to expose the dual DIP switches. Move the input mode DIP switch **0** (left switch) to the **ON** position for the bottom feed **INP0** (expected to be connected), and DIP switch **1** (middle switch) to the **ON** position for the top feed **INP1** (expected to be connected). If both DIP switches **0** and **1** are turned to the **ON** position, then both top and bottom feeds are expected to be connected, (see Figure 158 on page 396).

   In addition, a PSM failure triggers the alarm LED on the craft interface.

NOTE: The DIP switches are only used to indicate presence of a feed. If both feeds are present, power is always drawn from feed **0**. Power will be drawn from feed **1** only if feed **0** fails.

Figure 158: Selecting Input Feed on the Universal (HVAC/HVDC) Power Supply Module
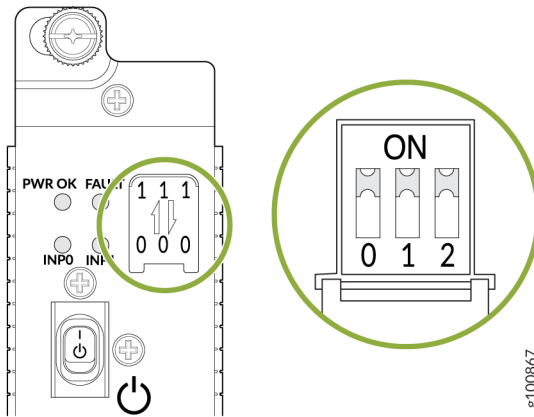
3. Using both hands, grasp the handle and slide the PSM straight into the chassis until the PSM is fully seated in the chassis slot. Tighten the two captive screws (see Figure 159 on page 397). Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.

Figure 159: Installing an MX2000 Router High-Voltage Universal (HVAC/HVDC) PSM
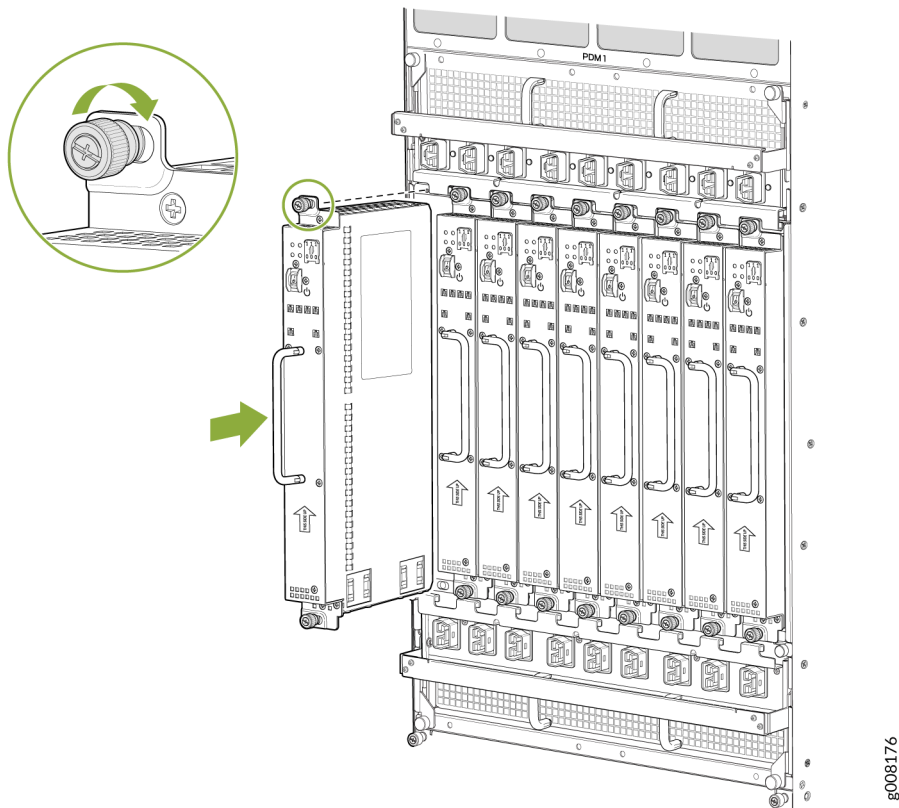
4. Verify that the **INP0** and/or **INP1** LEDs on the PSM are lit green steadily (see).

> **NOTE**: If you are connecting two feeds, **INP0** and **INP1**, both LEDs on the PSM will be lit green steadily.

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

6. Move the switch to the on (|) position.

7. Verify that the **PWR OK** LED is lit green steadily. See *MX2020 High-Voltage Universal Power Supply Module LEDs*, *MX2010 High-Voltage Universal (HVAC/HVDC) Power Supply Module LEDs*, or .

8. Repeat Steps 1 through 7 for installing PSMs in slots **0**, **1**, and **2**, where required.

Figure 160: Selecting Input Feed on the Universal (HVAC/HVDC) Power Supply Module
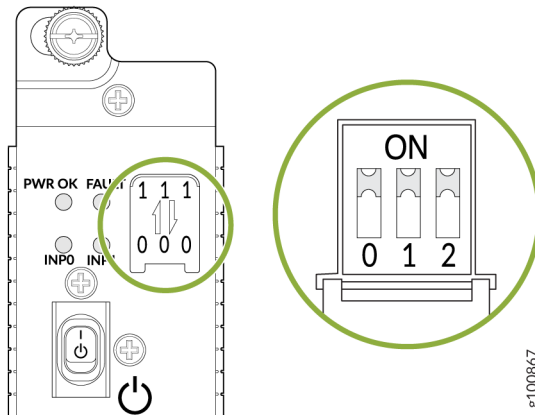
NOTE: Each PSM slot not occupied by a universal (HVAC/HVDC) PSM must be covered by a PSM blank panel.

SEE ALSO

Powering Off the AC-Powered or Universal HVAC/HVDC-Powered MX2000 Router

Replacing an MX2000 High-Voltage Second-Generation Universal (HVAC/HVDC) Power Supply Module | **558**

Connecting Power to a High Voltage-Powered MX2000 Router with Power Distribution Modules

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

> **NOTE**: Ensure that you have connected the chassis to earth ground. See *Grounding an MX2000 Router*.

You connect AC or DC power to the router by connecting the power cord from a universal (HVAC/HVDC) PDM to an AC or DC power source. See "MX2000 High-Voltage Universal PDM (MX2K-PDM-HV) Power Cord Specifications" on page 147 for the list of supported power cords.

To connect the DC or AC source power cables to the router:

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

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

> **NOTE**: If the PSMs are installed in the router, make sure the power switches on all PSMs are turned to the off (**O**) position.

3. Plug the power cord into the power sockets on the high-voltage second-generation universal (HVAC/HVDC) PDM . See Figure 1. Apply slight pressure so that the power cord is firmly seated in the power socket until you feel it engage. As you plug in each power cord, the power LED for the socket lights up green.

Figure 161: Connecting Power to the Universal (HVAC/HVDC) PDM
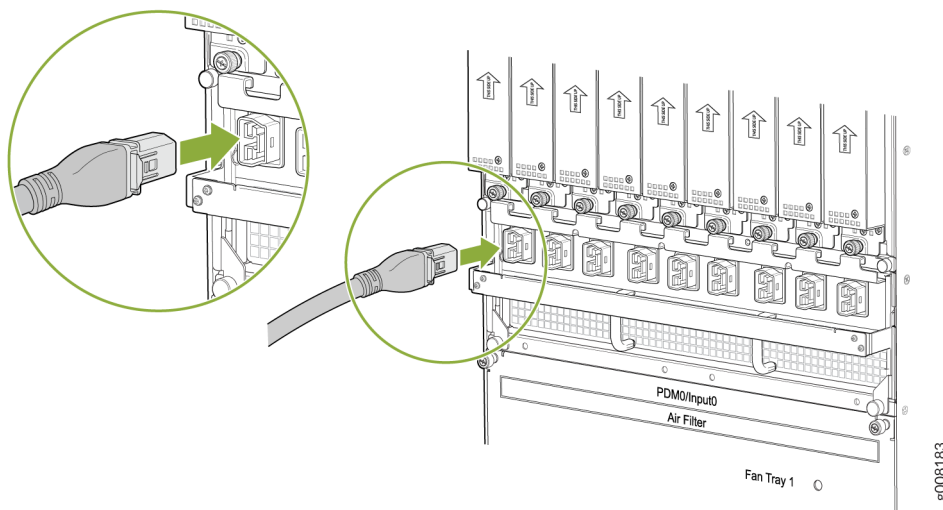
4. Connect the power cords for the remaining PDMs.

Powering On the High-Voltage Powered Universal (HVAC/HVDC) MX2000 Router

To power on a high-voltage second-generation universal (HVAC/HVDC) powered router:

1. Verify that an external management device is connected to one of the Routing Engine ports on the Control Board and Routing Engine (CB-RE) (**AUX**, **CONSOLE**, or **MGMT**).

2. Turn on the power to the external management device.

3. Verify that the PDMs are fully inserted in the chassis.

4. Verify that the source power cables are connected to the PDM power cable.

5. Switch on the dedicated customer site circuit breakers to provide power to the AC or DC power cables. Follow your site's procedures.

6. Check that the input labeled LEDs are lit green steadily, indicating the PDMs are installed and functioning normally.

    NOTE: Nine input LEDs indicate proper voltage level and polarity of input feeds.

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

8. For each of the universal (HVAC/HVDC) PDMs installed, switch the AC or DC circuit breaker at the power source, moving it to the (**ON**) position.

9. On each of the universal (HVAC/HVDC) PSMs, move the switch to the on (**|**) position.

10. Verify that the **PWR OK** LED is lit green steadily, indicating the PSM is correctly installed and functioning normally.

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

    If any of the status LEDs indicates that the PSM is not functioning normally, repeat the installation and cabling procedures.

11. Verify that the **INP0** or **INP1** LEDs on the PSM are lit green steadily if using two feeds.

> **NOTE**: The DIP switches **0** and **1** must be set to the **ON** position for a two feed installation.

12. On the external management device connected to the Control Board and Routing Engine (CB-RE), monitor the startup process to verify that the system has booted properly.

> **NOTE**: If the system is completely powered off when you power on the PSM, the Routing Engine boots as the PSM completes its startup sequence. Normally, the router boots from the Junos OS on the CompactFlash card.
>
> To power off the system after the Routing Engine finishes booting, see *Powering Off the AC-Powered or Universal HVAC/HVDC-Powered MX2000 Router*.

13. Verify the MX2000 router power up, system initialization, and status, see *Initially Configuring the MX2020 Router*, *Initially Configuring the MX2010 Router*, or "Initially Configuring the MX2008 Router" on page 406.

SEE ALSO

Preventing Electrostatic Discharge Damage to an MX2020 Router

Replacing an MX2000 High-Voltage Universal (HVAC/HVDC) Power Distribution Module | **567**

Replacing an MX2000 High-Voltage Second-Generation Universal (HVAC/HVDC) Power Supply Module | **558**

Connecting the MX2008 to the Network

IN THIS SECTION

Tools and Parts Required for MX2008 Router Connections

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

- Phillips (+) screwdrivers, numbers 1 and 2

- 2.5 mm flat-blade (–) screwdriver

- 2.5 mm Phillips (+) screwdriver

- Wire cutters

- Electrostatic discharge (ESD) grounding wrist strap

SEE ALSO

Connecting the Alarm Relay Wires to the MX2008 Craft Interface

To connect the alarm relay wires between a router and an alarm-reporting device (see Figure 162 on page 403):

1. Prepare the required length of replacement wire with gauge between 28 AWG (0.08 mm^2) and 14 AWG (2.08 mm^2).

2. Insert the replacement wires into the slots in the front of the block (see Table 126 on page 403). Use a 2.5-mm flat-blade screwdriver to tighten the screws and secure the wire.

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. Plug the terminal block into the relay contact, and use a 2.5-mm flat-blade screwdriver to tighten the screws on the face of the block.

5. Attach the other end of the wires to the external device.

Figure 162: Alarm Relay Contacts
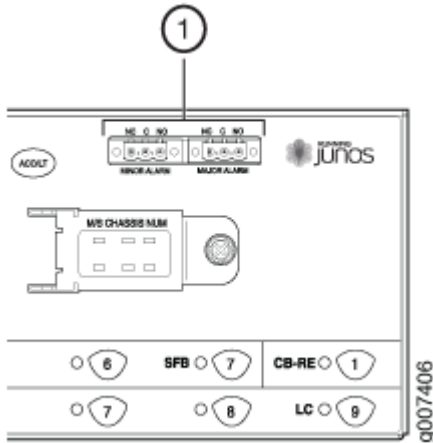
Table 126: Connecting Alarm Relay Contacts

Function No.	Label	Description
1	**MINOR ALARM—[NC C NO]** **MAJOR ALARM—[NC C NO]**	The alarm relays consist of three terminal contacts with a normal closed (NC), a common (C), and a normal open (NO) relay that signal a minor or major alarm when broken.

SEE ALSO

Disconnecting the Alarm Relay Wires from the MX2008 Craft Interface

To disconnect the alarm relay wires from the router and an alarm-reporting device (see):

1. Disconnect the existing wire at the external device.
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. Using a 2.5-mm flat-blade screwdriver, loosen the small screws on the face of the terminal block and remove the block from the relay contact.

4. Using the 2.5-mm flat-blade screwdriver, loosen the small screws on the side of the terminal block. Remove existing wires from the slots in the front of the block (see Table 127 on page 404).

Figure 163: Alarm Relay Contacts
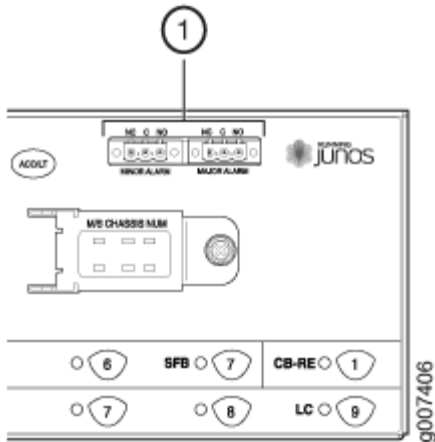
Table 127: Alarm Relay Contacts on the Craft Inteface

Function No.	Label	Description
1	MINOR ALARM—[NC C NO] MAJOR ALARM—[NC C NO]	The alarm relays consist of three terminal contacts with a normal closed (NC), common (C), and normal open (NO) relays that signal a minor or major alarm when broken.

SEE ALSO

MX2008 Craft Interface Description | 37

Connecting MPC or MIC Cables to the MX2008 Router

To connect the MPCs or MICs to the network (see Figure 164 on page 406):

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

2. Remove the rubber safety plug from the cable connector port.

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

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

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

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

⚠ **CAUTION**: 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 164: Attaching a Cable to a MIC or MPC
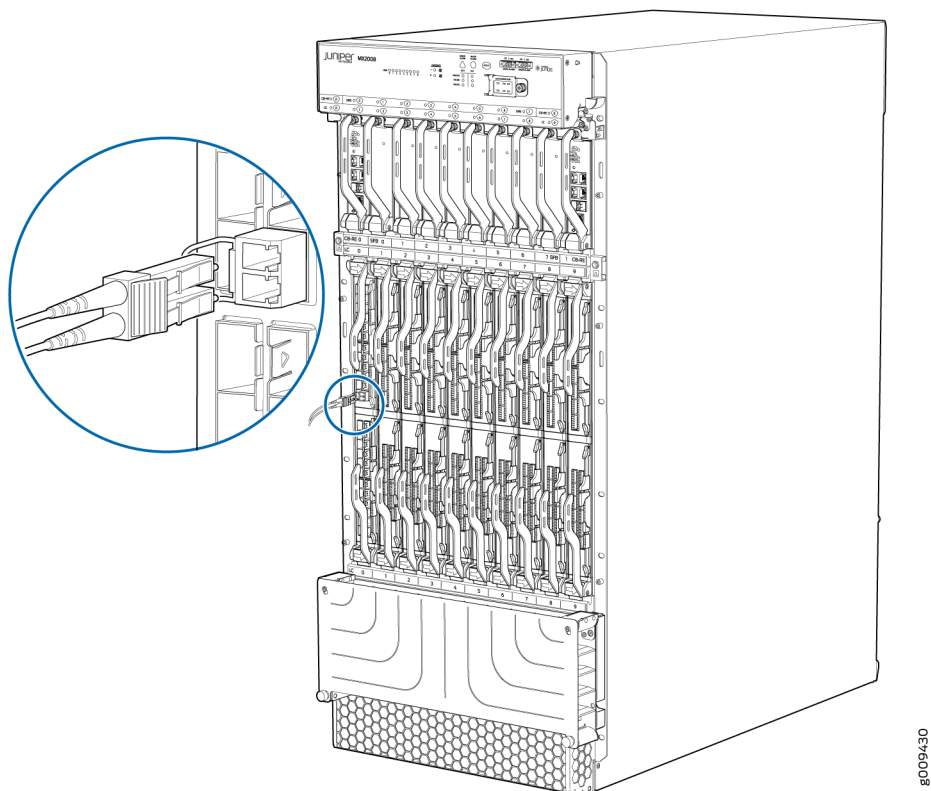
Connecting the MX2008 Router to Management and Alarm Devices

Tools and Parts Required for MX2008 Router Connections | **402**

Connect the Grounding Cable | **354**

Initially Configuring the MX2008 Router

The MX2008 router is shipped with Junos OS preinstalled and ready to be configured when the MX2008 router is powered on. There are two copies of the software: one on the solid-state drive (SSD) in the RCB, and one on a USB flash drive that can be inserted into the slot in the RCB faceplate (see Figure 165 on page 407).

> **NOTE**: The SSD is internal in the RCB and cannot be removed.

When the router boots, it first attempts to start the image on the USB flash drive. If a USB flash drive is not inserted into the RCB or the attempt otherwise fails, then the router next tries the SSD.

You configure the router by issuing Junos OS 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.

Figure 165: USB Flash Drive Port on RCB
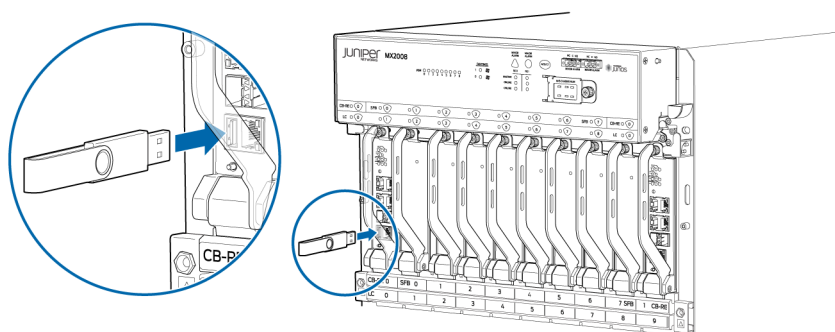
Gather the following information before configuring the router:

- Name the router will use on the network

- Domain name the router will use

- IP address and prefix length information for the Ethernet interface

- IP address of a default router

- IP address of a DNS server

- Password for the root user

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

To configure the software:

1.   Verify that the router is powered on.

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

3. Start the CLI.

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

4. Enter configuration mode.

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

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

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

6. Create a management console user account.

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

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

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

8. Configure the router's domain name.

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

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

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

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

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

11. Configure the IP address of a DNS server.

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

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

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

or

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

or

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

or

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

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

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

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

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

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

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

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

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

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

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

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

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

NOTE: To reinstall 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), it expands its search in the **/config** directory of the ruoter 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 files can be loaded properly, the router does not function properly. If the router boots from an alternate boot device, Junos OS displays a message indicating this when you log in to the router.

5

CHAPTER

Maintaining Components

Maintaining MX2008 Components

Tools and Parts Required for Replacing MX2008 Hardware Components

To replace hardware components, you need the tools and parts listed in Table 128 on page 413.

Table 128: Tools and Parts Required for Component Replacement

Components	Tool or Part
All	Electrostatic discharge (ESD) grounding wrist strap
AC power supply module	Phillips (+) screwdrivers, number 1 and 2
AC power distribution module Three-phase delta AC PDM Three-phase wye AC PDM	Phillips (+) screwdriver, number 2 to access the metal AC wiring compartment 7/16-in. (11 mm) hexagonal-head external drive socket wrench, or nut driver, with a torque range between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) to attach the ground wire. 1/4-in. slotted screwdriver and 5/32-in. (4 mm) Allen wrench to attach input terminal wires of the AC power cord.

Table 128: Tools and Parts Required for Component Replacement *(Continued)*

Components	Tool or Part
AC power cord	Phillips (+) screwdrivers, numbers 1 and 2 7/16-in. (11 mm) hexagonal-head external drive socket wrench, or nut driver, with a torque range between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) to attach the ground wire. 1/4-in. slotted screwdriver and 5/32-in. (4 mm) Allen wrench to attach input terminal wires of the AC power cord.
Craft interface	Phillips (+) screwdrivers, numbers 1 and 2
DC power distribution module	Phillips (+) screwdrivers, numbers 1 and 2 7/16-in. (11 mm) hexagonal-head external drive socket wrench, or nut driver, with a torque range between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) to attach the ground wire. 1/4-in. slotted screwdriver and 5/32-in. (4 mm) Allen wrench to attach input terminal wires of the AC power cord.
DC power supply cable	7/16-in. (11 mm) nut driver or socket wrench **CAUTION**: You must use an appropriate torque-controlled tool to tighten the nuts. Apply excessive torque damages the terminal studs and the PDM. The absolute maximum that may be applied to this nut is between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm).
Fan trays (upper and lower)	Phillips (+) screwdrivers, numbers 1 and 2
Air Baffle	Phillips (+) screwdrivers, numbers 1 and 2
MPC	Phillips (+) screwdrivers, numbers 1 and 2 Blank panels (if component is not reinstalled) Electrostatic bag or antistatic mat

Table 128: Tools and Parts Required for Component Replacement *(Continued)*

Components	Tool or Part
MIC	Phillips (+) screwdrivers, numbers 1 and 2
	Rubber safety cap for fiber-optic MICs
	Flat-blade (–) screwdriver
	Electrostatic bag or antistatic mat
	Blank panels (if component is not reinstalled)
Routing Engine and Control Board (RCB)	Phillips (+) screwdrivers, numbers 1 and 2
	Electrostatic discharge (ESD) grounding wrist strap
	Blank panels (if component is not reinstalled)
SFB	Phillips (+) screwdrivers, numbers 1 and 2
	Electrostatic discharge (ESD) grounding wrist strap
	Blank panels (if component is not reinstalled)
Serial cable to Auxiliary or Console Routing Engine port	Flat-blade (–) screwdriver
PSM air filter	Phillips (+) screwdrivers, numbers 1 and 2
Card-cage air filter	Phillips (+) screwdrivers, numbers 1 and 2
Air filter (lower)	Phillips (+) screwdrivers, numbers 1 and 2

SEE ALSO

Tools and Parts Required to Remove Components from an MX2008 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

- EMI (electromagnetic interference) covers—shipped with router

- Electrostatic bag or antistatic mat, for each component

- Electrostatic discharge (ESD) grounding wrist strap

- Flat-blade (–) screwdriver

- Pallet jack with attachment—recommended

- Phillips (+) screwdrivers, numbers 1 and 2

- Rubber safety cap for fiber-optic interfaces or cable

- Wire cutters

SEE ALSO

Contact Customer Support

Tools and Parts Required to Maintain the MX2008 Hardware Components

To maintain hardware components, you need the following tools and parts:

- ESD grounding wrist strap

- Flat-blade (–) screwdriver

- Phillips (+) screwdriver, number 1 and number 2

Replacing the MX2008 Extended Cable Manager

IN THIS SECTION

Removing the MX2008 Extended Cable Manager

To remove the extended cable manager:

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

2. To remove the cover, loosen the two captive screws on the extended cable manager cover. Set the extended cable manager cover aside.

3. Remove the eight screws that secure the extended cable manager to the chassis as shown in Figure 1.

4. Pull the extended cable manager away from the chassis.

Figure 166: Removing the Extended Cable Manager
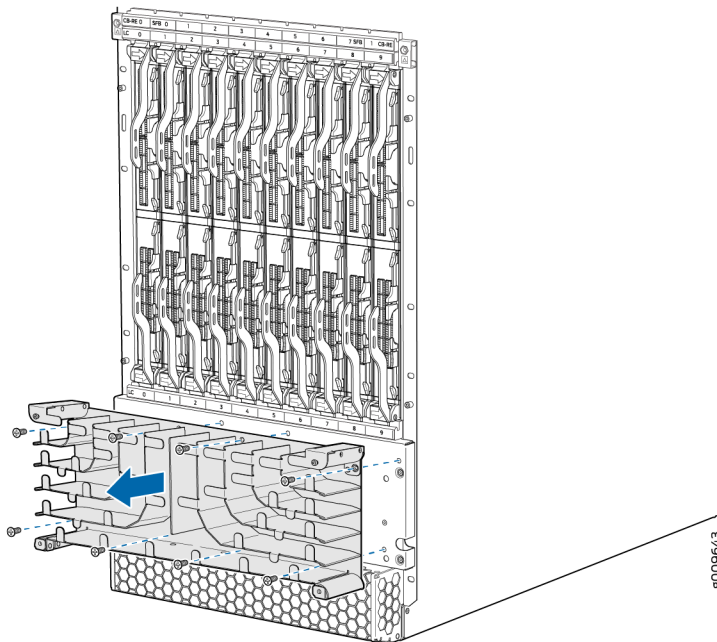
Removing the MX2008 Extended DC Cable Manager

To remove the extended DC cable manager (see):

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

2. Using a Phillips (+) screwdriver (number 1 or 2), loosen the two captive screws on the DC cable manager.

3. Grasp the extended DC cable manager, lift up and pull straight out from the DC PDM on the rear of the chassis.

4. Place the extended DC cable manager into an electrostatic bag and set it aside.

Figure 167: Removing the Extended DC Cable Manager
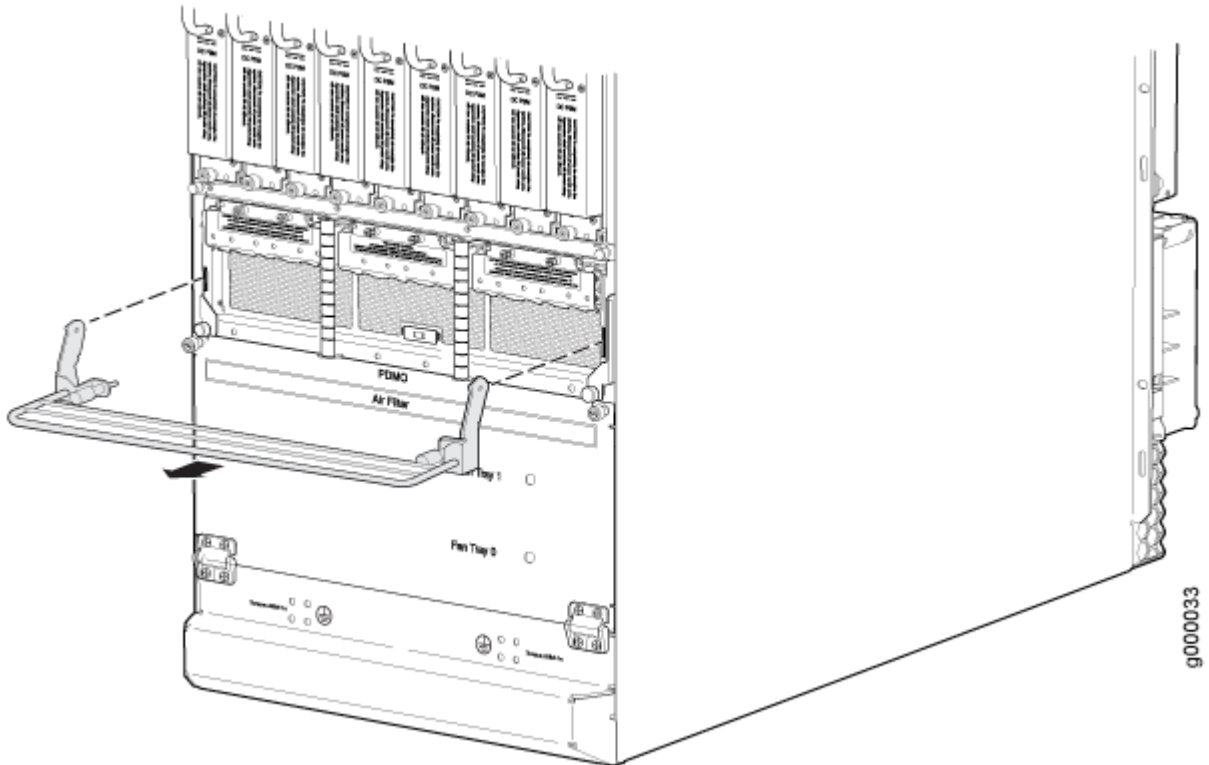
To remove the cable manager for the DC PDM (240 V China) and the universal (HVAC/HVDC) PDM (see):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See the instructions for your site.

2. Using a screwdriver, loosen the two screws on each side of the cable manager (see).

Figure 168: Removing the DC Cable Manager for DC PDM (240 V China) and the Universal (HVAC/HVDC) PDM
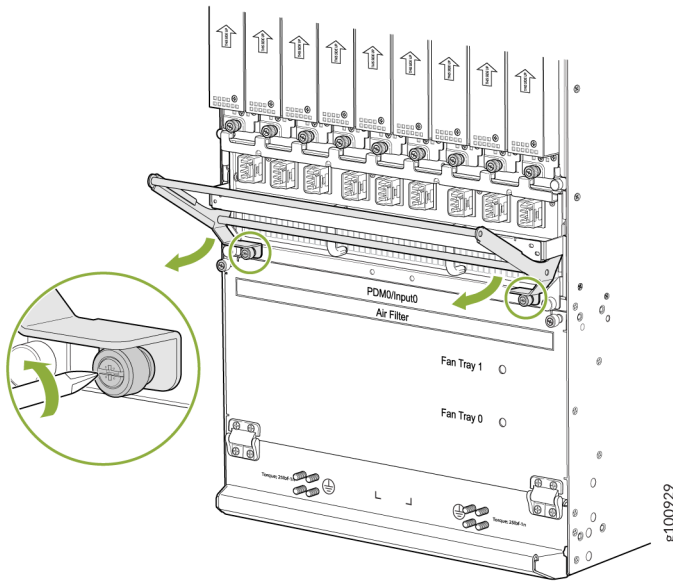
3. Grasp the DC cable manager, lift up and pull straight out from the DC PDM on the rear of the chassis.

4. Place the DC cable manager into an electrostatic bag and set it aside.

Installing the MX2008 Extended Cable Manager

To install the extended cable manager (see Figure 169 on page 421):

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

2. Position the extended cable manager on the studs below the lower card cage.

3. Attach the extended cable manager using eight screws as shown in Figure 169 on page 421.

4. Replace the cable manager cover, and secure it with the two captive screws.

Figure 169: Installing the Extended Lower Cable Manager
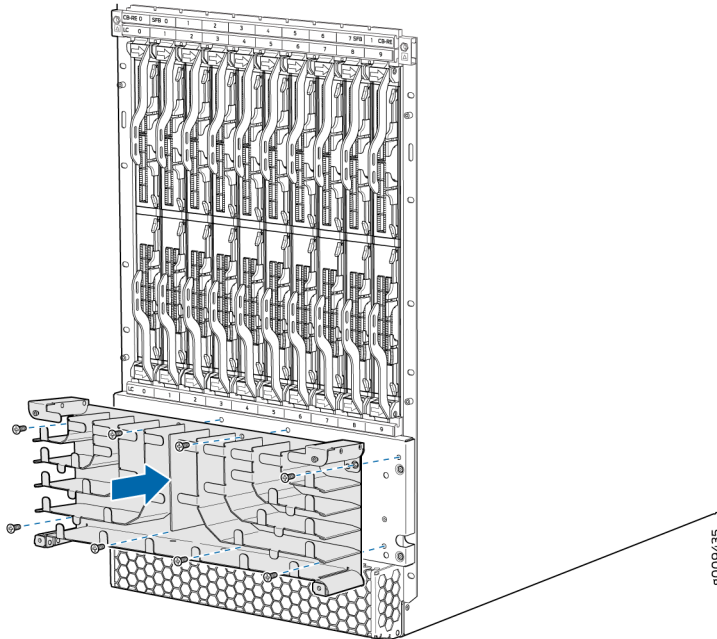
Installing the MX2008 Extended DC Cable Manager

To install the extended DC cable manager (see):

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

2. Position the extended DC cable manager over the two slots located on both sides of the DC PDM.

3. Lift the extended DC cable manager slightly up while inserting the two flanges into the slots on both sides of the DC PDM.

4. Push the extended DC cable manager into place.

5. Tighten the two captive screws to secure the extended DC cable manager.

Figure 170: Installing the Extended DC Cable Manager
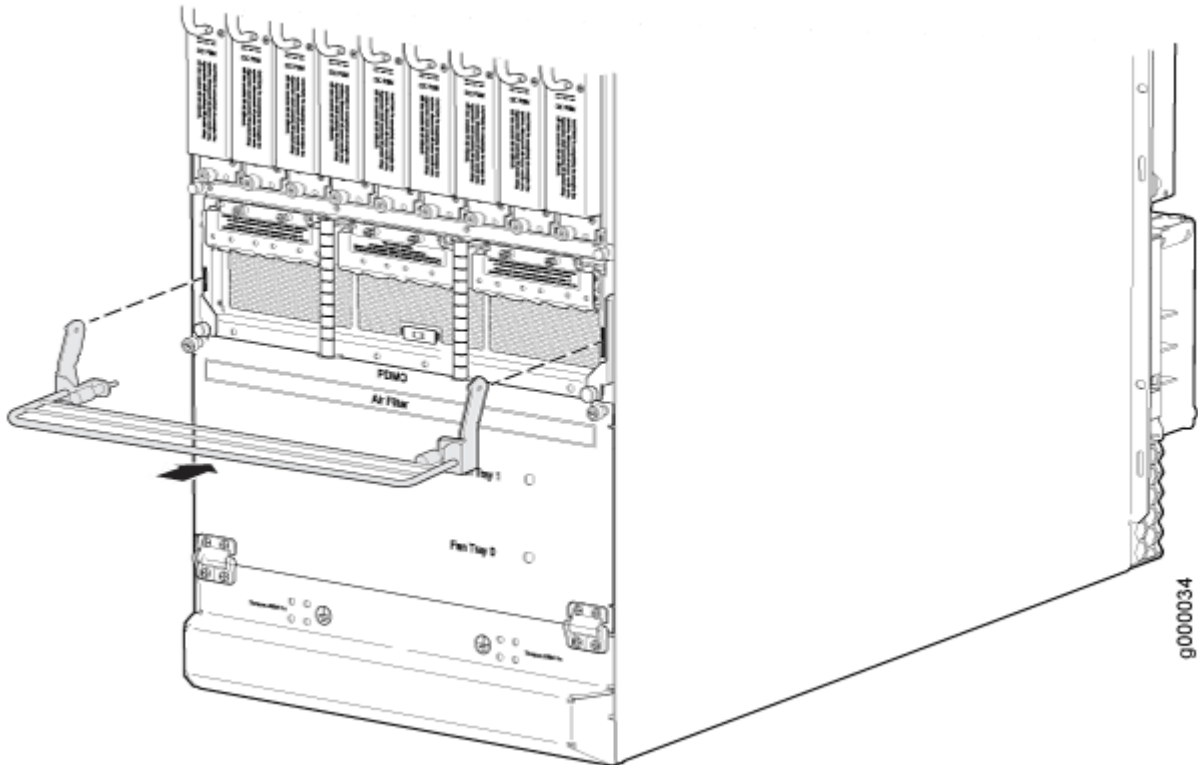
To install the DC cable manager for the DC PDM (240 V China) or the universal (HVAC/HVDC) PDM (see):

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

2. Position the DC cable manager over the two slots located on both sides of the DC PDM.

3. Lift the DC cable manager slightly up while inserting the two flanges into the slots on both sides of the DC PDM.

Figure 171: Installing the DC Cable Manager on the DC PDM (240 V China) and Universal (HVAC/ HVDC) PDM
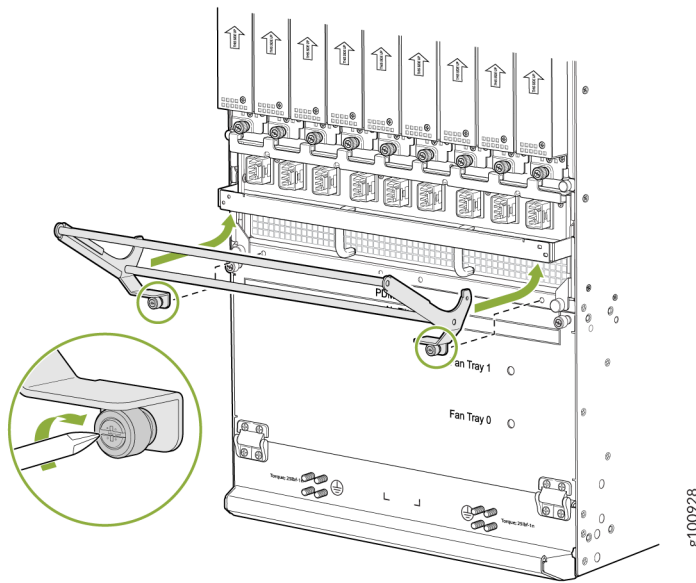
4. Push down to secure the DC cable manager in place. Tighten the screws using a screwdriver. See .

RELATED DOCUMENTATION

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Replacing the MX2008 Craft Interface

IN THIS SECTION

- Disconnecting the Alarm Relay Wires from the MX2008 Craft Interface | **424**
- Removing the MX2008 Craft Interface | **424**
- Installing the MX2008 Craft Interface | **425**
- Connecting the Alarm Relay Wires to the MX2008 Craft Interface | **426**

Disconnecting the Alarm Relay Wires from the MX2008 Craft Interface

To disconnect the alarm relay wires from the router and an alarm-reporting device (see Figure 7):

1. Disconnect the existing wire at the external device.

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. Using a 2.5-mm flat-blade screwdriver, loosen the small screws on the face of the terminal block and remove the block from the relay contact.

4. Using the 2.5-mm flat-blade screwdriver, loosen the small screws on the side of the terminal block. Remove existing wires from the slots in the front of the block (see Table 2).

Figure 172: Alarm Relay Contacts
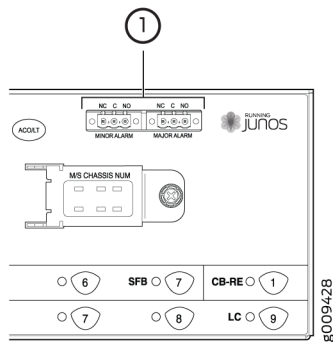
Table 129: Alarm Relay Contacts on the Craft Inteface

Function No.	Label	Description
1	MINOR ALARM—[NC C NO] MAJOR ALARM—[NC C NO]	The alarm relays consist of three terminal contacts with a normal closed (NC), common (C), and normal open (NO) relays that signal a minor or major alarm when broken.

Removing the MX2008 Craft Interface

To remove the craft interface (see Figure 173 on page 425):

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

2. Detach any external devices connected to the craft interface.

3. Loosen the two captive screws at the left and right sides of the craft interface faceplate by using the Torx (T10) screwdriver.

4. Grasp the craft interface faceplate and carefully tilt it toward you until it is horizontal.

5. Disconnect the ribbon cable from the back of the faceplate by gently pressing on both sides of the latch with your thumb and forefinger. Remove the craft interface from the chassis.

Figure 173: Removing the Craft Interface
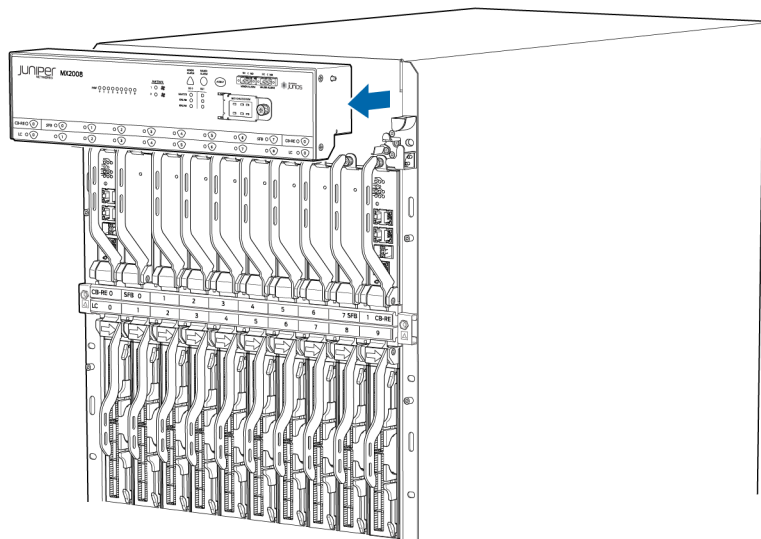
Installing the MX2008 Craft Interface

To install the craft interface (see):

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

2. Grasp the craft interface with one hand, and hold the bottom edge of the craft interface with the other hand to support its weight.

3. Orient the ribbon cable so that it plugs into the connector socket. The connector is keyed and can be inserted only one way. The pin on the right side of the craft interface indicates the positioning.

4. Align the bottom of the craft interface with the sheet metal above the card cage, and press it into place.

5. Tighten the two screws on the left and right sides of the craft interface faceplate by using the Torx (T10) screwdriver.

6. Reattach any external devices connected to the craft interface.

Figure 174: Installing the Craft Interface
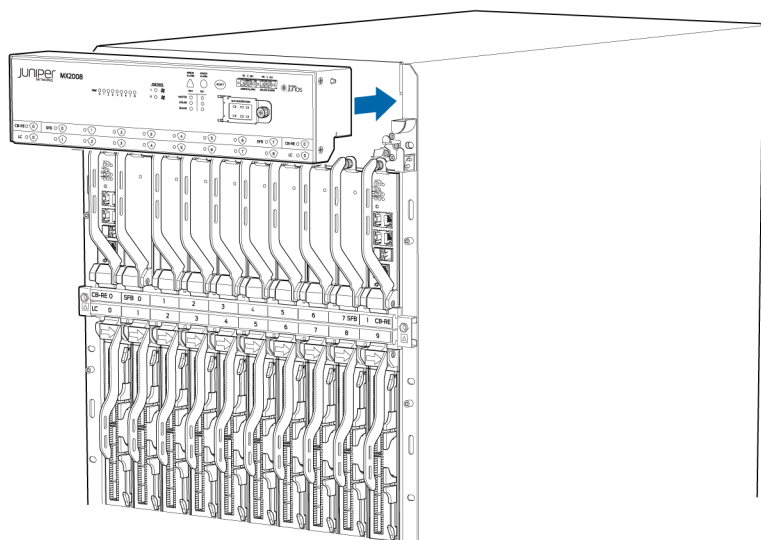
Connecting the Alarm Relay Wires to the MX2008 Craft Interface

To connect the alarm relay wires between a router and an alarm-reporting device (see Figure 175 on page 427):

1. Prepare the required length of replacement wire with gauge between 28 AWG (0.08 mm^2) and 14 AWG (2.08 mm^2).

2. Insert the replacement wires into the slots in the front of the block (see Table 130 on page 427). Use a 2.5-mm flat-blade screwdriver to tighten the screws and secure the wire.

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. Plug the terminal block into the relay contact, and use a 2.5-mm flat-blade screwdriver to tighten the screws on the face of the block.

5. Attach the other end of the wires to the external device.

Figure 175: Alarm Relay Contacts
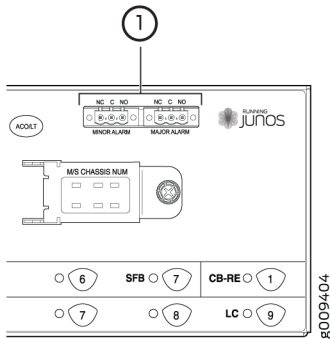
Table 130: Connecting Alarm Relay Contacts

Function No.	Label	Description
1	**MINOR ALARM—[NC C NO]** **MAJOR ALARM—[NC C NO]**	The alarm relays consist of three terminal contacts with a normal closed (NC), a common (C), and a normal open (NO) relay that signal a minor or major alarm when broken.

RELATED DOCUMENTATION

MX2008 Craft Interface Description | **37**

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Disconnecting the Alarm Relay Wires from the MX2008 Craft Interface | **403**

MX2008 Craft Interface Serial Number Label | **608**

Replacing the MX2008 Standard EMI Cover

IN THIS SECTION

- Removing the MX2008 Standard EMI Cover | **428**
- Installing the MX2008 Standard EMI Cover | **428**

Removing the MX2008 Standard EMI Cover

To remove the electromagnetic interference (EMI) card-cage cover (see Figure 11).

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Loosen the four captive screws that secure the EMI cover to the router.
3. Pull the cover away from the router toward you to remove it.

Figure 176: Removing the EMI Card-Cage Cover
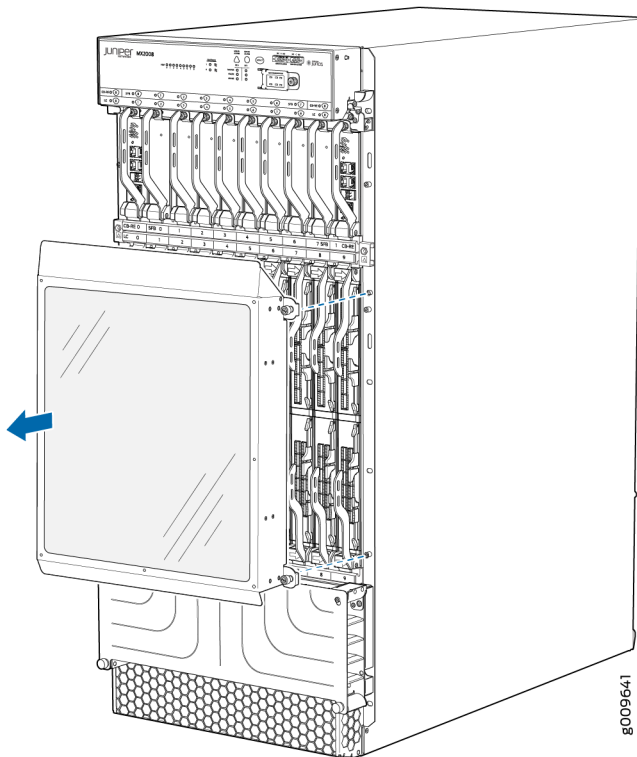
Installing the MX2008 Standard EMI Cover

The MPCs require an EMI cover to reduce the risk of radio frequency interference disturbance that affects an electrical circuit because of electromagnetic interference emitted from an external source. The EMI cover is designed to reduce the electromagnetic interference (EMI) to comply with the Federal Communications Commission (FCC) requirements.

To install the EMI card-cage cover (see Figure 177 on page 429):

1. Align the four brackets on either side of the EMI cover with the chassis front-mounting flanges on the outside of the card cage.

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

2. Adjust the EMI cover until the four captive screws align with the holes in the front-mounting flanges.

3. Tighten the four captive screws to secure the EMI cover in place.

Figure 177: Installing the EMI Card-Cage Cover
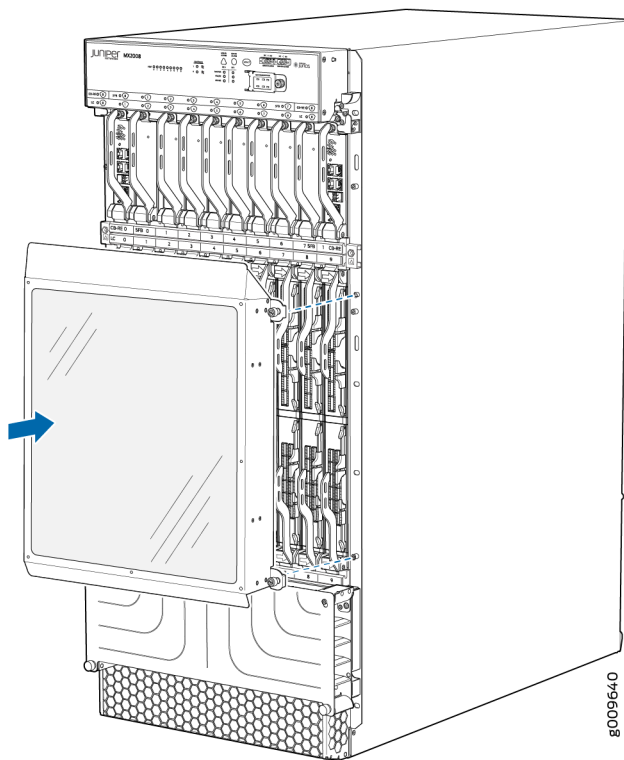
RELATED DOCUMENTATION

Preventing Electrostatic Discharge Damage to an MX2008 Router | 628

Replacing the MX2008 Extended EMI Cover

IN THIS SECTION

Removing the MX2008 Extended EMI Cover

The extended electromagnetic interference (EMI) cover attaches to the router over the card cage and tilts out from the top.

To remove the extended electromagnetic interference (EMI) card-cage cover (see Figure 14):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Gripping the flap on the extended EMI cover, tilt it away from the router toward you.
3. Holding the cover on both sides, lift so that the points on the cover lift out of the grooves on the EMI cover brackets.
4. Pull the cover away from the router toward you to remove it.
5. Using a number 2 Phillips (+) screwdriver, remove the two mounting screws from the mounting brackets on either side of the card cage. Then remove the mounting brackets (see Figure 13).

Figure 178: Removing the Extended EMI Cover Mounting Brackets
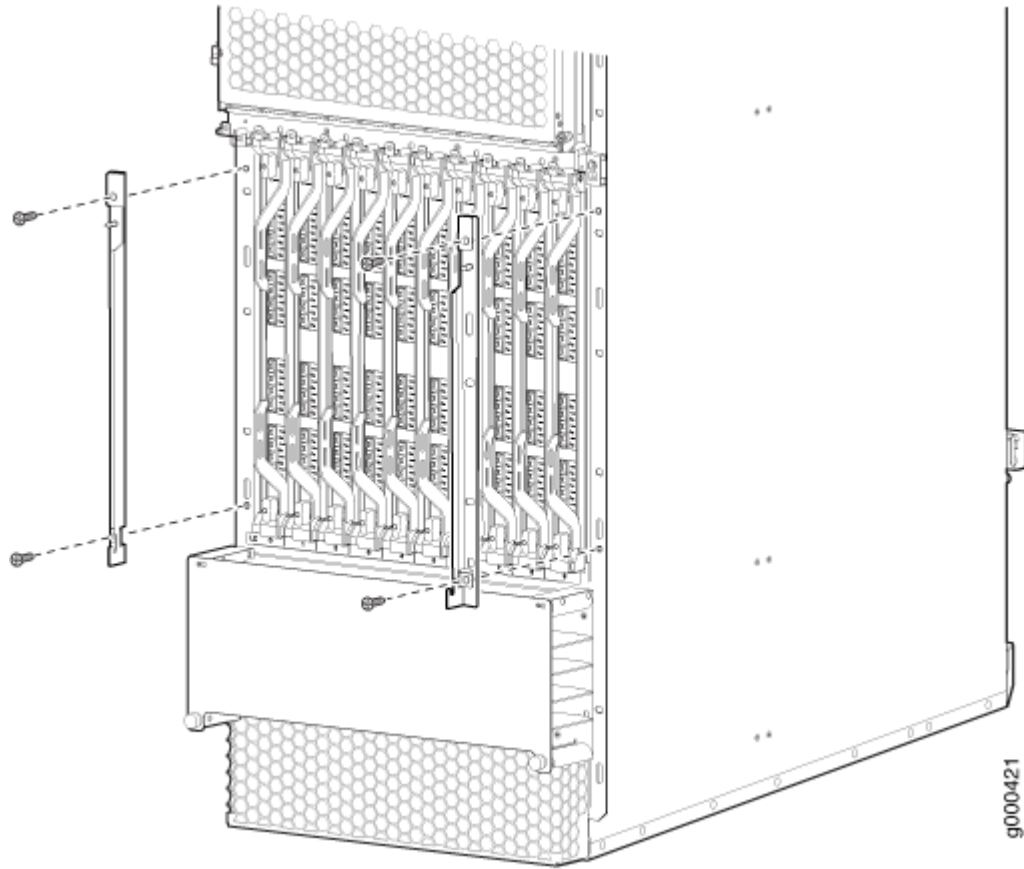
Figure 179: Removing the Extended EMI Card-Cage Cover
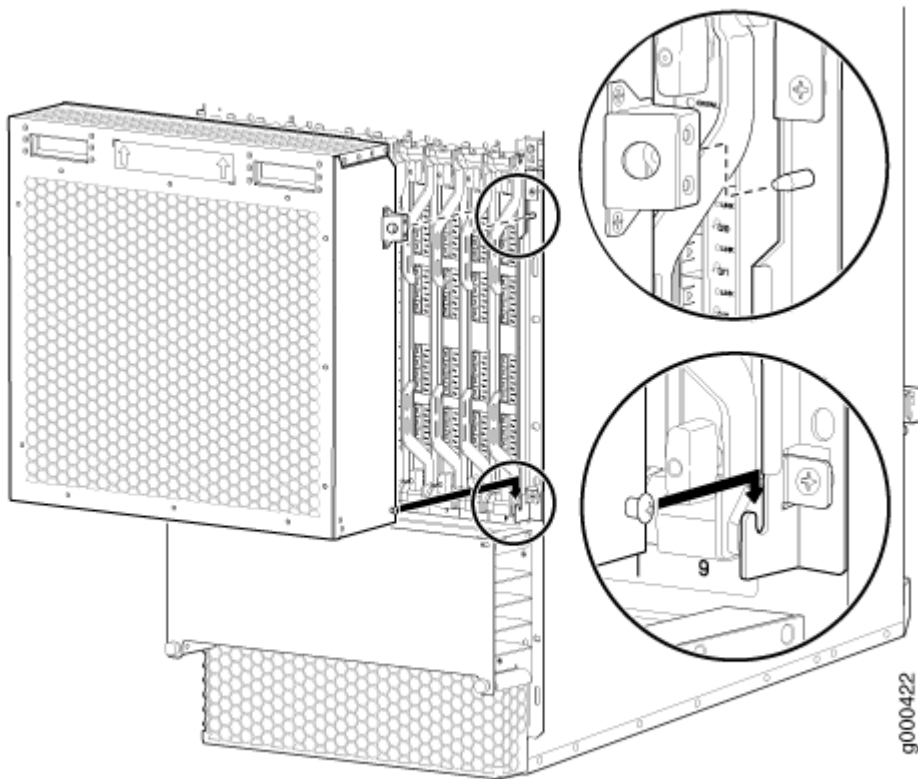
Installing the MX2008 Extended EMI Cover

The extended electromagnetic interference (EMI) covers attaches to the router over the card cage.

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

2. On each side of the card cage, orient the extended EMI cover's mounting brackets so that they line up with the mounting holes. The groove that holds the points on the cover should be at the top.

3. Using a number 2 Phillips (+) screwdriver, secure the extended EMI cover mounting brackets to the sides of the card cage by using the four screws provided (two on each side) (see).

Figure 180: Installing the Extended EMI Cover Mounting Brackets
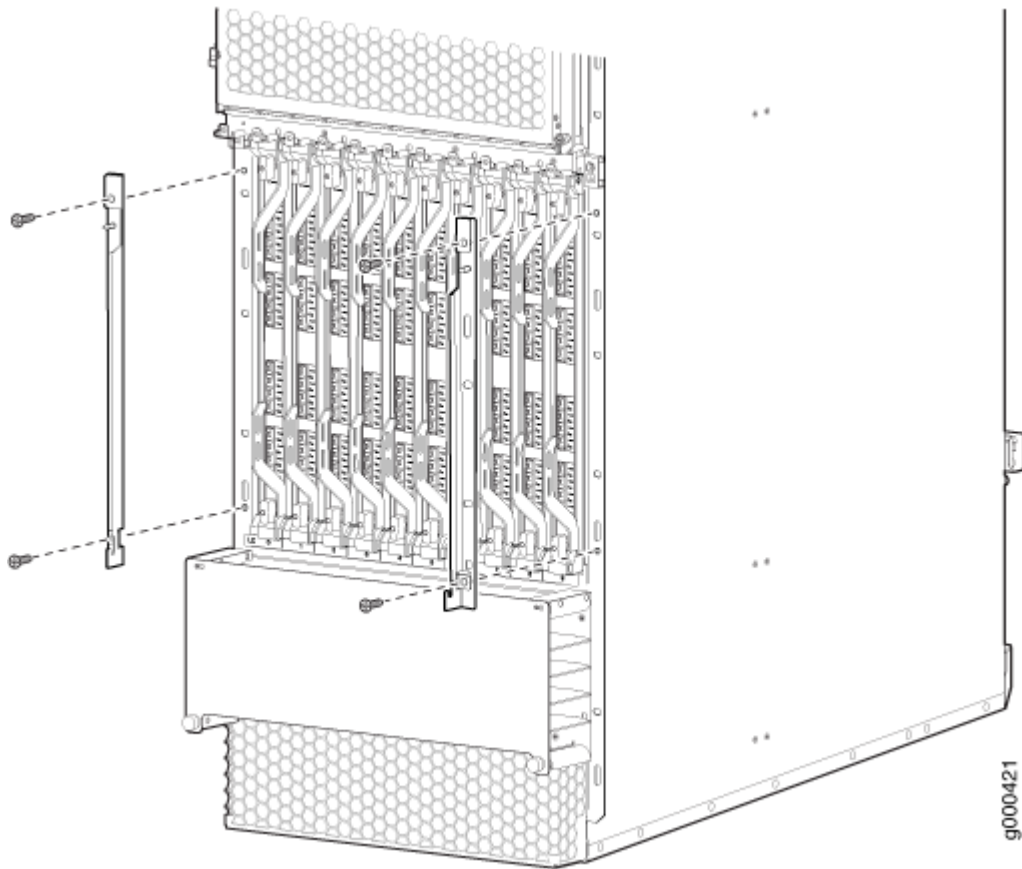
4. Orient the cover so that the arrows point up in front of the card cage.

5. Angle the extended EMI cover so that the points at each side fit into the grooves on the EMI cover's mounting brackets.

6. Tilt the extended EMI cover into place and press firmly until the sides contact the mounting brackets of the EMI cover.

Figure 181: Installing the Extended EMI Card-Cage Cover
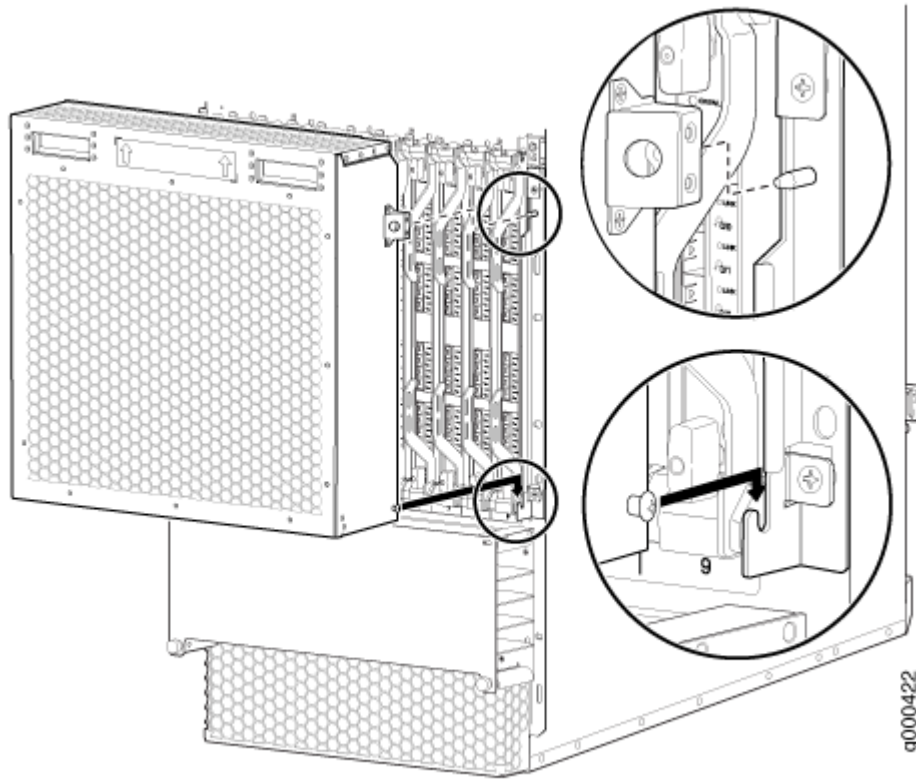
RELATED DOCUMENTATION

Maintaining MX2008 Cooling System Components

Replacing the MX2008 Air Filters

NOTE: The MX2008, MX2010, and MX2020 routers support the same fan modules.

Removing the MX2008 Air Filter

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

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

To remove the air filter:

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

2. Loosen the two captive screws located on either side of the fan tray and air filter access door.

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

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

3. Grasp the handle on the air filter, and pull the air filter straight out from the chassis.

   NOTE: The air filter has a built-in handle.

4. Slide the air filter out of the chassis as shown in Figure 1.

Figure 182: Removing the Air Filter from the Chassis
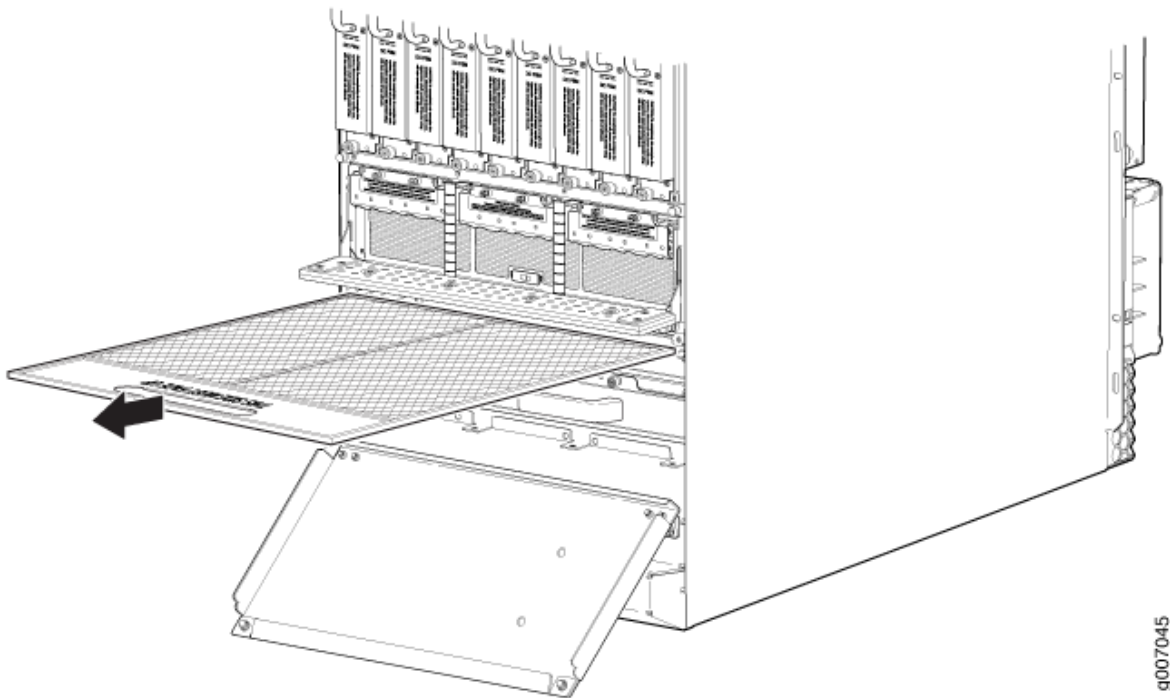
To remove the PSM air filter:

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

2. Loosen the two captive screws located on either side of the air filter and pull slightly out of the chassis.

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

3. Grasp the PSM air filter, and pull the air filter straight out from the chassis.

4. Slide the air filter out of the chassis as shown in Figure 2.

> **NOTE**: The AC–powered MX2008 router has the same air filter.

Figure 183: Removing the PSM Air Filter from the Chassis
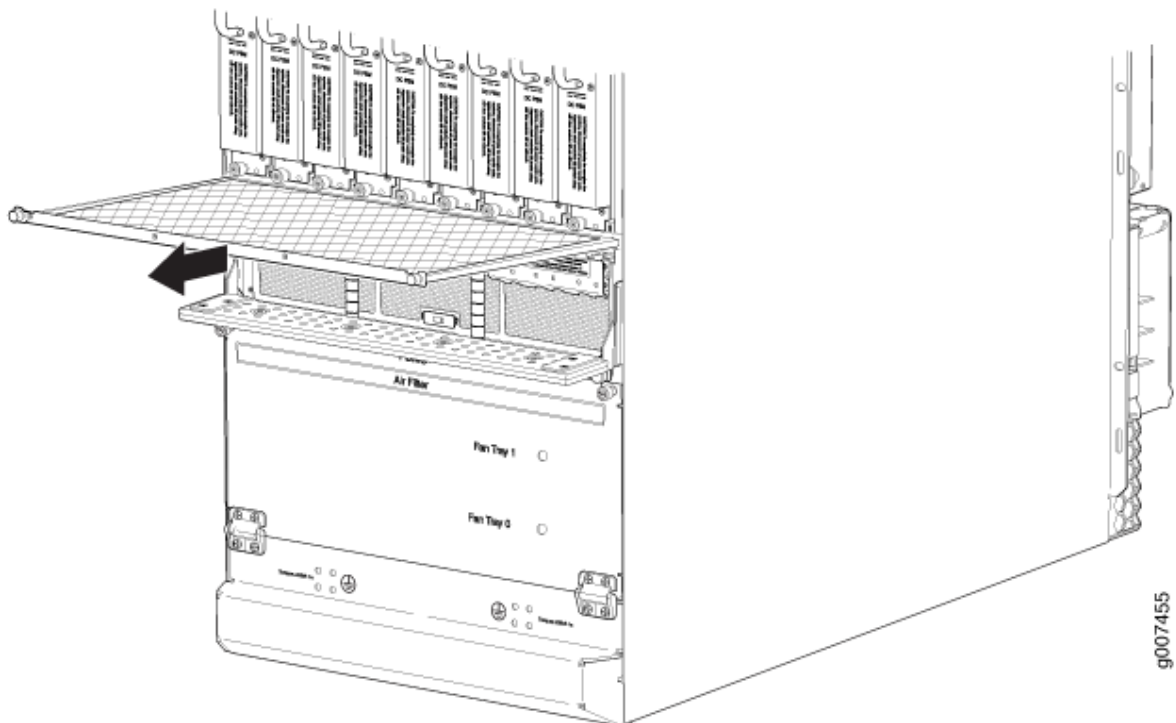
To remove the PSM air filter—MX2000-FLTR-PWR for a chassis with the DC PDM (240 V China) or universal HVAC/HVDC PDM installed:

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

b. Remove the screws from the mechanical interlock bracket to remove it. See Figure 3 and Figure 4 .

Figure 184: Removing the bracket from the PDM
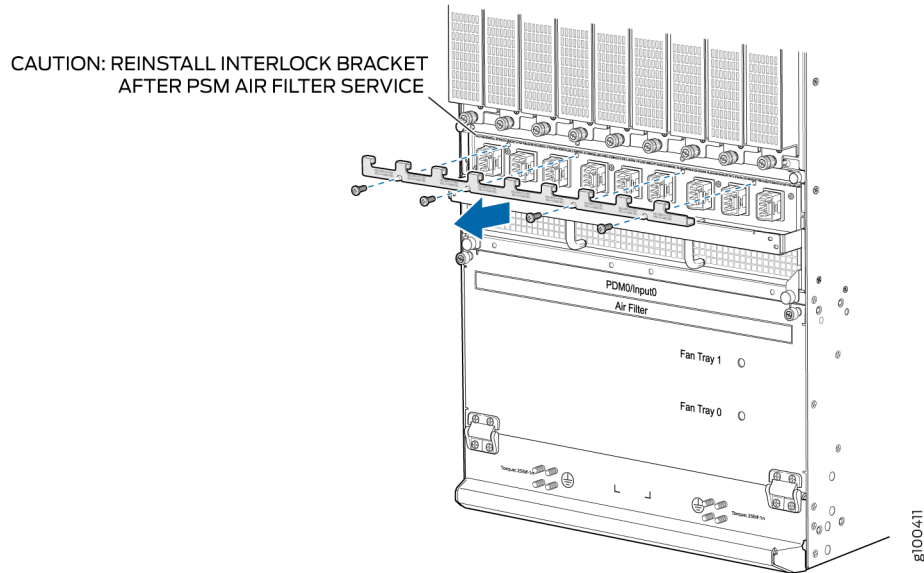
Figure 185: Removing the Bracket from the Universal (HVAC/HVDC) PDM
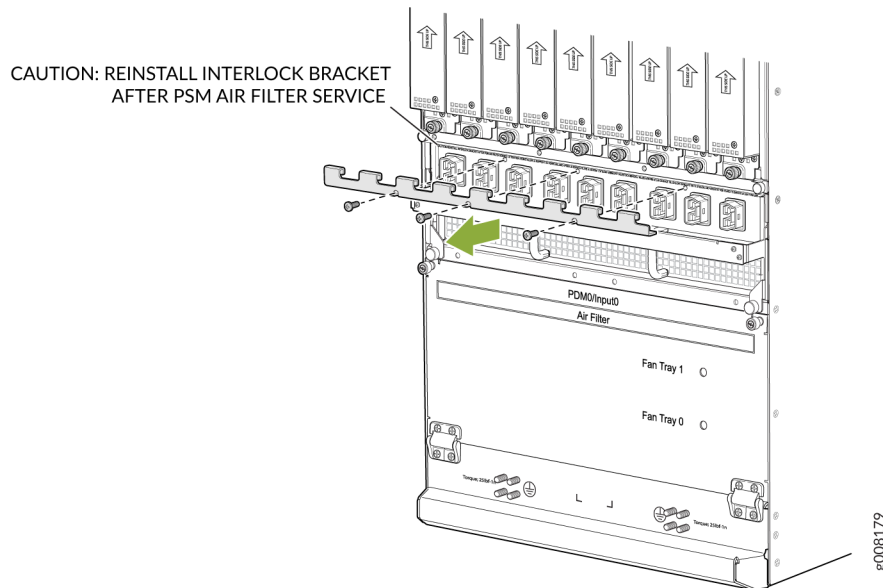
c. Loosen the two captive screws located on either side of the air filter and pull slightly out of the chassis.

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

d. Grasp the PSM air filter, and pull the air filter straight out from the chassis.

e. Slide the air filter out of the chassis as shown in Figure 5 and Figure 6.

Figure 186: Removing the PSM Air Filter from the Chassis
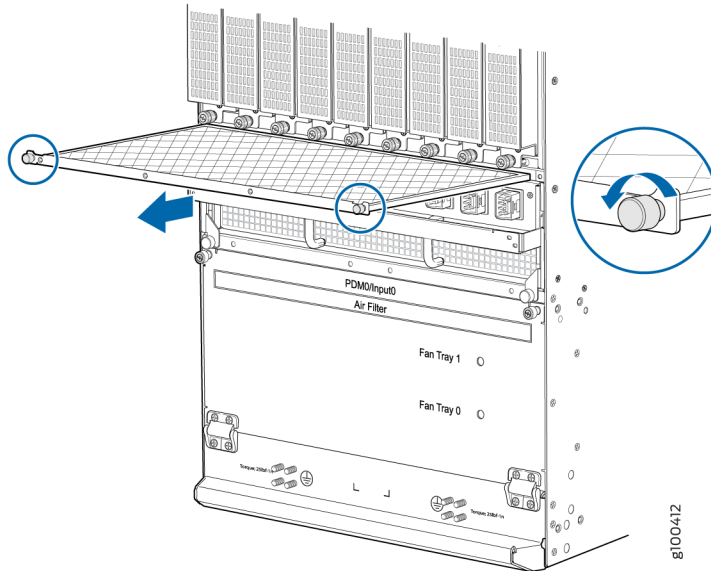
Figure 187: Removing the PSM (for the Universal HVAC/HVDC) Air Filter from the Chassis
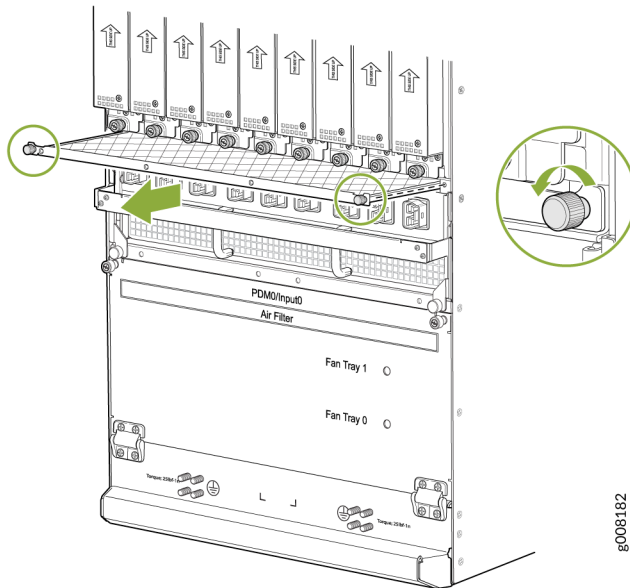
f. Make sure to re-install the mechanical interlock bracket after you remove the filter. Secure the screws on the mechanical interlock bracket.

Figure 188: Installing the Mechanical Interlock Bracket
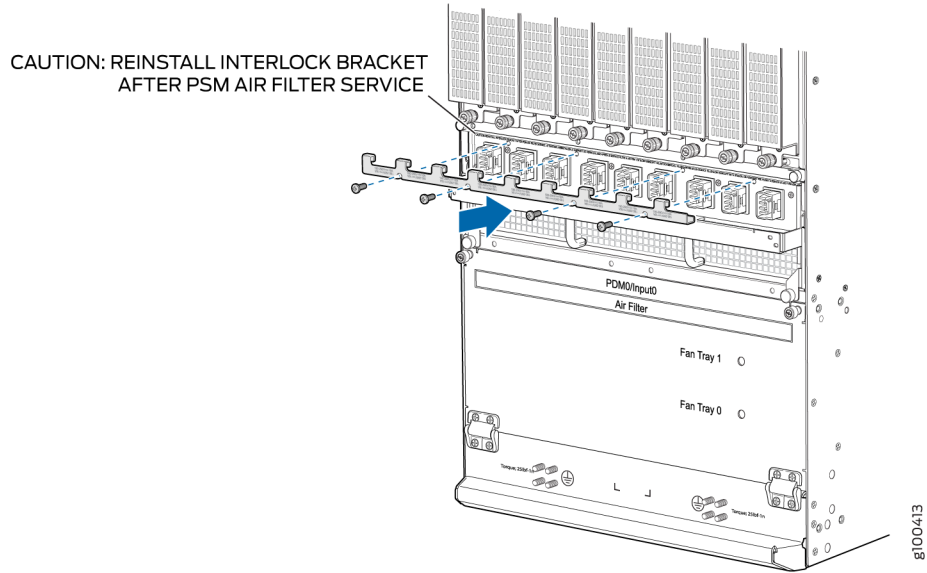
Figure 189: Installing the Mechanical Interlock Bracket (with Universal HVAC/HVDC PSM Installed)
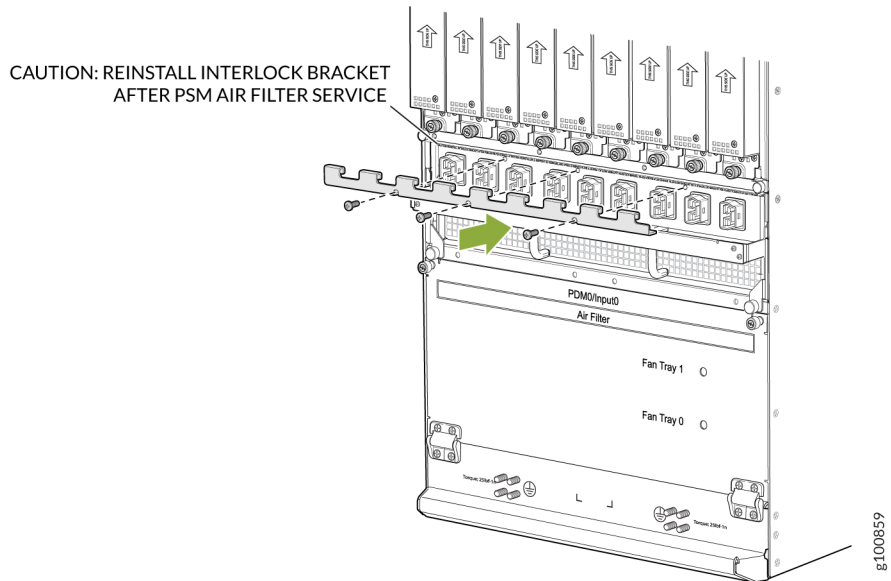
Installing the MX2008 Air Filter

To install the air filter:

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

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

3. Open the fan tray and air filter access door, located at the bottom of the chassis.

4. Grasp the handle on the air filter and insert into the chassis until it stops (see).

5. Close the access door and tighten the two captive screws to secure.

6. Lower the cable manager back into position, and rearrange the cables in the cable manager.

Figure 190: Installing the Air Filter
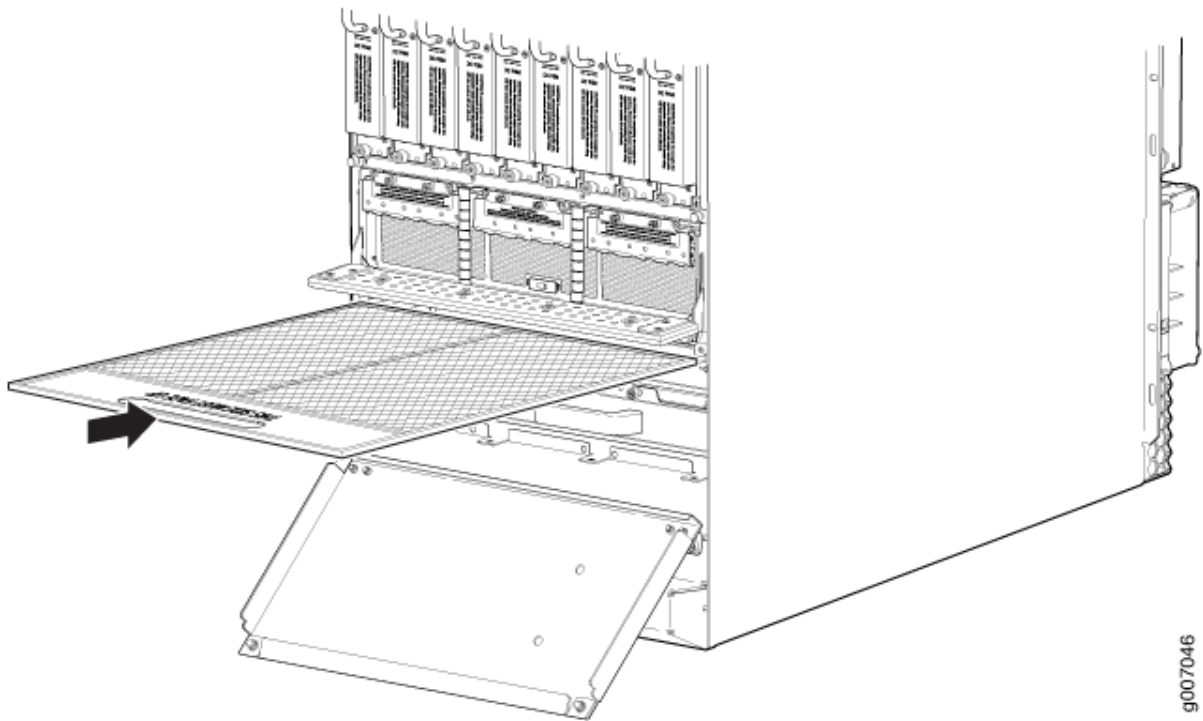
To install the PSM air filter:

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

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

3. Grasp the PSM air filter and insert into the chassis until it stops, (see).

4. Tighten the two captive screws to secure.

> **NOTE**: The AC–powered MX2008 router has the same air filter.

Figure 191: Installing the PSM Air Filter
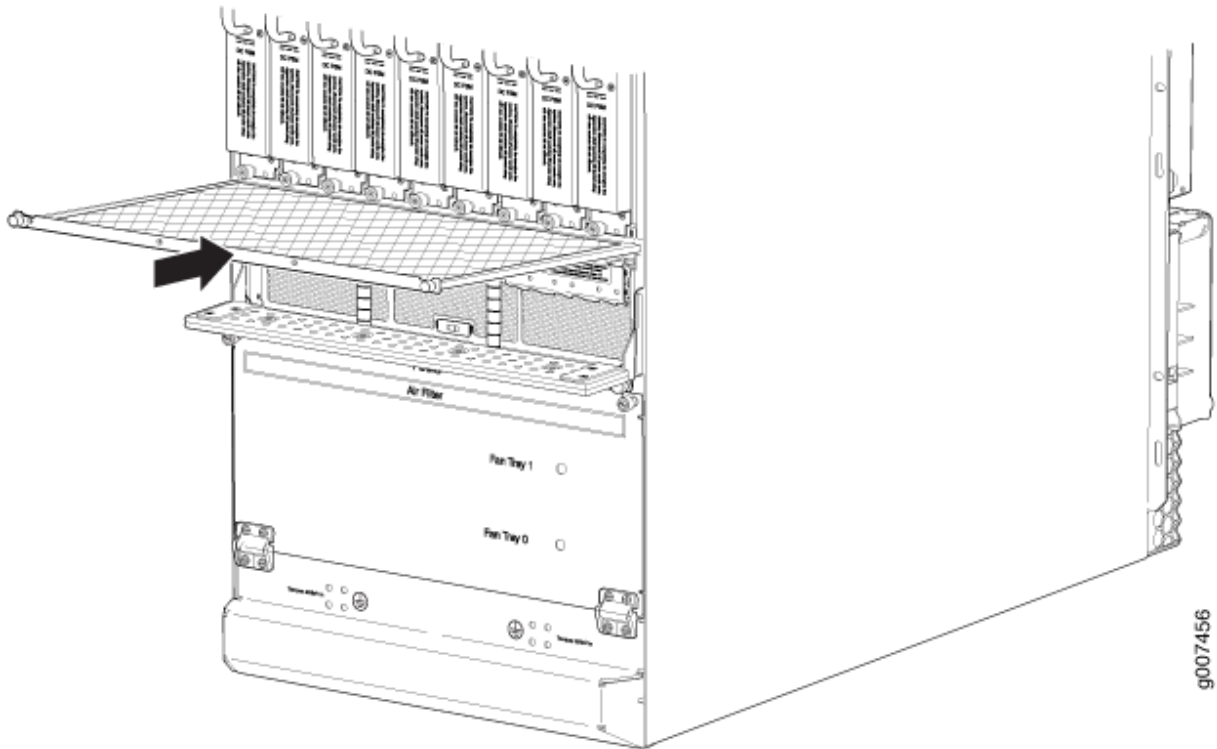
To install the PSM air filter—MX2000-FLTR-PWR for chassis with 240 V China power supplies and universal (HVAC/HVDC) power supplies:

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

2. Unscrew the mechanical interlock bracket from the PDM (see).

Figure 192: Removing the Bracket from the 240 V China PDM
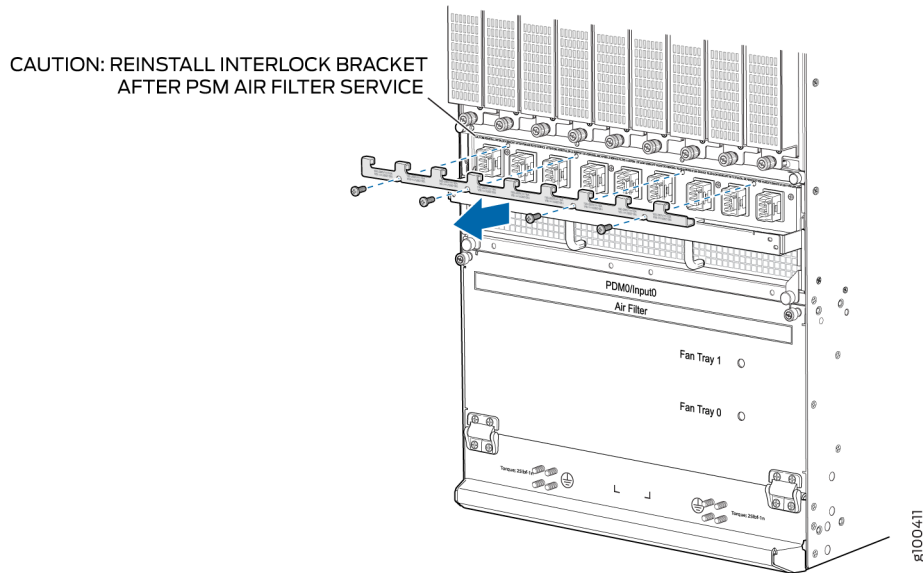
Figure 193: Removing the Bracket from the Universal (HVAC/HVDC) PDM
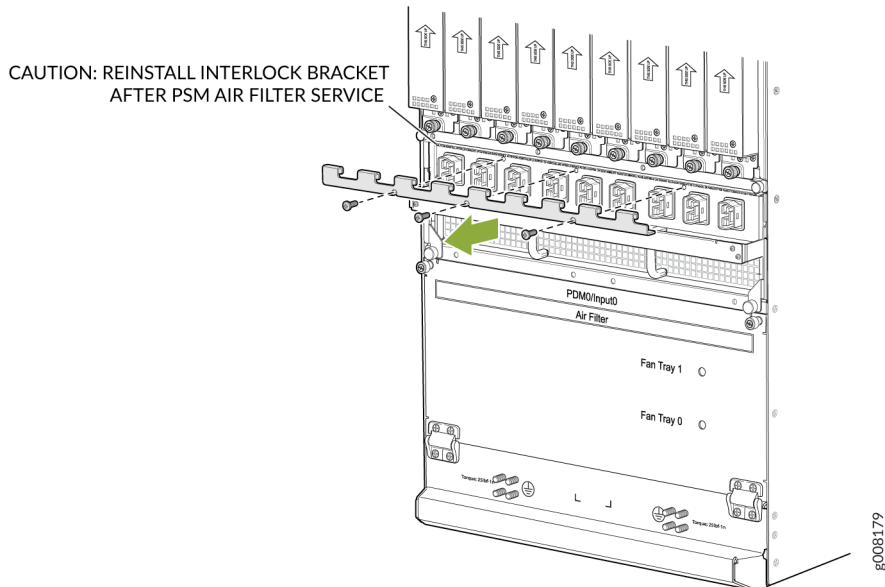
3. Ensure that the air filter is right side up.

4. Grasp the PSM air filter and insert into the chassis until it stops, (see Figure 194 on page 445).

5. Tighten the two captive screws to secure.

Figure 194: Installing the PSM Filter
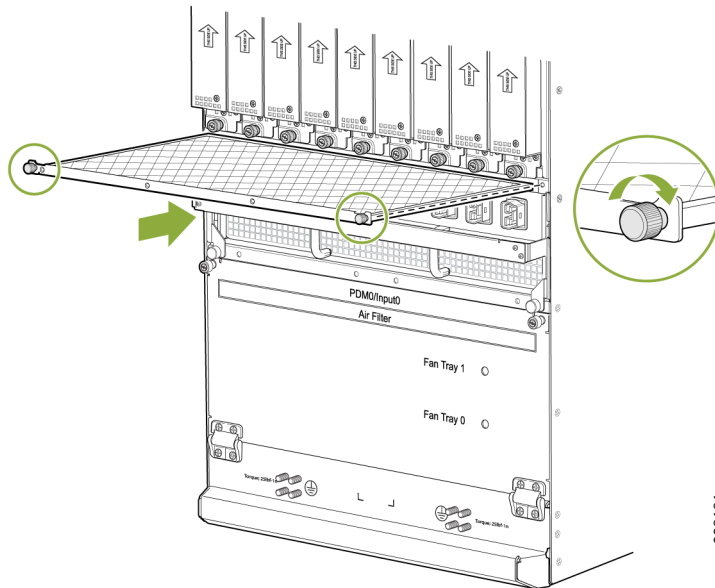
6. Install the mechanical interlock bracket and tighten the screws. See Figure 195 on page 445 and Figure 196 on page 446.

Figure 195: Installing the Bracket (with 240 V China PSM Installed)
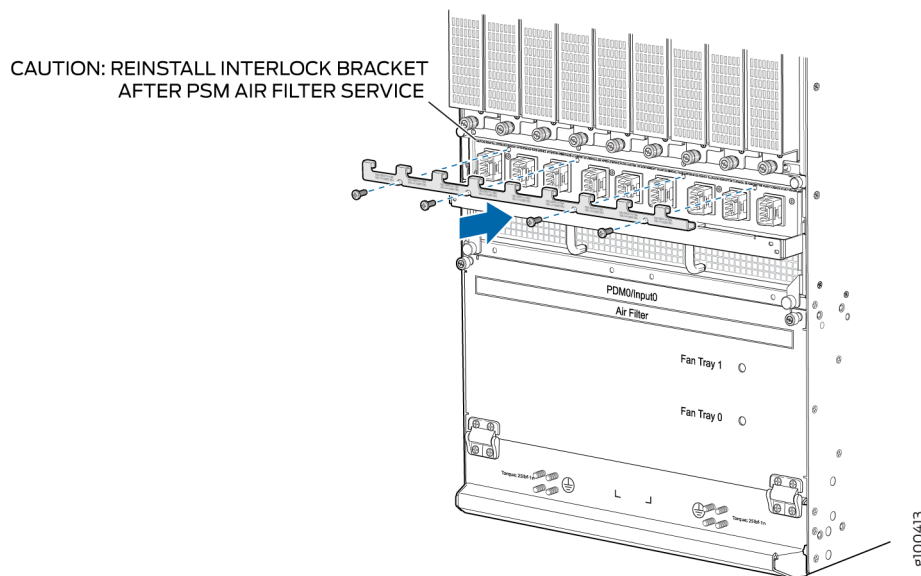
Figure 196: Installing the Mechanical Interlock Bracket (with Universal HVAC/HVDC PSM Installed)
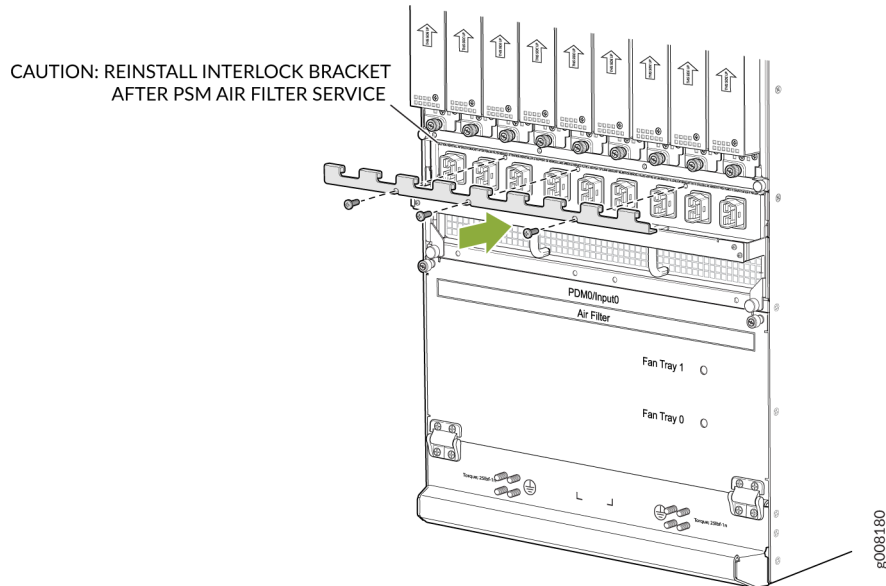
RELATED DOCUMENTATION

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

MX2008 Cooling System Description | **51**

Replacing an MX2008 Fan Tray

IN THIS SECTION

- Removing an MX2008 Fan Tray | **447**
- Installing an MX2008 Fan Tray | **448**

NOTE: The MX2008, MX2010, and MX2020 routers support the same fan modules.

Removing an MX2008 Fan Tray

> ⚠️ **CAUTION**: To prevent overheating, install the replacement fan tray immediately after removing the existing fan tray.

To remove the lower fan trays (see Figure 16):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Reposition the DC cable manager, if necessary, before removing the lower fan tray:
   - Unwrap any cables on the DC cable manager, and remove the cables from the tray. Arrange the cables so that they do not block the front of the cable manager and tray, and secure them with temporary fasteners so that they are not supporting their own weight as they hang from the connector.
3. Loosen the two captive screws on each side of the fan tray access panel and open.
4. Loosen the two captive screws on the fan tray faceplate.
5. While grasping the handle, press and hold the latch until the status LED turns off. Pull the fan tray out approximately 1 to 3 inches until it stops.

> **NOTE**: The fan trays are interchangeable and are hot-insertable and hot-removable.

6. Press and hold the latch a second time to disengage fan operation. Place one hand under the fan tray for support while pulling the fan tray completely out of the router.

> ⚠️ **WARNING**: The fan trays use a double latch safety mechanism. You must continually press and hold the latch while removing the fan trays.

7. Place the fan tray on an antistatic mat or in an approved ESD bag.

> ⚠️ **WARNING**: Before removing a fan tray, make sure the fan blades have stopped completely.

Figure 197: Removing Fan Trays
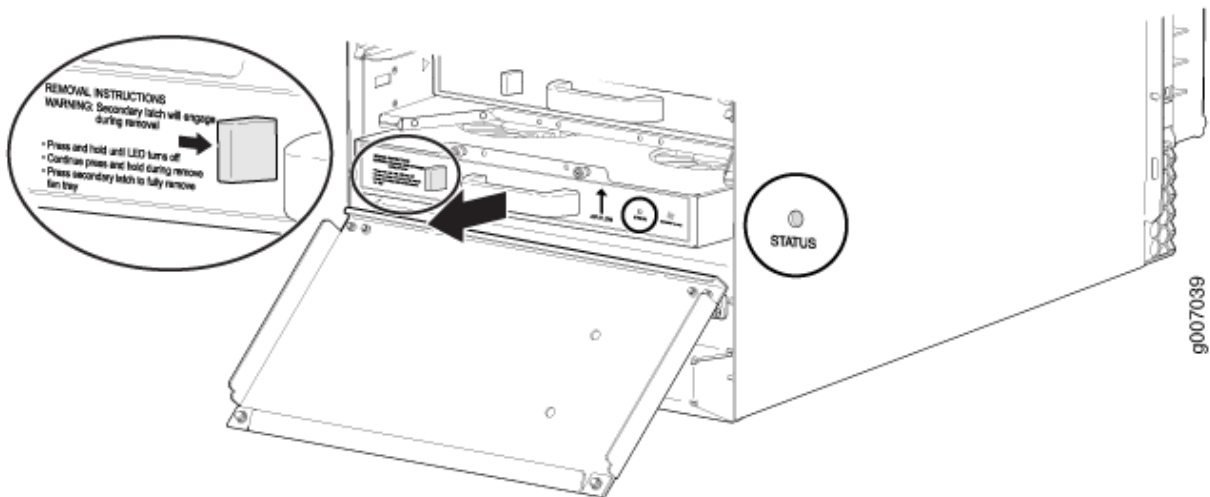
Installing an MX2008 Fan Tray

This topic describes how to install the lower fan trays in a MX2008. This procedure applies to both the standard fan tray and the optimized power fan tray.

To install the lower fan tray (see):

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

2. Reposition the DC cable manager, if necessary, before installing the lower fan tray:

    - Unwrap any cables on the DC cable manager and remove the cables from the tray. Arrange the cables so that they do not block the front of the cable manager, and tray and secure them with temporary fasteners so that they are not supporting their own weight as they hang from the connector.

3. Loosen the two captive screws on the access panel and open.

4. Remove the fan tray from the antistatic mat or ESD bag.

5. Grasp the fan tray by the handle, and place one hand under the fan tray for support. Insert the fan tray partially into the chassis while pressing the latch.

    NOTE: When inserting the fan tray, observe the correct orientation by the **"this side up"** label on the fan tray.

6. Press and hold the latch again while carefully pushing the fan tray into the chassis.

> **NOTE**: The fan tray has a double-locking safety mechanism that allows you to safely install the fan tray in a two-stage process.

7. Tighten the two captive screws on the fan tray faceplate.

8. Close the access panel and secure the two captive screws on either side of the access panel.

9. Reinstall the DC cable manager back into position, if necessary.

Figure 198: Installing Fan Trays
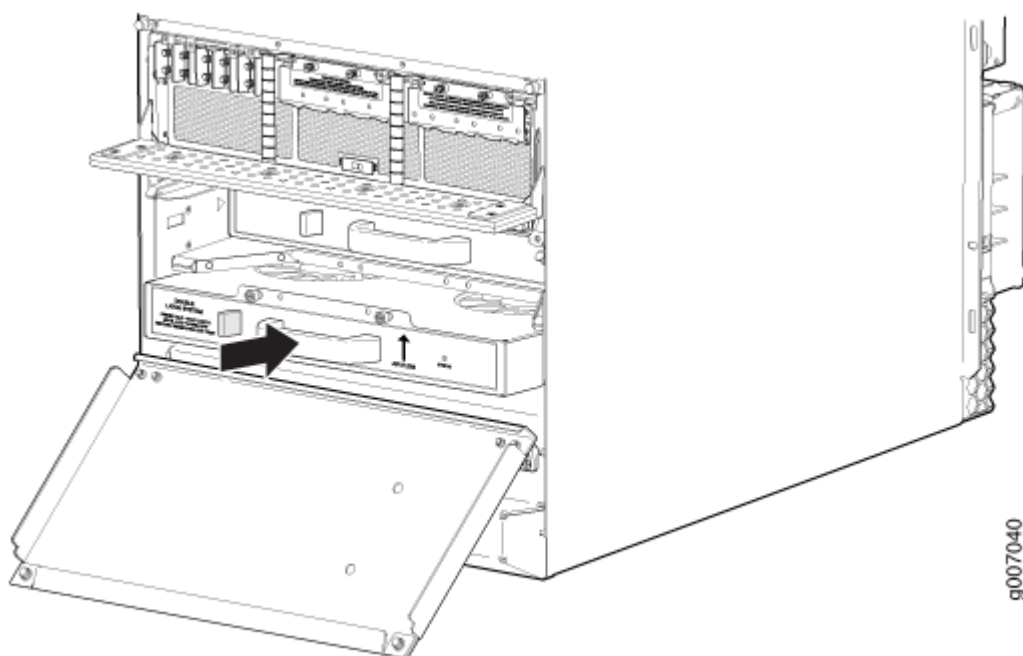
RELATED DOCUMENTATION

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

MX2008 Cooling System Description | **51**

Maintaining MX2008 Interface Modules

Replacing an MX2008 MIC

Removing an MX2008 MIC

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

The MICs are located in the MPCs installed in the front of the router. A MIC weighs less than 2 lb (0.9 kg).

> **NOTE**: Steps involved to remove or install a MIC are the same for MX2008, MX2010, and MX2020 routers.

To remove a MIC (see Figure 1):

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

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

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

- Press its online/offline button. Use a narrow-ended tool that fits inside the opening that leads to the button. Press and hold the button until the MIC **OK/FAIL** LED goes off (about 5 seconds).

- Issue the following CLI command:

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

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

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

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

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

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

6. Arrange the cable to prevent it from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop.

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

7. On the MPC, pull the ejector lever that is adjacent to the MIC you are removing away from the MPC faceplate. This disconnects the MIC from the MPC.

> **NOTE**: To remove a dual-wide MIC that takes up both MIC slots, you must pull both ejector levers away from the MPC faceplate.

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

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

Figure 199: Removing a Single-Wide MIC
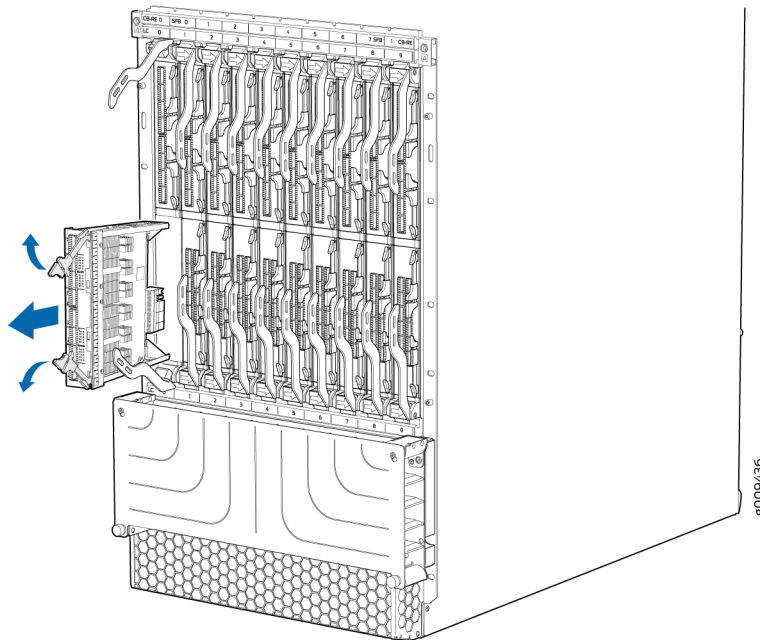
Installing an MX2008 MIC

To install a MIC (see):

> **NOTE**: Steps involved to remove or install a MIC are the same for MX2008, MX2010, and MX2020 routers.

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

2. If you have used a dual-wide MIC and are now replacing it with two single-wide MICs, install the septum (see):

   a. Place the MPC on a flat surface (if necessary, remove the MPC from the adapter card as described in .

   b. Position the septum in the center of the MPC so that it lines up with holes labeled **S** on the top of the MPC.

   c. Insert a screw into each of the two holes labeled **S**, and then tighten them completely.

   d. On the bottom of the MPC, insert a screw into each of the four holes labeled **S**, and then tighten them completely.

   e. Install the MPC as described in .

Figure 200: Installing the Septum
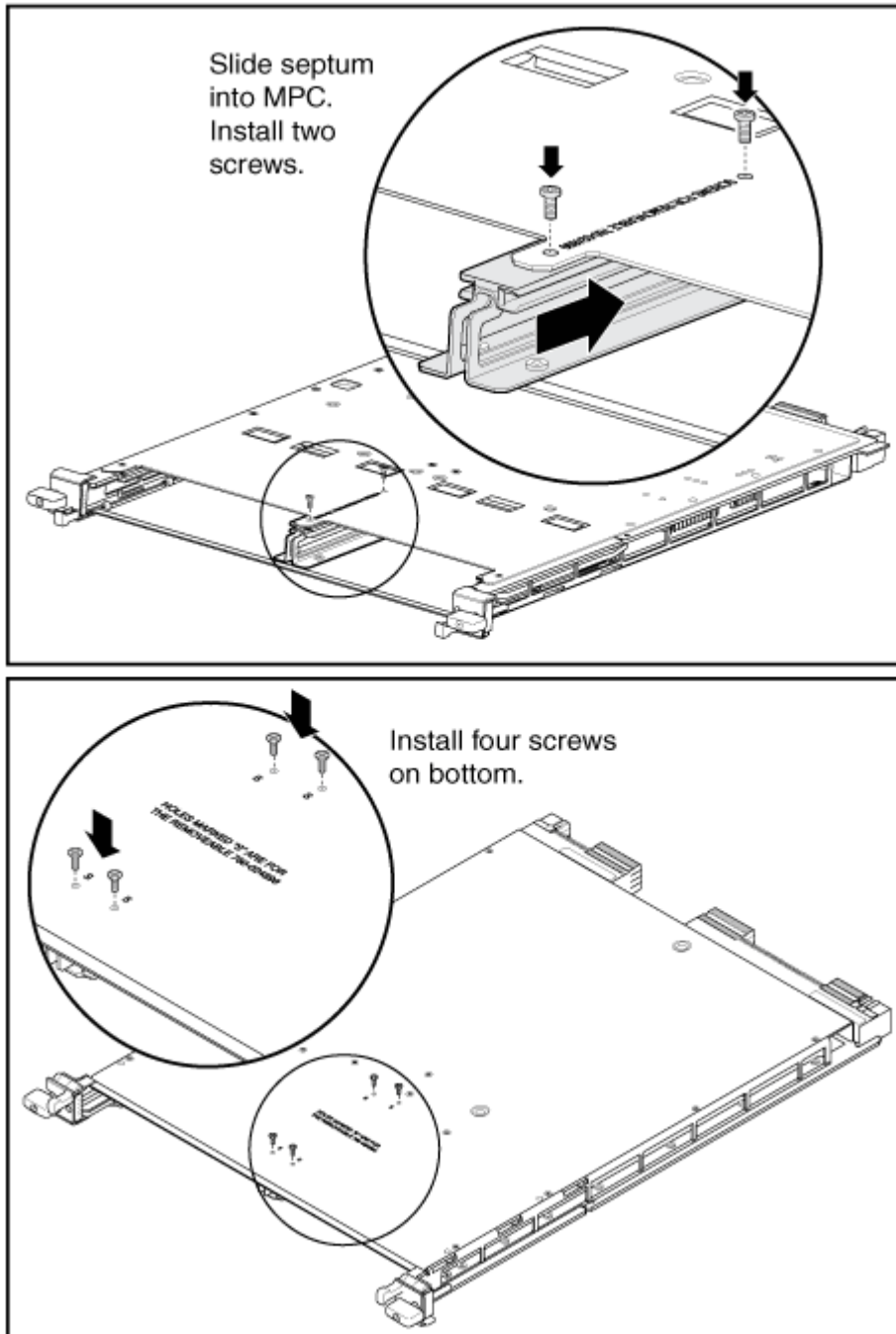
3. If the MIC uses fiber-optic cable, verify that a rubber safety cap is over each transceiver on the faceplate. Install a cap if necessary.

4. On the MPC, pull the ejector lever that is adjacent to the MIC you are installing away from the MPC faceplate.

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

6. Slide the MIC into the MPC until it is firmly seated in the MPC.

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

7. Verify that the ejector lever is engaged by pushing it toward the MPC faceplate.

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

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

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

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

10. Arrange each cable 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.

> ⚠️ **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.

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

- Press the MIC offline/online button until the MIC **OK/FAIL** LED lights green.

- Issue the following CLI command:

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

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

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

Figure 201: Installing a MIC
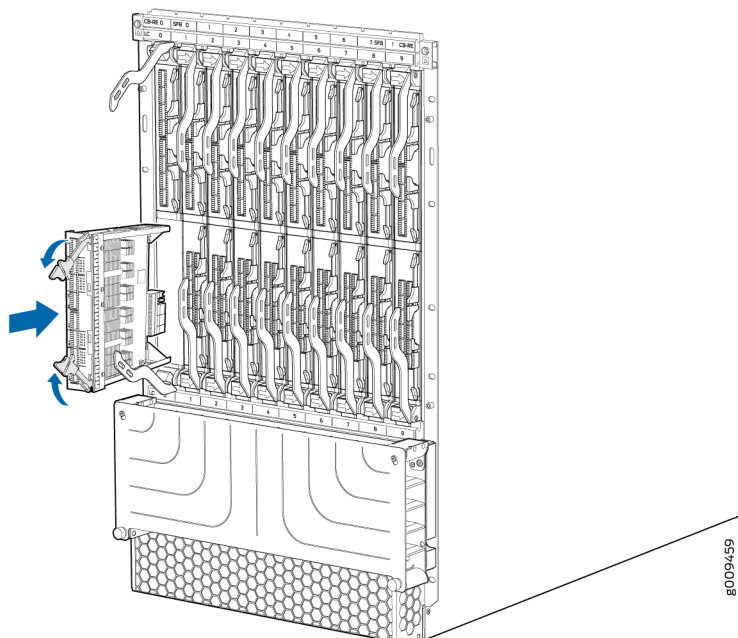
Installing an MX2008 Dual-Wide MIC

To install a dual-wide MIC:

> **NOTE**: Steps involved to remove or install a MIC are the same for MX2008, MX2010, and MX2020 routers.

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

2. Remove the septum, if necessary (see Figure 202 on page 458):

   a. Place the MPC on a flat surface. If necessary, remove the MPC from the adapter card as described in "Replacing an MX2008 MPC" on page 462.

   b. Remove the four screws labeled **S** on the bottom of the MPC.

c. Remove the two screws labeled **S** on the top of the MPC.

d. Slide the septum toward you and out of the MPC.

e. Store the septum and screws for later use.

f. Install the MPC as described in .

Figure 202: Removing the Septum
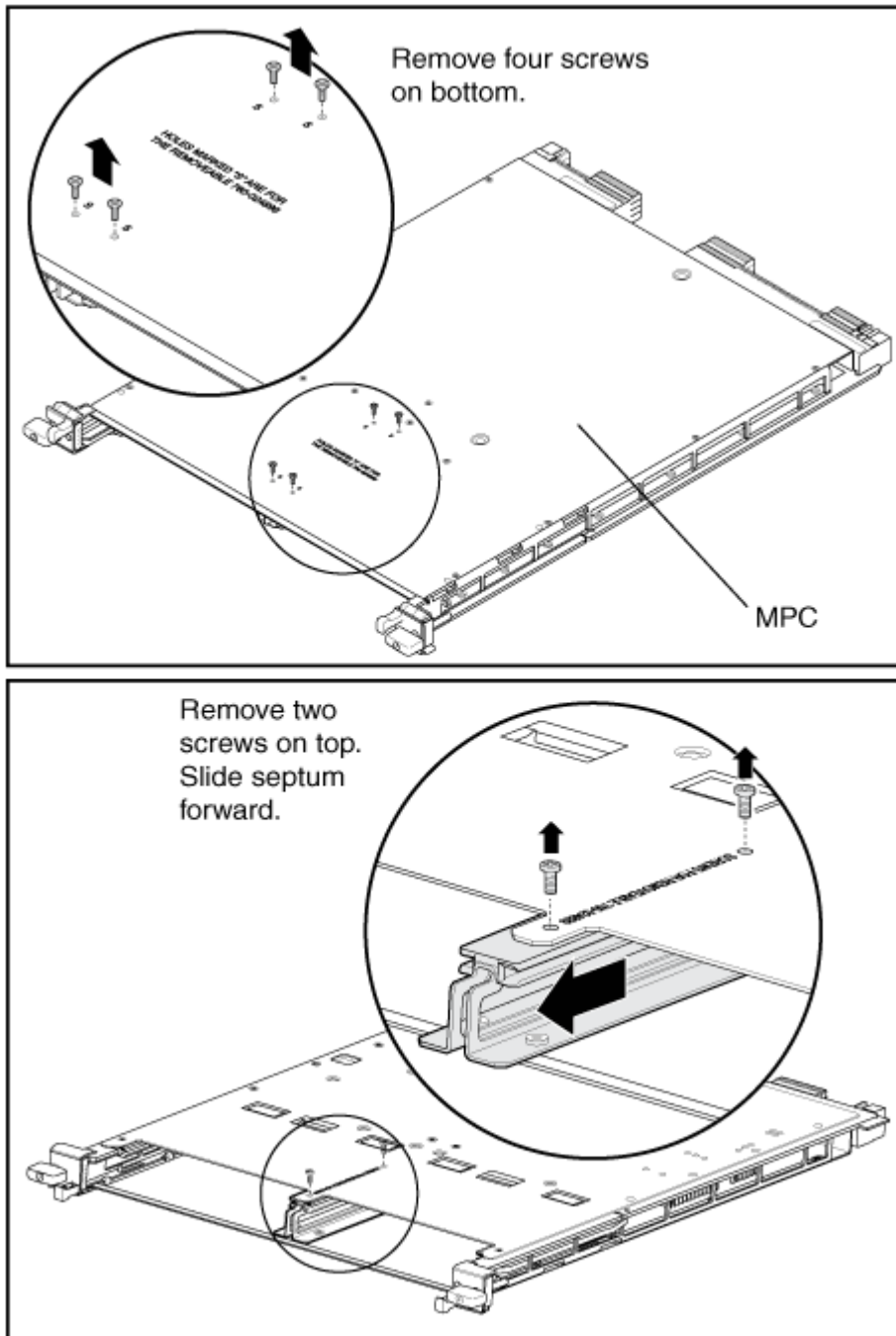
3. If the MIC uses fiber-optic cable, verify that a rubber safety cap is over each transceiver on the faceplate. Install a cap if necessary.

4. Pull the ejector lever above both MIC slots outward away from the router.

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

6. Slide the MIC into the MIC slot until it is firmly seated in the chassis.

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

7. Verify that the ejector levers are engaged by pushing them inward toward the router.

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

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

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

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

10. Arrange each cable 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.

> ⚠ **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.

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

- Press the MIC offline/online button until the MIC **OK/FAIL** LED lights green.

- Issue the following CLI command:

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

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

SEE ALSO

Replacing a MIC Installed on an MPC6E

IN THIS SECTION

The MPC6E line cards are supported on the MX2008, MX2010 and MX2020 routers. You can install the MPC6E directly into the MX2008, MX2010 and MX2020 line-card slots without using adapter cards.

The MPC6E has two slots for installing MICs. For information about which MICs are supported on this MPC, see *MICs Supported by MX Series Routers*.

You use the two ejector levers on an MPC6E to insert the MPC into the line-card slot and to remove it from the slot. Similarly, the two ejector levers on a MIC enable you to insert the MIC into the MPC and to remove the MIC from the MPC. The ejector levers on the MICs are very close to an ejector lever of the MPC6E that houses the MICs. This proximity makes the MIC ejector levers difficult to access. The MPC6E has a unique mechanism by which you can shift the MPC6E ejector levers temporarily, enabling easy access to the MIC.

Video: https://www.youtube.com/watch?v=uo5kISOIdS8

Removing a MIC from an MPC6E

To remove a MIC installed on an MPC6E:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Identify the MIC that you want to remove from the MPC6E.
3. On the MPC6E that houses the MIC, hold the ejector lever at the base and move it gently toward the direction indicated by the arrow. You might need to apply firm pressure to move the ejector lever.

The MPC6E lever moves about an inch from its original position, leaving enough space for you to easily access the MIC ejector levers.

> **NOTE**:
>
> - The arrow on top and bottom of the MPC6E indicates that the ejector lever of the MPC6E can be moved perpendicular to its actuation direction.
>
> - Moving the ejector lever of the MPC6E blocks access to the adjacent MPC. Remember to move the lever back to its original position after removing the MIC.

4. Pull the MIC ejector levers to slide the MIC out of the MIC slot on the MPC6E.

5. Push the MPC6E ejector lever in the direction opposite to the arrow, to return the ejector lever to its original position. The ejector lever no longer blocks access to the adjacent MPC.

Installing a MIC on an MPC6E

To install a MIC on an MPC6E:

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

2. Identify the slot in the MPC6E where you want to install the MIC.

3. On the MPC6E, hold the ejector lever at the base and move it gently toward the direction indicated by the arrow. You might need to apply firm pressure to move the ejector lever.

   The MPC6E ejector lever moves about an inch from its original position, leaving enough space for you to easily access the MIC slot.

> **NOTE**:
>
> - The arrow present on top and bottom of the MPC6E indicates that the ejector lever of the MPC6E can be moved perpendicular to its actuation direction.
>
> - Moving the ejector lever of the MPC6E blocks access to the adjacent MPC. Remember to move the lever back to its original position after inserting the MIC.

4. Slide the MIC into the MIC slot until it is firmly seated in the MPC.

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

5. Push the MPC6E ejector lever in the direction opposite to the arrow, to return the ejector lever to its original position. The ejector lever no longer blocks access to the adjacent MPC.

RELATED DOCUMENTATION

MPC6E

Replacing an MX2010 MIC

Replacing an MX2020 MIC

MIC/MPC Compatibility

RELATED DOCUMENTATION

Replacing an MX2008 MPC

IN THIS SECTION

NOTE: Steps involved to remove or install an MPC are the same for MX2008, MX2010, and MX2020 routers.

Removing an MX2008 MPC with Adapter Card

An MPC with an adapter card weighs up to 25 lb (11.34 kg). Be prepared to accept its full weight.

To remove an MPC with an adapter card:

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

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

3. Label the cables connected to each port on the MPC so that you can later reconnect the cables to the correct ports.

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

   - Press and hold the corresponding **LC** online button on the craft interface. The green **OK** LED next to the button begins to blink. Hold the button down until the LED goes off.

   - Issue the following CLI command:

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

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

     > **NOTE**: When you issue the `request chassis fpc slot slot-number offline` command, the FRU loses power, and the system's total power increases.

5. Disconnect the cables from the MPC.

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

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

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

6. Immediately cover each optical transceiver and the end of each fiber-optic cable with a rubber safety cap.

7. Arrange the disconnected cables in the standard upper and lower cable managers to prevent the cables from developing stress points.

8. Simultaneously turn both of the ejector handles outward to unseat the MPC along with the adapter card.

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

10. Place one hand around the front of the combined cards and the other hand under it to support it. Slide the combined cards completely out of the chassis.

> ⚠️ **CAUTION**: The weight of the MPC with the adapter card is concentrated in the back end. Be prepared to accept the full weight—up to 25 lb (11.34 kg)—as you slide the cards out of the chassis.
>
> When the combined cards are out of the chassis, do not hold the cards by the ejector handles, bus bars, or edge connectors. They cannot support the card's weight.
>
> Do not stack the combined cards on top of one another after removal.

11. Place each card (MCP and adapter card) individually in an electrostatic bag or on its own antistatic mat on a flat, stable surface.

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

> ⚠️ **CAUTION**: After removing both cards from the chassis, wait at least 30 seconds before reinserting it, removing an MPC and adapter card from a different slot, or inserting an MPC and adapter card into a different slot.

Removing an MX2008 MPC from the Adapter Card

An MPC without the adapter card weighs up to 18.35 lb (8.32 kg). Be prepared to accept its full weight.

> **NOTE**: Steps involved to remove or install an MPC are the same for MX2008, MX2010, and MX2020 routers.

To remove an MPC from the adapter card (see):

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

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

3. Label the cables connected to each port on the MPC so that you can later reconnect the cables to the correct ports.

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

   - Press and hold the corresponding MPC **LC** online button on the craft interface. The green **OK** LED next to the button begins to blink. Hold the button down until the LED goes off.

   - Issue the following CLI command:

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

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

     > **NOTE**: When you issue the `request chassis fpc slot slot-number offline` command, the FRU loses power, and the system's total power increases.

5. Disconnect the cables from the MPC.

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

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

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

6. Immediately cover each optical transceiver and the end of each fiber-optic cable with a rubber safety cap.

7. Arrange the disconnected cables in the upper and lower cable managers to prevent the cables from developing stress points.

8. Simultaneously turn both of the knobs counterclockwise to unseat the MPC from the adapter card.

9. Grasp both the knobs, and slide the MPC straight out of the adapter card.

10. Place one hand around the front of the MPC and the other hand under it to support it. Slide the MPC completely out of the adapter card.

> ⚠️ **CAUTION**: The weight of the MPC without the adapter card is concentrated in the back end. Be prepared to accept the full weight—up to 18.35 lb (8.32 kg)—as you slide the MPC out of the adapter card.
>
> When the MPC is out of the adapter card, do not hold it by the knobs, bus bars, or edge connectors. They cannot support its weight.
>
> Do not stack MPCs on top of one another after removal.

11. Place each adapter card individually in an electrostatic bag or on its own antistatic mat on a flat, stable surface.

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

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

Figure 203: Removing an MPC from the Adapter Card
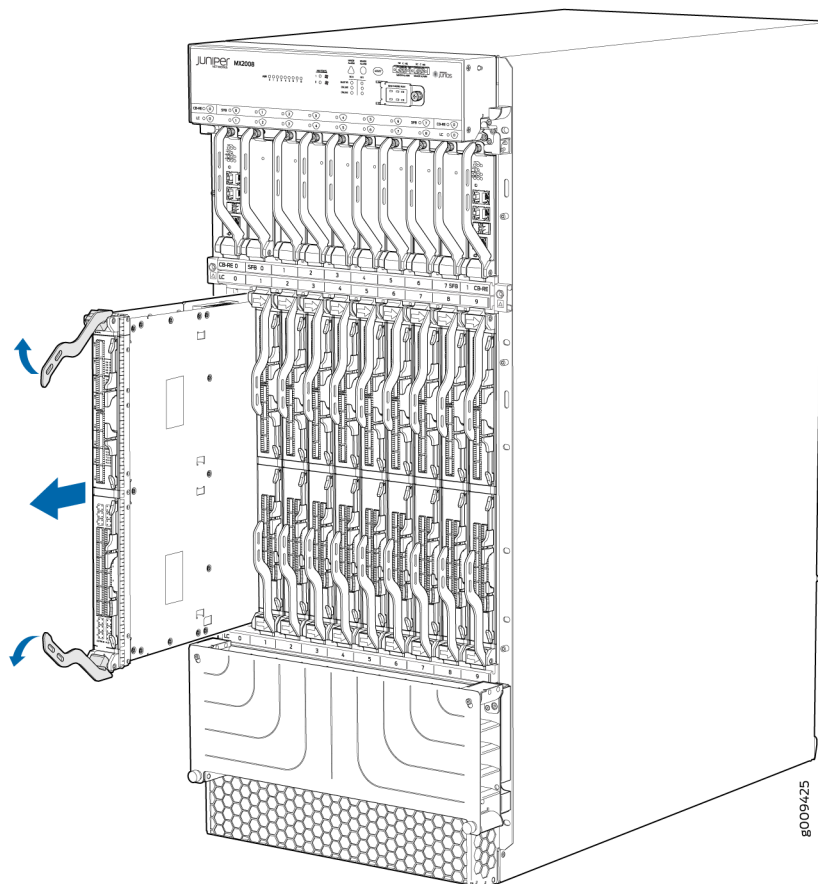
Removing an MX2008 Adapter Card

An adapter card weighs up to 15 lb (6.80 kg). Be prepared to accept its full weight.

> **NOTE**: Steps involved to remove or install an MPC are the same for MX2008, MX2010, and MX2020 routers.

To remove an adapter card:

1. Have ready a replacement adapter card and an antistatic mat for the adapter card.
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.

   - To take the MPC offline, see .

3. Issue the following CLI command to take the adapter card offline:

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

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

> **NOTE**: When you issue the `request chassis adc slot slot-number offline` command, the FRU loses power, and the system's total power increases.

4. Open the ejector handles outward simultaneously to unseat the adapter card.

5. Grasp the ejector handles, and slide the adapter card about halfway out of the chassis.

6. Place one hand underneath the adapter card to support it, and slide it completely out of the chassis.

7. Place the adapter card on the antistatic mat or into an antistatic bag.

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

Figure 204: Removing an Adapter Card
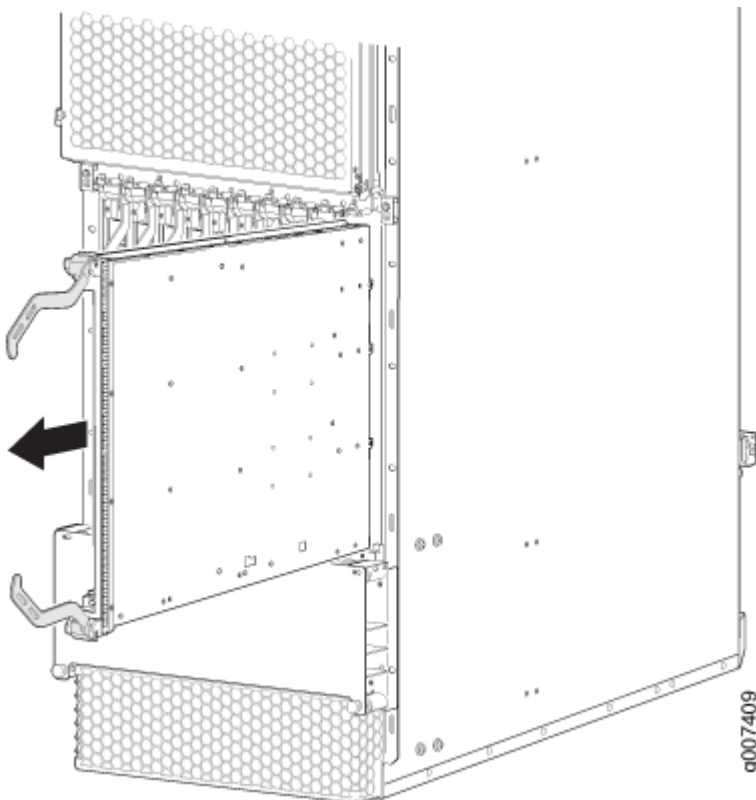
Installing an MX2008 Adapter Card

An adapter card weighs up to 15 lb (6.80 kg). Be prepared to accept its full weight.

To install an adapter card (see Figure 205 on page 470):

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

2. Remove the adapter card from its electrostatic bag.

3. Identify the slot on the router where it will be installed.

4. Orient the adapter card so that the faceplate faces you vertically.

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

6. Slide the adapter card all the way into the card cage until you feel resistance.

7. Grasp both ejector handles, and gently close them inward simultaneously until the adapter card is fully seated.

8. Issue the following CLI command to bring the adapter card online:

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

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

NOTE: When you issue the `request chassis fpc slot slot-number online` command, the FRU gains power, and the system's total power decreases.

Figure 205: Installing an Adapter Card

Installing an MX2008 MPC into an Adapter Card

An MPC weighs up to 25 lb (11.34 kg). Be prepared to accept its full weight.

To install an MPC (see):

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

2. Remove the MPC from its electrostatic bag.

3. Identify the slot on the router where it will be installed.

4. Verify that each fiber-optic transceiver is covered with a rubber safety cap.

5. Orient the MPC so that the faceplate faces you vertically.

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

7. Slide the MPC all the way into the adapter card until you feel resistance.

8. Grasp both knobs, and rotate them clockwise simultaneously until the MPC is fully seated into the adapter card.

9. Remove the rubber safety cap from each fiber-optic transceiver and cable.

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

10. Insert the cables into the cable connector ports on each MPC (see Figure 207 on page 473).

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

> ⚠ **CAUTION**: Do not let fiber-optic 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.

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

- Press and hold the corresponding MPC **LC** online button on the craft interface until the green **OK** LED next to the button lights steadily, in about 5 seconds.

- Issue the following CLI command:

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

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

> **NOTE**: When you issue the `request chassis fpc slot slot-number online` command, the FRU gets power, and the system's total power decreases.

> ⚠ **CAUTION**: After the **OK** LED turns green, wait at least 30 seconds before removing the MPC again, removing an MPC from a different slot, or inserting a MPC in a different slot.

You can also verify that the MPC is functioning correctly by issuing the **show chassis fpc** and `show chassis fpc pic-status` commands.

Figure 206: Installing an MPC into an Adapter Card
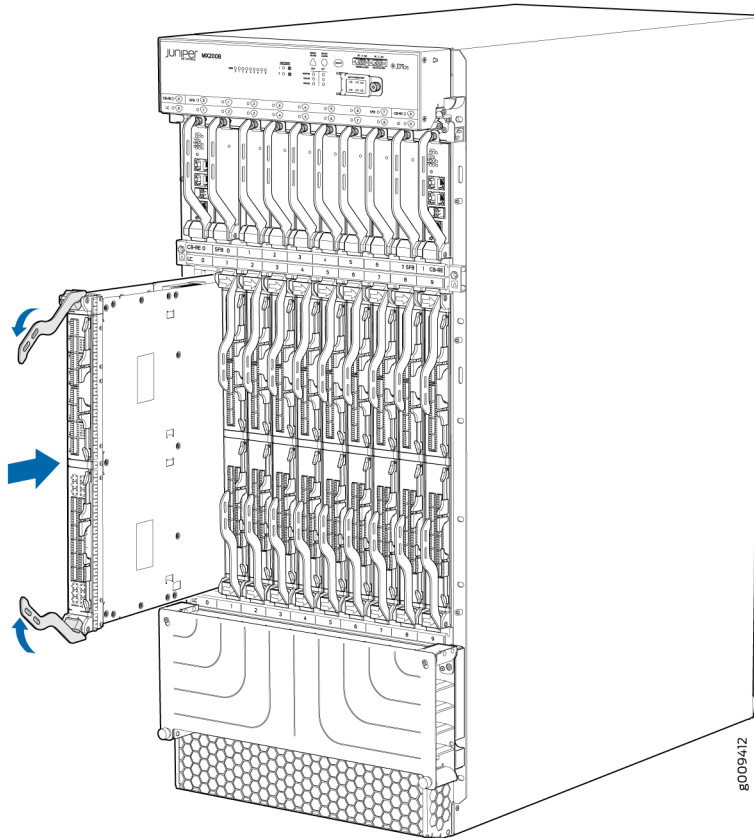
Figure 207: Attaching a Cable to an MPC or MIC
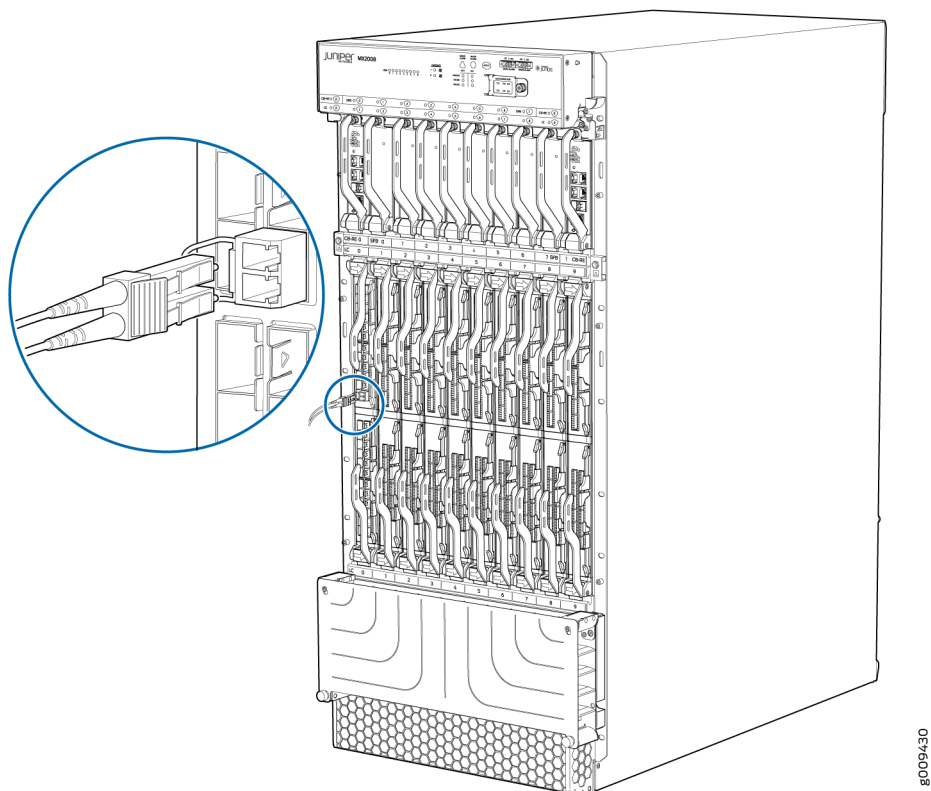
RELATED DOCUMENTATION

Replacing a Cable on an MX2008 MPC or MIC

Removing a Cable on an MX2008 MPC or MIC

Removing and installing cables on an MPC or a MIC does not affect router function, except that the component does not receive or transmit data while its cable is disconnected.

To remove a fiber-optic cable:

1. If the component connects to fiber-optic cable, have ready a rubber safety cap for each cable and transceiver.
2. If you are removing all cables connected to the component, use one of the following methods to take the component offline:

   - To take an MPC offline:

     - Press and hold the corresponding online button on the craft interface. The green **OK** LED next to the button begins to blink. Hold the button down until the LED goes off.

     - Issue the following CLI command:

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

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

       > **NOTE**: When you issue the `request chassis fpc slot slot-number offline` command, the FRU loses power, and the system's total power increases.

   - To take a MIC offline:

     - Press the online/offline button on the MIC. Use a narrow-ended tool that fits inside the opening that leads to the button. Press and hold the button until the MIC LED goes off (about 5 seconds).

- Issue the following CLI command:

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

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

3. Unplug the cable from the cable connector port. If the MIC uses fiber-optic cable, immediately cover each transceiver and the end of each cable with a rubber safety cap.

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

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

4. Remove the cable from the cable manager, and detach it from the destination port.

Installing a Cable on an MX2008 MPC or MIC

To install a MIC cable or an MPC cable (see):

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

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

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

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

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

Figure 208: Installing a MIC or an MPC Cable
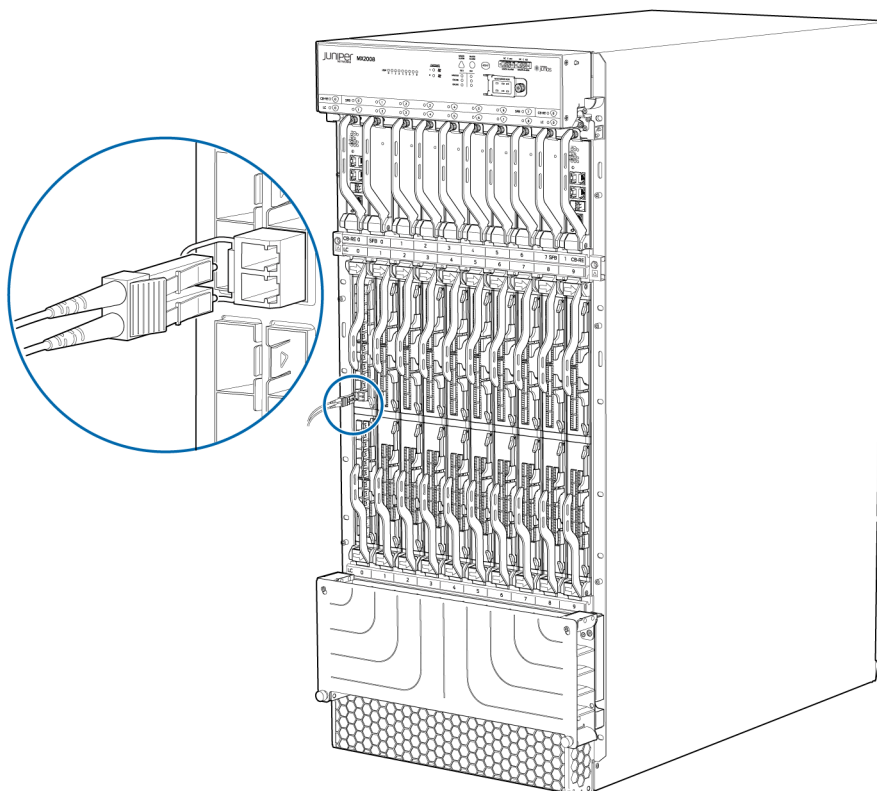
4. Arrange the cable in the cable manager to prevent it from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on the loop helps to maintain its shape.

> ⚠ **CAUTION**: 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 component is offline (its failure indicator LED is lit), use one of the following methods to bring it online.

- To bring an MPC online:

  - Press and hold the corresponding online button on the craft interface until the green **OK** LED next to the button lights steadily, in about 5 seconds.

 - Issue the following CLI command:

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

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

    > **NOTE**: When you issue the `request chassis fpc slot slot-number online` command, the FRU gets power, and the system's total power decreases.

- To bring a MIC online:

  - Press the MIC offline/online button until the MIC LED lights green.

  - Issue the following CLI command:

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

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

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

RELATED DOCUMENTATION

Replacing an SFP or XFP Transceiver on an MX2008 MPC or MIC

Maintaining Switch Fabric Board

Replacing an MX2008 SFB

Removing an MX2008 SFB

To remove an MX2008 Switch Fabric Board (SFB) (see Figure 1):

> **NOTE**: You can remove the SFB as a unit.

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

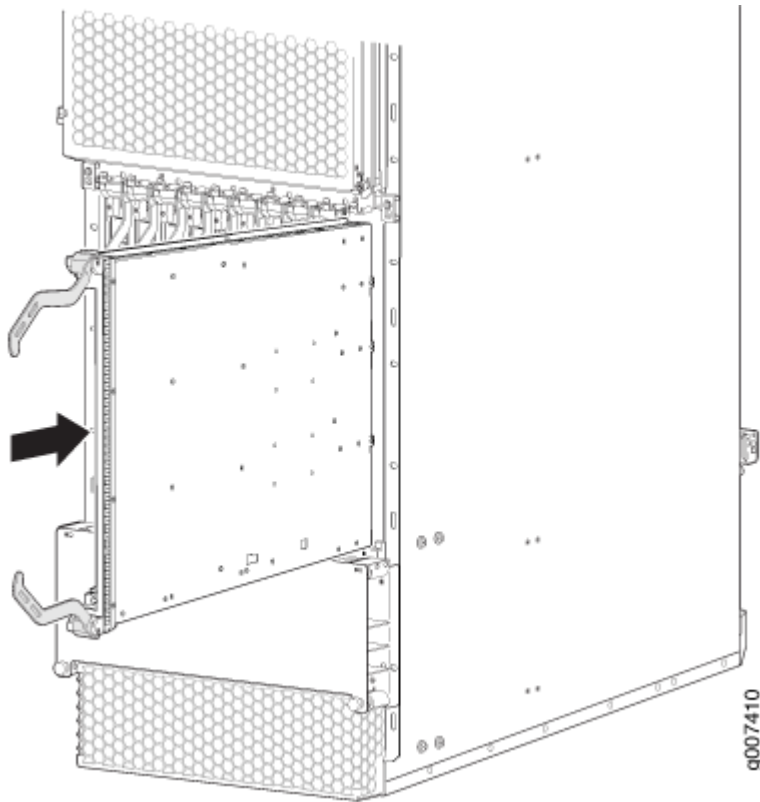1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
3. Open the ejector handle outward to unseat the SFB.
4. Grasp the ejector handle, and slide the SFB about halfway out of the chassis.
5. Place one hand underneath the SFB to support it, and slide it completely out of the chassis.
6. Place the SFB on the antistatic mat or into an antistatic bag.
7. If you are not replacing the SFB immediately, install a blank panel over the empty slot.

Figure 209: Removing an SFB
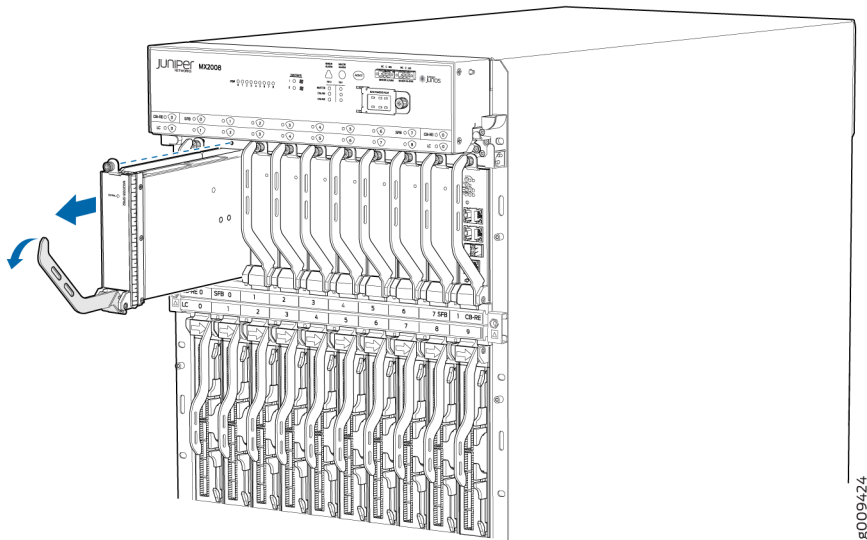
Installing an MX2008 SFB

To install an SFB (see):

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

2. Remove the SFB from the electrostatic bag.

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

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

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

6. Check the LEDs on the SFB faceplate to verify that it is functioning normally.

   - The green **OK/FAIL** LED should light steadily a few minutes after the SFB is installed.

   - If the **OK/FAIL** LED is red, remove and install the SFB again. If the **OK/FAIL** LED still lights steadily, the SFB is not functioning properly. Contact your customer support representative. See *Contact Customer Support*.

7. Check the status of the SFB by using the `show chassis sfb` command:

```
user@host> show chassis sfb
Slot  State              Uptime
 0    Online              2 hours, 22 minutes, 15 seconds
 1    Offline                --- Offlined by cli command ---
 2    Online              2 hours, 22 minutes, 6 seconds
 3    Online              2 hours, 21 minutes, 59 seconds
```

```
4    Offline              --- Offlined by cli command ---
5    Online               2 hours, 21 minutes, 49 seconds
6    Offline              --- Offlined by cli command ---
7    Online               2 hours, 21 minutes, 35 seconds
```

Figure 210: Installing an SFB
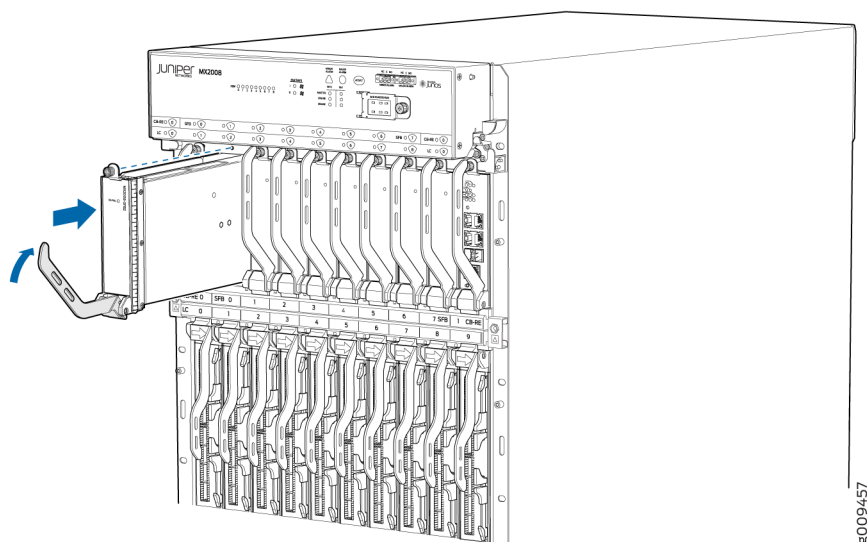
RELATED DOCUMENTATION

MX2008 Enhanced Switch Fabric Board (MX2008 SFB2) Description | **195**

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Maintaining Host Subsystem components

IN THIS SECTION

- Replacing an MX2008 RCB | **481**
- Upgrading the MX2008 Routing and Control Board (RCBs) in a Redundant Host Subsystem | **485**

Replacing an MX2008 RCB

IN THIS SECTION

Removing an MX2008 RCB

The MX2008 host subsystem consists of two Routing and Control Boards (RCBs). The RCB is an integrated board and a single FRU that provides Routing Engine and Control Board functionality and supports virtualization.

To remove an RCB (see Figure 1):

NOTE: You can remove the RCB as a unit.

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

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

1. Take the host subsystem offline.

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

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

4. Open the ejector handle outward to unseat the RCB.

5. Grasp the ejector handle, and slide the RCB about halfway out of the chassis.

6. Place one hand underneath the RCB to support it, and slide it completely out of the chassis.

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

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

Figure 211: Removing a RCB
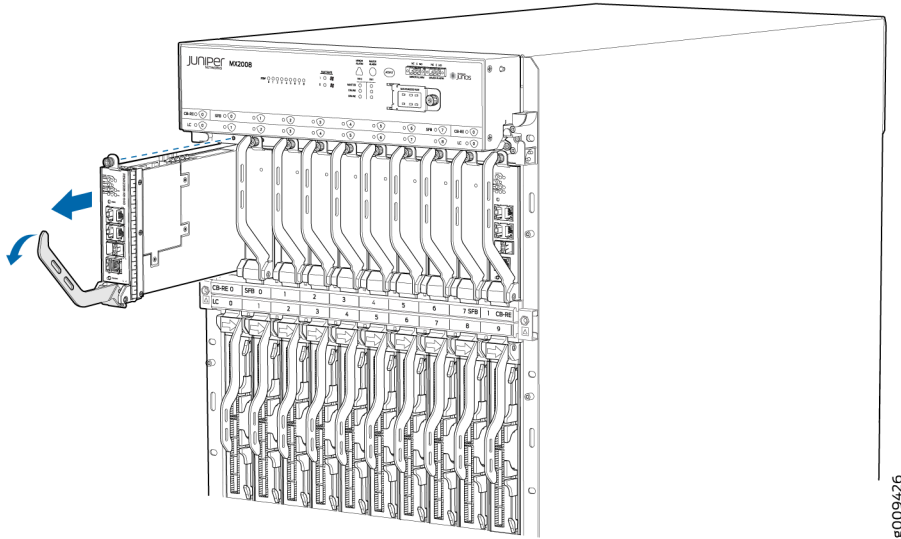
Installing an MX2008 RCB

To install an MX2008 RCB (see Figure 212 on page 484):

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

2. Remove the RCB from the electrostatic bag.

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

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

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

6. Check the LEDs on the RCB faceplate to verify that it is functioning normally.

   - The green **OK/FAIL** LED should light steadily a few minutes after the RCB is installed.

   - If the **OK/FAIL** LED is red, remove and install the RCB again. If the **OK/FAIL** LED still lights steadily, the RCB is not functioning properly. Contact your customer support representative. See *Contact Customer Support*.

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

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                 Master
    Election priority              Master (default)
    CPU temperature               61 degrees C / 141 degrees F
    DRAM                         49117 MB (49152 MB installed)
    Memory utilization           5 percent
    5 sec CPU utilization:
      User                         0 percent
      Background                   0 percent
      Kernel                       4 percent
      Interrupt                    0 percent
      Idle                        95 percent
    1 min CPU utilization:
      User                         0 percent
      Background                   0 percent
      Kernel                       4 percent
      Interrupt                    0 percent
      Idle                        96 percent
    5 min CPU utilization:
      User                         0 percent
      Background                   0 percent
      Kernel                       4 percent
      Interrupt                    0 percent
      Idle                        96 percent
    15 min CPU utilization:
      User                         0 percent
      Background                   0 percent
      Kernel                       4 percent
      Interrupt                    0 percent
      Idle                        96 percent
    Model                          RE-MX2008-X8-64G
    Serial ID                      BUILTIN
    Start time                     2017-03-06 02:31:29 UTC
    Uptime                         2 hours, 17 minutes, 31 seconds
    Last reboot reason             0x2000:hypervisor reboot
    Load averages:                 1 minute   5 minute  15 minute
                                      0.18       0.27       0.25
Routing Engine status:
```

```
Slot 1:
  Current state               Backup
  Election priority           Backup (default)
  CPU temperature             62 degrees C / 143 degrees F
  DRAM                      49117 MB (49152 MB installed)
  Memory utilization         11 percent
  5 sec CPU utilization:
    User                      0 percent
    Background                0 percent
    Kernel                    0 percent
    Interrupt                 0 percent
    Idle                    100 percent
  Model                       RE-MX2008-X8-64G
  Serial ID                   BUILTIN
  Start time                  2017-03-01 11:16:41 UTC
  Uptime                      4 days, 17 hours, 32 minutes, 4 seconds
  Last reboot reason          0x1:power cycle/failure
  Load averages:              1 minute   5 minute  15 minute
                                  0.14       0.13       0.12
```

Figure 212: Installing an MX2008 RCB
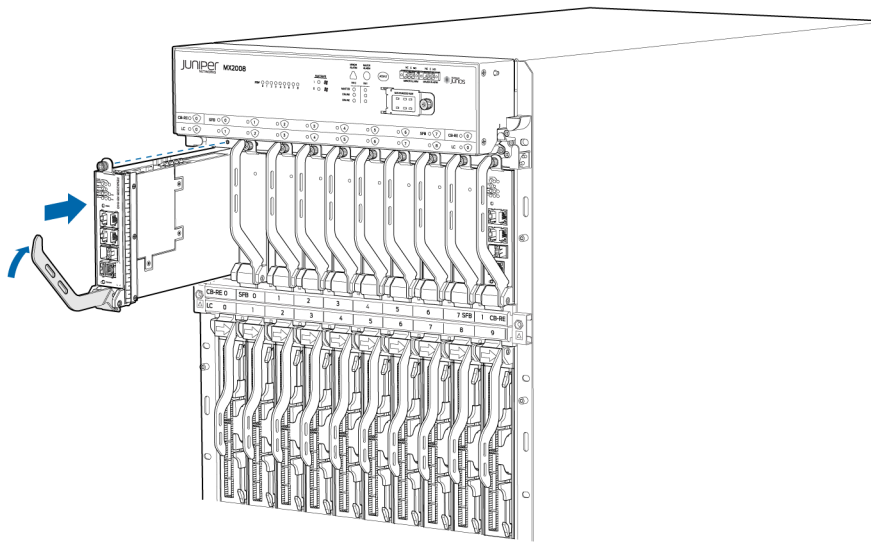
Upgrading the MX2008 Routing and Control Board (RCBs) in a Redundant Host Subsystem

IN THIS SECTION

A redundant host subsystem consists of a primary RCB (`RE0`) and a backup RCB (`RE1`). To upgrade the host subsystem to use the REMX2008-X8-64G, you must first uninstall the backup RCB and install the REMX2008-X8-64G RCB, which then becomes the backup RCB. Configure this backup RCB as the primary RCB. Then replace the other RCB and configure it as the backup RCB.

> **NOTE**: Save the router configuration before upgrading the RCB.

Taking the Host Subsystem Offline

To take the host subsystem offline perform the following steps:

1. On the external management device connected to the RCB, issue the `request vmhost power-off other-routing-engine` operational mode command to offline the backup RCB. The command shuts down the RCB cleanly by preserving the state information.

```
user@host> request vmhost power-off other-routing-engine
```

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

2. Take the Control board offline by using the `request chassis cb slot 0/1 offline` operational mode command. The command shuts down the RCB completely.

```
user@host> request chassis cb slot 1 offline
```

## Removing the Backup RCB

To remove an RCB (see ):

**NOTE**: Remove the RCB as a unit.

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

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

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
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. Open the ejector handle outward to unseat the RCB.
4. Grasp the ejector handle, and slide the RCB about halfway out of the chassis.
5. Place one hand underneath the RCB to support it, and slide it completely out of the chassis.
6. Place the RCB on the antistatic mat or inside an antistatic bag.
7. If you are not replacing the RCB immediately, install a blank panel over the empty slot.

**Figure 213: Removing a RCB**
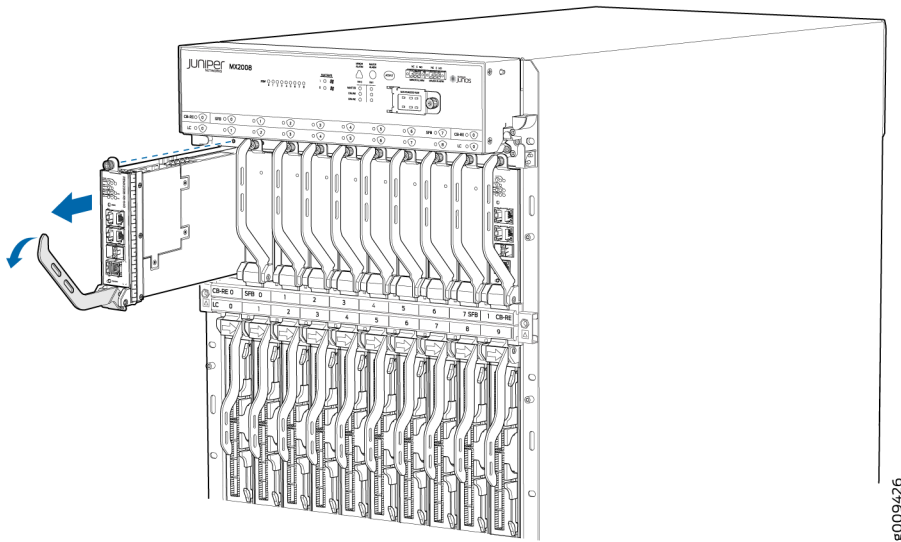


## Installing the REMX2008-X8-64G RCB

To install an RCB:

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 RCB from the electrostatic bag.

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

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

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

6. Check the LEDs on the RCB faceplate to verify that it is functioning normally.

   - The green **ONLINE** LED should blink green initially and light steadily a few minutes after the RCB is installed.

   - If the **OK/FAIL** LED is yellow, remove and install the RCB again. If the **OK/FAIL** LED still lights steadily, the RCB is not functioning properly. Contact your customer support representative. See *Contact Customer Support*.

7. Check the status of the RCB by using the `show chassis environment cb` command.

The RCB might require several minutes to boot. After the RCB boots, verify that it is installed correctly by checking the **FAIL**, **RE0**, and **RE1** LEDs on the craft interface. If the router is operational and the RCB is functioning properly, the green **ONLINE** LED on the RCB lights steadily. If the red **FAIL** LED on the RCB lights steadily instead, remove and install the RCB again. If the red **FAIL** LED still lights steadily, the RCB is not functioning properly. Contact your customer support representative.

## Verifying and Configuring the Upgraded RCB as the Primary

After replacing the backup RCB with the REMX2008-X8-64G RCB, perform the following steps:

1. Verify that the REMX2008-X8-64G RCB is online by issuing the `show chassis hardware` and `show chassis routing-engine |no-more` commands.

   Verify the software by using the `show vmhost status` and `show vmhost version` commands.

2. After you install the REMX2K-X8-64G RCB, the RCB is automatically powered on and comes up in *amnesiac* mode as it is loaded with factory defaults. After the RCB comes up in amnesiac mode, load the base configuration and commit.

3. Configure the backup RCB by using the `commit synchronize` command to copy the configuration to the backup RCB.

4. Use the `request chassis routing-engine master switch` command to make the REMX2008-X8-64G RCB (RE1) the primary RCB. All FPCs reboot after this step.

## Verifying and Configuring the Upgraded RCB as the Backup

After replacing the primary RCB with the REMX2008-X8-64G RCB, perform the following steps:

1. Use the `request chassis routing-engine master switch` command to make the newly installed REMX2008-X8-64G RCB (RE0) the backup RCB.

2. Use the `commit synchronize` command to copy the active configuration from the primary RCB to the backup RCB.

### RELATED DOCUMENTATION

## Upgrading the MX2008 Routing and Control Board (RCBs) in a Nonredundant Host Subsystem

**IN THIS SECTION**

In a nonredundant host subsystem, only one RCB is present in the chassis. When you upgrade the RCB, taking the host subsystem offline shuts down the router. To upgrade the host subsystem with the MX2008 RCB (model number: REMX2008-X8-64G), you must uninstall the existing RCB and install the MX2008 RCB.

> **NOTE**: Save the router configuration before proceeding with the MX2008 RCB upgrade.

## Taking the Host Subsystem Offline

To take the host subsystem offline perform the following steps:

1. On the external management device connected to the Routing Engine, issue the `request vmhost halt` operational mode command. The command shuts down the Routing Engines cleanly by preserving their state information.

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

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

2. Take the Control board offline by using the `request chassis cb slot 0/1 offline` operational mode command. The command shuts down the RCB completely.

   ```
   user@host> request chassis cb slot 1 offline
   ```

Removing the MX2008 RCB

To remove an RCB (see):

> **NOTE**: Remove the RCB as a unit.

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

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

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
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. Open the ejector handle outward to unseat the RCB.
4. Grasp the ejector handle, and slide the RCB about halfway out of the chassis.
5. Place one hand underneath the RCB to support it, and slide it completely out of the chassis.
6. Place the RCB on the antistatic mat or inside an antistatic bag.
7. If you are not replacing the RCB immediately, install a blank panel over the empty slot.

Figure 214: Removing an RCB
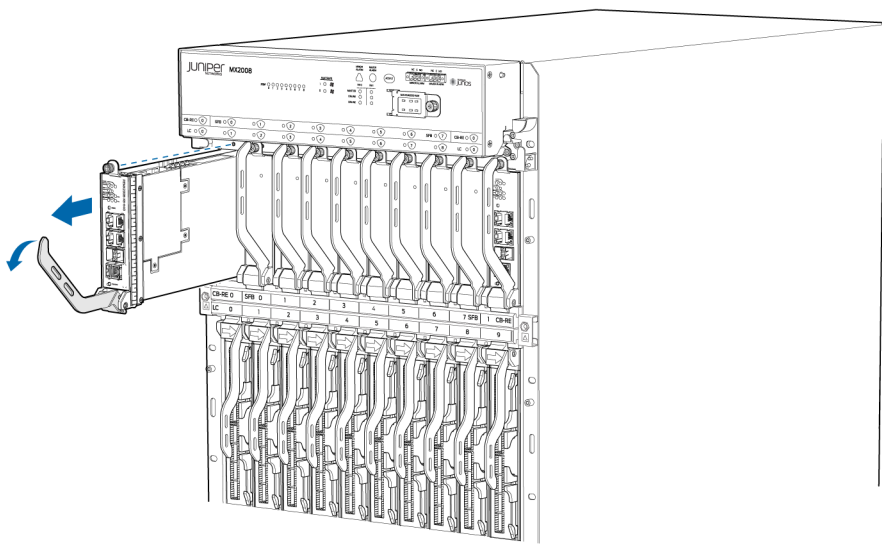
Installing the MX2008 RCB

To install the RCB (see):

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

2. Remove the RCB from the electrostatic bag.

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

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

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

6. Check the LEDs on the RCB faceplate to verify that it is functioning normally.

   - The green **ONLINE** LED should blink green initially and light steadily a few minutes after the RCB is installed.

   - If the **OK/FAIL** LED is yellow, remove and install the RCB again. If the **OK/FAIL** LED still lights steadily, the RCB is not functioning properly. Contact your customer support representative. See *Contact Customer Support*.

7. Check the status of the RCB by using the `show chassis environment cb` command.

Figure 215: Installing an RCB
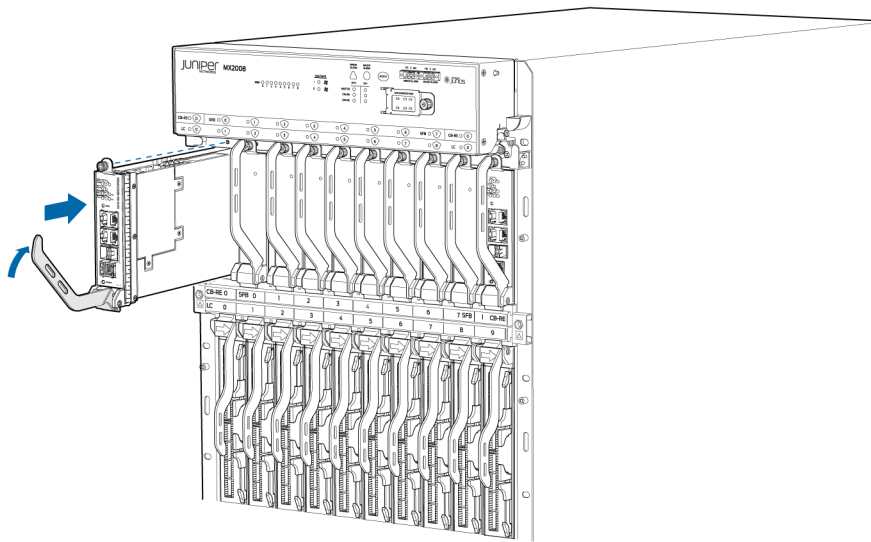
The RCB might require several minutes to boot. After the RCB boots, verify that it is installed correctly by checking the **FAIL**, **RE0**, and **RE1** LEDs on the craft interface. If the router is operational and the RCB is functioning properly, the green **ONLINE** LED on the RCB lights steadily. If the red **FAIL** LED lights steadily instead, remove the RCB and reinstall it. If the red **FAIL** LED on the RCB still lights steadily, the RCB is not functioning properly. Contact your customer support representative.

Verifying and Configuring the Upgraded MX2008 RCB

After replacing the RCB, perform the following steps:

1. Verify that the \RCB is online by issuing the `show chassis hardware` and `show chassis routing-engine |no-more` commands.

   Verify the software by using the `show vmhost status` and `show vmhost version` commands.

2. After you install the RCB, the RCB gets automatically powered on and comes up in *amnesiac* mode as it is loaded with factory defaults. After the RCB comes up in amnesiac mode, load the base configuration and commit.

RELATED DOCUMENTATION

Maintaining MX2008 Power System Components

IN THIS SECTION

Replacing an MX2008 AC Power Supply Module

IN THIS SECTION

Removing an MX2008 AC Power Supply Module

Before you remove a PSM, be aware of the following:

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

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

To remove an AC PSM (see Figure 1):

> **NOTE**: The minimum number of AC PSMs changes based on the configuration.

1. With one PSM installed and operational, remove any additional PSM by turning the power switch to the off (**O**) position.
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. Loosen the two captive screws on the PSM faceplate.
4. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the PSM away from the chassis.
5. Pull the PSM straight out of the chassis.

> ⚠️ **CAUTION**: Do not touch the power connectors on back of the PSM. They can get damaged.

6. Place the PSM module into an antistatic bag.

> **NOTE**: Each PSM slot not occupied by an AC PSM must be covered by a PSM blank panel.

Figure 216: Removing an AC Power Supply Module from the MX2008 Router
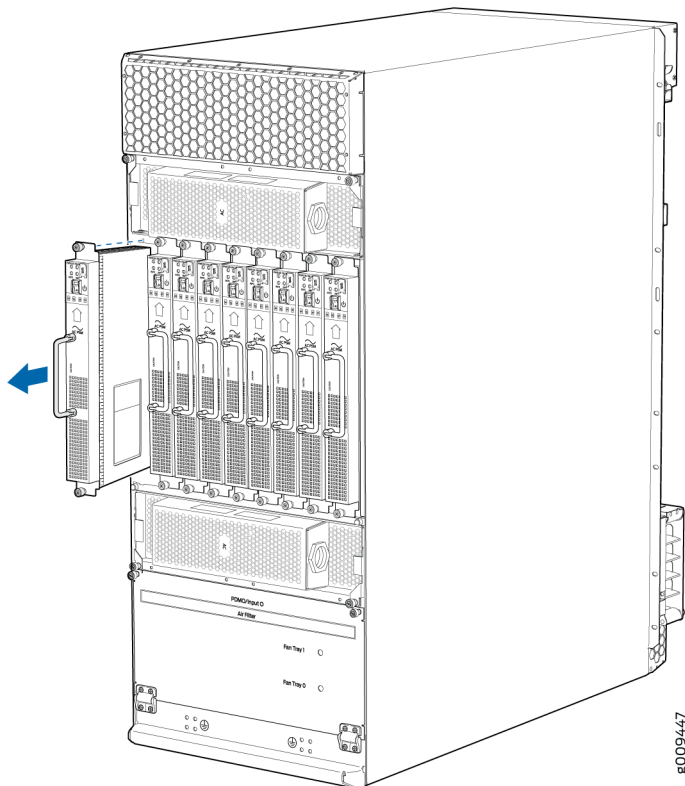
Installing an MX2008 AC Power Supply Module

Before you install a PSM, be aware of the following:

> **NOTE**: The AC PSM is hot-swappable when a minimum number of PSMs installed and operational.

> **WARNING**: The AC PSMs have no circuit breakers that can physically disconnect AC line from the router. After AC feeds have been connected to the PDM, the AC voltage is always present on the power midplane and is distributed to the PSM connectors on the power midplane.

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

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

To install an AC PSM (see):

1. With one PSM installed and operational, install an additional PSM with the power supply switch in the off (**O**) or in the on (**|**) position.

   > **WARNING**: If there is only one PSM installed and operational, the power supply switch must be placed in the off (**O**) position.

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. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the power supply module into the chassis.

4. Tighten the captive screws on the PSM faceplate.

5. Turn on the power switch to the on (**|**) position.

6. Verify that the **PWR OK** LED is lit steadily green.

Figure 217: Installing an AC Power Supply Module

g009446
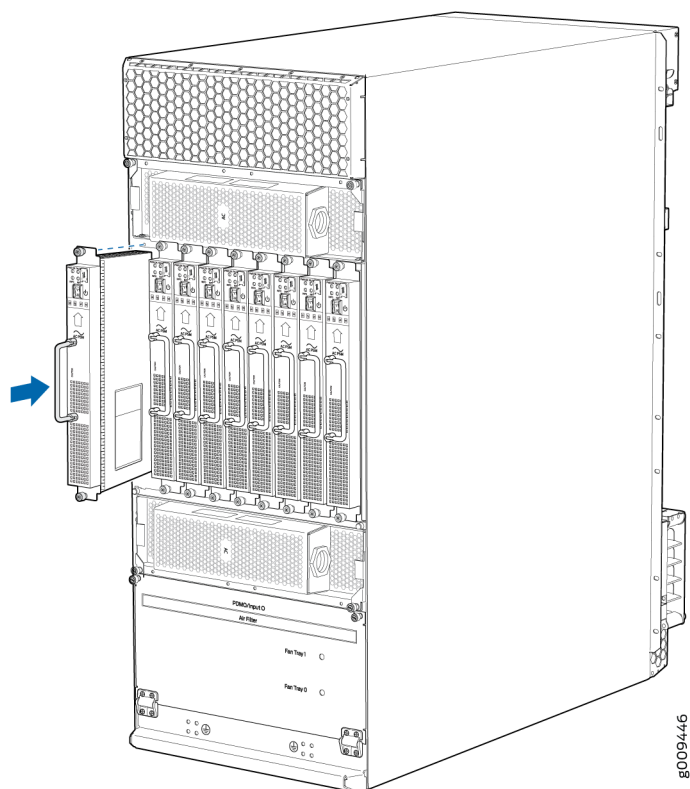
RELATED DOCUMENTATION

MX2008 AC Power Supply Module Description | **62**

Replacing an MX2008 AC Power Supply Module | **493**

MX2008 AC Power System Electrical Specifications | **89**

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

MX2008 AC Power Requirements | **76**

Replacing an MX2000 Three-Phase Delta AC Power Distribution Module

Removing an MX2000 Three-Phase Delta AC Power Distribution Module

Before you remove a three-phase delta AC PDM, be aware of the following:

> **WARNING**: Before performing AC power procedures, disconnect all power sources. To ensure that all power is **OFF**, locate the circuit breaker on the panel board that services the AC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

> **WARNING**: Do not touch the power connectors on the PDM. They can contain dangerous voltages.

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

> **NOTE**: After powering off a PDM, wait at least 60 seconds before turning the circuit breaker to the **ON** position.

> **NOTE**: The MX2008, MX2010, and MX2020 routers support the same power modules (AC/DC PSMs and AC/DC PDMs).

To remove a three-phase delta AC PDM:

1. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the removal process.

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point. See instructions for your site.

3. Disconnect the AC power cord (see Figure 3) from the power source.

Figure 218: Three-Phase Delta AC Power Cord
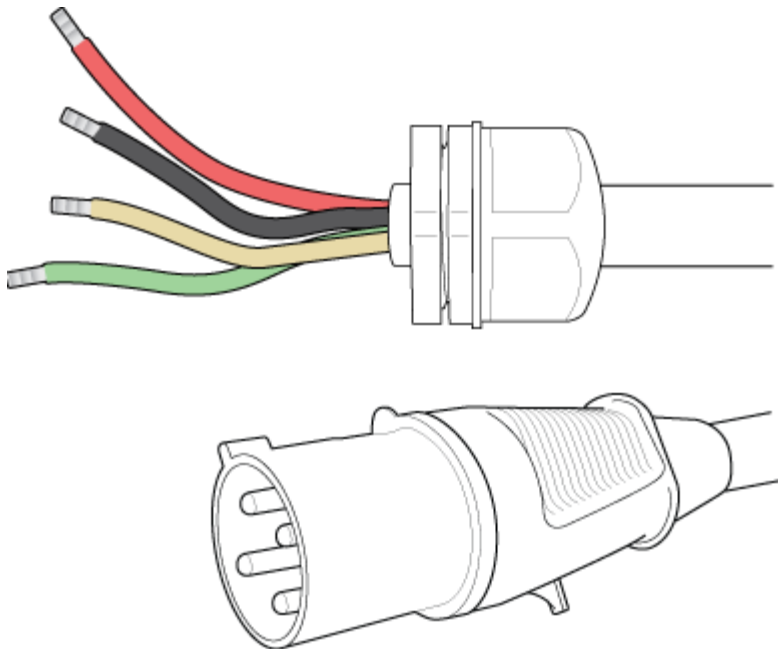
4. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

5. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

6. Remove the cover of the metal AC wiring compartment.

7. Disconnect the wires from the AC terminal block on the three-phase delta AC PDM (see Figure 4), loosen each of the input terminals or grounding point screws, and remove each wire form the grounding point or input terminal.

   To remove wires from the terminal block that serves six PSMs:

   a. Remove the wire labeled **L3** from the input terminal labeled **C1**.

   b. Remove the wire labeled **L2** from the input terminal labeled **B1**.

   c. Remove the wire labeled **L1** from the input terminal labeled **A1**.

   d. Remove the grounding wire from the grounding point labeled **GND**.

Figure 219: Disconnecting the Power Cord from a Three-Phase Delta AC Power Distribution Module
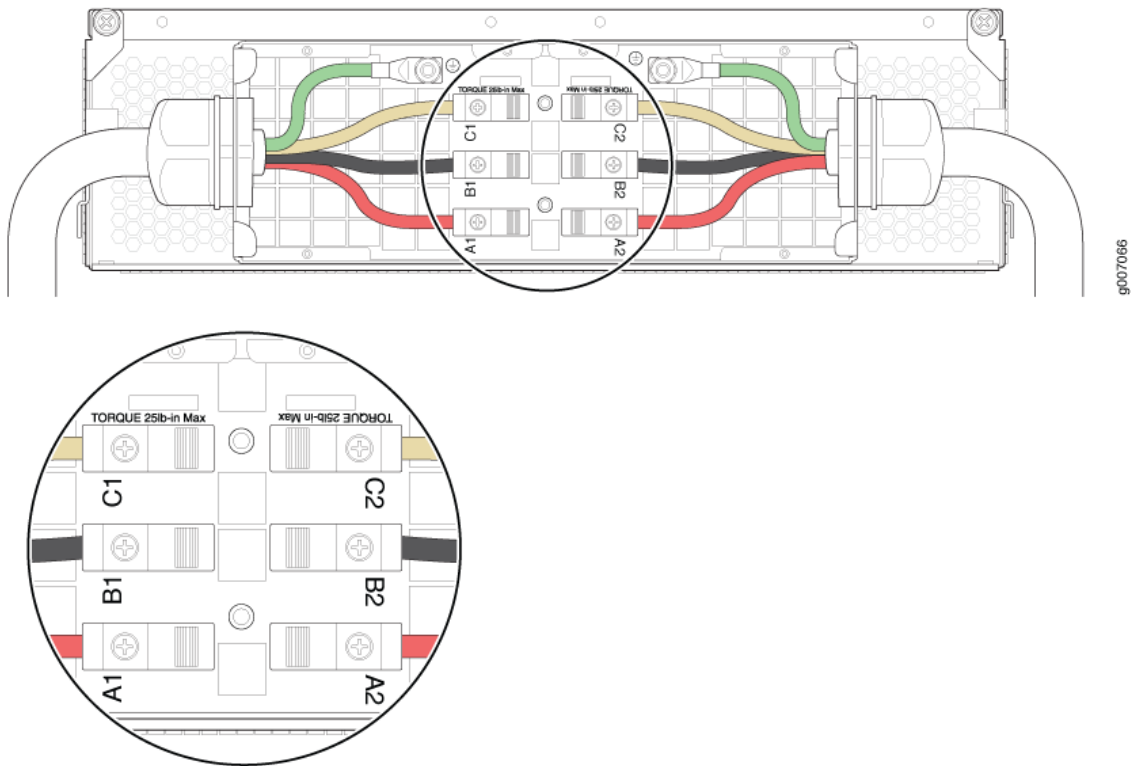
To remove wires from the terminal block that serves three PSMs:

a. Remove the wire labeled **L3** from the input terminal labeled **C2**.

b. Remove the wire labeled **L2** from the input terminal labeled **B2**.

c. Remove the wire labeled **L1** from the input terminal labeled **A2**.

d. Remove the grounding wire from the grounding point labeled **GND**.

NOTE: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

NOTE: The color of each AC power wire might vary. The MX2000 chassis is not sensitive to phase rotation sequence—either clockwise or counterclockwise will operate correctly.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

8. Loosen the plastic cable tie fastening the AC power cord to the PDM.

9. Loosen and remove the retaining nut from the AC power cord.

10. Pull the AC power cord out of the metal wiring compartment.

11. Carefully move the AC power cable out of the way.

12. Disconnect both of the AC power cords from the AC PDM.

13. Loosen the two captive screws on the locking levers of the PDM faceplate completely.

14. Pull the locking levers on either side of the faceplate up to unseat the PDM.

15. Grasp the levers on the PDM faceplate and pull firmly. Slide it halfway out of the chassis (see Figure 5, Figure 6 (MX2010), and Figure 7 (MX2008).

> ⚠️ **CAUTION**: Each three-phase delta AC PDM weighs approximately 12 lb (5.44 kg). Be prepared to support the full weight of the PDM as you remove it from the router.

16. Place one hand underneath the PDM to support it, and slide it completely out of the chassis.

Figure 220: Removing a Three-Phase Delta AC Power Distribution Module (MX2020 Router)
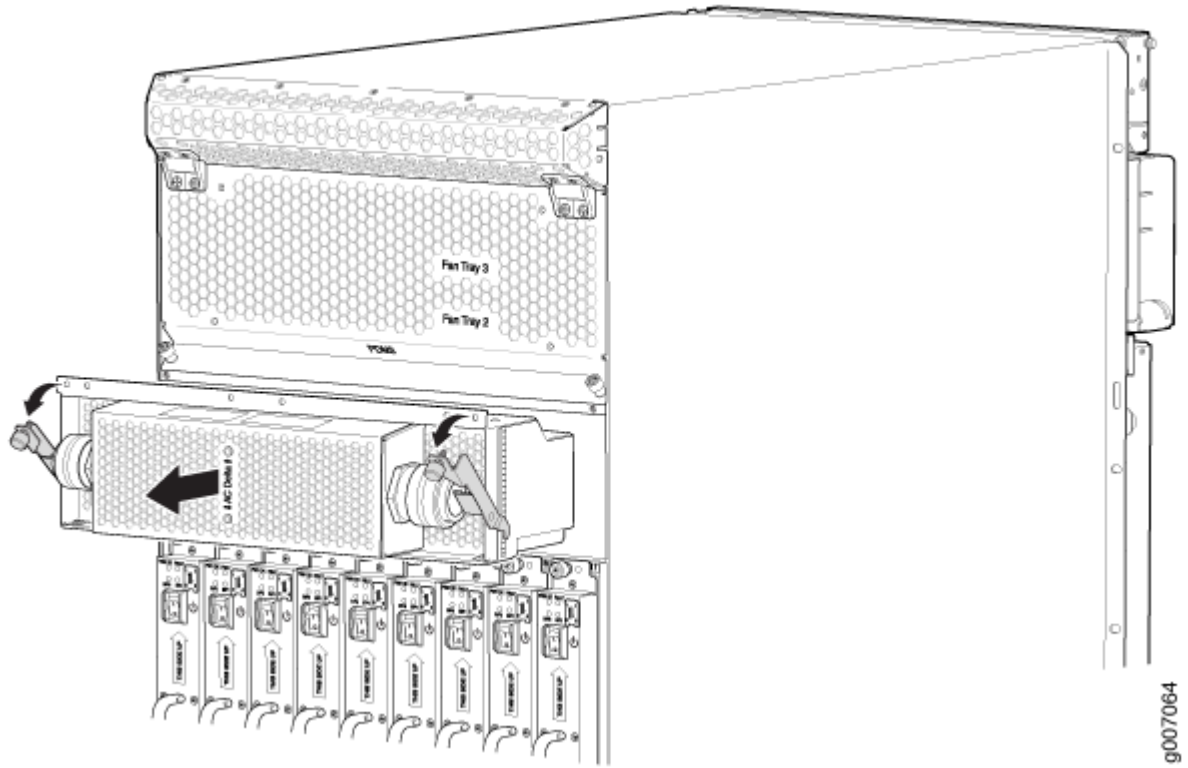
Figure 221: Removing a Three-Phase Delta AC Power Distribution Module (MX2010 Router)
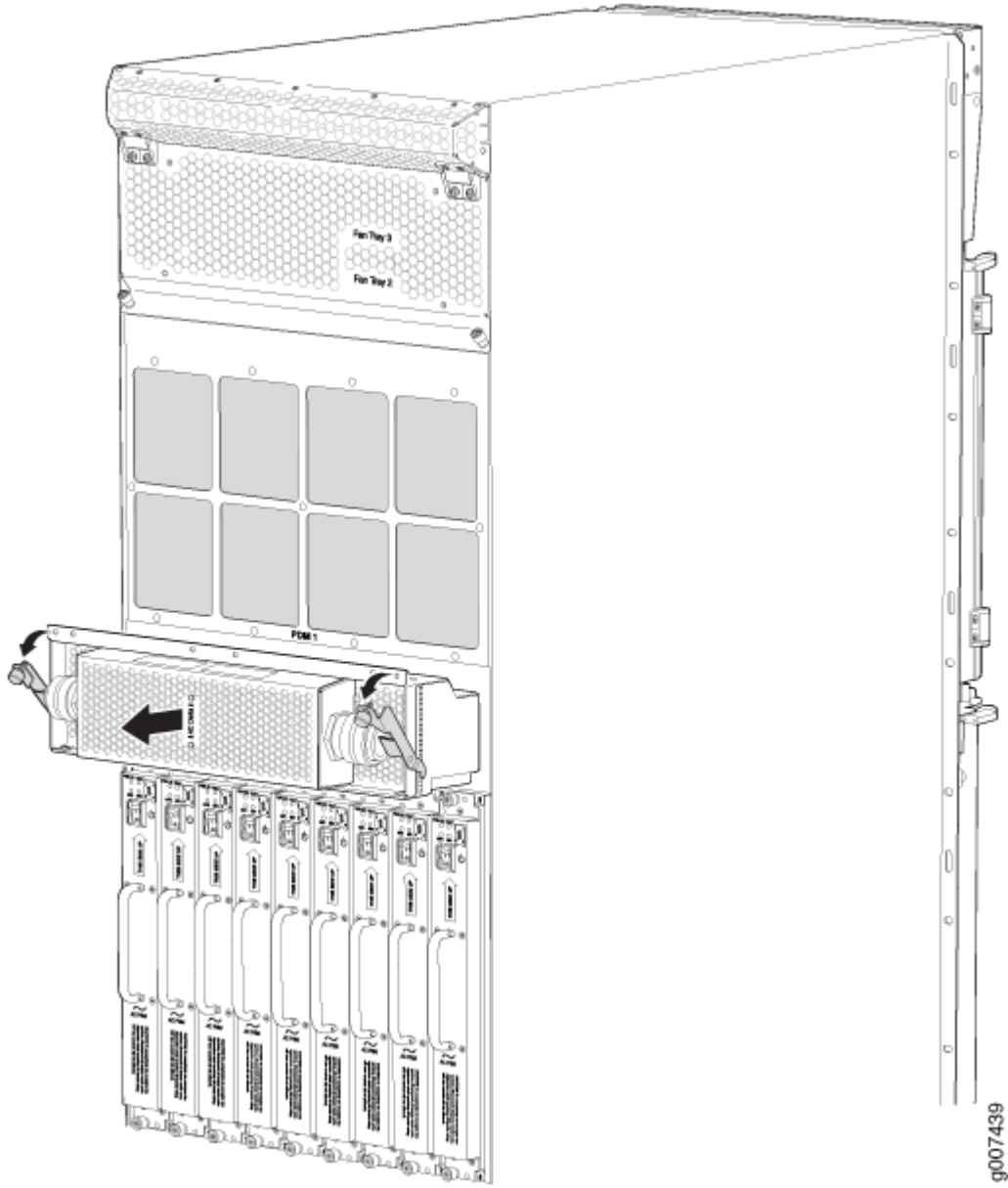
Figure 222: Removing a Three-Phase Delta AC Power Distribution Module (MX2008 Router)
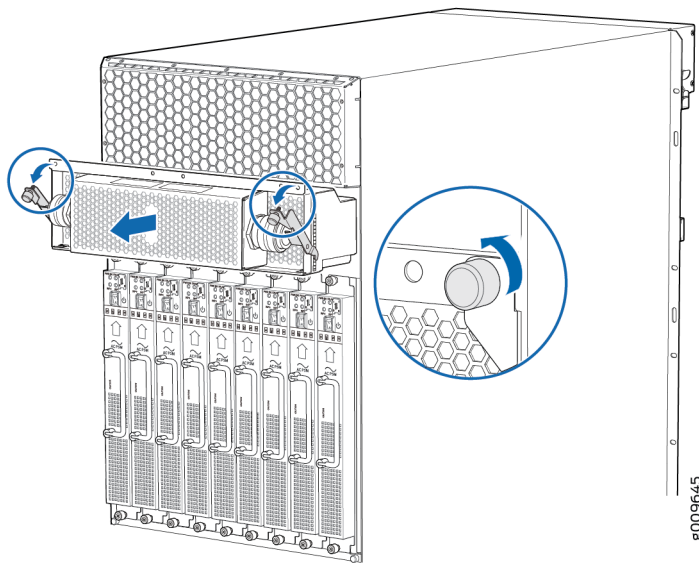
NOTE: Each PDM slot not occupied by a AC PDM must be covered by a PDM blank panel.

SEE ALSO

MX2000 Three-Phase Delta AC Power Distribution Module Description

MX2000 Three-Phase Delta AC Power Distribution Module Electrical Specifications

Installing an MX2000 Router Three-Phase Delta AC Power Distribution Module

Before you install a three-phase delta AC power distribution module (PDM), be aware of the following:

WARNING: Before performing AC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services the AC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

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

> remove a PDM, you must install a replacement PDM or a blank panel shortly after the removal.

NOTE: After powering off a PDM, wait at least 60 seconds before turning the circuit breaker back on.

NOTE: The PDMs are hot swappable in a redundant configuration. However, you cannot switch from one type of PDM (AC or DC) to another while the system is on.

Each three-phase delta AC PDM weighs approximately 12 lb (5.44 kg). To install a three-phase delta AC PDM:

1. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.
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. [Optional]—If you are switching from a DC PDM to an AC PDM, see *Converting an MX2000 Router Between AC and DC Power* for instructions on how to change the setting on the internal bar of the power distribution unit (PDU) cage to AC.
4. Pull the locking levers on either side of the faceplate away until they stop.
5. Using both hands, slide the PDM into the chassis until you feel resistance (see Figure 8Figure 9, and Figure 10).
6. Push the lock levers until they make contact with the PDM faceplate.
7. Tighten the two captive screws on the locking levers of the PDM faceplate to secure the PDM in the chassis. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.
8. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

Figure 223: Installing a Three-Phase Delta AC Power Distribution Module (MX2020)
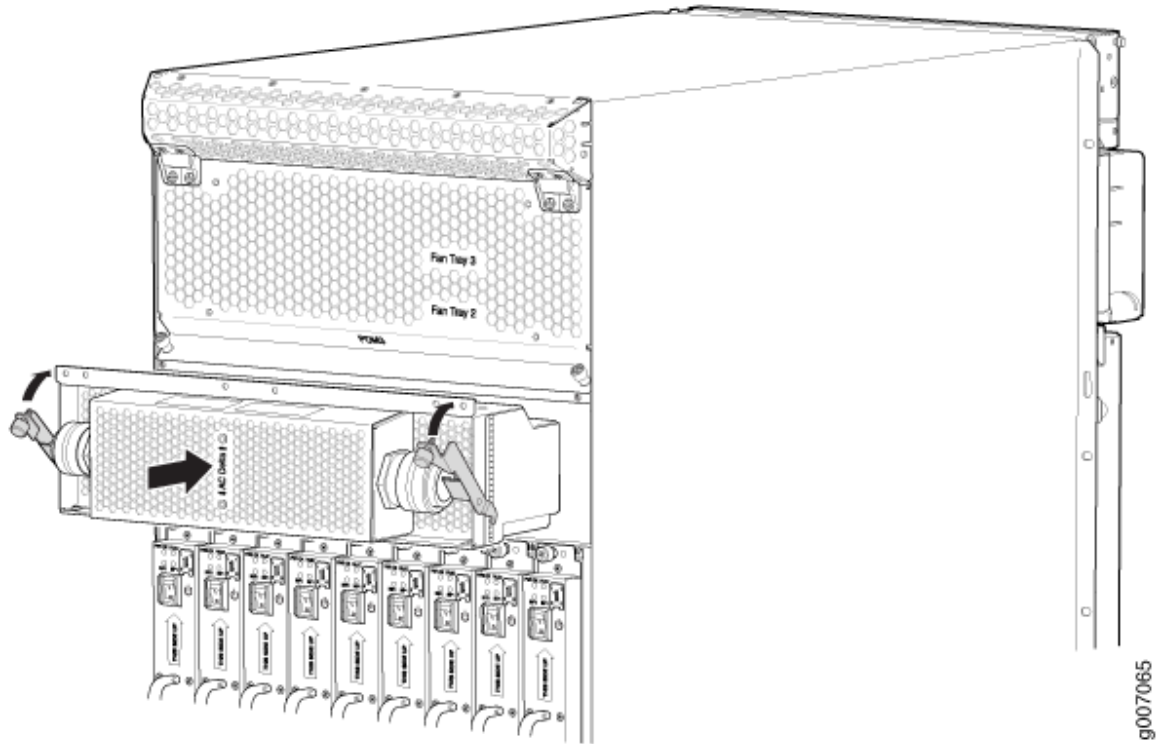
Figure 224: Installing a Three-Phase Delta AC Power Distribution Module (MX2010)
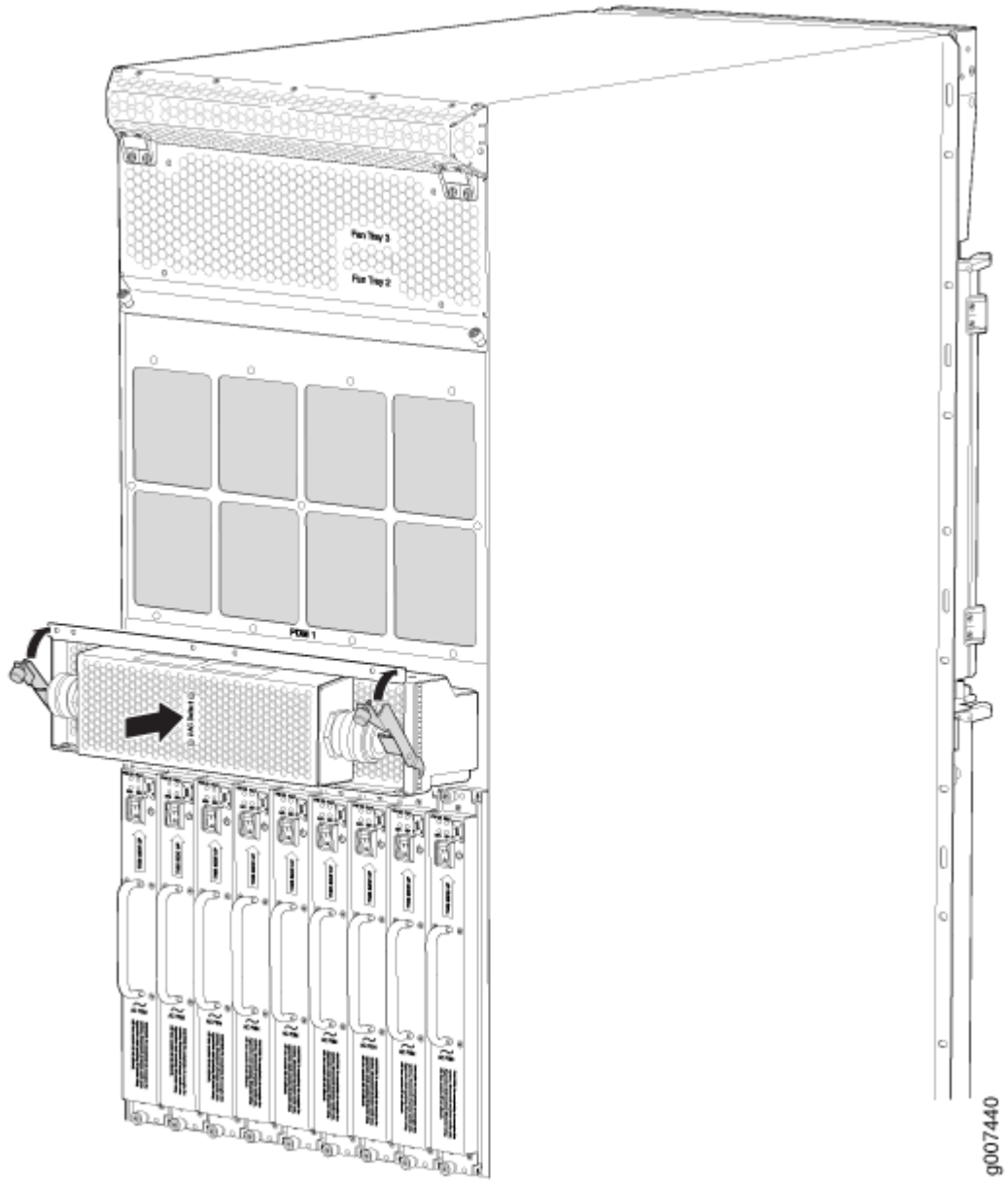
Figure 225: Installing a Three-Phase Delta AC Power Distribution Module (MX2008)
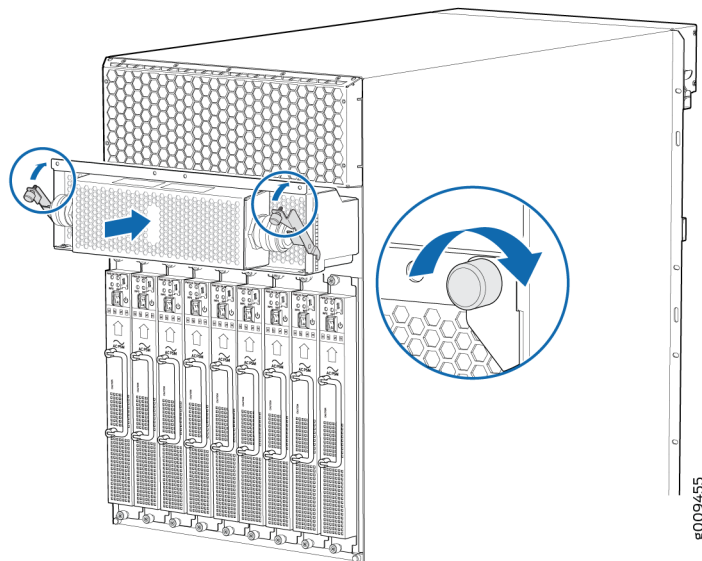
9. Remove the cover of the metal AC wiring compartment.

10. Unscrew the retaining nut from the AC power cord.

11. Place the retaining nut inside the metal wiring compartment.

12. Insert the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

13. Insert the wires of the AC power cord through the hole of the metal wiring compartment.

14. Connect the wires to the AC terminal block on the three-phase delta AC PDM (see Figure 11). Loosen each of the input terminals or grounding point screws, and insert the wire into the grounding point or input terminal, and tighten the screw (see Table 1 for approved AC wire gauge).

    To insert wires into the terminal block that serves six PSMs:

    a. Insert the grounding wire into the grounding point labeled **GND**.

    b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

    c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

    d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

Figure 226: Connecting Power to a Three-Phase Delta AC Power Distribution Module

> **NOTE**: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

> **NOTE**: The color of each AC power wire might vary. The MX2000 chassis is not sensitive to phase rotation sequence—either clockwise or counterclockwise will operate correctly.

> ⚠ **CAUTION**: Wire label configuration is for Juniper Networks supplied cable only. If you are using your own cable, make sure you use the proper connections.

To insert wires into the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

> ⚡ **WARNING**: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment, apply AC voltage to the PDM (with the PSM power switch turned off). Verify that the two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-B1, B1-C1, C1-A1, A2-B2, B2-C2, and C2-A2 for three-phase delta PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker to remove power from the PDM and install the metal cover.

> **NOTE**: Three-phase delta AC wire assembly kits can be purchased from Juniper Networks.

Table 131: Supported Three-Phase Delta AC Wire Gauge

Wire Gauge	Description
4 x 6-AWG or equivalent	4 conductor wires, each wire is 6-AWG

> **NOTE**: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring will result in the cable clamps not tightening properly.

> ⚡ **WARNING**: Power connections must be performed by a licensed electrician only.

15. Verify that the power cord wire connections are correct.

16. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

17. Using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

18. Verify that the AC power cord does not touch or block access to router components, and that it does not drape where people could trip on it.

19. Remove the ESD grounding strap from the ESD points on the chassis. Connect the strap to an approved site ESD grounding point. See the instructions for your site.

20. Connect the AC power cord plug to the power source.

21. Switch on the customer-site circuit breakers to provide voltage on the AC power cord.

22. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

23. Verify that the LED on the PDM faceplate is lit steadily, indicating that the AC terminal block is receiving power.

RELATED DOCUMENTATION

MX2000 Three-Phase Delta AC Power Distribution Module Description

MX2000 Three-Phase Delta and Wye AC Power Distribution Module LEDs

Connecting AC Power to an MX2000 Router with Three-Phase Delta AC Power Distribution Modules

Powering On a Three-Phase AC-Powered MX2000 Router | **373**

Powering Off the AC-Powered or Universal HVAC/HVDC-Powered MX2000 Router

Troubleshooting the MX2000 Router Power System | **585**

MX2000 AC Power Cord Specifications

MX2000 AC Power System Electrical Specifications

MX2000 Three-Phase Delta AC Power Distribution Module Electrical Specifications

Replacing an MX2008 Three-Phase Delta AC Power Cord

IN THIS SECTION

- Removing an MX2008 Three-Phase Delta AC Power Cord | **511**
- Installing an MX2008 Three-Phase Delta AC Power Cord | **514**

The MX2008 router has either one redundant PDM or two redundant PDMs. An AC power cord on a redundant PDM is hot-insertable and hot-removable. When a redundant PDM is powered down, the other PDM automatically assumes the entire electrical load for the router. If you have only one PDM, you must power off the system before removing the AC power cord.

Removing an MX2008 Three-Phase Delta AC Power Cord

To remove a three-phase delta AC power cord:

1. Switch off the customer-site circuit breakers to the PDM being removed. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.

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 PSM faceplate to the off (**O**) position.

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

4. Remove the ESD grounding strap from the ESD point on the chassis, and attach it to an approved site ESD grounding point. See the instructions for your site.

5. Disconnect the AC power cord (see Figure 12) from the power source.

Figure 227: Three-Phase Delta AC Power Cord
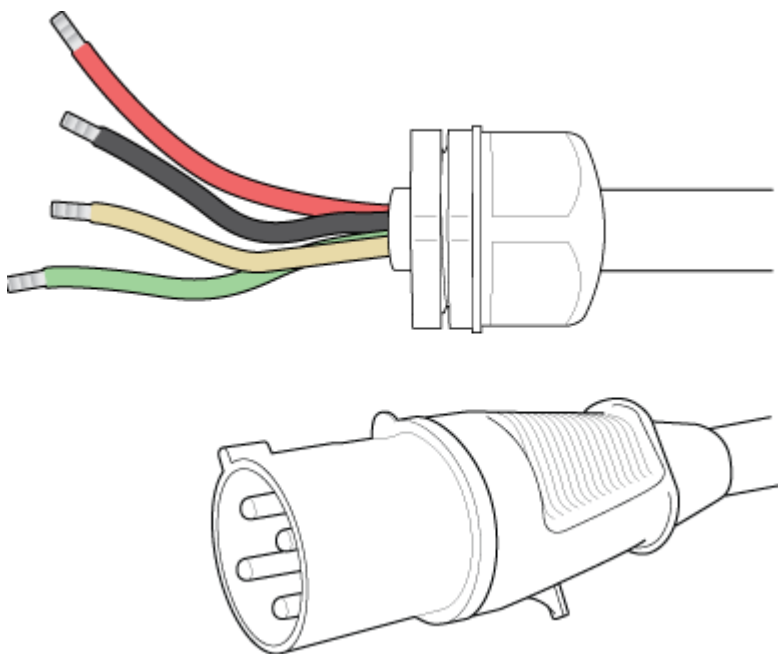
6. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

7. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

8. Remove the cover of the metal wiring compartment.

9. Disconnect the wires from the AC terminal block on the three-phase delta AC PDM (see Figure 13). Loosen each of the input terminals or grounding point screws, and remove each wire from the grounding point or input terminal.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

To remove wires from the terminal block that serves six PSMs:

a. Remove the wire labeled **L3** from the input terminal labeled **C1**.

b. Remove the wire labeled **L2** from the input terminal labeled **B1**.

c. Remove the wire labeled **L1** from the input terminal labeled **A1**.

d. Remove the grounding wire from the grounding point labeled **GND**.

Figure 228: Disconnecting the Power Cord from a Three-Phase Delta AC Power Distribution Module

To remove wires from the terminal block that serves three PSMs:

a. Remove the wire labeled **L3** from the input terminal labeled **C2**.

b. Remove the wire labeled **L2** from the input terminal labeled **B2**.

c. Remove the wire labeled **L1** from the input terminal labeled **A2**.

d. Remove the grounding wire from the grounding point labeled **GND**.

> **NOTE**: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

10. Loosen the plastic cable tie fastening the AC power cord to the PDM.
11. Loosen and remove the retaining nut from the AC power cord.
12. Pull the AC power cord out of the metal wiring compartment.
13. Carefully move the AC power cable out of the way.
14. Disconnect the AC power cord from the AC PDM.

Installing an MX2008 Three-Phase Delta AC Power Cord

To install a three-phase delta AC power cord:

1.   Switch off the customer-site circuit breakers to the PDM being removed. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.

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 switches on all the PSM faceplates to the off (**O**) position for any PSMs that are powered only from this PDM.

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

4.   Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

5.   Remove the cover of the metal AC wiring compartment.

6.   Unscrew the retaining nut from the AC power cord.

7.   Place the retaining nut inside the metal wiring compartment.

8.   Insert the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

9.   Insert the wires of the AC power cord through the hole of the metal wiring compartment.

10. Connect the wires to the AC terminal block on the three-phase delta AC PDM (see Figure 229 on page 515). Loosen each of the input terminal or grounding point screws, and insert the wire into the grounding point or input terminal, and tighten the screw (see Table 132 on page 516 for approved AC wire gauge).

To insert wires into the terminal block that serves six PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

Figure 229: Connecting Power to a Three-Phase Delta AC Power Distribution Module

NOTE: The three-phase delta AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

NOTE: The color of each AC power wire might vary. The MX2008 chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

⚠ **CAUTION**: Wire label configuration is for Juniper Networks supplied cable only. If you are using your own cable, make sure you use the proper connections.

To insert wires into the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

> ⚡ **WARNING**: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment, apply AC voltage to the PDM (with disengaged PSM) to make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-B1, B1-C1, C1-A1, A2-B2, B2-C2, and C2-A2 for three-phase delta PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker, de-energizing the PDM, and install the metal cover and engage all AC PSMs.

> **NOTE**: Three-phase delta AC wire assembly kits can be purchased from Juniper Networks.

Table 132: Supported Three-Phase Delta AC Wire Gauge

Wire Gauge	Description
4 x 6-AWG or equivalent	4 conductor wires, each wire is 6-AWG

> **NOTE**: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring will result in the cable clamps not tightening properly.

> ⚡ **WARNING**: Power connections must be performed by a licensed electrician only.

11. Verify that the power cord wire connections are correct.

12. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

13. Using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

14. Verify that the AC power cord does not touch or block access to router components, and that it does not drape where people could trip on it.

15. Remove the ESD grounding strap from the ESD points on the chassis. Connect the strap to an approved site ESD ground point. See the instructions for your site.

16. Connect the AC power cord plug to the power source.

17. Switch on the customer-site circuit breakers to provide voltage to the AC power cord.

18. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

19. Verify the LED on the PDM faceplate is lit steadily, indicating that the AC terminal block is receiving power.

20. Switch the power switch on the PSM to the on (|) position to provide power to the router components.

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

RELATED DOCUMENTATION

MX2000 Three-Phase Delta AC Power Distribution Module Description

Replacing an MX2000 Three-Phase Delta AC Power Distribution Module | **497**

MX2000 Three-Phase Delta AC Power Distribution Module Electrical Specifications

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Preventing Electrostatic Discharge Damage to an MX2008 Router | **628**

Replacing an MX2020 Three-Phase Wye AC Power Distribution Module

Removing an MX2000 Three-Phase Wye AC Power Distribution Module

Before you remove a three-phase wye AC Power Distribution Module (PDM), be aware of the following:

> ⚡ **WARNING**: Before performing AC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services the AC circuit, move the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

> ⚡ **WARNING**: Do not touch the power connectors on the PDM. They can contain dangerous voltages.

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

> **NOTE**: After powering off a PDM, wait at least 60 seconds before turning the circuit breaker back on.

To remove a three-phase wye AC PDM:

1. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the removal process.
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. Remove the ESD grounding strap from the ESD point on the chassis, and attach it to an approved site ESD grounding point. See instructions for your site.

4. Disconnect the AC power cord (see Figure 15) from the power source.
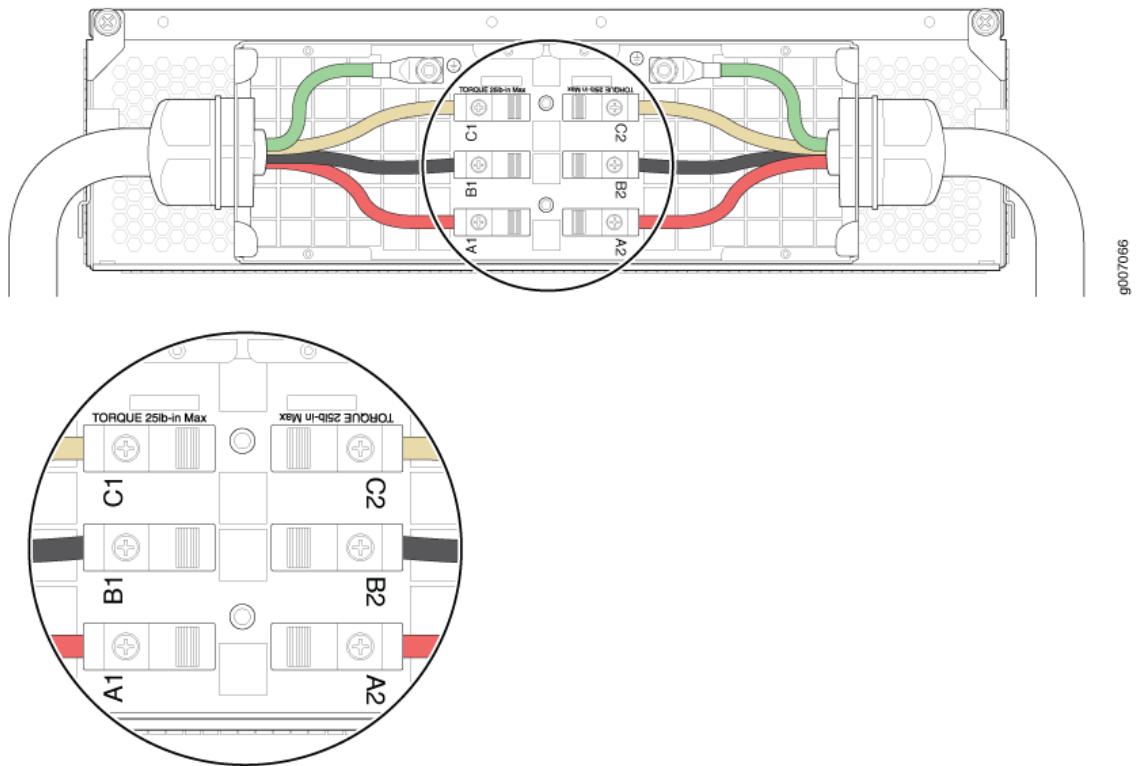
Figure 230: Three-Phase Wye AC Power Cord
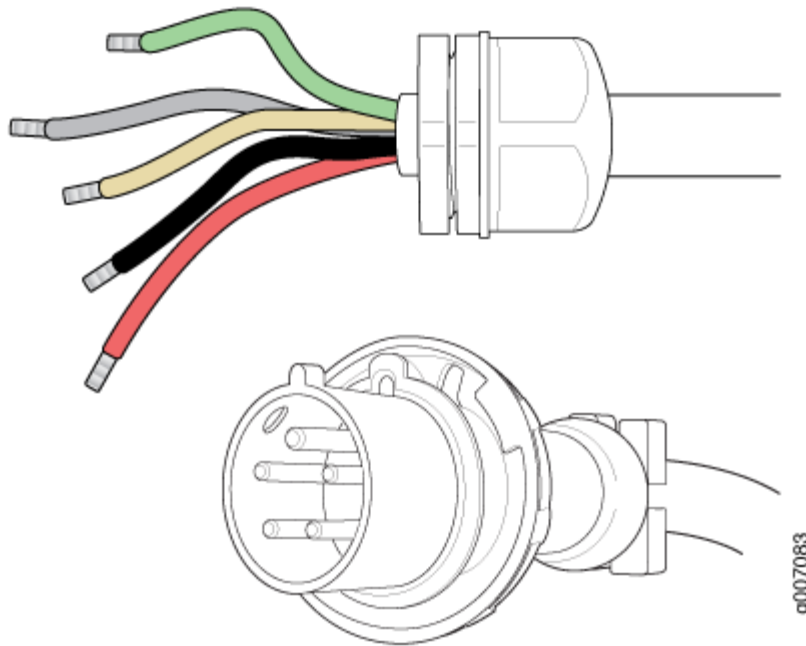
5. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

6. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

7. Remove the cover of the metal AC wiring compartment.

8. Disconnect the wires from the AC terminal block on the three-phase wye AC PDM (see Figure 16), loosen each of the input terminals or grounding point screws, and remove each wire from the grounding point or input terminal.

   To remove wires from the terminal block that serves six PSMs:

   a. Remove the wire labeled **N** from the input terminal labeled **N1**.

   b. Remove the wire labeled **L3** from the input terminal labeled **C1**.

   c. Remove the wire labeled **L2** from the input terminal labeled **B1**.

   d. Remove the wire labeled **L1** from the input terminal labeled **A1**.

   e. Remove the grounding wire from the grounding point labeled **GND**.

Figure 231: Disconnecting the Power Cord from a Three-Phase Wye AC Power Distribution Module
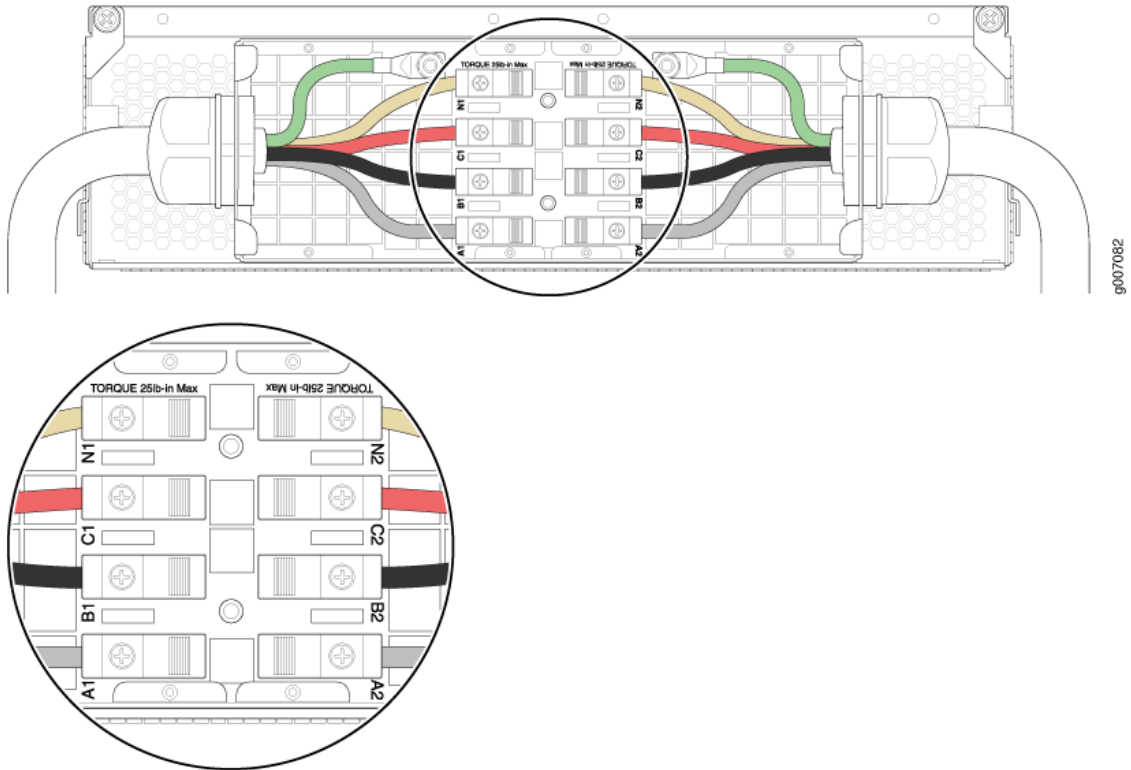
To remove wires from the terminal block that serves three PSMs:

a. Remove the wire labeled **N** from the input terminal labeled **N2**.

b. Remove the wire labeled **L3** from the input terminal labeled **C2**.

c. Remove the wire labeled **L2** from the input terminal labeled **B2**.

d. Remove the wire labeled **L1** from the input terminal labeled **A2**.

e. Remove the grounding wire from the grounding point labeled **GND**.

> **NOTE**: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged in to.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

9. Loosen the plastic cable tie fastening the AC power cord to the PDM.
10. Loosen and remove the retaining nut from the AC power cord.
11. Pull the AC power cord out of the metal wiring compartment.
12. Carefully move the AC power cable out of the way.
13. Disconnect the AC power cord from the AC PDM.
14. Loosen the two captive screws on the locking levers of the PDM faceplate completely.
15. Pull the locking levers on either side of the faceplate up to unseat the PDM.
16. Grasp the levers on the PDM faceplate and pull firmly. Slide it halfway out of the chassis (see Figure 17, Figure 18, and Figure 19).

> ⚠️ **CAUTION**: Each three-phase wye AC PDM weighs approximately 12 lb (5.44 kg). Be prepared to support the full weight of the PDM as you remove it from the router.

17. Place one hand underneath the PDM to support it, and slide it completely out of the chassis.

Figure 232: Removing an MX2020 Three-Phase Wye AC PDM
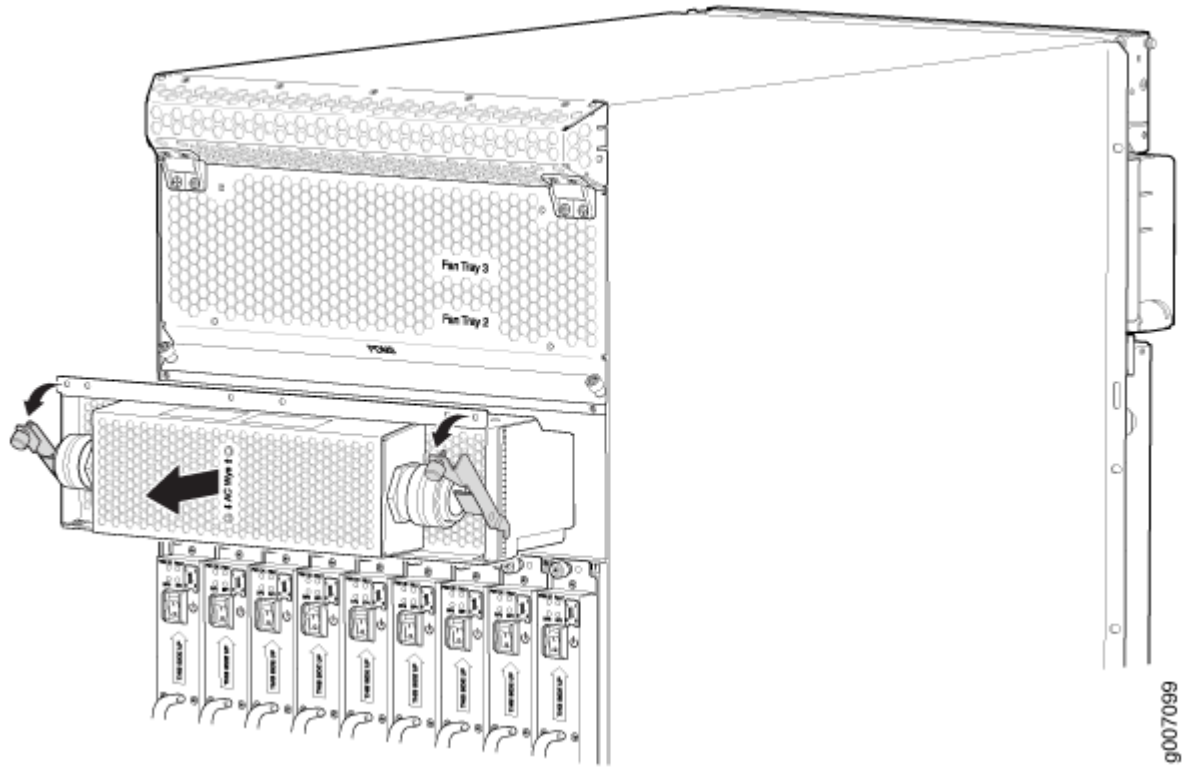
Figure 233: Removing an MX2010 Three-Phase Wye AC Power Distribution Module
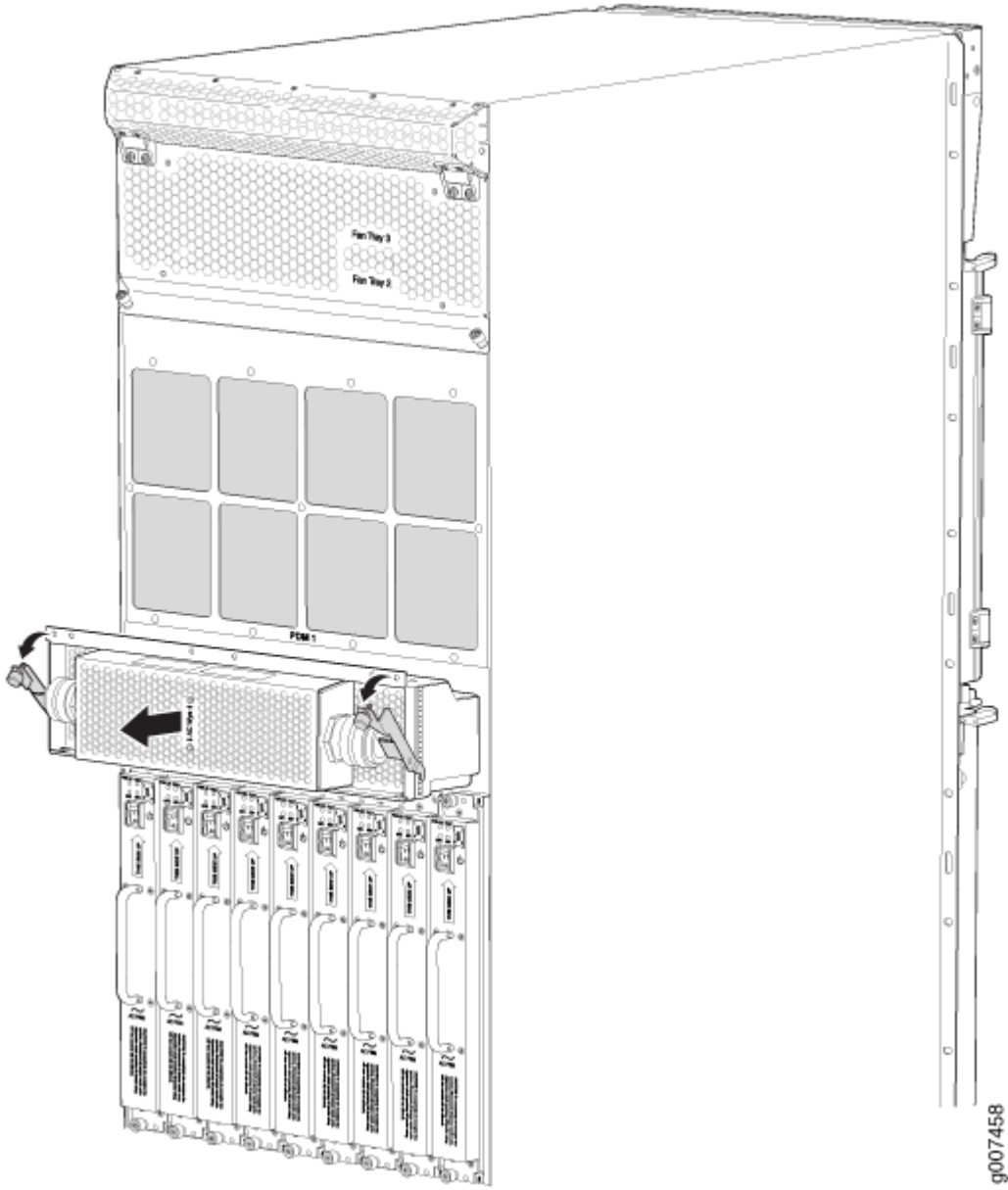
Figure 234: Removing an MX2008 Three-Phase Wye AC Power Distribution Module
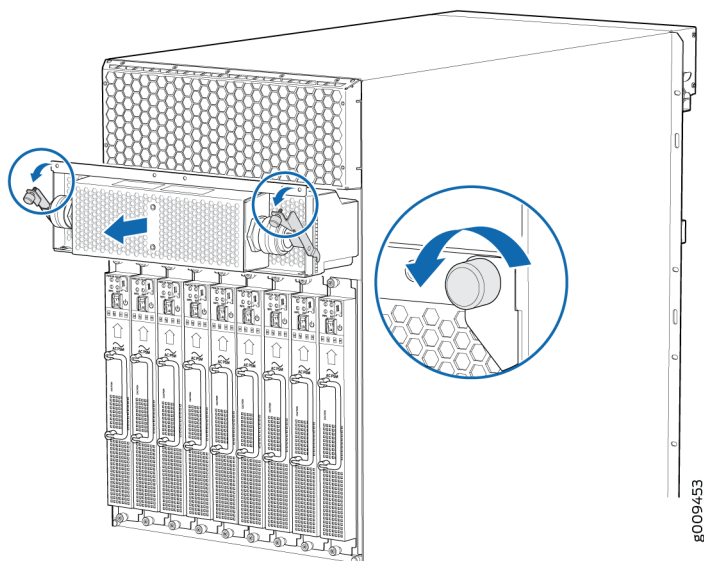
> **NOTE**: Each PDM slot not occupied by a AC PDM must be covered by a PDM blank panel.

Installing an MX2000 Router Three-Phase Wye AC Power Distribution Module

Each three-phase wye AC PDM weighs approximately 12 lb (5.44 kg). To install a three-phase wye AC PDM:

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

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

NOTE: After powering off a PDM, wait at least 60 seconds before turning the circuit breaker back on.

NOTE: The PDMs are hot swappable in a redundant configuration. However, you cannot convert to a DC configuration while the system is on.

1. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.

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. [Optional]—If you are switching from a DC PDM to an AC PDM, see *Converting an MX2000 Router Between AC and DC Power* for instructions on how to change the setting on the internal bar of the power distribution unit (PDU) cage to AC.

4. Pull the locking levers on either side of the faceplate away until they stop.

5. Using both hands, slide the PDM into the chassis until you feel resistance (see Figure 20, Figure 21, or Figure 22.

Figure 235: Installing a Three-Phase Wye AC PDM (MX2020)
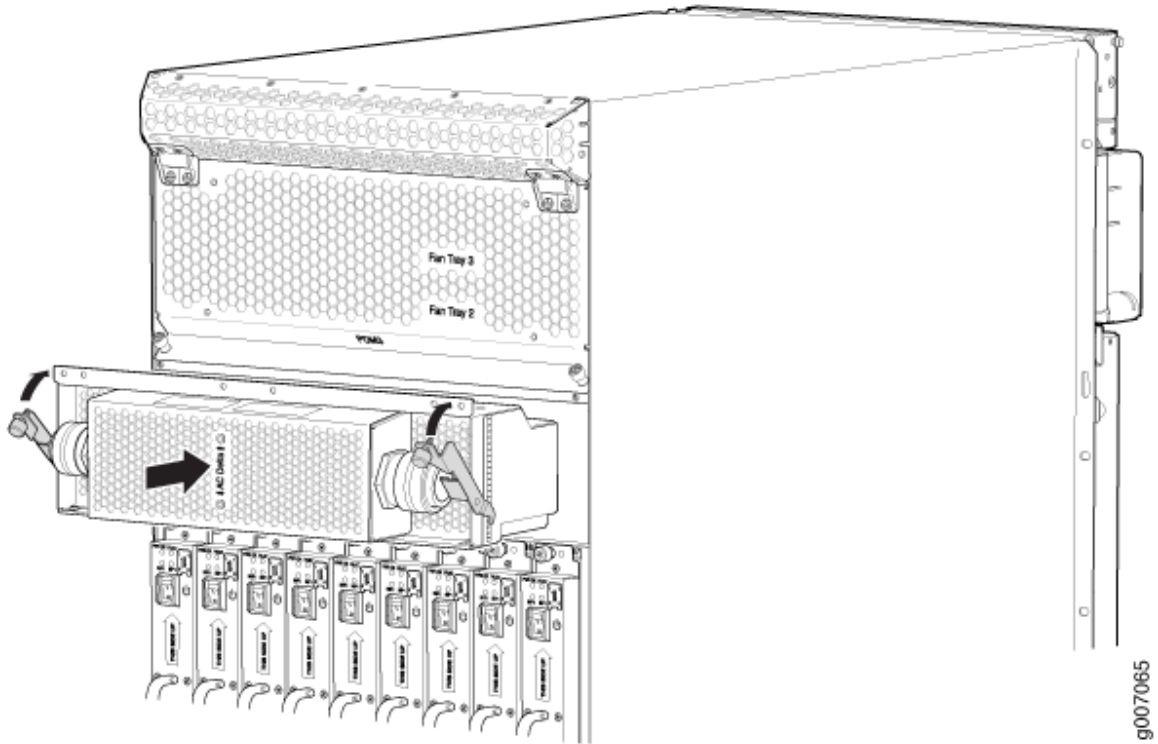
Figure 236: Installing a Three-Phase Wye AC PDM (MX2010)
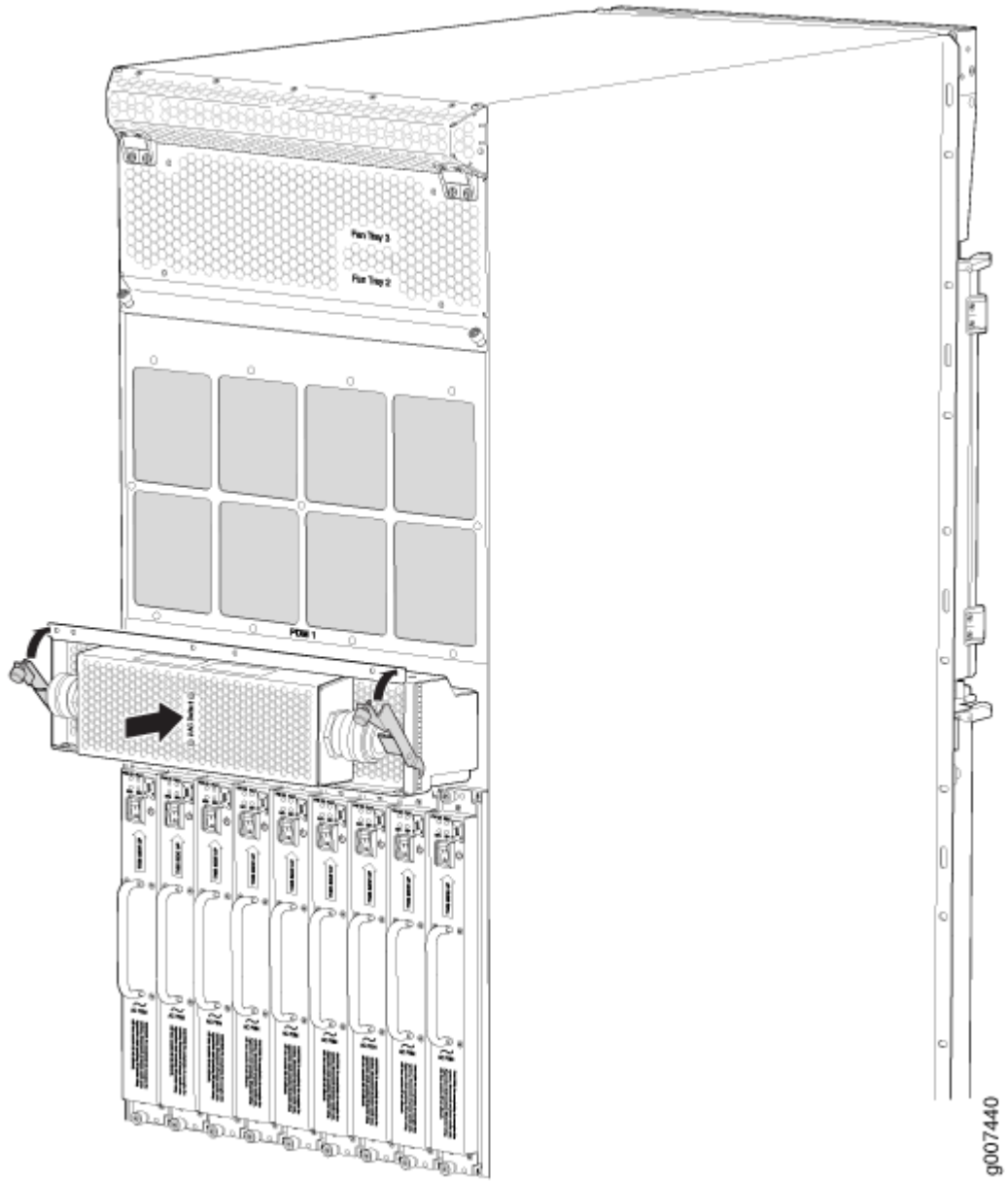
Figure 237: Installing an Three-Phase Wye AC PDM (MX2008)
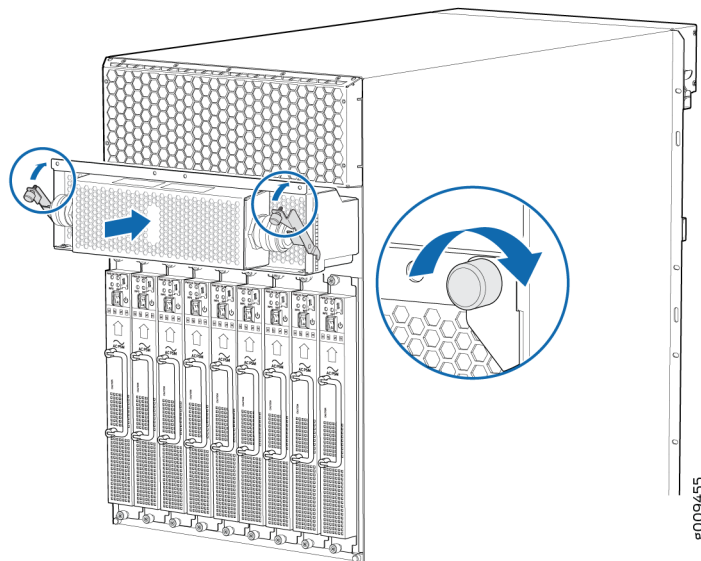
6. Push the lock levers completely in until they make contact with the PDM faceplate.

7. Tighten the two captive screws on the locking levers of the PDM faceplate to secure the PDM in the chassis.

8. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

9. Remove the cover of the metal AC wiring compartment.

10. Unscrew the retaining nut from the AC power cord.

11. Place the retaining nut inside the metal wiring compartment.

12. Insert the wires of the AC power cord through the hole of the retaining nut and rubber grommet.

13. Insert the wires of the AC power cord through the hole of the metal wiring compartment.

14. Connect the wires to the AC terminal block on the three-phase wye AC PDM (see Figure 23). Loosen each of the input terminals or grounding point screws, insert the wire into the grounding point or input terminal, and tighten the screw (see Table 3 for approved AC wire gauge).

    To insert wires into the terminal block that serves six PSMs:

    a. Insert the grounding wire into the grounding point labeled **GND**.

    b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

    c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

    d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

    e. Insert the wire labeled **N** into the input terminal labeled **N1**.

Figure 238: Connecting Power to a Three-Phase Wye AC Power Distribution Module

> NOTE: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

> NOTE: The color of each AC power wire might vary. The MX2000 chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

> ⚠ CAUTION: Wire label configuration is for Juniper Networks supplied cable only. If using your own cable, make sure you use the proper connections.

To insert wires into the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

    c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

    d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

    e. Insert the wire labeled **N** into the input terminal labeled **N2**.

> ⚡ **WARNING**: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment, apply AC voltage to the PDM (with disengaged PSM) to make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-N1, B1-N1, C1-N1, A2-N2, B2-N2, and C2-N2 for three-phase wye PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker de-energizing the PDM and install the metal cover and engage all AC PSMs.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

> **NOTE**: Three-phase wye AC wire assembly kits can be purchased from Juniper Networks.

Table 133: Supported Three-Phase Wye AC Wire Gauge

Wire Gauge	Description
5 x 10-AWG or equivalent	5 conductor wires, each wire is 10-AWG

> **NOTE**: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring will result in the cable clamps not tightening properly.

> ⚡ **WARNING**: Power connections must be performed by a licensed electrician only.

15. Verify that the power cord wire connections are correct.

16. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

17. Reinstall the metal PDM wiring cover, and using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

18. Verify that the AC power cord is not touching or blocking access to router components, and that it does not drape where people could trip on it.

19. Remove the ESD grounding strap from the ESD points on the chassis. Connect the strap to an approved site ESD grounding point. See the instructions for your site.

20. Connect the AC power cord plug to the power source.

21. Switch on the customer-site circuit breakers to provide voltage on the AC power cord.

22. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

23. Verify that the LED on the PDM faceplate is lit steadily, indicating that the AC terminal block is receiving power.

RELATED DOCUMENTATION

MX2000 Three-Phase AC Power Electrical Safety Guidelines | 653

Connecting AC Power to an MX2000 Router with Three-Phase Wye AC Power Distribution Modules

MX2000 Three-Phase Wye AC Power Distribution Module Description

MX2000 Three-Phase Delta and Wye AC Power Distribution Module LEDs

Troubleshooting the MX2000 Router Power System | 585

Replacing an MX2008 Three-Phase Wye AC Power Cord

IN THIS SECTION

- Removing an MX2008 Three-Phase Wye AC Power Cord | 532
- Installing an MX2008 Three-Phase Wye AC Power Cord | 535

The MX2008 router has either one redundant PDM or two redundant PDMs. An AC power supply cord on a redundant PDM is hot-insertable and hot-removable. When a redundant PDM is powered down, the other PDM automatically assumes the entire electrical load for the router. If you have only one PDM, you must power off the system before removing the AC power supply cord.

Removing an MX2008 Three-Phase Wye AC Power Cord

To remove a three-phase wye AC power cord:

1. Switch off the customer-site circuit breakers to the PDM being removed. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.

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 PSM faceplate to the off (**O**) position.

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

4. Remove the ESD grounding strap from the ESD point on the chassis, and attach it to an approved site ESD grounding point. See the instructions for your site.

5. Disconnect the AC power cord (see Figure 24) from the power source.

Figure 239: Three-Phase Wye AC Power Supply Cord
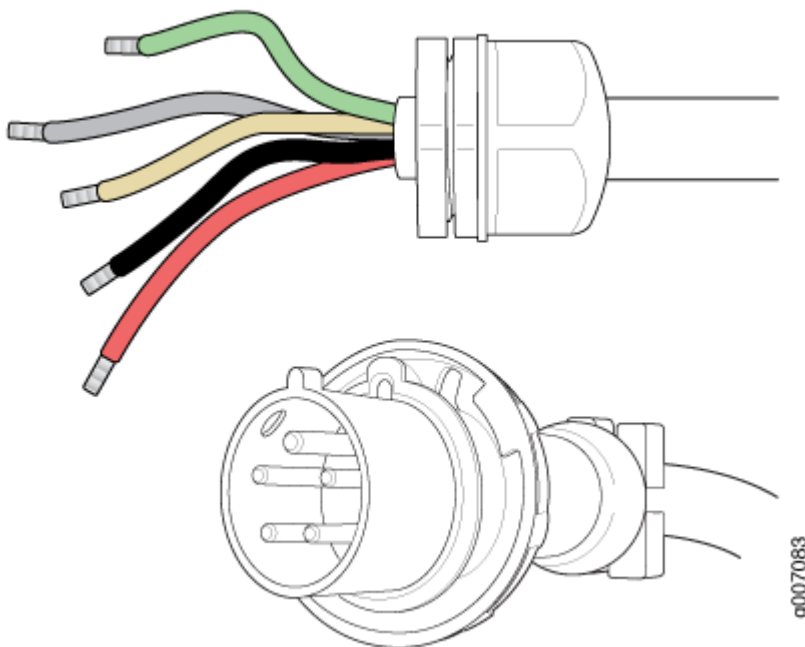
6. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

7. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

8. Remove the cover of the metal AC wiring compartment.

9. Disconnect the wires from the AC terminal block on the three-phase wye AC PDM (see Figure 25). Loosen each of the input terminals or grounding point screws, and remove each wire from the grounding point or input terminal.

> **NOTE**: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

To remove wires from the terminal block that serves six PSMs:

a. Remove the wire labeled **N** from the input terminal labeled **N1**.

b. Remove the wire labeled **L3** from the input terminal labeled **C1**.

c. Remove the wire labeled **L2** from the input terminal labeled **B1**.

d. Remove the wire labeled **L1** from the input terminal labeled **A1**.

e. Remove the grounding wire from the grounding point labeled **GND**.

Figure 240: Disconnecting the Power Cord from a Three-Phase Wye AC Power Distribution Module

To remove wires from the terminal block that serves three PSMs:

a. Remove the wire labeled **N** from the input terminal labeled **N2**.

b. Remove the wire labeled **L3** from the input terminal labeled **C2**.

c. Remove the wire labeled **L2** from the input terminal labeled **B2**.

d. Remove the wire labeled **L1** from the input terminal labeled **A2**.

e. Remove the grounding wire from the grounding point labeled **GND**.

> **NOTE**: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

10. Loosen the plastic cable tie fastening the AC power cord to the PDM.

11. Loosen and remove the retaining nut from the AC power cord.

12. Pull the AC power cord out of the metal wiring compartment.

13. Carefully move the AC power cable out of the way.

14. Disconnect the AC power cord from the AC PDM.

Installing an MX2008 Three-Phase Wye AC Power Cord

To install a three-phase wye AC power cord:

1. Switch off the customer-site circuit breakers to the PDM being removed. Make sure that the voltage across the AC power source cord is 0 V and that there is no chance that the cord might become active during the installation process.

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 all the power switches on the PSM faceplates to the off (**O**) position.

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

4. Using a number 2 Phillips (+) screwdriver, loosen the four screws on the cover of the metal wiring compartment that protects the AC terminal block.

5. Remove the cover of the metal AC wiring compartment.

6. Unscrew the retaining nut from the AC power cord.

7. Place the retaining nut inside the metal wiring compartment.

8. Insert the wires of the AC power cord through the hole of the metal wiring compartment.

9. Screw the retaining nut onto the AC power cord to secure it to the metal wiring compartment.

10. Connect the wires to the AC terminal block on the three-phase delta AC PDM (see Figure 241 on page 536). Loosen each of the input terminal or grounding point screws, insert the wire into the grounding point or input terminal, and tighten the screw (see Table 134 on page 537 for approved AC wire gauge).

   To insert wires into the terminal block that serves six PSMs:

   a. Insert the grounding wire into the grounding point labeled **GND**.

   b. Insert the wire labeled **L1** into the input terminal labeled **A1**.

   c. Insert the wire labeled **L2** into the input terminal labeled **B1**.

   d. Insert the wire labeled **L3** into the input terminal labeled **C1**.

   e. Insert the wire labeled **N** into the input terminal labeled **N1**.

Figure 241: Connecting Power to a Three-Phase Wye AC Power Distribution Module

> **NOTE**: The three-phase wye AC PDM terminal blocks will be flipped depending on which slot the PDM gets plugged into.

> **NOTE**: The color of each AC power wire might vary. The MX2008 chassis is not sensitive to phase rotation sequence—either CW or CCW will operate correctly.

> ⚠ **CAUTION**: Wire label configuration is for Juniper Networks supplied cable only. If using your own cable, make sure you use the proper connections.

To insert wires into the terminal block that serves three PSMs:

a. Insert the grounding wire into the grounding point labeled **GND**.

b. Insert the wire labeled **L1** into the input terminal labeled **A2**.

c. Insert the wire labeled **L2** into the input terminal labeled **B2**.

d. Insert the wire labeled **L3** into the input terminal labeled **C2**.

e. Insert the wire labeled **N** into the input terminal labeled **N2**.

NOTE: The terminal connections have either slotted screws or hex screws. Use a 1/4-in. slotted screwdriver for the slotted screws. Use a 5/32-in. (4 mm) Allen wrench for the 5/16-in. hex screws.

WARNING: To protect power supplies from input voltage that might be caused by mis-wired PDMs, before reinstalling the metal cover to the wiring compartment, apply AC voltage to the PDM (with disengaged PSM) to make sure that two LEDs on the PDM are lit green and that the AC voltage between AC terminal blocks A1-N1, B1-N1, C1-N1, A2-N2, B2-N2, and C2-N2 for three-phase wye PDM is not more than 264 VAC when measured with a digital voltage meter (DVM). Then turn off the AC breaker, de-energizing the PDM, and install the metal cover and engage all AC PSMs.

NOTE: Three-phase wye AC wire assembly kits can be purchased from Juniper Networks.

Table 134: Supported Three-Phase Wye AC Wire Gauge

Wire Gauge	Description
5 x 10-AWG or equivalent	5 conductor wires, each wire is 10-AWG

NOTE: We recommend that you use the proper gauge wire in order for the cable clamps to hold the AC cables. Using smaller gauge wiring will result in the cable clamps not tightening properly.

WARNING: Power connections must be performed by a licensed electrician only.

11. Verify that the power cord wire connections are correct.

12. Reinstall the metal PDM wiring cover, and using a number 2 Phillips (+) screwdriver, tighten the four captive screws on the metal AC wiring compartment.

13. Verify that the AC power cord does not touch or block access to router components, and that it does not drape where people could trip on it.

14. Remove the ESD grounding strap from the ESD points on the chassis. Connect the strap to an approved site ESD ground point. See the instructions for your site.

15. Connect the AC power cord plug to the power source.

16. Switch on the customer-site circuit breakers to provide voltage to the AC power cord.

17. Remove the ESD grounding strap from the approved site ESD grounding point. See the instructions for your site. Reconnect the strap to one of the ESD points on the chassis.

18. Verify the LED on the PDM faceplate is lit steadily, indicating that the AC terminal block is receiving power.

19. Switch the power switch on the PSM to the on (|) position to provide power to the router components.

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

RELATED DOCUMENTATION

Replacing an MX2008 DC Power Supply Module (-48 V)

IN THIS SECTION

Removing an MX2008 DC Power Supply Module (-48 V)

Before you remove a PSM, be aware of the following:

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

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

To remove a DC PSM (see Figure 27):

> **NOTE**: The DC PSM is hot-swappable, with a minimum number of PSMs installed.

1. With one PSM installed and operational, remove any additional PSM by turning the power switch to the off (**O**) position.
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. Loosen the two captive screws on the PSM faceplate.
4. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the PSM away from the chassis.
5. Pull the PSM straight out of the chassis.

> ⚡ **WARNING**: Do not touch the power connectors on back of the PSM. They can get damaged.

6. Place the PSM module into an antistatic bag.

> **NOTE**: Each PSM slot not occupied by a DC PSM must be covered by a PSM blank panel.

Figure 242: Removing a DC Power Supply Module (-48 V) from the MX2008 Router
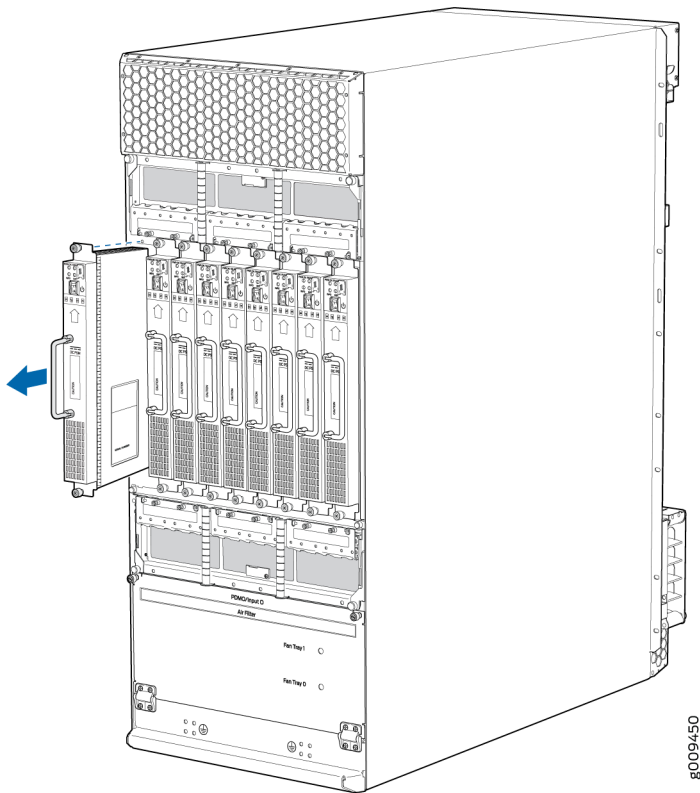
Installing an MX2008 DC Power Supply Module (-48 V)

Before you install a PSM, be aware of the following:

NOTE: The DC PSM is hot-swappable when a minimum number of PSMs installed and operational.

WARNING: The DC PSMs have no circuit breakers that can physically disconnect DC line from the router. After DC feeds have been connected to the PDM, the DC voltage is always present on the power midplane and is distributed to the PSM connectors on the power midplane.

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

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

To install a DC PSM (see):

1. With one PSM installed and operational, install an additional PSM with the power supply switch in the off (**O**) or in the on (**|**) position.

> ⚠️ **CAUTION**: If there is only one PSM installed and operational, the power supply switch must be placed in the off (**O**) position.

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. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the power supply module into the chassis.

4. Tighten the captive screws on the PSM faceplate.

5. Turn on the power switch to the on (**|**) position.

6. Verify that the **PWR OK** LED is lit steadily green.

Figure 243: Installing a DC Power Supply Module
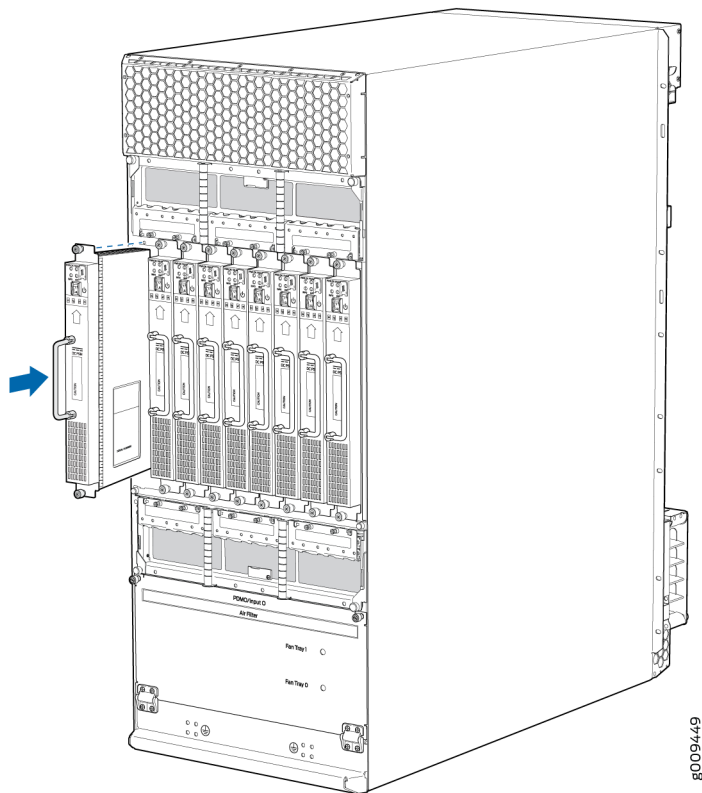
RELATED DOCUMENTATION

MX2008 DC Power Supply Module (-48 V) Description **| 106**

MX2008 DC Power Requirements **| 113**

MX2008 DC Power (-48 V) System Electrical Specifications **| 125**

MX2008 DC Power Distribution Description (-48 V) **| 121**

Preventing Electrostatic Discharge Damage to an MX2008 Router **| 628**

MX2008 DC Power Electrical Safety Guidelines **| 655**

Replacing an MX2008 DC Power Distribution Module Cable (-48 V)

Disconnecting an MX2008 DC Power Distribution Module Cable

> ⚠️ **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

To disconnect a power cable for a DC PDM:

1. Switch off the dedicated customer-site circuit breaker for the PDM being removed. Follow your site's procedures for ESD.

2. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active during the removal process.

3. Verify that the **−48V** LED on the PDM is not lit.

4. Remove the power cable from the external DC power source.

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

6. Remove the clear plastic cover protecting the terminal studs on the faceplate.

7. Remove the nut and washers from each of the terminal studs. (Use a 7/16-in. [11 mm] nut driver or socket wrench.)

8. Remove the cable lug from the terminal studs.

9. Carefully move the power cable out of the way.

10. Replace the clear plastic cover protecting the terminal studs on the faceplate.

Connecting an MX2008 DC Power Distribution Module Cable (-48 V)

> ⚡ **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

To connect a power cable for a DC PDM:

1. Locate a replacement power cable that meets the specifications defined in "MX2008 DC Power (-48 V) System Electrical Specifications" on page 125.
2. Verify that a licensed electrician has attached a cable lug to the replacement power cable.
3. Verify that the **–48V** LED is off.
4. Secure the power cable lug to the terminal studs, first with the flat washer, then with the split washer, and finally with the nut. Apply between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) of torque to each nut (see Figure 244 on page 545). Do not overtighten the nut. (Use a 7/16-in. [11 mm)] torque-controlled driver or socket wrench.)

> ⚠ **CAUTION**: Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the nuts. Ensure that each nut is properly threaded onto the terminal stud. The nut should be able to spin freely with your fingers when it is first placed onto the terminal stud. Applying installation torque to the nut when the nut is improperly threaded might result in damage to the terminal stud.

> ⚠ **CAUTION**: The maximum torque rating of the terminal studs on the DC PDM is 25 lb-in. (33.89 Nm). The terminal studs might be damaged if excessive torque is applied. Use only a torque-controlled driver or socket wrench to tighten nuts on the DC PDM terminal studs.

Figure 244: Connecting Power Cables to the DC Power Distribution Module

5. Route the positive and negative DC power cables through the plastic cable restraint cover. Make sure that the cable does not touch or obstruct any router components.

6. Verify that the DC power 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.

7. Attach the power cable to the DC power source.

8. Turn on the dedicated customer-site circuit breaker to the PDM.

9. Verify that the **–48V** LED on the PDM is lit steadily.

10. On each of the DC power input sources, switch the DC circuit breaker to the center position before moving it to the **ON** position.

> **NOTE**: The circuit breaker might bounce back to the **OFF** position if you move the breaker too quickly.

Observe the status LEDs on the PDM faceplate. If the PDM is correctly installed and functioning normally, the **–48V** LEDs light green steadily.

Replacing an MX2000 DC Power Supply Module (240 V China)

IN THIS SECTION

Removing an MX2000 Router DC Power Supply Module (240 V China)

Before you remove a PSM, be aware of the following:

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

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

To remove a DC PSM (see and):

> **NOTE**: The minimum number of DC PSMs change, based on the configuration.

1. With one PSM installed and operational, remove any additional PSM by turning the power switch to the off (**O**) position.
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. Loosen the two captive screws on the PSM faceplate. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.
4. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the PSM away from the chassis.
5. Pull the PSM straight out of the chassis.

> ⚠ **WARNING**: To avoid damage, do not touch the power connectors in back of the PSM.

6. Place the PSM module into an antistatic bag.

> **NOTE**: Each PSM slot not occupied by a DC PSM must be covered by a PSM blank panel.

Figure 245: Removing an MX2000 Router DC Power Supply Module (240 V China)
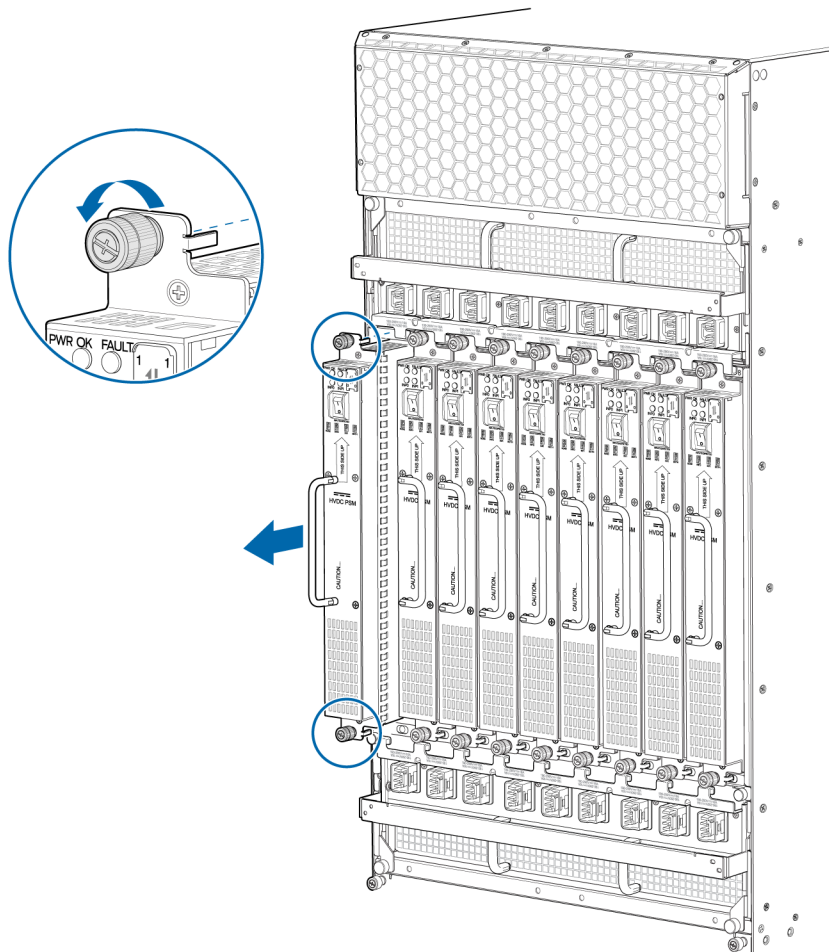
SEE ALSO

Installing an MX2000 Router DC Power Supply Module (240 V China)

Before you install a DC PSM (240 V China), be aware of the following:

> **NOTE**: The DC PSM is hot-swappable when a minimum number of PSMs installed and operational.

WARNING: The DC PSMs have no circuit breakers that can physically disconnect DC current from the router. After DC feeds have been connected to the PDM, the DC voltage is always present on the power midplane and is distributed to the PSM connectors on the power midplane.

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

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

To install a DC PSM (see Figure 246 on page 550):

1. With one PSM installed and operational, install an additional PSM with the power supply switch in the off (**O**) or in the on (**|**) position.

CAUTION: If there is only one PSM installed and operational, the power supply switch must be placed in the off (**O**) position.

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. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the power supply module into the chassis.
4. Tighten the captive screws on the PSM faceplate. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.
5. Turn on the power switch to the on (**|**) position.
6. Verify that the **PWR OK** LED is lit steadily green.

Figure 246: Installing a DC Power Supply Module (240 V China)
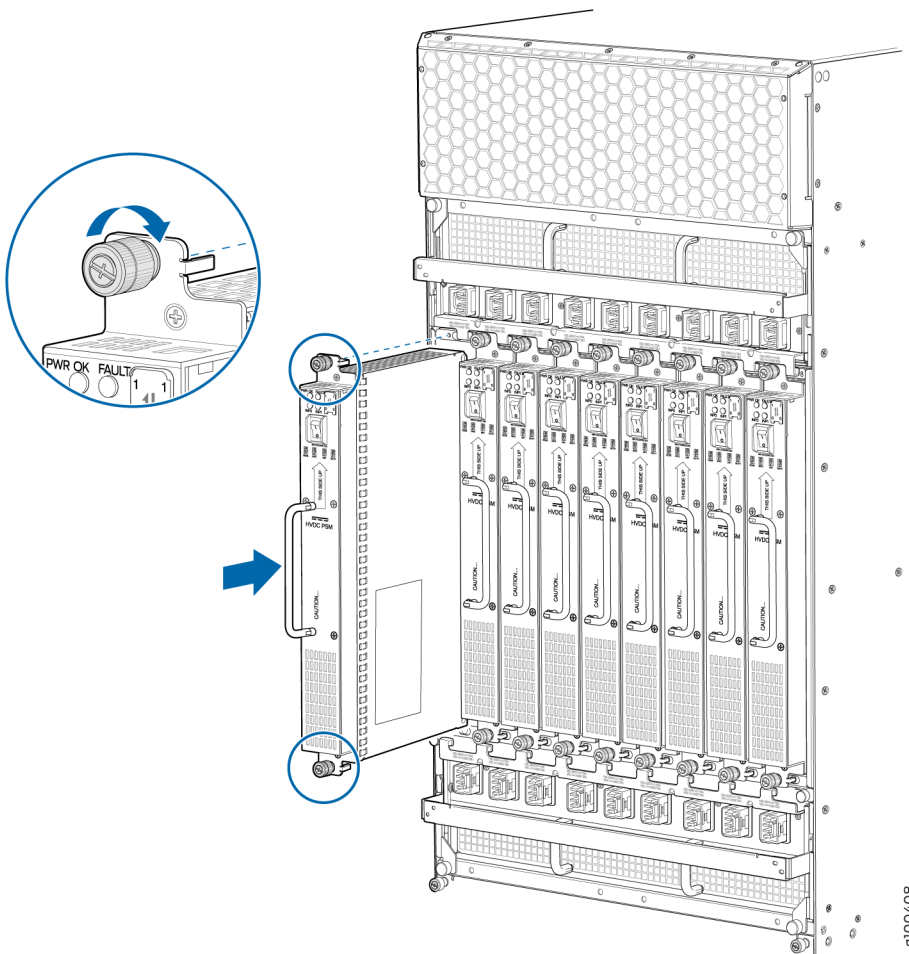
RELATED DOCUMENTATION

Preventing Electrostatic Discharge Damage to an MX2020 Router

Powering Off the DC-Powered or DC-Powered (240 V China) MX2000 Router

Troubleshooting the MX2000 Router Power System | **585**

Maintaining the Power Supply Modules on the MX2000 Line of Routers

MX2020 DC Power Distribution (240 V China) Description

MX2020 DC Power Electrical Safety Guidelines

Replacing an MX2000 DC Power Distribution Module (240 V China)

Removing an MX2000 Router DC Power Distribution Module (240 V China)

Before you remove a PDM, be aware of the following:

> **NOTE**: The minimum number of PDMs must be present in the router at all times.

> **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

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

> **NOTE**: After powering off a PDM, wait at least 60 seconds before turning the circuit breaker back on.

1. Switch off the dedicated customer site circuit breaker for the PDM being removed. Follow your site's procedures for ESD.
2. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Verify that the LEDs on the PDM to be removed are not lit.

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

5. Move the DC circuit breaker on the power input source to the **OFF** position.

6. Starting at one end of the PDM, unplug all the power cords. Press the latch on the side of the power cable before pulling it out. See Figure 247 on page 552.

Figure 247: Unplugging the 240 V China Power Cord an MX2000 Router
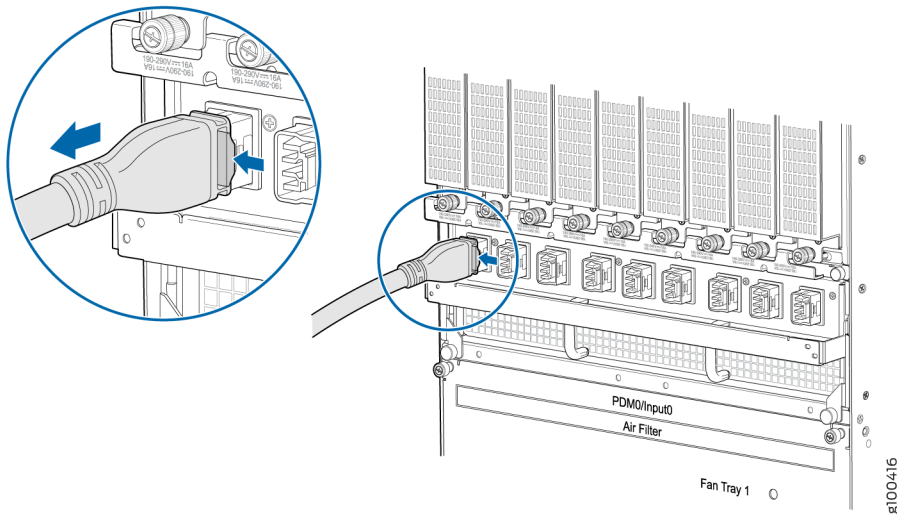
7. Loosen the two captive screws on the locking levers, and pull away from the chassis. See Figure 248 on page 553.

> **NOTE**: For the MX2020 Router, pull down the **PDM3/Input1** and **PDM1/Input1** locking levers to release the PDM from the chassis, and pull up the **PDM0/Input0** and **PDM2/Input0** locking levers to release the PDM from the chassis.

> **NOTE**: For the MX2010 and MX2008 Routers, pull down the **PDM1/Input1** locking levers to release the PDM from the chassis, and pull up the **PDM0/Input0** locking levers to release the PDM from the chassis.

Figure 248: Removing a DC PDM (240 V China) from an MX2000 Router
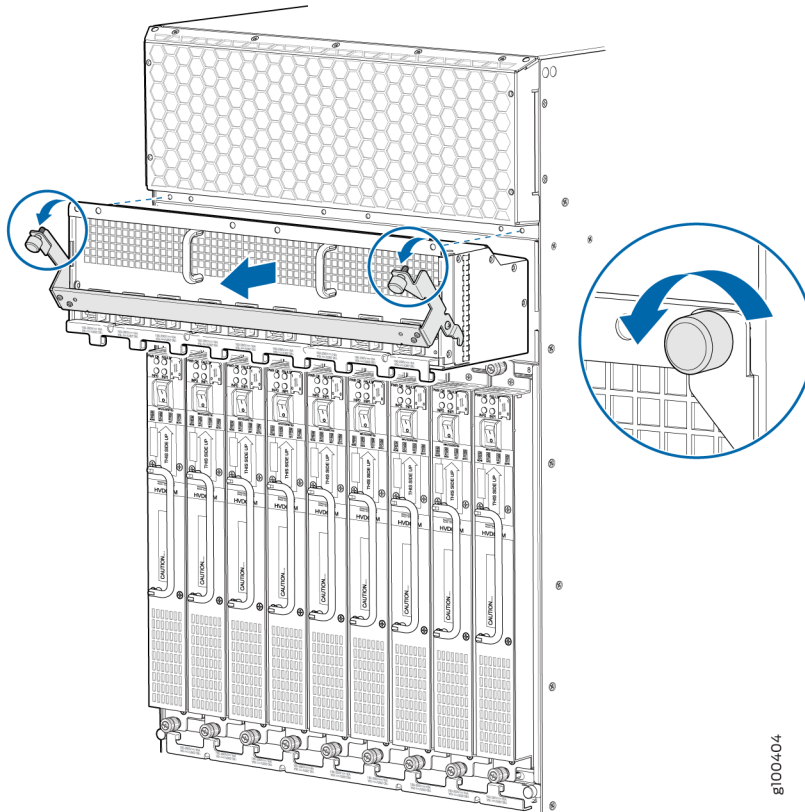
8. The PDM is extended slightly away from the chassis. See Figure 248 on page 553.

9. With both hands, grasp the two handles and gently pull the PDM straight out of the chassis.

> ⚠ **CAUTION**: Do not touch the power connectors on the back of the PDM. It can get damaged.

> **NOTE**: Each PDM slot not occupied by a DC PDM must be covered by a PDM blank panel.

10. Place the PDM onto an antistatic mat or into a ESD bag.

Installing an MX2000 Router DC Power Distribution Module (240 V China)

> ⚡ **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is off, locate the circuit breaker on the panel board that services

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

To install a DC power distribution module (PDM) in an MX2000 Router:

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

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

3. Move the DC circuit breaker on the power input source to the off position.

4. [Optional]—If you are switching from an AC PDM to DC PDM, see *Converting an MX2000 Router Between AC and DC Power* for instructions on how to change the setting on the internal bar of the power distribution unit (PDU) cage to DC.

5. Remove the blank panel covering the PDM slot in the chassis.

6. Open the locking levers on the PDM.

7. While holding both handles, guide the PDM until the locking levers are inserted into the chassis. With both hands push the locking levers simultaneously until the PDM is fully seated into the chassis (see).

Figure 249: Installing an MX2020 Router DC Power Distribution Module (240 V China)
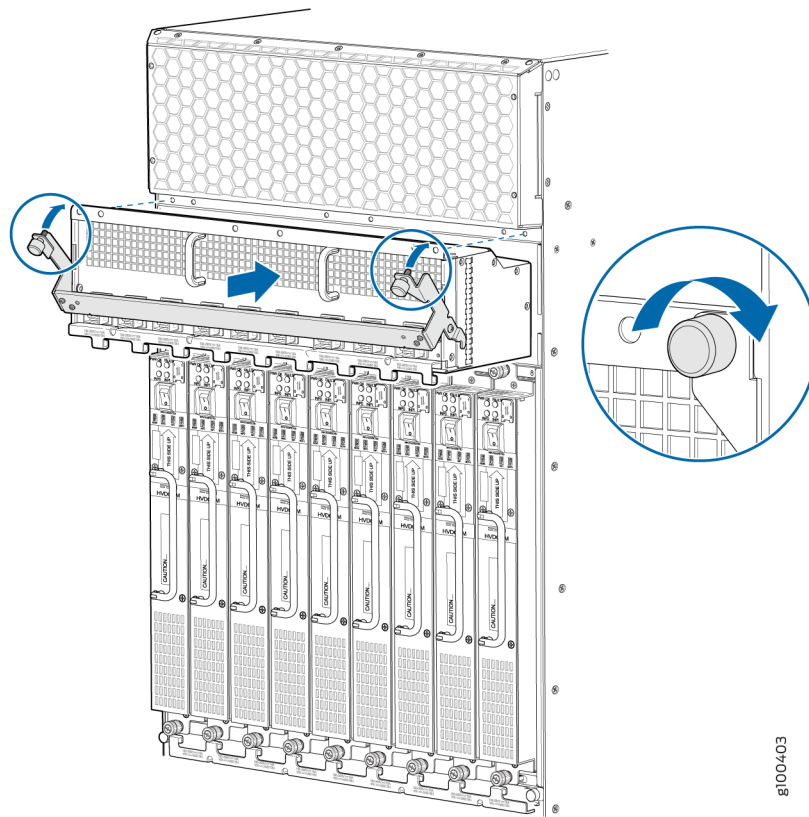
8. Tighten both captive screws on the PDM. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.

9. Starting at one end of the PDM, plug the power cords into the power sockets on the PDM. Press the latch on the side of the power cable before pushing it in. Apply slight pressure so that the power cord is firmly seated in the power socket until you feel it engage. As you plug in each power cord, the power LED for the socket lights up green. See Figure 250 on page 556.

Figure 250: Plugging the 240 V China Power Cord an MX2000 Router

Connecting an MX2000 DC Router Power Distribution Module (240 V China) Cable

> ⚠ **WARNING**: Before performing DC power procedures, disconnect all power sources. To ensure that all power is **OFF**, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

To connect the DC (240 V China) source power cables (CBL-PWR-240V-CH) to the router:

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

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

> **NOTE**: If the DC PSMs (240 V China) are installed in the router, make sure the power switches on all PSMs are turned to the off (**O**) position.

3. Plug the power cord into the power sockets on the DC PDM (240 V China). Refer to Figure 1. Press the latch on the side of the power cable before pushing it in. Apply slight pressure so that the power cord is firmly seated in the power socket until you feel it engage. As you plug in each power cord, the power LED for the socket lights up green.

Figure 251: Connecting Power
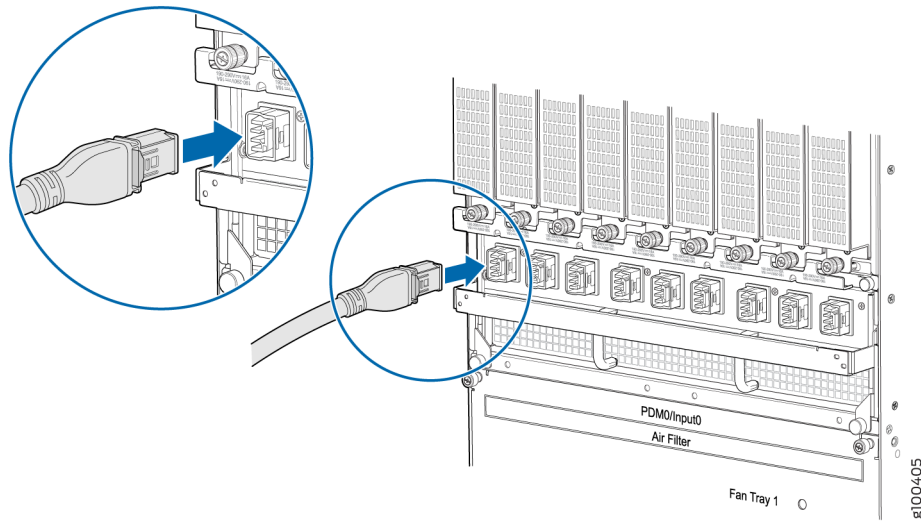
4. Connect the power cords for the remaining PDMs.

5. Connect the power cable (CBL-PWR-240V-CH) to the DC power source. See .

Figure 252: 240 V China Power Cable
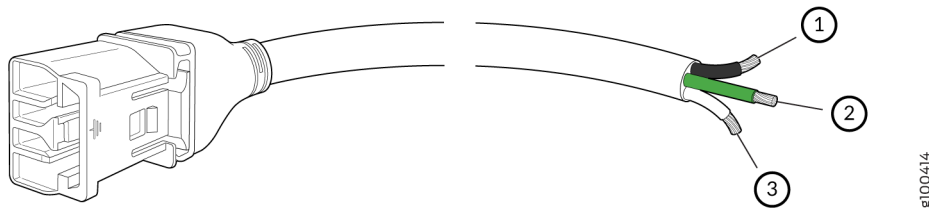
1–	Negative	3–	Positive
2–	Ground		

6. Switch on the dedicated customer site circuit breaker.

7. On each of the DC power input sources, switch the DC circuit breaker to the center position before moving it to the **ON** position.

> **NOTE**: The circuit breaker may bounce back to the off position if you move the breaker too quickly.

8. Observe the status LEDs on the PDM faceplate. If the PDM is correctly installed and functioning normally, the LEDs light green steadily.

9. On each of the DC PSMs, move the switch to the on (|) position.

Powering Off the DC-Powered or DC-Powered (240 V China) MX2000 Router

MX2008 Router DC (240 V China) System Electrical Specifications | **127**

Troubleshooting the MX2000 Router Power System | **585**

Preventing Electrostatic Discharge Damage to an MX Series Router

Replacing an MX2000 High-Voltage Second-Generation Universal (HVAC/HVDC) Power Supply Module

IN THIS SECTION

- Removing an MX2000 Router High-Voltage Second-Generation Universal (HVAC/HVDC) Power Supply Module | **558**
- Installing an MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Supply Module | **562**

Removing an MX2000 Router High-Voltage Second-Generation Universal (HVAC/HVDC) Power Supply Module

Before you remove a PSM, be aware of the following:

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

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

To remove a universal HVAC/HVDC PSM (see Figure 38, Figure 39, and Figure 40):

> **NOTE**: The minimum number of PSMs change, based on the configuration.

1. With one PSM installed and operational, remove any additional PSM by turning the power switch to the off (**O**) position.
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. Loosen the two captive screws on the PSM faceplate. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.
4. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the PSM away from the chassis.
5. Pull the PSM straight out of the chassis.

> ⚡ **WARNING**: To avoid damage, do not touch the power connectors in back of the PSM.

6. Place the PSM module into an antistatic bag.

> **NOTE**: Each PSM slot not occupied by a universal (HVAC/HVDC) PSM must be covered by a PSM blank panel.

Figure 253: Removing an MX2020 Router Universal (HVAC/HVDC) Power Supply Module

g100855
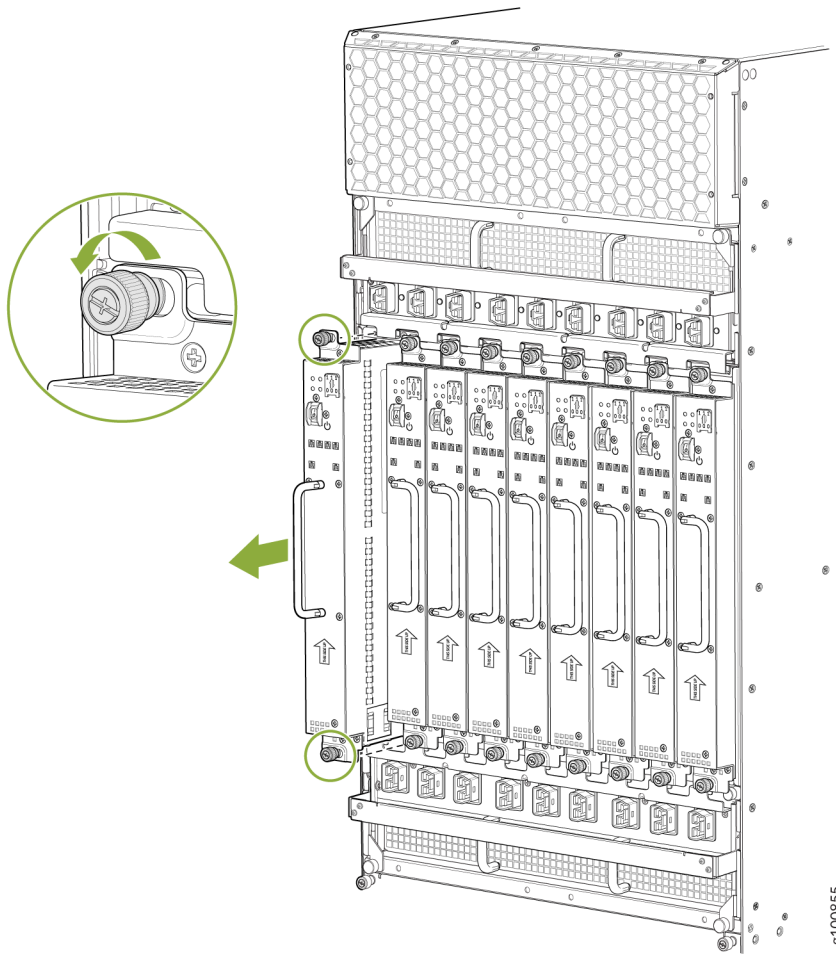
Figure 254: Removing an MX2010 Router Universal (HVAC/HVDC) Power Supply Module

g008175
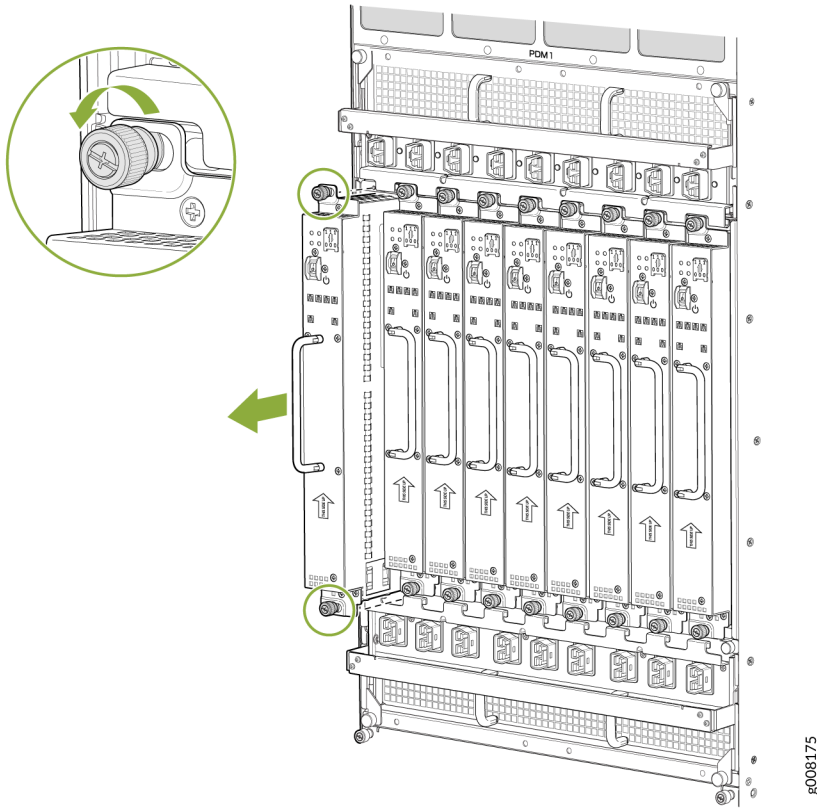
Figure 255: Removing an MX2008 Router Universal (HVAC/HVDC) Power Supply Module
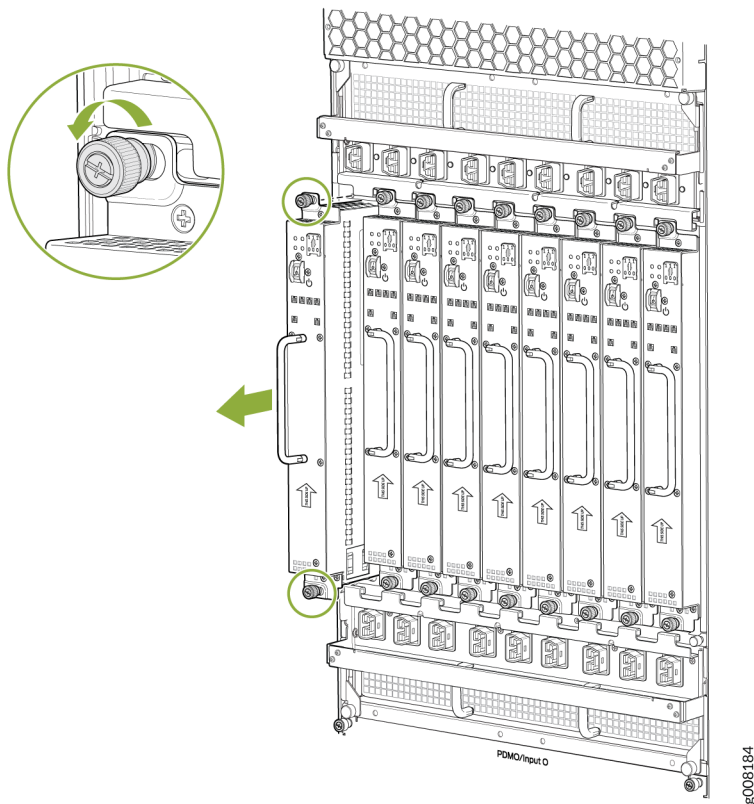
SEE ALSO

MX2020 DC Power Supply Module (-48 V) Description

MX2010 DC Power Supply Module (-48 V) Description

Installing an MX2020 DC Power Supply Module (-48 V)

Installing an MX2010 DC Power Supply Module (-48 V)

Installing an MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Supply Module

Before you install a universal (HVAC/HVDC) PSM, be aware of the following:

NOTE: The universal (HVAC/HVDC) PSM is hot-swappable when a minimum number of PSMs installed and operational.

Depending on whether you are connecting to AC or DC power, these warnings apply to the universal HVAC/HVDC power distribution module (PDM):

> **WARNING**: The DC PSMs have no circuit breakers that can physically disconnect DC current from the router. After DC feeds have been connected to the PDM, the DC voltage is always present on the power midplane and is distributed to the PSM connectors on the power midplane.

> **WARNING**: The AC PSMs have no circuit breakers that can physically disconnect AC current from the router. After AC feeds have been connected to the PDM, the AC voltage is always present on the power midplane and is distributed to the PSM connectors on the power midplane.

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

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

To install a universal (HVAC/HVDC) PSM (see , , and):

1. With one PSM installed and operational, install an additional PSM with the power supply switch in the off (**O**) or in the on (**|**) position.

   > **CAUTION**: If there is only one PSM installed and operational, the power supply switch must be placed in the off (**O**) position.

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. While grasping the handle on the PSM faceplate with one hand, use your other hand to guide the power supply module into the chassis.

4. Tighten the captive screws on the PSM faceplate. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.

5. Turn on the power switch to the on (**|**) position.

6. Verify that the **PWR OK** LED is lit steadily green.

Figure 256: Installing an MX2020 Router Universal (HVAC/HVDC) Power Supply Module
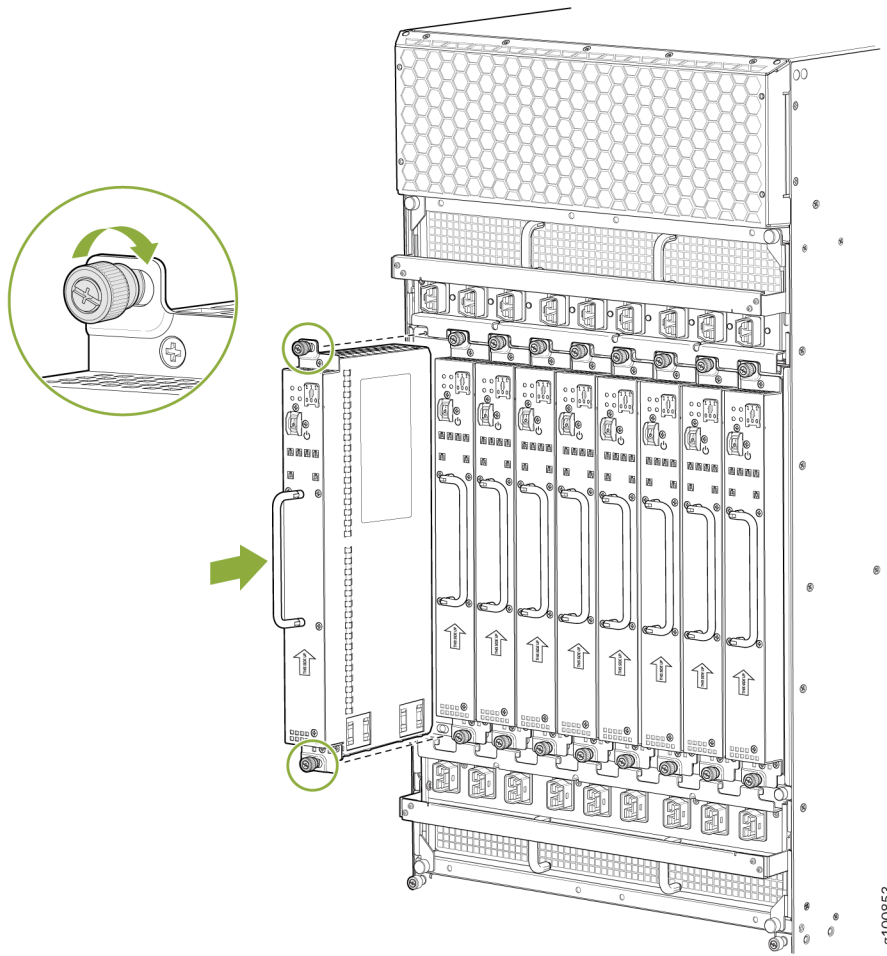
Figure 257: Installing an MX2010 Router Universal (HVAC/HVDC) Power Supply Module
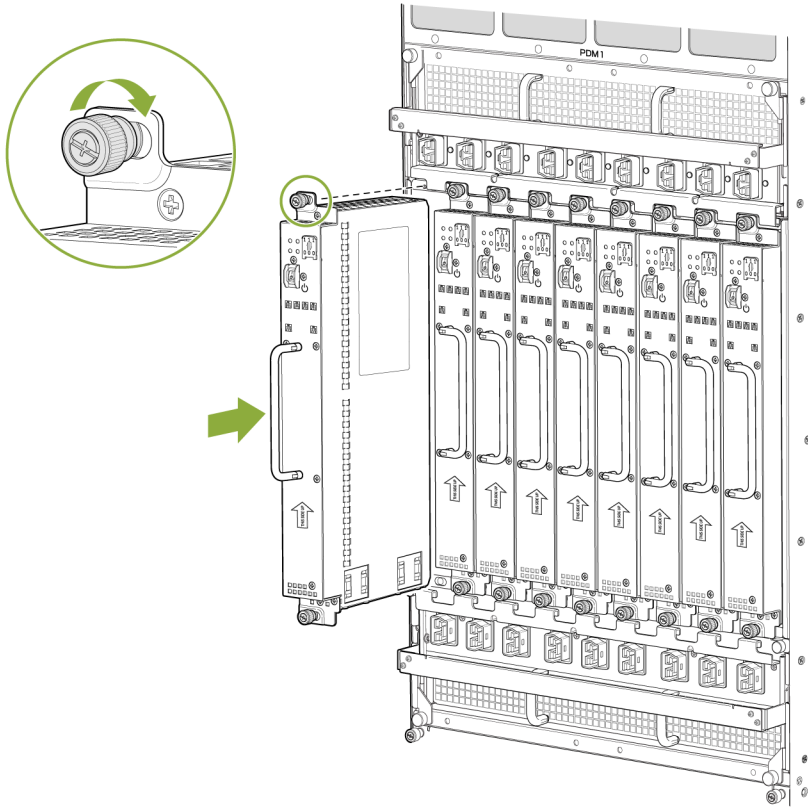
g008176

Figure 258: Installing an MX2008 Router Universal (HVAC/HVDC) Power Supply Module
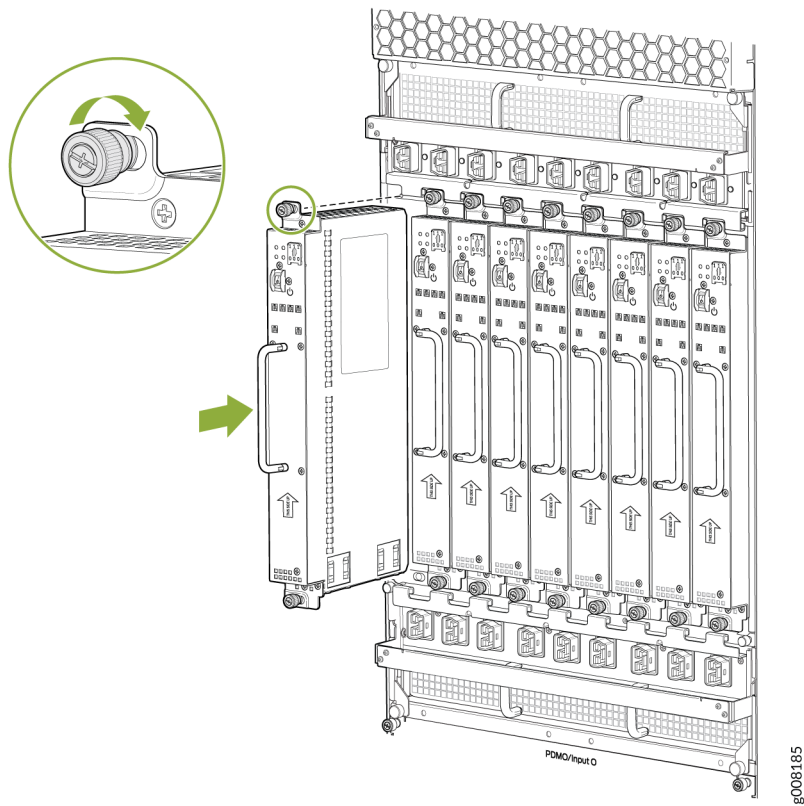
RELATED DOCUMENTATION

Preventing Electrostatic Discharge Damage to an MX2020 Router

Troubleshooting the MX2000 Router Power System | 585

Maintaining the Power Supply Modules on the MX2000 Line of Routers

Replacing an MX2000 High-Voltage Universal (HVAC/HVDC) Power Distribution Module

Installing an MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Distribution Module

Depending on whether you are connecting to AC or DC power, these warnings apply to the universal HVAC/HVDC power distribution module (PDM):

WARNING: Before performing DC power procedures, disconnect all power sources. 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.

WARNING: Before performing AC power procedures, disconnect all power sources. To ensure that all power is **OFF**, locate the circuit breaker on the panel board that services the AC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

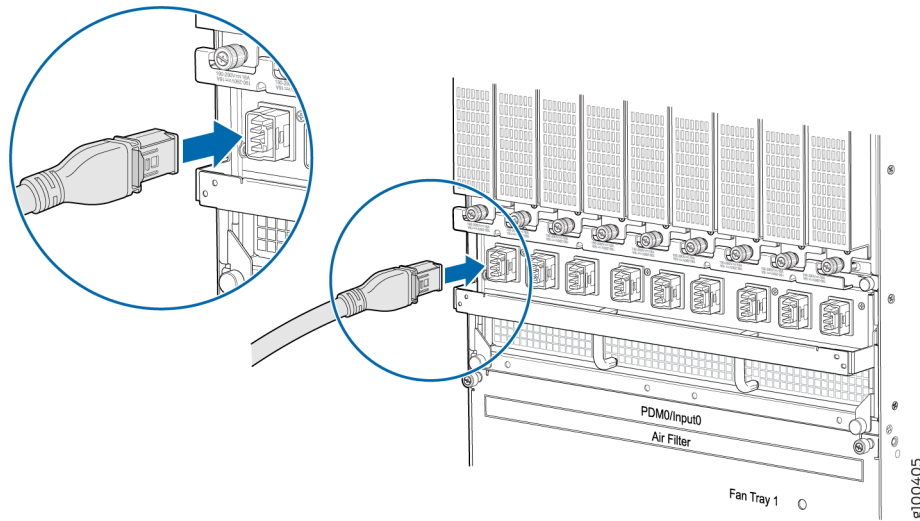To install a universal HVAC/HVDC power distribution module (PDM) in an MX2000 Router:

1. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
3. Move the DC circuit breaker on the power input source to the off position.

4. [Optional]—If you are switching from an AC PDM or 48V DC PDM to a universal PDM, the universal HVAC/HVDC PSMs and PDMs work with either AC or DC bar setting, see *Converting an MX2000 Router Between AC and DC Power* for details.

5. Remove the blank panel covering the PDM slot in the chassis.

6. Open the locking levers on the PDM.

7. While holding both handles, guide the PDM until the locking levers are inserted into the chassis. With both hands push the locking levers simultaneously until the PDM is fully seated into the chassis (see Figure 44).

Figure 259: Installing an MX2000 Router Universal (HVAC/HVDC) Power Distribution Module
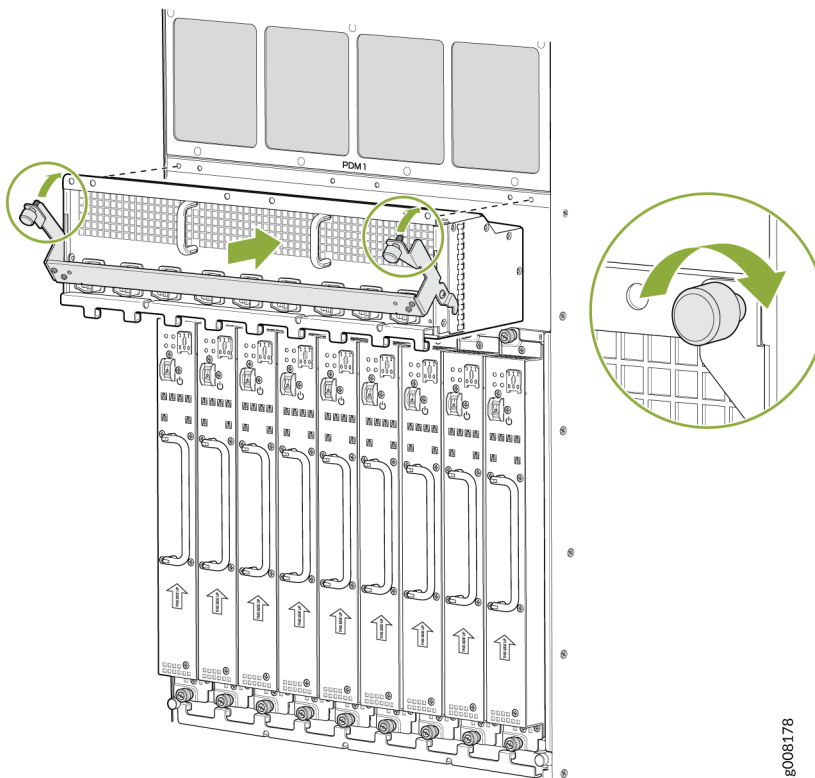
8. Tighten both captive screws on the PDM. Apply between 10 lb-in. (1.13 Nm) to 12 lb-in. (1.35 Nm) of torque to each screw. Do not overtighten the screws.

9. Starting at one end of the PDM, plug the power cords into the power sockets on the PDM. Press the latch on the side of the power cable before pushing it in. Apply slight pressure so that the power cord is firmly seated in the power socket until you feel it engage. As you plug in each power cord, the power LED for the socket lights up green. See Figure 45.

Figure 260: Plugging the Universal (HVAC/HVDC) Power Cord an MX2000 Router
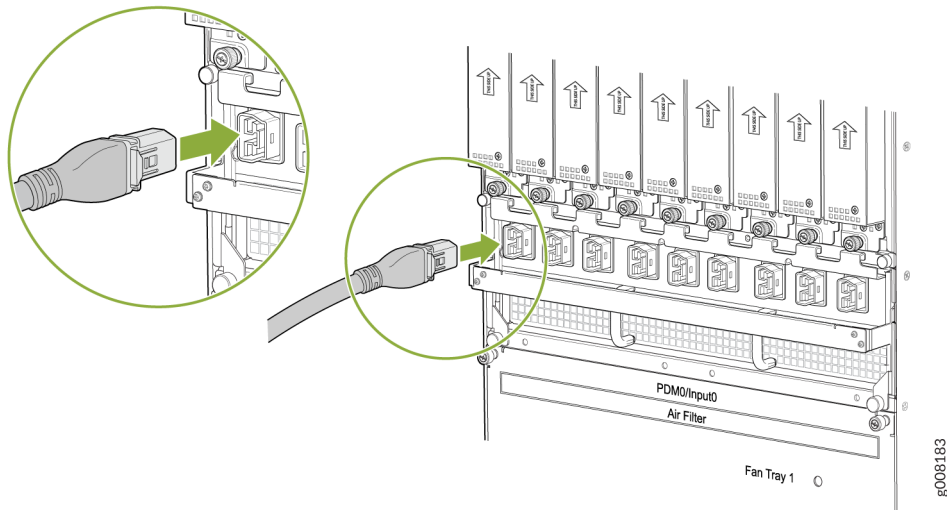
Removing an MX2000 Router High-Voltage Second Generation Universal (HVAC/HVDC) Power Distribution Module

Before you remove a PDM, be aware of the following:

NOTE: The minimum number of PDMs must be present in the router at all times while it is operating.

Depending on whether you are connecting to AC or DC power, these warnings apply to the universal HVAC/HVDC power distribution module (PDM):

WARNING: Before performing DC power procedures, disconnect all power sources. 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.

NOTE: These warnings apply to the HVAC/HVDC universal PDM:

WARNING: Before performing AC power procedures, disconnect all power sources. To ensure that all power is **OFF**, locate the circuit breaker on the panel board that services

the AC circuit, switch the circuit breaker to the **OFF** position, and tape the switch handle of the circuit breaker in the **OFF** position.

WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

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

NOTE: After powering off a PDM, wait at least 60 seconds before turning the circuit breaker back on.

1. Switch off the dedicated customer site circuit breaker for the PDM being removed. Follow your site's procedures for ESD.
2. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Verify that the LEDs on the PDM to be removed are not lit.
4. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
5. Move the AC or DC circuit breaker on the power input source to the **OFF** position.
6. Starting at one end of the PDM, unplug all the power cords. Press the latch on the side of the power cable before pulling it out. See Figure 46.

Figure 261: Unplugging the Universal HVAC/HVDC Power Cord an MX2000 Router
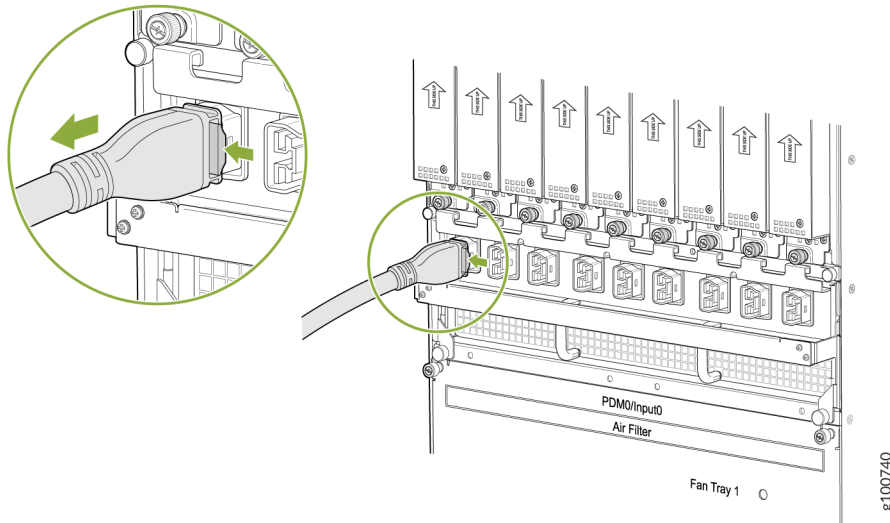
7. Loosen the two captive screws on the locking levers, and pull away from the chassis. See .

> **NOTE**: For the MX2020 Router, pull down the **PDM3/Input1** and **PDM1/Input1** locking levers to release the PDM from the chassis, and pull up the **PDM0/Input0** and **PDM2/Input0** locking levers to release the PDM from the chassis.

> **NOTE**: For the MX2010 and MX2008 Routers, pull down the **PDM1/Input1** locking levers to release the PDM from the chassis, and pull up the **PDM0/Input0** locking levers to release the PDM from the chassis.

Figure 262: Removing a Universal (HVAC/HVDC) PDM from an MX2020 Router

g100854
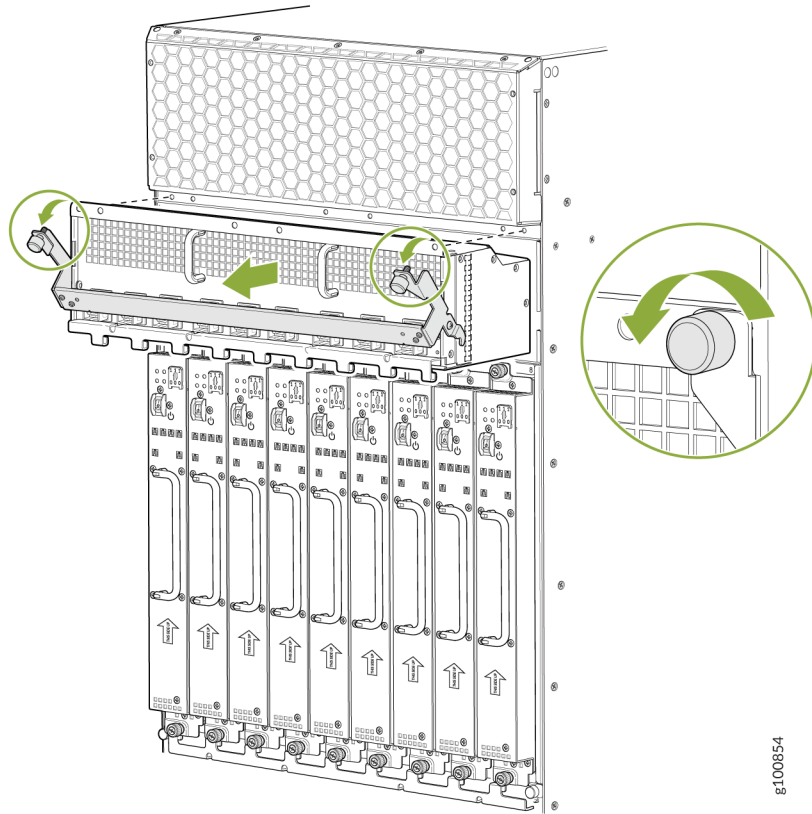
Figure 263: Removing a Universal (HVAC/HVDC) PDM from an MX2010 Router

g008177
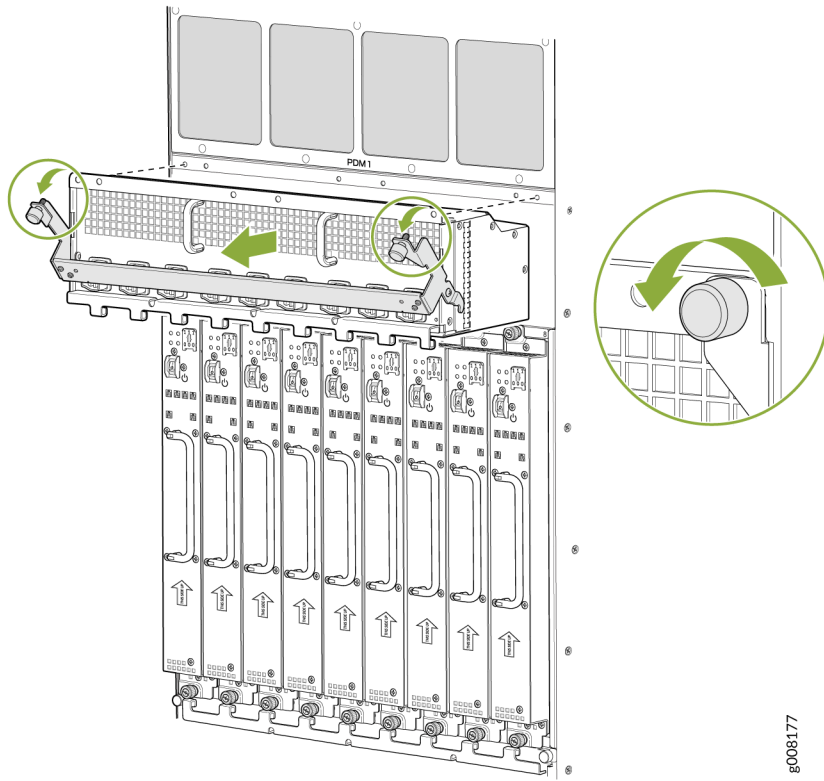
Figure 264: Removing a Universal (HVAC/HVDC) PDM from an MX2008 Router
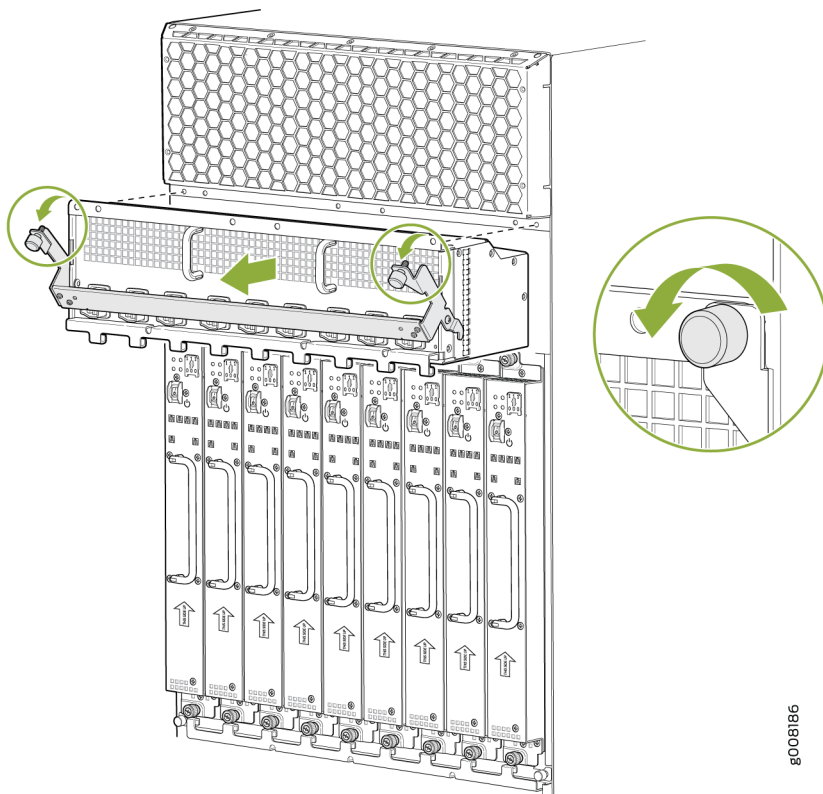
8. The PDM is extended slightly away from the chassis. See Figure 47, Figure 48, and Figure 49.

9. With both hands, grasp the two handles and gently pull the PDM straight out of the chassis.

> ⚠ **CAUTION**: Do not touch the power connectors on the back of the PDM. It can get damaged.

> **NOTE**: Each PDM slot not occupied by a PDM must be covered by a PDM blank panel.

10. Place the PDM onto an antistatic mat or into a ESD bag.

RELATED DOCUMENTATION

Troubleshooting the MX2000 Router Power System | **585**

MX2000 Router High-Voltage Universal (HVAC/HVDC) Power Subsystem Electrical Specifications | **151**

Maintaining Cables That Connect to MX2008 MPCs or MICs

Purpose

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

Action

On a regular basis:

- Use the lower cable manager (shown in Figure 265 on page 576) to support cables and prevent cables from dislodging or developing stress points.

Figure 265: Lower Cable Manager Cable Routing
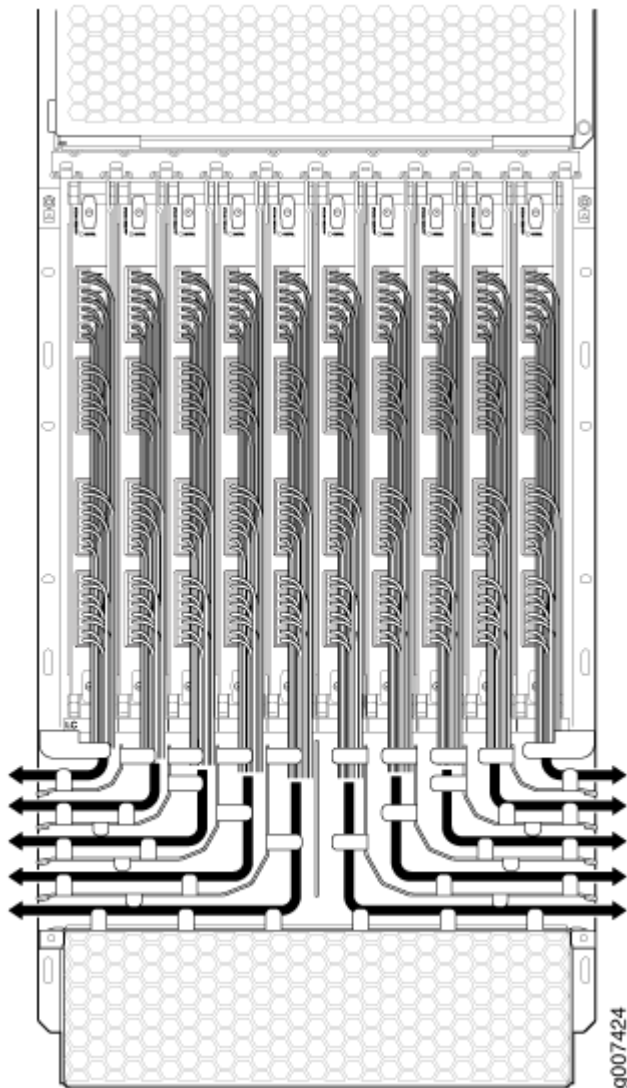
> **NOTE**: The MX2008 supports a standard and extended upper and lower cable manager.

- Place excess cable out of the way in the lower cable manager. Do not allow fastened loops of cable to dangle from the connector or cable manager because this stresses the cable at the fastening point. Putting fasteners on the loops helps to maintain their shape.

- Keep the cable connections clean and free of dust and other particles, which can cause drops in the received power level. Always inspect cables and clean them, if necessary, before connecting an interface.

- Label both ends of the cables to identify them.

The following guidelines apply specifically to fiber-optic cables:

- When you unplug a fiber-optic cable, always place a rubber safety plug over the transceiver on the faceplate and on the end of the cable.

- Anchor fiber-optic cables to avoid stress on the connectors. Be sure to secure fiber-optic cables so that they do not support their own weight as they hang to the floor. Never let fiber-optic cable hang free from the connector.

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

- Frequent plugging and unplugging of fiber-optic cable into and out of optical instruments can cause damage to the instruments that is expensive to repair. Instead, attach a short fiber extension to the optical equipment. Any wear and tear due to frequent plugging and unplugging is then absorbed by the short fiber extension, which is easy and inexpensive to replace.

- Keep fiber-optic cable connections clean. Small microdeposits of oil and dust in the canal of the transceiver or cable connector could cause loss of light, reducing signal power and possibly causing intermittent problems with the optical connection.

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

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

RELATED DOCUMENTATION

6
CHAPTER

Troubleshooting Hardware

Troubleshooting the MX2008 | 579

Troubleshooting the MX2008

MX2008 Troubleshooting Resources

Command-Line Interface

To troubleshoot an MX2008 router, you use the Junos OS CLI, alarms, devices connected to the alarm relay contacts, and LEDs on both the components and craft interface.

- LEDs—When the Routing Engine detects an alarm condition, it lights the red or yellow alarm LED on the craft interface. In addition, you can also use the component-specific LEDs on the craft interface and on the faceplate of a component to troubleshoot the routing matrix.

- Alarm devices connected to the alarm relay contact—When a red or yellow alarm occurs, it trips the corresponding alarm relay.

- CLI—The CLI is the primary tool for controlling and troubleshooting hardware, Junos OS, routing protocols, and network connectivity. CLI commands display information about routing tables, information specific to routing protocols, and information about network connectivity derived from the **ping** and **traceroute** utilities.

You enter CLI commands on one or more external management devices connected to ports on the Routing Engine.

For information about using the CLI to troubleshoot Junos OS, see the appropriate Junos OS configuration guide.

- JTAC—If you need assistance during troubleshooting, you can contact the Juniper Networks Technical Assistance Center (JTAC) by using the Web or by telephone. If you encounter software problems, or problems with hardware components not discussed here, contact JTAC.

Chassis and Interface Alarm Messages

When the Routing and Control Board (RCB) detects an alarm condition, it lights the red or yellow alarm LED on the craft interface as appropriate, trips the alarm relay, and reports the cause of the alarm in the craft interface. To view a more detailed description of the alarm cause, issue the `show chassis alarms` command:

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

There are two classes of alarm messages:

- Chassis alarms indicate a problem with a chassis component such as the cooling system or power system.

- Interface alarms indicate a problem with a specific network interface.

Alarm Relay Contacts

The craft interface has two alarm relay contacts for connecting the router to external alarm devices. Whenever a system condition triggers either the red or yellow alarm on the craft interface, the alarm relay contacts are also activated. The alarm relay contacts are located on the upper right of the craft interface.

Craft Interface LEDs

The craft interface displays system status messages and enables you to troubleshoot the MX2008 router. The craft interface is located on the upper front of the router and contains LEDs for the router components, the alarm relay contacts, and alarm cutoff button.

The craft interface includes the following LEDs:

- Alarm LEDs—One large red circular LED and one large yellow triangular LED, located on the upper right of the craft interface, indicate two levels of alarm conditions. 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. A condition that causes an alarm LED to light also activates the corresponding alarm relay contact on the craft interface.

- Host subsystem LEDs—The host subsystem consists of a Routing and Control Board (RCB). Three LEDs, **MASTER**, **ONLINE**, and **OFFLINE**, indicate the status of the Routing Engine function of the host subsystem. A green **MASTER** LED indicates that the host is functioning as the primary. The **ONLINE** LED indicates that the host is online. The **OFFLINE** LED indicates that the host is installed but the Routing Engine is offline. The Routing Engine component of the host subsystem LEDs is located on the upper right of the craft interface and labeled **RE0** and **RE1**.

- Power supply module LEDs—A set of nine bicolor LEDs, labeled (**PSM**), indicates the status of each PSM. Green indicates that the PSM is functioning normally. Red indicates that the PSM is not functioning normally. The PSM LEDs are located at the top of the craft interface, and are labeled **0** through **8**.

- Line-card LEDs—Ten bicolor LEDs, **LC0** through **LC9**, for the ten line cards (MPCs), indicate the status. Green indicates the line card is online, green blinking indicates that the line card is booting, and red indicates a failure. The line-card LEDs are located along the bottom of the craft interface.

- SFB LEDs—Eight bicolor LEDs, **SFB0** through **SFB7**, indicate the status of each SFB. Green indicates the SFB is online, green blinking indicates the SFB is booting, and red indicates a failure. The SFB LEDs are located along the middle of the craft interface along the bottom.

- RCB—Two bicolor LEDs, **CB-RE0** and **CB-RE1**, indicate the status of each RCB. Green indicates the RCB is online, green blinking indicates the RCB is booting, and red indicates a failure. The RCB LEDs are located along the bottom far left and far right of the craft interface.

- Fan tray LEDs—Four bicolor LEDs, **0** through **3**, indicate the status of the upper two and lower two fan trays. Green indicates the fan trays are functioning normally, and red indicates that a fan tray has failed. The fan tray LEDs are located on the upper middle of the craft interface.

Component LEDs

The following LEDs are located on various router components and display the status of those components:

- MPC LED—One LED labeled **OK/FAIL** on each MPC faceplate indicates the MPC's status. For more information, see the *MX Series Interface Module Reference*.

- MIC LED—One LED labeled **OK/FAIL** on each MIC faceplate indicates the MIC's status. For more information, see the *MX Series Interface Module Reference*.

- SFB LEDs—One LED, labeled **OK/FAIL**, on each SFB faceplate indicate the status of the SFB. If no LEDs are lit, the primary RCB might still be booting or the SFB is not receiving power.

- RCB LEDs—For the Control Board portion of the RCB, there is a set of bicolor LEDs, labeled **OK/FAIL**, **LINK**, **ExtClk-0**, **ExtClk-1**, **BITS**, and **GPS**. For the Routing Engine portion of the RCB, there are three LEDs, labeled **ONLINE**, **MASTER**, and **OK/FAIL**. These LEDs on the faceplate indicate the status of the RCB.

  NOTE: Even though the RCB are combined into one unit; the LED functionality is separate for the Control Board and Routing Engine.

- AC delta or wye PDM LEDs—One LED for each input terminal block indicating the input feed status.

- DC PDM LEDs—One LED on each PDM next to each of the nine –48VDC power feeds indicates the status of that PDM's incoming power.

- Universal (HVAC/HVDC) PDM LEDs—One LED on each PDM next to each of the nine power feeds indicates the status of that PDM's incoming power.

- AC, DC, or universal PSM LEDs—Four LEDs, labeled **PWR OK**, **FAULT**, **INP0**, and **INP1**, on each PSM faceplate indicate the status of that PSM.

SEE ALSO

Troubleshooting the MX2008 Cooling System

Problem

Description

The following alarms, LEDs, and other conditions indicate a problem with the cooling system:

- A red alarm indicates that temperature of the router exceeds the maximum ("temperature hot") threshold.

- Automatic shutdown of the power system was caused by the temperature of the router exceeding the maximum ("temperature hot") threshold.

- A red alarm indicates that a fan failed.

- A yellow alarm indicates that the router temperature exceeds the "temperature warm" threshold.

- A yellow alarm indicates that one of the fan trays was removed.

- One or more fans in a fan tray function at full speed. The RCB constantly monitors the temperatures detected by sensors on the midplane and router components, adjusting the speed of the fans as necessary.

Solution

To troubleshoot the cooling system:

1. Place your hand near the exhaust vents at the back of the chassis to determine whether the fans are pushing air out of the chassis.

2. If the red alarm LED on the craft interface lights, look at the craft interface display to find the source of the problem. The number of alarm conditions, as well as the source of each alarm, appears on the screen.

3. If the craft interface display lists only one fan failure and the other fans are functioning normally, the fan is probably faulty and you need to replace the fan tray.

4. Use the CLI to check the status of the fans. For example, you can issue the following command to get information about the source of an alarm condition:

user@host>**show chassis alarms**

For information about the alarms (see).

Table 135: MX2008 Cooling System Alarms

Component	Alarm Type	CLI Message	Alarm Condition	Solution
Fans	Red	*fan-name* Failure	A fan has failed.	Replace the fan tray.
Temperature sensors	Red	**Temperature Hot**	The chassis temperature exceeded the hot temperature threshold. If this condition persists, the router shuts down.	• Verify that the room temperature is within acceptable limits. • Verify that there is sufficient air flow. • Verify that the cooling system in the chassis is operating properly.
		Temperature sensor failure	A temperature sensor failed.	Contact JTAC

Table 135: MX2008 Cooling System Alarms *(Continued)*

Component	Alarm Type	CLI Message	Alarm Condition	Solution
	Yellow	**Temperature Warm**	The chassis temperature exceeded the warm temperature threshold.	- Verify that the room temperature is within acceptable limits. - Verify that there is sufficient air flow. - Verify that the cooling system in the chassis is operating properly.

SEE ALSO

Troubleshooting the MX2000 Router Power System

IN THIS SECTION

Problem

Description

The following alarms, LEDs, and other conditions indicate a problem with the AC or DC power system:

- If all AC, DC, universal power supply modules (PSMs) have failed, the system temperature might have exceeded the threshold, causing the system to shut down.

- The yellow **PWR OK** LED blinks when an AC or a DC PSM is out of the power limit or is in an overcurrent condition.

- The red **FAULT** LED lights when the PSM is not receiving enough airflow to maintain the proper temperature.

- The red **FAULT** LED lights when the AC or DC output voltages are not within range.

- The yellow **INP0** LED blinks when the AC or DC voltage is present, but out of limits. This LED blinks continuously for approximately a few seconds on and a few seconds off.

- The yellow **INP1** LED blinks when the AC or DC voltage is present, but out of limits. This LED blinks continuously for approximately a few seconds on and a few seconds off.

- The red **-48V** LED lights when the wrong polarity of DC input voltage is connected on the DC PDM.

> **NOTE**: For the universal power supply LEDs, see *MX2020 High-Voltage Universal Power Supply Module LEDs* and *MX2010 High-Voltage Universal (HVAC/HVDC) Power Supply Module LEDs*.

Solution

To troubleshoot the MX2000 router power system:

1. Check the LEDs on all AC, DC, or universal PSM faceplates.

   - **PWR OK** PSM LED is blinking—Check the fans and air filters to be sure that they are functioning and providing sufficient airflow through the chassis.

   - **PWR OK** PSM LED is off and no red alarm condition exists—Check that the circuit breakers are switched to the **ON** position. Check that the AC or DC power switch is in the on (|) position.

   - **PWR OK** LED on PSMs is not lit—Check that the PSMs are inserted and are operating.

   - If an AC PSM, or a DC PSM, or a universal PSM is correctly installed and functioning normally, the **PWR OK**, **INP0**, and **INP1** LEDs light steadily, and the **FAULT** LED is not lit.

If the **PWR OK** LED on the installed spare does not light, the replaced PSM might be faulty. To return it for replacement, see *Contact Customer Support*.

7. Check the status of a PSM, issuing the following CLI command. The value **Online** in the rows labeled **State** indicates that each of the PSMs is functioning normally.

> **NOTE**: For the MX2010, the PSMs are referred to as **PSM0** through **PSM8**.
>
> For the MX2020, the PSMs are referred to as **PSM0** through **PSM8** (bottom) and **PSM9** through **PSM17** (top).

Here is an example of the AC PSM input status for an MX2020:

```
user@host> show chassis environment psm

PSM 0 status:
  State                   Online
  Temperature             OK
  AC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0          223.75       1.40      313.25
                          INP1          0.00         0.00      0.00
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            52.00      4.25        221.00     10.52
  Hours Used              6862
PSM 1 status:
  State                   Online
  Temperature             OK
  AC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0          225.00       1.40      315.00
                          INP1          2.50         0.00      0.00
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            52.00      4.25        221.00     10.52
  Hours Used              6862
PSM 2 status:
  State                   Online
  Temperature             OK
  AC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0          225.00       1.30      292.50
                          INP1          3.75         0.00      0.00
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            52.00      4.25        221.00     10.52
  Hours Used              6862
```

```
PSM 3 status:
  State                   Online
  Temperature             OK
  AC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0           223.75       1.50     335.62
                          INP1             3.75       0.00       0.00
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            52.00       5.00      260.00     12.38
  Hours Used              6861
...
```

Here is an example of the DC PSM (-48) input status for an MX2020:

```
user@host> show chassis environment psm
PSM 4 status:
  State                   Online
  Temperature             OK
  DC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0             0.00       0.00       0.00
                          INP1            51.20      11.55     591.36
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            51.25      10.25      525.31     25.01
  Hours Used              1369
PSM 5 status:
  State                   Online
  Temperature             OK
  DC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0             0.00       0.00       0.00
                          INP1            50.80      11.55     586.74
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            51.25      10.50      538.12     25.62
  Hours Used              1722
PSM 6 status:
  State                   Online
  Temperature             OK
  DC Input                Feed        Voltage(V)  Current(A) Power(W)
                          INP0             0.00       0.00       0.00
                          INP1            50.80      11.20     568.96
  DC Output               Voltage(V) Current(A)  Power(W)   Load(%)
                            51.25      10.00      512.50     24.40
  Hours Used              2969
PSM 7 status:
```

```
    State                   Online
    Temperature             OK
    DC Input                Feed        Voltage(V)  Current(A) Power(W)
                            INP0         0.00         0.00        0.00
                            INP1        51.60        11.20      577.92
    DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                             51.25      10.00       512.50      24.40
    Hours Used              2970
PSM 8 status:
    State                   Online
    Temperature             OK
    DC Input                Feed        Voltage(V)  Current(A) Power(W)
                            INP0         0.00         0.00        0.00
                            INP1        51.60        11.20      577.92
    DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                             51.25      10.00       512.50      24.40
    Hours Used              2970
...
```

Here is an example of the DC PSM (240 V China) input status for an MX2020:

```
user@host> show chassis environment psm
PSM 0 status:
    State                   Online
    Temperature             OK
    DC Input                Feed        Voltage(V)  Current(A) Power(W)
                            INP0         0.00         0.00        0.00
                            INP1       240.00         1.10      264.00
    DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                             52.75       4.50       237.38      9.49
    Hours Used              2640
PSM 1 status:
    State                   Online
    Temperature             OK
    DC Input                Feed        Voltage(V)  Current(A) Power(W)
                            INP0         0.00         0.00        0.00
                            INP1       240.00         1.00      240.00
    DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                             52.75       4.00       211.00      8.44
    Hours Used              3144
PSM 2 status:
    State                   Online
```

```
   Temperature                 OK
   DC Input                    Feed      Voltage(V)  Current(A) Power(W)
                               INP0         0.00        0.00      0.00
                               INP1       240.00        1.00    240.00
   DC Output                   Voltage(V) Current(A)  Power(W)   Load(%)
                                 52.75      4.00       211.00     8.44
   Hours Used                  3144
......
```

> **NOTE**: If two input sources are grounded at the positive terminal (i.e. -240 V DC source) and if both positive input wiring are connected to the PDM, the PSM reports both inputs to be active and reports the higher of the two -240V DC input source. This is the case even if one negative input source is switched off through a breaker.

> **NOTE**: For midpoint impedance grounded source, the CLI display of the input voltage is inaccurate for the input source with lower input voltage. For example, if one source is +/-120V, and the other source is +/-125V, the CLI input voltage display is 250 V for one input, and is 245 V (should be 240 V) for the other.

Here is an example of the universal PSM (HVAC/HVDC) input status for an MX2020:

```
user@host> show chassis environment psm
  PSM 0 status:
  State                       Online
  Temperature                           OK
  AC Input                    Feed      Voltage(V)  Current(A) Power(W)
                              INP0        209.10       0.10     20.91
                              INP1        209.10       0.10     20.91
  DC Output                   Voltage(V) Current(A)  Power(W)   Load(%)
                                52.50      5.10       267.75     7.87
  Hours Used                  1832
PSM 1 status:
  State                       Online
  Temperature                           OK
  AC Input                    Feed      Voltage(V)  Current(A) Power(W)
                              INP0        209.10       0.20     41.82
                              INP1        209.10       0.90    188.19
  DC Output                   Voltage(V) Current(A)  Power(W)   Load(%)
```

```
                          52.50      6.46      339.15      9.98
  Hours Used              2571
PSM 2 status:
  State                   Online
  Temperature                        OK
  AC Input                Feed       Voltage(V)  Current(A) Power(W)
                          INP0        209.10      3.70      773.67
                          INP1        210.80      2.70      569.16
  DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                          52.50      17.34       910.35      26.78
  Hours Used              3404
PSM 3 status:
  State                   Online
  Temperature                        OK
  AC Input                Feed       Voltage(V)  Current(A) Power(W)
                          INP0        209.10      3.60      752.76
                          INP1        209.10      0.60      125.46
  DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                          52.50      11.90       624.75      18.37
  Hours Used              2571
...
```

Here is an example of the universal PSM (HVAC/HVDC) input status for an MX2008:

```
user@host> show chassis environment psm
 PSM 0 status:
  State                   Online
  Temperature                        OK
  AC Input                Feed       Voltage(V)  Current(A) Power(W)
                          INP0        268.60      0.90      241.74
                          INP1        268.60      0.80      214.88
  DC Output               Voltage(V) Current(A)  Power(W)    Load(%)
                          51.75      7.82        404.69      11.90
  Fan 0                   5280 RPM
  Fan 1                   5280 RPM
  Fan 2                   5280 RPM
  Hours Used              706
PSM 1 status:
  State                   Online
  Hours Used              707
PSM 2 status:
  State                   Online
```

```
    Temperature                            OK
    AC Input                    Feed       Voltage(V)  Current(A) Power(W)
                                INP0         270.30       0.80      216.24
                                INP1         270.30       0.70      189.21
    DC Output                   Voltage(V) Current(A)  Power(W)   Load(%)
                                  51.75      6.46       334.31      9.83
    Fan 0                       5310 RPM
    Fan 1                       5310 RPM
    Fan 2                       5310 RPM
    Hours Used                  707
  PSM 3 status:
    State                       Online
    Temperature                            OK
    AC Input                    Feed       Voltage(V)  Current(A) Power(W)
                                INP0         270.30       0.90      243.27
                                INP1         270.30       0.80      216.24
    DC Output                   Voltage(V) Current(A)  Power(W)   Load(%)
                                  51.75      7.82       404.69     11.90
    Fan 0                       5280 RPM
    Fan 1                       5310 RPM
    Fan 2                       5310 RPM
    Hours Used                  707

  ...
```

8. If a red alarm condition occurs, issue the `show chassis alarms` command to determine the source of the problem.

9. If all PSMs have failed, the system temperature might have exceeded the threshold, causing the system to shut down.

> **NOTE**: If the system temperature exceeds the threshold, the Junos OS shuts down all power supplies so that no status is displayed.
>
> The Junos OS also can shut down one of the power supplies for other reasons. In this case, the remaining power supplies provide power to the router, and you can still view the system status through the CLI or display.

Troubleshooting the MX2008 Host Subsystems

IN THIS SECTION

- Problem | **594**
- Solution | **594**

Problem

Description

The following alarms and LEDs indicate a problem with a host subsystem Routing and Control Board (RCB):

- A red alarm indicates that the host subsystem has been removed.

- The red host subsystem **OFFLINE** LED on the craft interface is lit.

- The green host subsystem **ONLINE** LED on the craft interface is not lit.

Solution

To troubleshooting the host subsystems:

1. Check the LEDs on the faceplate of each RCB.

2. Check the LEDs on the craft interface.

3. Use the CLI to check the alarms.

   - Issue the `show chassis alarms` command to view the alarms.

SEE ALSO

MX2008 Host Subsystem Description | **153**

Troubleshooting the MX2008 MICs

Problem

Description

A MIC LED lit red indicates a problem with the MIC.

Solution

To troubleshoot a MIC:

1. Check the status of each port on a MIC by looking at the LED located on the MIC faceplate. For information about the meaning of LED states on different MICs, see the *MX Series Interface Module Reference*

2. Check the status of a MIC by issuing the `show chassis fpc pic-status` CLI command. The MIC slots in the MPC are labeled **PIC 0/1** and **PIC 2/3**, top to bottom:

```
user@host> show chassis fpc pic-status
Slot 0   Online       MPCE Type 1 3D Q
  PIC 0  Online       10x 1GE(LAN) SFP
  PIC 1  Online       10x 1GE(LAN) SFP
  PIC 2  Online       1x 10GE XFP
  PIC 3  Online       1x 10GE XFP
Slot 1   Online       MPCE Type 2 3D
  PIC 2  Online       2x 10GE  XFP
  PIC 3  Online       2x 10GE  XFP
Slot 2   Online       MPCE Type 3 3D
  PIC 0  Online       1x 10GE XFP
  PIC 1  Online       1x 10GE XFP
  PIC 2  Online       1X100GE CFP
Slot 9   Online       MPC 3D 16x 10GE EM
```

```
    PIC 0  Online      4x 10GE(LAN) SFP+
    PIC 1  Online      4x 10GE(LAN) SFP+
    PIC 2  Online      4x 10GE(LAN) SFP+
    PIC 3  Online      4x 10GE(LAN) SFP+
```

For further description of the command output, see the *Junos OS System Basics and Services Command Reference*.

Troubleshooting the MX2008 MPCs

IN THIS SECTION

- Problem | **596**
- Solution | **596**

Problem

Description

The following LEDs indicate a problem with an MPC:

- The red **FAIL** LED above the MPC is lit.

- The green **OK** LED above the MPC is not lit.

Solution

To troubleshoot an MPC:

1. Monitor the green LED labeled **OK** above the MPC on the craft interface as soon as an MPC is seated in an operating router.

   > **NOTE**: The Routing and Control Board (RCB) downloads the software to the MPC under two conditions: The MPC is present when the RCB boots Junos OS, and the MPC is installed and requested online through the CLI or the push button on the front panel. The MPC then runs diagnostics, during which the **OK** LED blinks. When the MPC is online and functioning normally, the **OK** LED lights green steadily.

2. Look at the display on the craft interface to check the status of the MPC and the MICs that are plugged into it.

3. Verify that the MPC is properly seated in the top and bottom backplanes of the adapter card (ADC). Check that each knob has been turned clockwise and is tight.

4. Check the **OK/FAIL** LED on the MPC, and the **OK** and **FAIL** line-card LEDs, **LC0** through **LC9**, on the craft interface. When the MPC is online and functioning normally, the **OK** LED lights green steadily.

5. Check the status of an MPC by using the `show chassis fpc` CLI command. As shown in the sample output, the value **Online** in the column labeled **State** indicates that the MPC is functioning normally:

```
user@host> show chassis fpc
              Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State          (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
   0  Online          37      8          0       2048       10         13
   1  Online          35      6          0       2048       13         13
   2  Online          37      9          0       2048       17         13
   3  Empty
   4  Online          37      9          0       2048       17         13
   5  Empty
   6  Empty
   7  Empty
   8  Empty
   9  Online          37     11          0       2048       21         13
```

Use the **detail** option to display more detailed information. The following example does not specify a slot number, which is optional:

For further description of the command output, see the *Junos OS System Basics Configuration Guide*.

```
user@host> show chassis fpc detail
Slot 0 information:
  State                               Online
  Temperature                   26
  Total CPU DRAM              2048 MB
  Total RLDRAM                 403 MB
  Total DDR DRAM             1572 MB
  Start time:                             2017-02-20 02:21:40 PST
  Uptime:                                 5 hours, 28 minutes, 57 seconds
  Max Power Consumption       249 Watts
Slot 1 information:
  State                               Online
  Temperature                   25
  Total CPU DRAM              2048 MB
  Total RLDRAM                 662 MB
  Total DDR DRAM             3072 MB
  Start time:                             2017-02-20 02:21:51 PST
  Uptime:                                 5 hours, 28 minutes, 46 seconds
  Max Power Consumption       348 Watts
Slot 2 information:
  State                               Online
  Temperature                   28
  Total CPU DRAM              2048 MB
  Total RLDRAM                1036 MB
  Total DDR DRAM             6656 MB
  Start time:                             2017-02-20 02:22:01 PST
  Uptime:                                 5 hours, 28 minutes, 36 seconds
  Max Power Consumption       520 Watts
Slot 9 information:
  State                               Online
  Temperature                   29
  Total CPU DRAM              2048 MB
  Total RLDRAM                1324 MB
  Total DDR DRAM             6144 MB
  Start time:                             2017-02-20 02:22:06 PST
  Uptime:                                 5 hours, 28 minutes, 31 seconds
  Max Power Consumption       440 Watts
```

SEE ALSO

7
CHAPTER

Contacting Customer Support and Returning the Chassis or Components

Contacting Customer Support and Returning the Chassis or Components

Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

- When you return components, make sure that they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

- Use the original shipping materials if they are available.

- Place individual components in antistatic bags.

- Write the RMA number on the exterior of the box to ensure proper tracking.

> ⚠️ **CAUTION**: Do not stack any of the hardware components.

Displaying MX2008 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 display all the router components and their serial numbers, enter the following command-line interface (CLI) command:

The sample output below shows the chassis hardware:

```
user@host> show chassis hardware
Hardware inventory:
Item              Version  Part number  Serial number   Description
Chassis                                 JN125ED29AFL    MX2008
Midplane          REV 01   750-067705   ABAD1703        Midplane
PMP               REV 01   711-051406   ACVD0320        Power Midplane
FPM Board         REV 01   760-068193   ABDH3608        Front Panel Display
PSM 0             REV 04   740-050037   1EDB40300GC     DC 52V Power Supply Module
PSM 1             REV 06   740-050037   1EDB61200NF     DC 52V Power Supply Module
PSM 2             REV 04   740-050037   1EDB40300RZ     DC 52V Power Supply Module
PSM 3             REV 07   740-050037   1EDB6160317     DC 52V Power Supply Module
PSM 4             REV 04   740-050037   1EDD4180439     DC 52V Power Supply Module
PSM 5             REV 04   740-050037   1EDB32905NS     DC 52V Power Supply Module
PSM 6             REV 06   740-050037   1EDB61200WL     DC 52V Power Supply Module
PSM 7             REV 04   740-050037   1EDB40300GH     DC 52V Power Supply Module
PSM 8             REV 04   740-050037   1EDB40300HA     DC 52V Power Supply Module
PDM 0             REV 03   740-050036   1EFD6010359     DC Power Dist Module
PDM 1             REV 03   740-050036   1EFD6010316     DC Power Dist Module
Routing Engine 0           BUILTIN      BUILTIN         RE-MX2008-X8-64G
Routing Engine 1           BUILTIN      BUILTIN         RE-MX2008-X8-64G
CB 0              REV 11   750-067373   ABDK3683        Control Board
CB 1              REV 11   750-067373   ABDK3680        Control Board
SFB 0             REV 08   750-067371   ABDJ7841        MX2008 Switch Fabric Board 2
SFB 1             REV 08   750-067371   ABDJ7838        MX2008 Switch Fabric Board 2
SFB 2             REV 08   750-067371   ABDJ7842        MX2008 Switch Fabric Board 2
SFB 3             REV 08   750-067371   ABDJ7843        MX2008 Switch Fabric Board 2
SFB 4             REV 08   750-067371   ABDK7023        MX2008 Switch Fabric Board 2
SFB 5             REV 08   750-067371   ABDK7080        MX2008 Switch Fabric Board 2
SFB 6             REV 08   750-067371   ABDK7118        MX2008 Switch Fabric Board 2
SFB 7             REV 08   750-067371   ABDK7211        MX2008 Switch Fabric Board 2
FPC 0             REV 22   750-063414   CAFF1148        MPC9E 3D
  CPU             REV 16   750-057177   CAFF9310        SMPC PMB
  MIC 0           REV 11   750-055992   CAFJ9396        MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 0                  BUILTIN      BUILTIN         MRATE-12xQSFPP-XGE-XLGE-CGE
```

```
   Xcvr 0    REV 01   740-064669   1622              QSFP28-LPBK
   Xcvr 1    REV 01   740-064669   1657              QSFP28-LPBK
   Xcvr 2    REV 01   740-064669   1634              QSFP28-LPBK
   Xcvr 3    REV 01   740-064669   1617              QSFP28-LPBK
   Xcvr 6    REV 01   740-064669   1627              QSFP28-LPBK
   Xcvr 7    REV 01   740-064669   1653              QSFP28-LPBK
   Xcvr 8    REV 01   740-064669   1630              QSFP28-LPBK
   Xcvr 9    REV 01   740-064669   1607              QSFP28-LPBK
 MIC 1       REV 11   750-055992   CAFM8048          MRATE-12xQSFPP-XGE-XLGE-CGE
   PIC 1              BUILTIN      BUILTIN           MRATE-12xQSFPP-XGE-XLGE-CGE
   Xcvr 0    REV 01   740-064669   1463              QSFP28-LPBK
   Xcvr 1    REV 01   740-064669   1444              QSFP28-LPBK
   Xcvr 2    REV 01   740-064669   1452              QSFP28-LPBK
   Xcvr 3    REV 01   740-064669   1462              QSFP28-LPBK
   Xcvr 6    REV 01   740-064669   1647              QSFP28-LPBK
   Xcvr 7    REV 01   740-064669   1448              QSFP28-LPBK
   Xcvr 8    REV 01   740-064669   1460              QSFP28-LPBK
   Xcvr 9    REV 01   740-064669   1454              QSFP28-LPBK
FPC 1        REV 22   750-063414   CAFJ3031          MPC9E 3D
  CPU        REV 17   750-057177   CAFJ0906          SMPC PMB
  MIC 0      REV 06   750-055992   CAFB0210          MRATE-12xQSFPP-XGE-XLGE-CGE
   PIC 0              BUILTIN      BUILTIN           MRATE-12xQSFPP-XGE-XLGE-CGE
   Xcvr 0    REV 01   740-064669   1654              QSFP28-LPBK
   Xcvr 1    REV 01   740-064669   1593              QSFP28-LPBK
   Xcvr 2    REV 01   740-064669   1614              QSFP28-LPBK
   Xcvr 3    REV 01   740-064669   1616              QSFP28-LPBK
   Xcvr 6    REV 01   740-064669   1640              QSFP28-LPBK
   Xcvr 7    REV 01   740-064669   1625              QSFP28-LPBK
   Xcvr 8    REV 01   740-064669   1628              QSFP28-LPBK
   Xcvr 9    REV 01   740-064669   1623              QSFP28-LPBK
 MIC 1       REV 11   750-055992   CAFJ9430          MRATE-12xQSFPP-XGE-XLGE-CGE
   PIC 1              BUILTIN      BUILTIN           MRATE-12xQSFPP-XGE-XLGE-CGE
   Xcvr 0    REV 01   740-064669   1615              QSFP28-LPBK
   Xcvr 1    REV 01   740-064669   1481              QSFP28-LPBK
   Xcvr 2    REV 01   740-064669   1482              QSFP28-LPBK
   Xcvr 3    REV 01   740-064669   1632              QSFP28-LPBK
   Xcvr 6    REV 01   740-064669   1602              QSFP28-LPBK
   Xcvr 7    REV 01   740-064669   1480              QSFP28-LPBK
   Xcvr 8    REV 01   740-064669   1483              QSFP28-LPBK
   Xcvr 9    REV 01   740-064669   1609              QSFP28-LPBK
FPC 2        REV 22   750-063414   CAFM7888          MPC9E 3D
  CPU        REV 18   750-057177   CAFK8979          SMPC PMB
FPC 3        REV 22   750-063414   CAFJ3027          MPC9E 3D
```

```
    CPU           REV 17   750-057177   CAFJ0968     SMPC PMB
   MIC 1          REV 11   750-055992   CAFM8105     MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 1                  BUILTIN      BUILTIN      MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0      REV 01   740-064669   1659         QSFP28-LPBK
      Xcvr 1      REV 01   740-064669   1658         QSFP28-LPBK
      Xcvr 2      REV 01   740-064669   1594         QSFP28-LPBK
      Xcvr 3      REV 01   740-064669   1621         QSFP28-LPBK
      Xcvr 6      REV 01   740-064669   1457         QSFP28-LPBK
      Xcvr 8      REV 01   740-064669   1592         QSFP28-LPBK
      Xcvr 9      REV 01   740-064669   1606         QSFP28-LPBK
FPC 4             REV 22   750-063414   CAFG7004     MPC9E 3D
  CPU             REV 16   750-057177   CAFF9189     SMPC PMB
   MIC 0          REV 11   750-055992   CAFM8073     MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 0                  BUILTIN      BUILTIN      MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0      REV 01   740-064669   1643         QSFP28-LPBK
      Xcvr 1      REV 01   740-064669   1611         QSFP28-LPBK
      Xcvr 2      REV 01   740-064669   1601         QSFP28-LPBK
      Xcvr 3      REV 01   740-064669   1624         QSFP28-LPBK
      Xcvr 6      REV 01   740-064669   1631         QSFP28-LPBK
      Xcvr 7      REV 01   740-064669   1649         QSFP28-LPBK
      Xcvr 8      REV 01   740-064669   1651         QSFP28-LPBK
      Xcvr 9      REV 01   740-064669   1604         QSFP28-LPBK
   MIC 1          REV 11   750-055992   CAFJ9323     MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 1                  BUILTIN      BUILTIN      MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0      REV 01   740-064669   1450         QSFP28-LPBK
      Xcvr 1      REV 01   740-064669   1610         QSFP28-LPBK
      Xcvr 2      REV 01   740-064669   1472         QSFP28-LPBK
      Xcvr 3      REV 01   740-064669   1479         QSFP28-LPBK
      Xcvr 6      REV 01   740-064669   1466         QSFP28-LPBK
      Xcvr 7      REV 01   740-064669   1598         QSFP28-LPBK
      Xcvr 8      REV 01   740-064669   1445         QSFP28-LPBK
      Xcvr 9      REV 01   740-064669   1464         QSFP28-LPBK
FPC 5             REV 22   750-063414   CAFY0418     MPC9E 3D
  CPU             REV 16   750-057177   CAFH0818     SMPC PMB
FPC 6             REV 22   750-063414   CAFF1149     MPC9E 3D
  CPU             REV 16   750-057177   CAFF9225     SMPC PMB
   MIC 0          REV 09   750-056967   CAGB2764     Load MIC - 12xQSFPP
    PIC 0                  BUILTIN      BUILTIN      Load MIC - 12xQSFPP
   MIC 1          REV 09   750-056967   CAGB2761     Load MIC - 12xQSFPP
    PIC 1                  BUILTIN      BUILTIN      Load MIC - 12xQSFPP
FPC 7             REV 22   750-063414   CAFJ3009     MPC9E 3D
  CPU             REV 17   750-057177   CAFJ0659     SMPC PMB
   MIC 0          REV 09   750-056967   CAGB2762     Load MIC - 12xQSFPP
```

```
   PIC 0                 BUILTIN     BUILTIN       Load MIC - 12xQSFPP
 MIC 1         REV 09    750-056967  CAGB2767      Load MIC - 12xQSFPP
   PIC 1                 BUILTIN     BUILTIN       Load MIC - 12xQSFPP
FPC 8          REV 36    750-056519  CAFM6723      MPC7E 3D MRATE-12xQSFPP-XGE-XLGE-CGE
  CPU          REV 16    750-057177  CAFF9096      SMPC PMB
  PIC 0                  BUILTIN     BUILTIN       MRATE-6xQSFPP-XGE-XLGE-CGE
    Xcvr 2     REV 01    740-064669  1474          QSFP28-LPBK
    Xcvr 5     REV 01    740-064669  1461          QSFP28-LPBK
  PIC 1                  BUILTIN     BUILTIN       MRATE-6xQSFPP-XGE-XLGE-CGE
    Xcvr 2     REV 01    740-064669  1468          QSFP28-LPBK
    Xcvr 5     REV 01    740-064669  1477          QSFP28-LPBK
FPC 9          REV 22    750-063414  CAFM7893      MPC9E 3D
  CPU          REV 18    750-057177  CAFM8259      SMPC PMB
  MIC 0        REV 12    750-055992  CAGG1088      MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 0                BUILTIN     BUILTIN       MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0   REV 01    740-064669  1458          QSFP28-LPBK
      Xcvr 1   REV 01    740-064669  1451          QSFP28-LPBK
      Xcvr 2   REV 01    740-064669  1486          QSFP28-LPBK
      Xcvr 3   REV 01    740-064669  1487          QSFP28-LPBK
      Xcvr 6   REV 01    740-064669  1456          QSFP28-LPBK
      Xcvr 7   REV 01    740-064669  1465          QSFP28-LPBK
      Xcvr 8   REV 01    740-064669  1453          QSFP28-LPBK
      Xcvr 9   REV 01    740-064669  1485          QSFP28-LPBK
  MIC 1        REV 11    750-055992  CAFG4662      MRATE-12xQSFPP-XGE-XLGE-CGE
    PIC 1                BUILTIN     BUILTIN       MRATE-12xQSFPP-XGE-XLGE-CGE
      Xcvr 0   REV 01    740-064669  1488          QSFP28-LPBK
      Xcvr 1   REV 01    740-064669  1469          QSFP28-LPBK
      Xcvr 2   REV 01    740-064669  1650          QSFP28-LPBK
      Xcvr 3   REV 01    740-064669  1662          QSFP28-LPBK
      Xcvr 6   REV 01    740-064669  1490          QSFP28-LPBK
      Xcvr 7   REV 01    740-064669  1489          QSFP28-LPBK
      Xcvr 8   REV 01    740-064669  1442          QSFP28-LPBK
      Xcvr 9   REV 01    740-064669  1484          QSFP28-LPBK
ADC 8          REV 21    750-043596  ABDB1442      Adapter Card
Fan Tray 0     REV 01    760-052467  ACAY6296      172mm FanTray - 6 Fans
Fan Tray 1     REV 01    760-052467  ACAY6297      172mm FanTray - 6 Fans
```

Most components also have a small rectangular serial number ID label attached to the component body (see).

Figure 266: Serial Number ID Label

How to Return a Hardware Component to Juniper Networks, Inc.

If a hardware component fails, 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 webpage at https://support.juniper.net/support/.

For product problems or technical support issues, contact the Juniper Networks Technical Assistance Center (JTAC) by using the Service Request Manager link at https://support.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.

MX2008 Chassis Serial Number Label

The chassis serial number is located on the side of the chassis (see).

Figure 267: MX2008 Chassis Serial Number Label
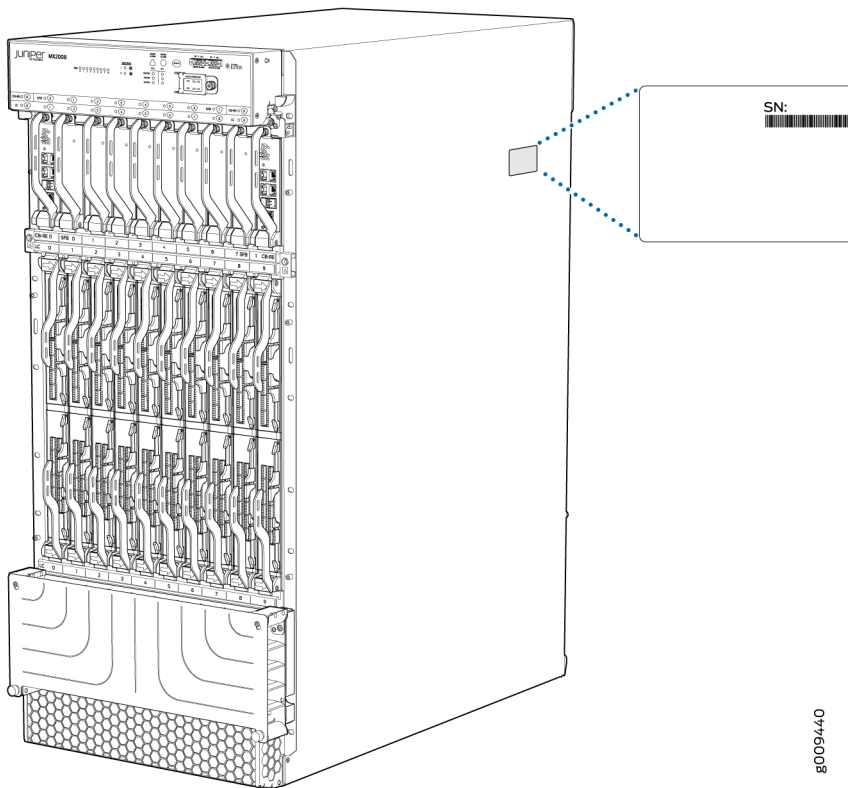
MX2008 Craft Interface Serial Number Label

The serial number is located on the back of the craft interface panel (see).

Figure 268: Craft Interface Serial Number Label
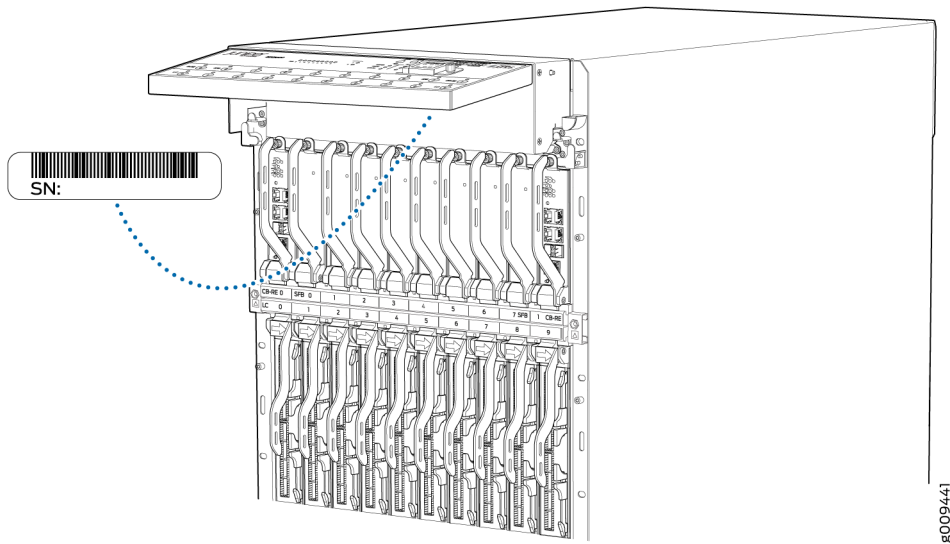
SEE ALSO

Displaying MX2008 Router Components and Serial Numbers | **602**

MX2008 SFB Serial Number Label

The serial number is located on the right side of the top of the SFB (see Figure 269 on page 610).

Figure 269: MX2008 SFB Serial Number Label
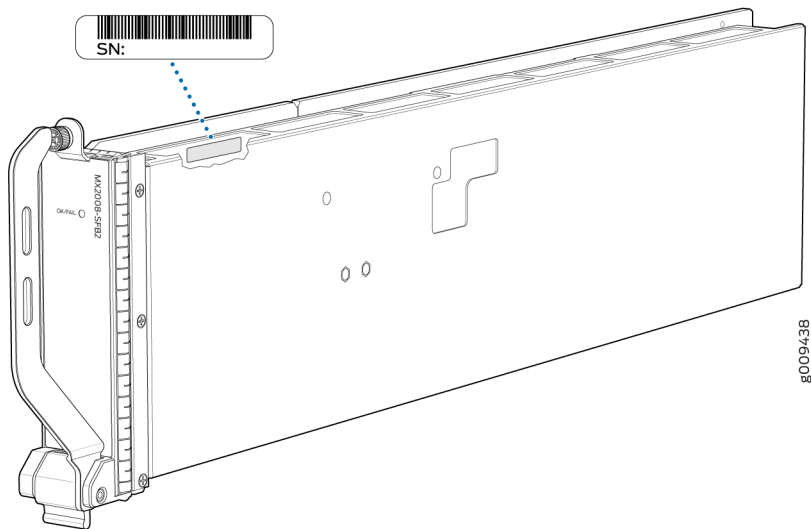
SEE ALSO

Displaying MX2008 Router Components and Serial Numbers | 602

MX2008 RCB Serial Number Label

The serial number label is located on the right side of the top of the RCB (see).

Figure 270: RCB Serial Number Label
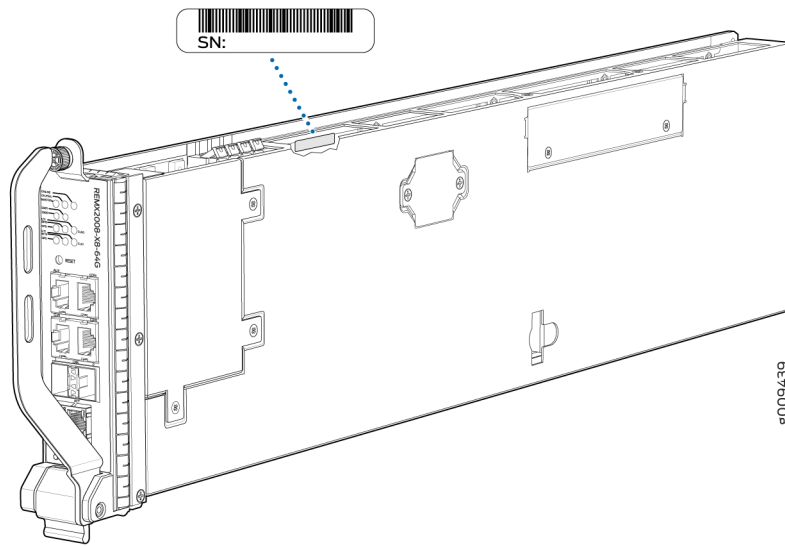
MX2008 Fan Tray Serial Number Label

The serial number is located on the top left-hand corner of the fan tray, near the captive screw (see Figure 271 on page 612).

Figure 271: MX2008 Fan Tray Serial Number Label
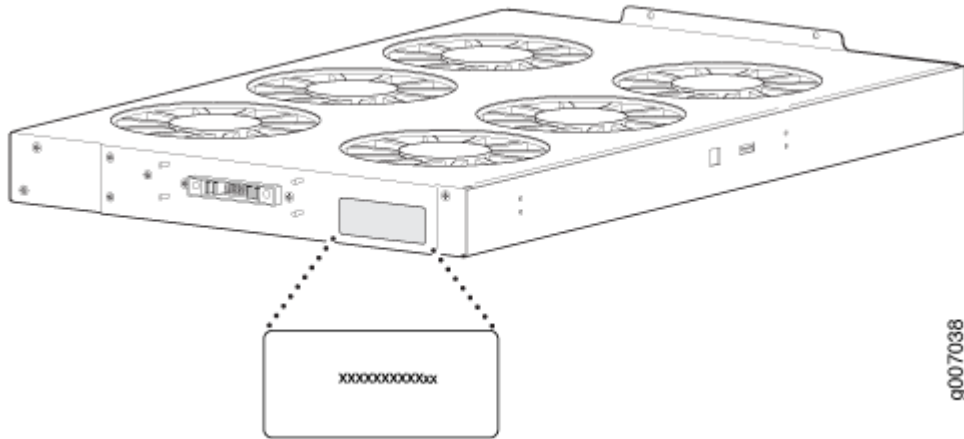
SEE ALSO

Displaying MX2008 Router Components and Serial Numbers | **602**

MX2008 MPC Serial Number Label

The serial number label is near the connectors located on the right side of the MPC when it is oriented vertically (see Figure 272 on page 613).

Figure 272: MPC Serial Number Label

SEE ALSO

614
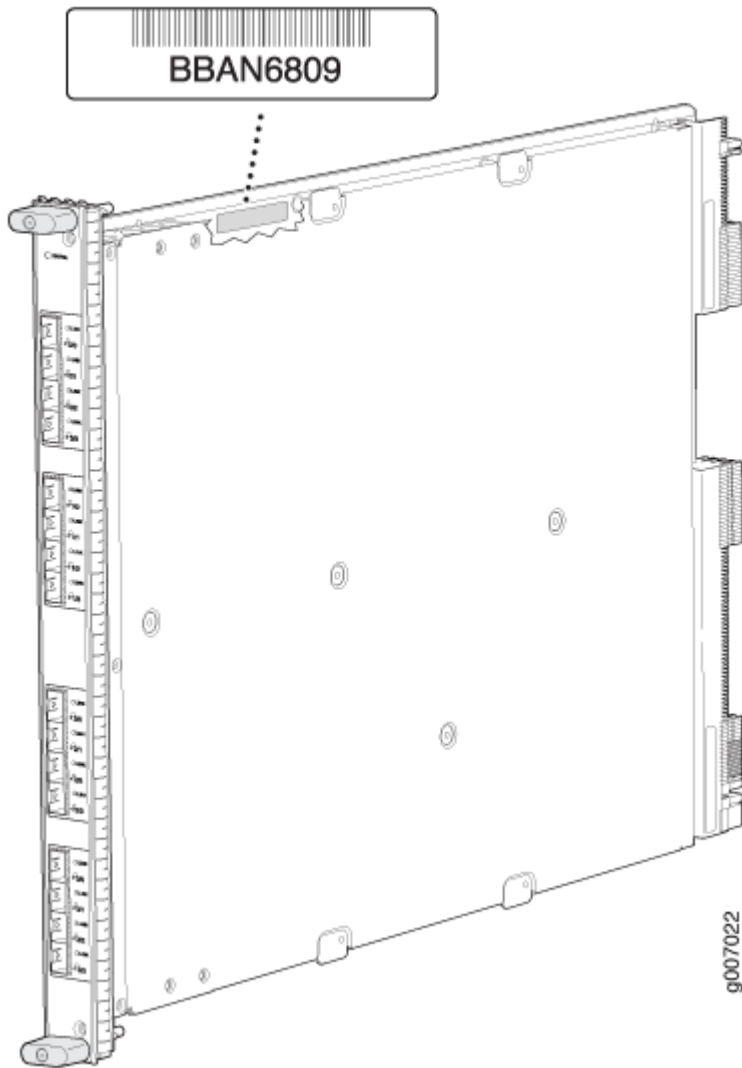
MX2008 MIC Serial Number Label

The serial number label location varies according to the number of ports on a MIC (see Figure 273 on page 614). The exact location might be slightly different on different MICs, depending on the placement of components on the MIC board.

Figure 273: MIC Serial Number Label
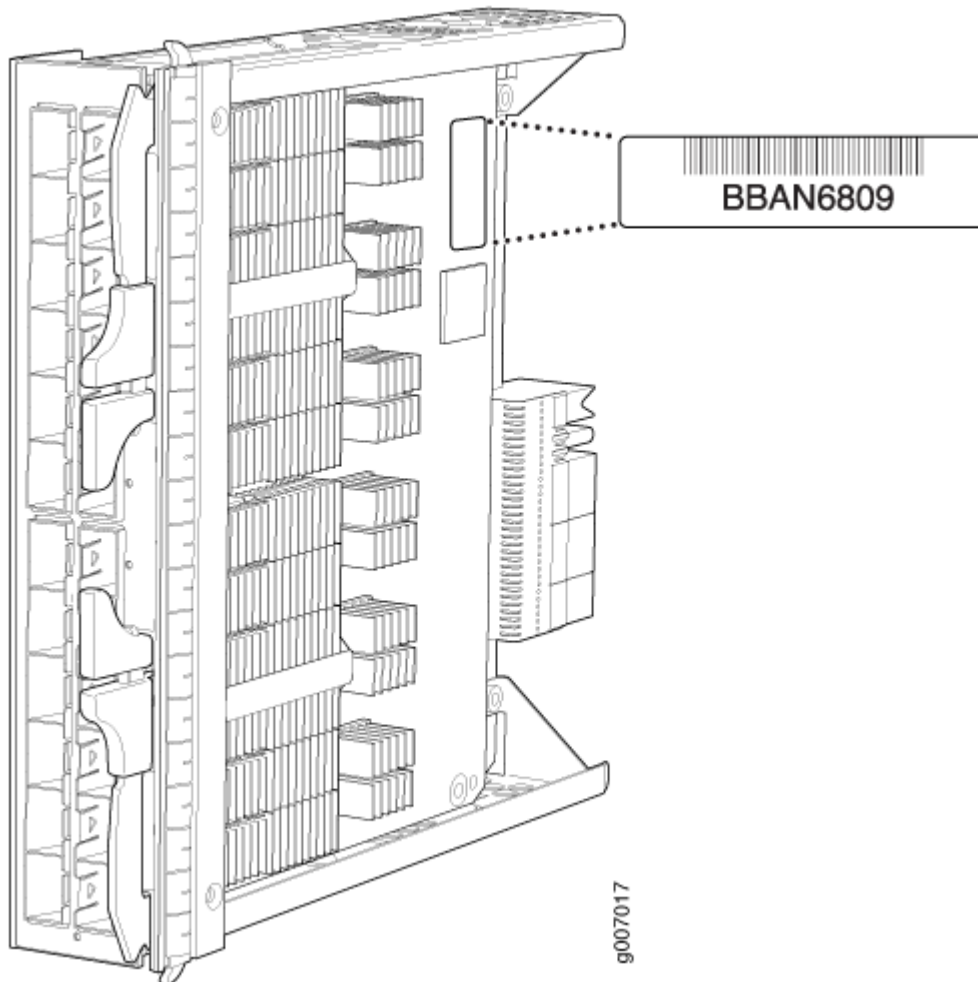
SEE ALSO

Displaying MX2008 Router Components and Serial Numbers | 602

MX2008 Power Distribution Module Serial Number Label

For the three-phase delta and wye AC PDM, the serial number label is located on the rear (see Figure 274 on page 615).

For the 60/80 A DC PDM, the serial number label is located on the rear (see Figure 275 on page 616).

Figure 274: AC Power Distribution Module Three-Phase Delta and Wye Serial Number Label
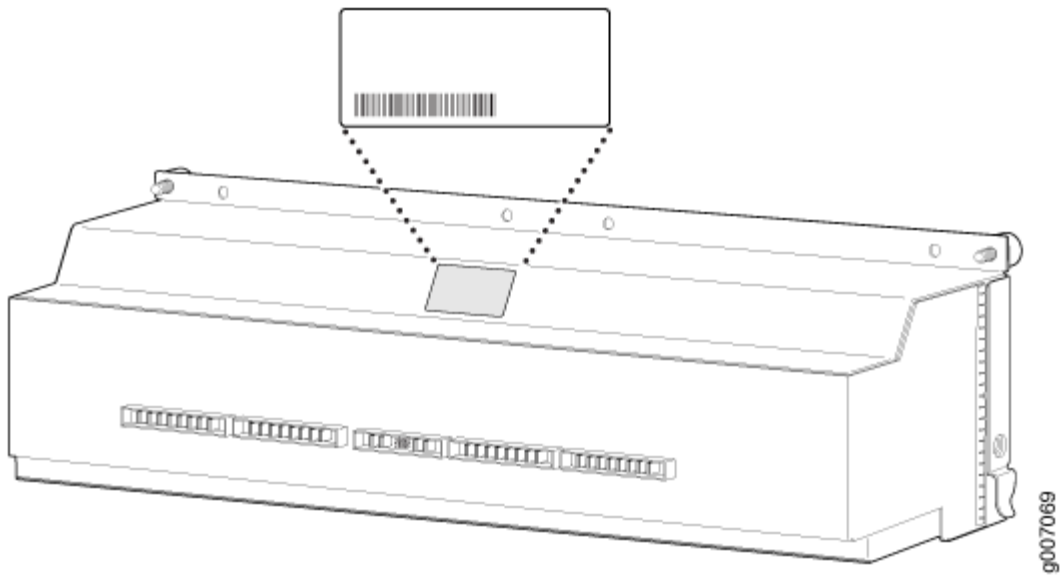
Figure 275: DC Power Distribution Module (-48 V) Serial Number Label
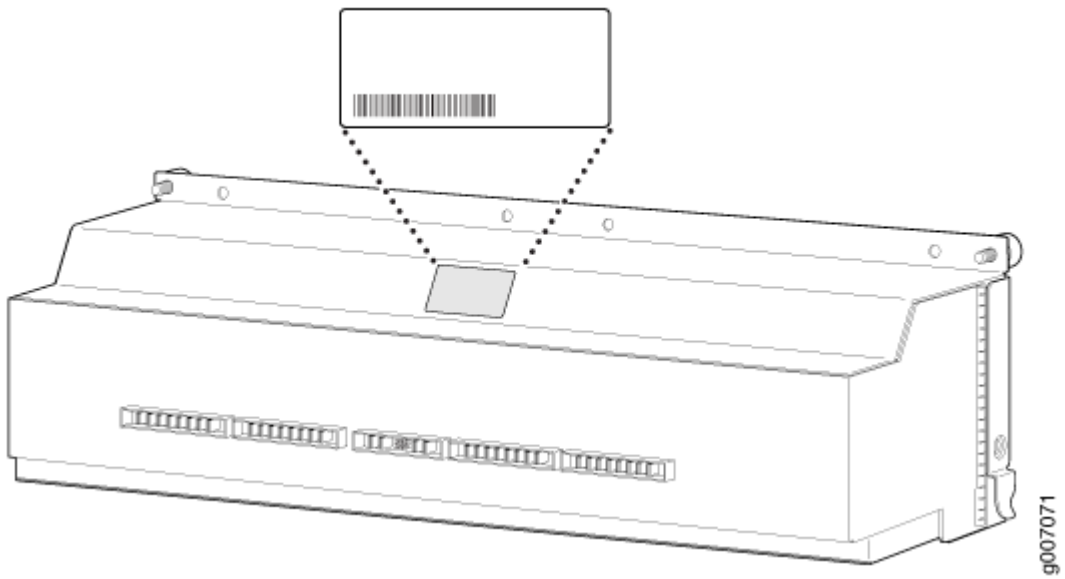
Figure 276: DC Power Distribution Module (240 V China) and Second-Generation Universal Power (HVAC/HVDC) Distribution Module Serial Number Label

Serial number ID label
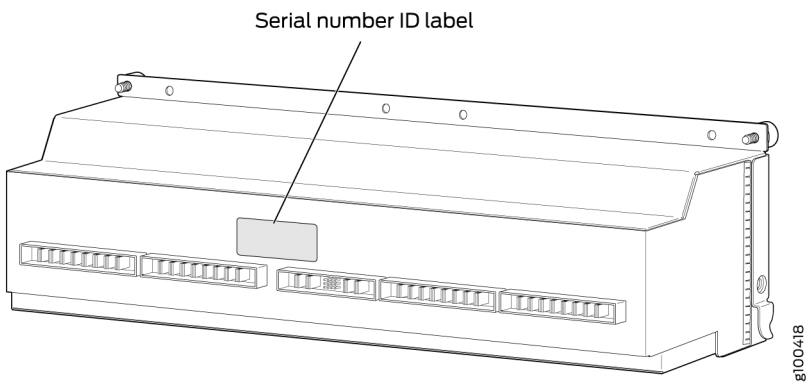
SEE ALSO

| Displaying MX2008 Router Components and Serial Numbers | **602**

MX2008 Power Supply Module Serial Number Label

The serial number label is located on the side of the AC PSM (see).

Figure 277: AC Power Supply Module Serial Number Label
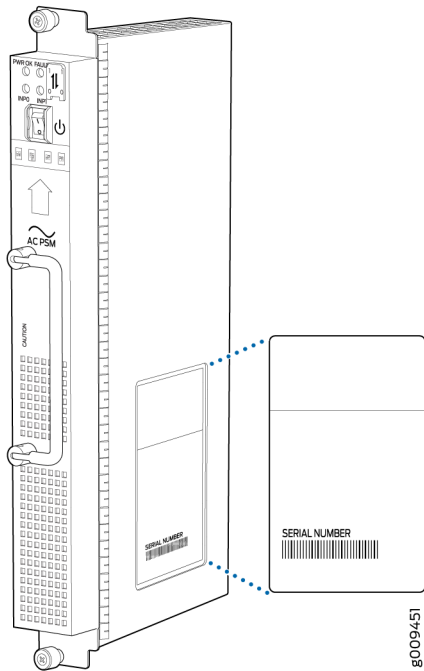
The serial number label is located on the side of the DC PSM (see).

Figure 278: DC Power Supply Module (-48 V) Serial Number Label
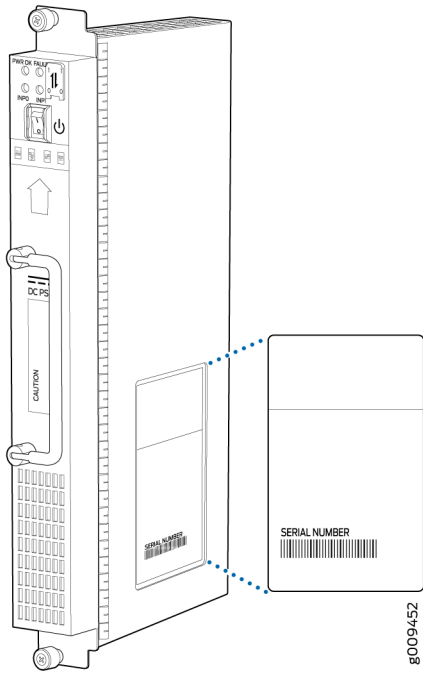
Figure 279: DC Power Supply Module (240 V China) and Second-Generation Universal Power (HVAC/HVDC) Distribution Module Serial Number Label

Serial number ID label
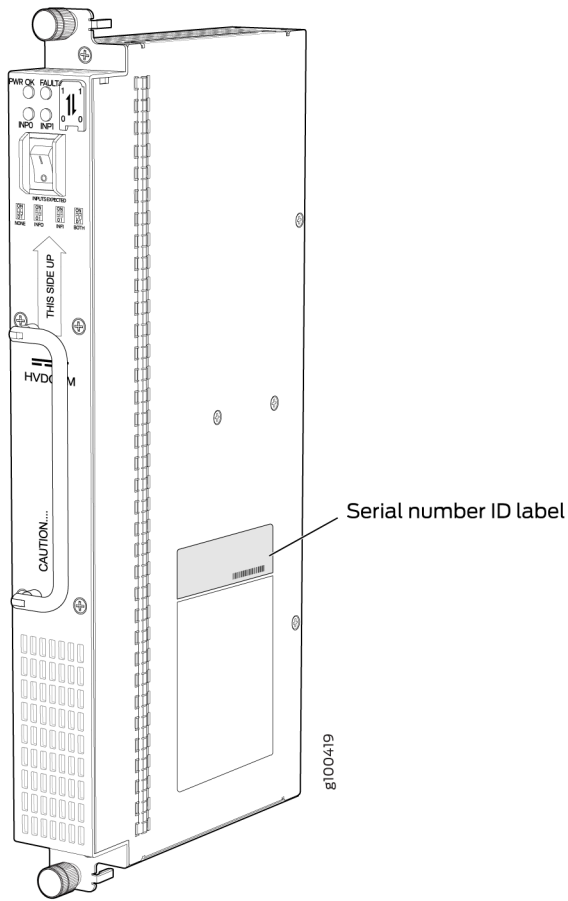
SEE ALSO

Displaying MX2008 Router Components and Serial Numbers | **602**

8
CHAPTER

Safety and Compliance Information

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.

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

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

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

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

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

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

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

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

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

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

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

RELATED DOCUMENTATION

General Safety Warnings for Juniper Networks Devices

Installation Safety Warnings for Juniper Networks Devices

Maintenance and Operational Safety Warnings for Juniper Networks Devices

General Electrical Safety Warnings for Juniper Networks Devices

DC Power Electrical Safety Warnings for Juniper Networks Devices

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:

General Safety Warnings for Juniper Networks Devices

IN THIS SECTION

Qualified Personnel Warning

> **WARNING**: Only trained and qualified personnel should install or replace the hardware equipment.
>
> **Waarschuwing** Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.
>
> **Varoitus** Ainoastaan koulutettu ja pätevä henkilökunta saa asentaa tai vaihtaa tämän laitteen.
>
> **Attention** Tout installation ou remplacement de l'appareil doit être réalisé par du personnel qualifié et compétent.

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

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

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

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

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

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

Restricted-Access Area Warning

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

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

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

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

L'accès aux zones de sécurité est sous le contrôle de l'autorité responsable de l'emplacement.

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

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

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

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

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

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

RELATED DOCUMENTATION

Installation Safety Warnings for Juniper Networks Devices

Maintenance and Operational Safety Warnings for Juniper Networks Devices

General Electrical Safety Warnings for Juniper Networks Devices

DC Power Electrical Safety Warnings for Juniper Networks Devices

Preventing Electrostatic Discharge Damage to an MX2008 Router

Many device 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 280 on page 628) . If you are returning a component, place it in an electrostatic bag before packing it.

Figure 280: Placing a Component into an Electrostatic Bag
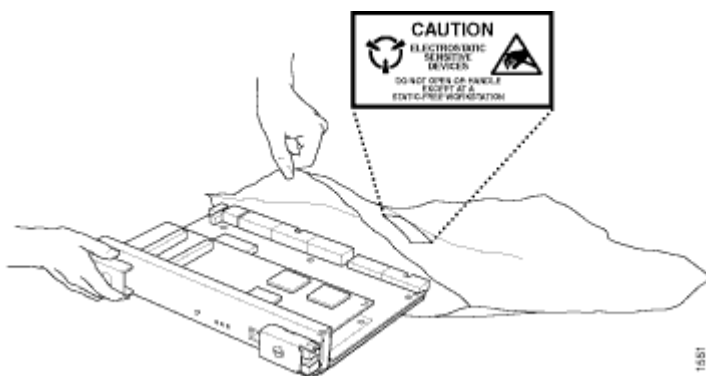
Fire Safety Requirements for Juniper Networks Devices

IN THIS SECTION

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 (CO_2) 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

General Safety Warnings for Juniper Networks Devices

General Electrical Safety Warnings for Juniper Networks Devices

DC Power Electrical Safety Warnings for Juniper Networks Devices

Installation Safety Warnings for Juniper Networks Devices

Observe the following warnings before and during hardware equipment installation:

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 metallically 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 metallically 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 vältytään 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 alaosasta kaikkein raskaimmalla esineellä ja siirry sitten sen yläosaan.

- Jos telinettä varten on vakaimet, asenna ne ennen laitteen asettamista telineeseen tai sen huoltamista siinä.

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

- Le rack sur lequel est monté le 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 käytä sellaista kaltevaa pintaa, jonka kaltevuus ylittää 10 astetta.

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

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

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

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

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

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

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

General Safety Guidelines for Juniper Networks Devices

General Safety Warnings for Juniper Networks Devices

Maintenance and Operational Safety Warnings for Juniper Networks Devices

General Laser Safety Guidelines for Juniper Networks Devices

Devices with single-mode optical interfaces are equipped with laser transmitters, which are considered Class 1 Laser product by the U.S. Food and Drug Administration, and are evaluated as a Class 1 Laser Product according to EN 60825–1 +A11 +A2 requirements.

When working around devices with optical interfaces, observe the following safety guidelines to prevent eye injury:

- Do not look into unterminated ports or at fibers that connect to unknown sources.

- Do not examine unterminated optical ports with optical instruments.

- Avoid direct exposure to the beam.

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

Laser Safety Warnings for Juniper Networks Devices

General Safety Warnings for Juniper Networks Devices

Laser Safety Warnings for Juniper Networks Devices

Class 1 Laser Product Warning

LASER WARNING: Class 1 laser product.
Waarschuwing Klasse-1 laser produkt.

Varoitus Luokan 1 lasertuote.

Attention Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning

LASER WARNING: Class 1 LED product.

Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Attention Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Maintenance and Operational Safety Warnings for Juniper Networks Devices

As you maintain the hardware equipment, observe the following warnings:

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.

In Case of an Electrical Accident

If an electrical accident results in an injury, take the following actions in this order:

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.

2. Disconnect power from the router.

3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, then call for help.

General Electrical Safety Warnings for Juniper Networks Devices

IN THIS SECTION

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 isäntälaite 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 strömmen vid överspänningsskyddet.

RELATED DOCUMENTATION

DC Power Electrical Safety Warnings for Juniper Networks Devices

General Electrical Safety Guidelines and Electrical Codes for Juniper Networks Devices

- Install the device 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 device within marked electrical ratings and product usage instructions.

- For the device 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 device components can be removed and replaced without powering off or disconnecting power to the device. Never install equipment if it appears damaged.

RELATED DOCUMENTATION

In Case of an Electrical Accident

TN Power Warning for MX2008 Routers

WARNING: The router is designed to work with TN power systems.

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

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

Attention Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

Warnung Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

Avvertenza Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

Advarsel Utstyret er utfomet til bruk med TN-strømsystemer.

Aviso O dispositivo foi criado para operar com sistemas de corrente TN.

¡Atención! El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.

Varning! Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.

RELATED DOCUMENTATION

Definition of Safety Warning Levels

General Electrical Safety Guidelines and Electrical Codes for Juniper Networks Devices

General Safety Warnings for Juniper Networks Devices

General Electrical Safety Warnings for Juniper Networks Devices

MX2000 Three-Phase AC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to AC-powered MX2000 series routers with three-phase AC power distribution modules:

- AC-powered routers are shipped with three-phase electrical cords with grounding. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.

- The delta cores in the terminal block are labeled as follows:

  - Terminal block labeled **GND**—Earth

  - Terminal block labeled **A1**

  - Terminal block labeled **B1**

  - Terminal block labeled **C1**

  - Terminal block labeled **GND**—Earth

  - Terminal block labeled **A2**

  - Terminal block labeled **B2**

  - Terminal block labeled **C2**

- The wye cores in the terminal block are labeled as follows:

  - Terminal block labeled **GND**—Earth

  - Terminal block labeled **A1**

  - Terminal block labeled **B1**

  - Terminal block labeled **C1**

  - Terminal block labeled **N1**

  - Terminal block labeled **GND**—Earth

  - Terminal block labeled **A2**

  - Terminal block labeled **B2**

  - Terminal block labeled **C2**

  - Terminal block labeled **N2**

RELATED DOCUMENTATION

General Electrical Safety Guidelines and Electrical Codes for Juniper Networks Devices

Site Electrical Wiring Guidelines for MX Series Routers

MX2008 DC Power Electrical Safety Guidelines and Warnings

MX2008 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 60 A per feed @ –48 VDC (nominal) for the system. We recommend that the 48 VDC facility DC source be equipped with a circuit breaker rated at 80 A (–48 VDC) minimum, or as required by local code. Incorporate an easily accessible disconnect device into the facility wiring. 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. 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.

- Run two wires from the circuit breaker box to a source of 48 VDC. Use appropriate gauge wire to handle up to 80 A.

- A DC-powered router that is equipped with a DC terminal block is intended for installation in a restricted access location only. 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 to be associated only 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 **RTN**, the negative lead to the terminal labeled **–48V**, and the earth ground to the chassis grounding points.

SEE ALSO

DC Power Electrical Safety Warnings for Juniper Networks Devices

IN THIS SECTION

When working with DC-powered equipment, observe the following warnings:

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

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

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

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

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

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

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

DC Power Wiring Terminations Warning

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

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

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

Attention Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. 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 forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

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

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

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

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa

kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

SEE ALSO

General Safety Warnings for Juniper Networks Devices

General Electrical Safety Warnings for Juniper Networks Devices

DC Power Electrical Safety Warnings for Juniper Networks Devices

IN THIS SECTION

- DC Power Copper Conductors Warning | 660
- DC Power Disconnection Warning | 661
- DC Power Wiring Terminations Warning | 662

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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.

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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 forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

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

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

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

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

General Safety Warnings for Juniper Networks Devices

General Electrical Safety Warnings for Juniper Networks Devices

Site Electrical Wiring Guidelines for MX Series Routers

IN THIS SECTION

Distance Limitations for Signaling

Improperly installed wires can emit radio interference. In addition, the potential for damage from lightning strikes increases if wires exceed recommended distances or if wires pass between buildings. The electromagnetic pulse (EMP) caused by lightning can damage unshielded conductors and destroy electronic devices. If your site has previously experienced such problems, you might want to consult experts in electrical surge suppression and shielding.

Radio Frequency Interference

You can reduce or eliminate the emission of radio frequency interference (RFI) from your site wiring by using twisted-pair cable with a good distribution of grounding conductors. If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

Electromagnetic Compatibility

If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, you might want to seek expert advice. Strong sources of electromagnetic interference (EMI) can destroy the signal drivers and receivers in the router and conduct power surges over the lines into the equipment, resulting in an electrical hazard. It is particularly important to provide a properly grounded and shielded environment and to use electrical surge-suppression devices.

> ⚠ **WARNING**: The intrabuilding port(s) of the equipment or subassembly is suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Agency Approvals and Compliance Statements for the MX2008 Router

IN THIS SECTION

Agency Approvals for MX2008 Routers

IN THIS SECTION

The routers comply with the following standards:

- Safety

  - CAN/CSA-C22.2 No. 60950-1 Safety of Information Technology Equipment

  - UL 60950-1 (2nd Edition) Safety of Information Technology Equipment

  - IEC 60950-1: 2005/A2:2013, Safety of Information Technology Equipment (All country deviations): CB Scheme

  - EN 60825-1 Safety of Laser Products - Part 1: Equipment classification and requirements

- EMC

  - EN 300 386 V1.6.1 Telecom Network Equipment - EMC requirements

  - EN 300 386 V2.1.1 Telecom Network Equipment - EMC requirements

  - EN 55032:2012 + EN55032:2012/AC:2013 Electromagnetic compatibility of multimedia equipment - Emission requirements

  - CISPR 32:2012 Electromagnetic compatibility of multimedia equipment - Emission requirements

  - EN 55022:2010/AC:2011 European Radiated Emissions

  - CISPR 22 edition 6.0 : 2008-09

  - FCC 47CFR , Part 15 Class A (2012) USA Radiated Emissions

  - ICES-003 Issue 6, Jan 2016 Canada Radiated Emissions

  - VCCI-V-3/2013.04 and V-4/2012.04 Japanese Radiated Emissions

  - BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions

  - AS/NZS CISPR22:2009/A1:2010

- AS/NZS CISPR 32:2015 Electromagnetic compatibility of multimedia equipment - Emission requirements

- TEC/EMI/TEL-001/01/FEB-09,Class A

- EN-61000-3-2 Power Line Harmonics

- EN-61000-3-3 Voltage Fluctuations and Flicker

- Immunity

  - EN 55024:2010 Information Technology Equipment Immunity Characteristics

  - CISPR 24:edition 2b: 2010 COREC 2011 IT Equipment Immunity Characteristics

  - EN 300 386 V1.6.1 Telecom Network Equipment - EMC requirements

  - EN 300 386 V2.1.1 Telecom Network Equipment - EMC requirements

  - TEC/EMI/TEL-001/01/FEB-09,Class A

  - EN-61000-4-2 ESD

  - EN-61000-4-3 Radiated Immunity

  - EN-61000-4-4 EFT

  - EN-61000-4-5 Surge

  - EN-61000-4-6 Low Frequency Common Immunity

  - EN-61000-4-11 Voltage Dips and Sags

The router is designed to comply with the following standards:

- IPC 1752 form filled and complete for all ordered AVL parts

- 2011/65/EU (RoHS) Restriction on Hazardous Substances

- 2002/96/EC (WEEE) Design for Easy Disassembly and Recycling

- 2006/1907/EC (REACH) Registration, Evaluation, Authorization of Chemicals

- JIG 101-A, JIG 101-B Joint Industry Guide Japanese Material Composition Declaration

- CAITEC SJ/T 11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products (China RoHS)

- Under Directive ErP /125/EC, the regulations below:

- Reg. 1275/2008/EC applies for products classified as Class B per EN55022. Note: standby mode not appropriate for Juniper network products which must remain active 24/7.

- Reg. 278/2009/EC applies for external power adapter on products classified as Class B per EN55022.

- AT&T TP-76200 Issue 18 (2013) Network Equipment Power, Grounding, Environmental, and Physical Design Requirements

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for NEBS for the MX2008 Router

- GR-63-Core Issue 4 (2012) Network Equipment, Building Systems (NEBS) Physical Protection

- GR-1089-Core Issue 6 (May, 2011) EMC and Electrical Safety for Network Telecommunications Equipment

- SR-3580 (2007) NEBS Criteria Levels (Level 3)

- Verizon TPR.9305 Issue 6 (2013) Verizon NEBS Compliance: NEBS Compliance Clarification Document

NOTE: The Premium 2 Chassis is not NEBs compliant.

Compliance Statements for EMC Requirements for the MX2008 Router
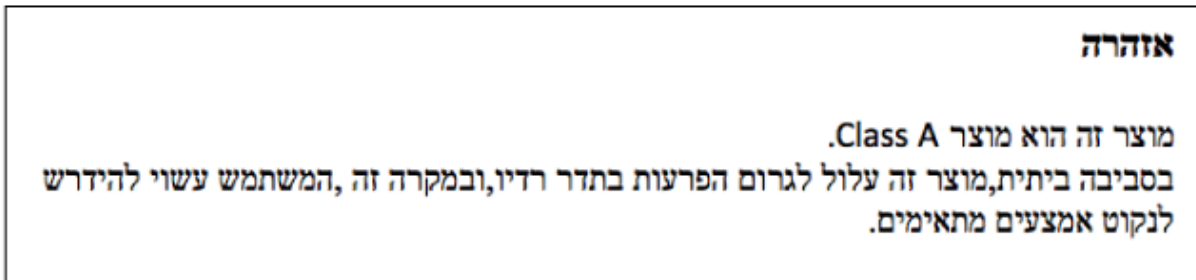
IN THIS SECTION

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.
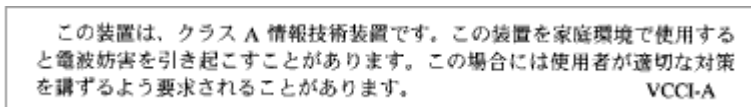
European Community

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

Israel

אזהרה

.Class A מוצר זה הוא מוצר
בסביבה ביתית,מוצר זה עלול לגרום הפרעות בתדר רדיו,ובמקרה זה, המשתמש עשוי להידרש
לנקוט אמצעים מתאימים.

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

Japan

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

Translation from Japanese—This is a Class A product. In a domestic environment this product might cause radio interference in which case the user might be required to take adequate measures. VCCI-A

United States

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

Compliance Statements for Environmental Requirements

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