
Foundry BigIron RX Series Installation Guide



2100 Gold Street
P.O. Box 649100
San Jose, CA 95164-9100
Tel 408.586.1700
Fax 408.586.1900

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Chapter 1

Getting Started

Introduction

This guide describes the BigIron RX Series Switch from Foundry Networks. It provides procedures for installing modules into the BigIron RX Series chassis, cabling the Ethernet interface ports, and performing a basic configuration of the software. The guide explains how to perform tasks using the CLI.

Audience

This guide is designed for network installers, system administrators, and resellers who will install and perform a basic software configuration for the BigIron RX Series Switch. This guide assumes a working knowledge of Layer 2 and Layer 3 switching and routing concepts.

Nomenclature

This guide uses the following typographical conventions to show information:

Italic highlights the title of another publication and occasionally emphasizes a word or phrase.

Bold highlights a CLI command.

Bold Italic highlights a term that is being defined.

NOTE: A note emphasizes an important fact or calls your attention to a dependency.

WARNING: A warning calls your attention to a possible hazard that can cause injury or death.

CAUTION: A caution calls your attention to a possible hazard that can damage equipment.

Related Publications

The following Foundry Networks documents supplement the information in this guide.

- *Foundry BigIron RX Series Configuration Guide* – describes the software features supported in the BigIron RX Series Switch and the CLI commands used to configure them.
- *Management Information Base Reference* – contains the Simple Network Management Protocol (SNMP) Management Information Base (MIB) objects that are supported in the Foundry devices.
- *IronView Network Management User's Guide* – describes how to use the SNMP-based GUI for managing Foundry Networks switches and switching routers.

To order additional copies of these manuals, do one of the following:

- Call 1.877.TURBOCALL (887.2622) in the United States or 1.408.586.1881 outside the United States.
- Send email to info@foundrynet.com.

How to Get Help

Foundry Networks technical support will ensure that the fast and easy access that you have come to expect from your Foundry Networks products will be maintained.

Web Access

- <http://www.foundrynetworks.com>

Email Access

Technical requests can also be sent to the following email address:

- support@foundrynet.com

Telephone Access

- 1.877.TURBOCALL (887.2622) United States
- 1.408.586.1881 Outside the United States

Warranty Coverage

Contact Foundry Networks using any of the methods listed above for information about the standard and extended warranties.

Chapter 2

Product Overview

The BigIron RX Series Switch provides high-performance L2/3 switching for the Enterprise, large data centers, and grid computing topologies. This chapter provides an overview of Foundry's BigIron RX Series Switch. It provides the following information:

- Overview of the benefits the BigIron RX Series Switch offers.
- Network topologies in which a BigIron RX Series Switch will be commonly deployed.
- The BigIron RX Series hardware and how each major hardware component functions.
- Software features that the BigIron RX Series Switch supports.
- The BigIron RX Series Switch's architecture, how it differs from other Layer 3 Switch architectures, and how you will benefit from the differences.

Product Overview

The BigIron RX Series Switch provides the following benefits:

- 240 Gbps full-duplex capacity per full slot and over 1.92 Terabit switching capacity for wire-speed, non-blocking switching and routing of up to 1.14 Bpps throughput capacity.
- Non-blocking 10 GbE and 1 GbE port density of up to 64 non-blocking 10 Gigabit Ethernet or 384 Gigabit Ethernet ports within a 16-slot chassis and up to 192 10 Gigabit Ethernet or 1,152 Gigabit Ethernet ports in a standard 7-foot Telco rack.
- Ultra-low latency routing of up to 512,000 IPv4 routes in hardware.
- Support for a comprehensive set of standards-based routing protocols including RIP, IS-IS, BGP4, and OSFP.
- Foundry Direct Routing (FDR) with rule-based ACLs provide wire-speed forwarding, filtering and accelerated convergence.
- End-to-end QoS delivery with Advanced Bandwidth Management (ABM) features.
- High availability (redundancy) of the following BigIron RX Series critical components:
 - Redundant Management modules with Hitless Management Failover (HMF)
 - Redundant Switch Fabric elements
 - Redundant fans
 - Interface modules with hot-Pluggable optics
 - Hot-swappable power supplies

- 80 Gbps of cross-module link aggregation based on 802.3ad for reliant bandwidth scalability between any two BigIron RX Series 10 Gigabit Ethernet Switches.
- Built-in sFlow™ technology (RFC 3176) delivers scalable network monitoring, accounting and billing at 10 Gbps speed using Layer 2-7 per-port information, offering detailed capacity planning and security analysis solutions.
- A management (10/100/1000BaseTX Ethernet) port that can provide connectivity to your existing management network.

Hardware Features

The BigIron RX Series Switches are composed of the following major hardware components:

- Chassis
- Management modules
- Interface modules
- Switch fabric module
- Power supplies
- Cooling system, which is composed of temperature sensors, fans, fan control modules, and an air filter
- Rack mount kit

The following sections provide more information about these components.

Chassis

The BigIron RX Series chassis consists of the following three chassis:

- BigIron RX-4: Provides four Interface slot.
- BigIron RX-8: Provides eight Interface slots.
- BigIron RX-16: Provides sixteen Interface slots.

The following figures illustrate the BigIron RX Series chassis.

Figure 2.1 BigIron RX-4 Chassis

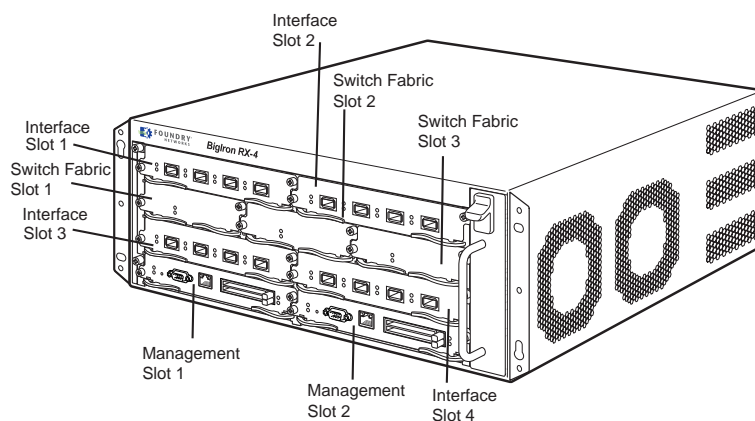


Figure 2.2 BigIron RX-8 Chassis

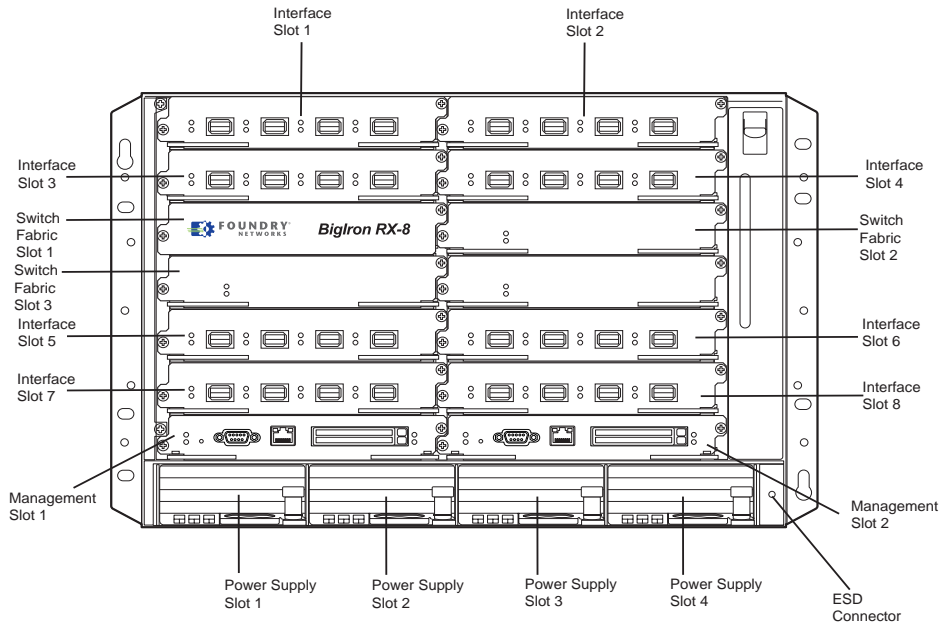
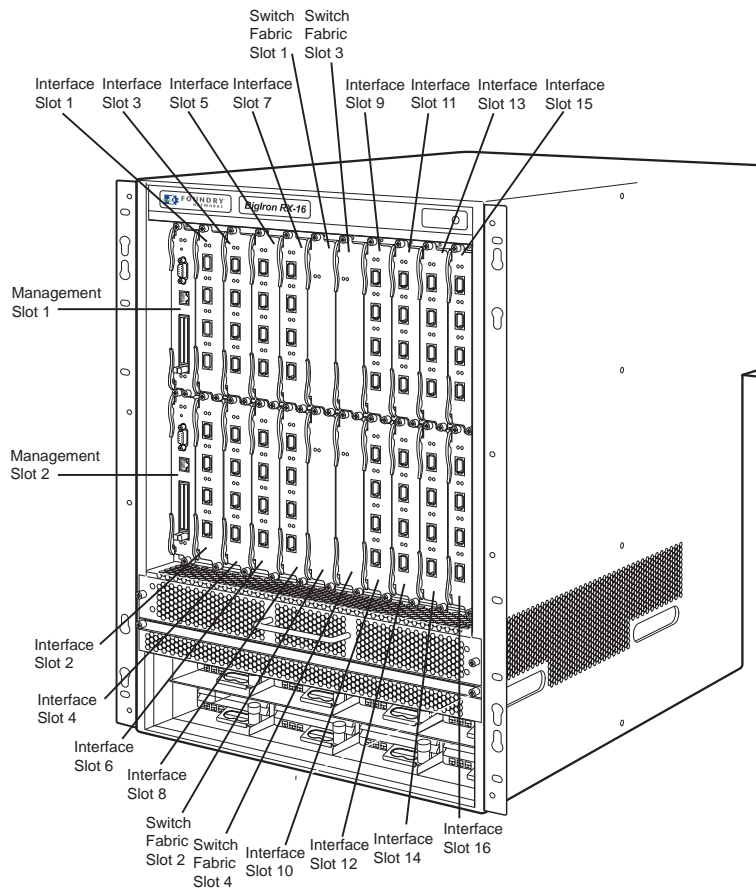


Figure 2.3 BigIron RX-16 Chassis



Upon shipment from the factory, the following components are installed in the three versions of the BigIron RX Series chassis as described:

BigIron RX-4

- Two switch fabric modules.
- A slot panel in each Interface module slot. The slot panel covers a slot that does not currently have a module installed in it, ensuring proper airflow within the chassis.
- A fan tray assembly, which is located in the front right side of the chassis. For more information about the fans, see “Cooling System” on page 2-13.
- One power supply (AC or DC).

In the slots of the chassis you can install the following:

- Up to two management modules (one active and one redundant).
- Up to three switch fabric modules.
- Up to four interface modules.
- Up to three power supplies (AC or DC).

Before installing any modules or power supplies, you must remove the slot panel or blank power supply faceplate, respectively.

BigIron RX-8

- Two switch fabric modules.
- A slot panel in each Interface module slot. The slot panel covers a slot that does not currently have a module installed in it, ensuring proper airflow within the chassis.
- A fan tray assembly, which is located in the front right side of the chassis. For more information about the fans, see “Cooling System” on page 2-13.
- Two power supplies (AC or DC).

In the slots of the chassis you can install the following:

- Up to two management modules (one active and one redundant).
- Up to three switch fabric modules.
- Up to eight interface modules.
- Up to four power supplies (AC or DC).

Before installing any modules or power supplies, you must remove the slot panel or blank power supply faceplate, respectively.

BigIron RX-16

- Three switch fabric modules.
- A slot panel in each Interface module slot. The slot panel covers a slot that does not currently have a module installed in it, ensuring proper airflow within the chassis.
- A fan tray assembly located in the front right side of the chassis. and two fan assemblies located at the rear of the chassis. For more information about the fans, see “Cooling System” on page 2-13.
- Four power supplies.

In the slots of the chassis you can install the following:

- Up to two management modules (one active and one redundant).
- Up to four switch fabric modules.
- Up to sixteen interface modules.

- Up to eight power supplies (AC or DC).

Before installing any modules or power supplies, you must remove the slot panel or blank power supply faceplate, respectively.

CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.

Figure 2.1, Figure 2.2 and Figure 2.3 show the BigIron RX Series chassis and the slots into which you install the various modules. You must install the primary power supplies and the redundant power supplies as described in the figures..

Figure 2.1, Figure 2.2 and Figure 2.3 also show an electrostatic discharge (ESD) connector, into which you can plug an ESD wrist strap to ground yourself while handling and installing modules. Another connector is provided on the upper right corner of the chassis' rear panel.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

All three chassis versions also include a grounding lug connector, located on the rear panel (left side).

Management Modules

The management module controls the BigIron RX Series hardware components, runs the networking protocols, and provides the Real Time Operating System (RTOS).

Each BigIron RX Series chassis requires one management module and can accept a second one for redundancy. A redundant management module works along with the active management module. If the active module becomes unavailable, the redundant management module automatically takes over the system operation, minimizing system downtime. For information about the redundancy feature, see "How Management Module Redundancy Works" on page 5-1.

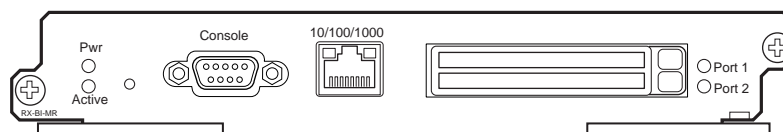
You can install management modules in dedicated slots marked M1 and M2 . By default, the system considers the module installed in the slot marked M1 to be the active management module.

NOTE: The BigIron RX Series management module is dedicated, which means that you must install it in the BigIron RX Series chassis only. If you attempt to install the BigIron RX Series management module in another Foundry chassis or a management module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and module will not function properly.

A management module is hot swappable, which allows you to remove and replace it without powering down the system.

Figure 2.4 shows the management module's front panel.

Figure 2.4 Management Module Front Panel



The front panel includes the following control features:

- Two PCMCIA slots
- A Console port
- A 10/100/1000 Ethernet port
- Six LEDs

PCMCIA Slots

The PCMCIA slots support a flash PC card. The flash PC card provides storage space in addition to the system's flash memory. A flash PC card can store system files, including boot images, startup configuration files, running configuration files, and so on. As a result, you can perform system management tasks, such as copying files between flash PC cards, copying files between a flash PC card and flash memory, and so on.

Console Port

The Console port is a standard DB-9 serial connector through which you can attach a PC or terminal to configure the BigIron RX Series system using the command line interface (CLI).

This port interfaces the control plane only and not the data plane.

10/100/1000 Ethernet Port

The front panel includes a 10BaseT/100BaseTX/1000BaseTX auto-sensing, auto-negotiating Ethernet port. This port has an RJ-45 unshielded twisted pair (UTP) connector.

Typical uses of this port include but are not limited to the following:

- Connecting a PC through which you can access the system through a Telnet or SSHv2 connection and configure, monitor, and manage the BigIron RX Series system.
- Connecting a 10BaseT/100BaseTX/1000BaseTX switch, which will provide connectivity to your existing management network. You can then access the BigIron RX Series system and configure, monitor, and manage the system from a management station.

NOTE: The existing management network into which you can connect the 10/100/1000 Ethernet port must be separate and isolated from the network over which user packets are switched and routed. For information about the management port's functionality, see "Understanding How the Management Port Functions" on page 4-5.

For information about connecting a PC and a switch to the 10/100/1000 Ethernet port, see "Attaching a Management Station" on page 3-17.

This port interfaces the control plane only and not the data plane.

LEDs

Table 2.1 describes the LEDs on the management module's front panel.

Table 2.1: Management Module LEDs

LED	Position	State	Meaning
Port 1 and Port 2	Each adjacent to the PCMCIA slot that is represents	On or blinking	You have inserted a PCMCIA flash card in a slot or initiated a task related to the file management system on a flash card. As a result, the software is currently accessing the flash card.
		Off	The software is not currently accessing a PCMCIA flash card inserted in a slot.
Active	Lower Left	On	The module is functioning as the active management module.
		Off	The module is functioning as the redundant management module.
Pwr	Upper Left	On	The module is receiving power.
		Off	The module is not receiving power.

Table 2.1: Management Module LEDs

LED	Position	State	Meaning
10/100/1000 Ethernet Port	Above and right of RJ-45 connector	On (Green)	A link is established with the remote port.
		Off	A link is not established with the remote port.
10/100/1000 Ethernet Port	Above and left of RJ-45 connector	On or blinking (Yellow)	The port is transmitting and receiving packets.
		Off for an extended period	The port is not transmitting or receiving packets.

Interface Modules

You can install from 4 to 16 BigIron RX Series interface modules in the BigIron RX Series chassis as described:

- BigIron RX-4: Supports 4 Interface modules.
- BigIron RX-8: Supports 8 Interface modules.
- BigIron RX-16: Supports 16 Interface modules.

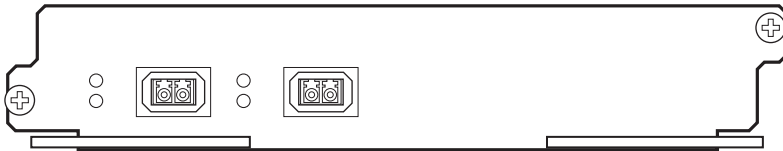
NOTE: A BigIron RX Series interface module is dedicated, which means that you must install it in the BigIron RX Series chassis only. If you attempt to install a BigIron RX Series interface module in another Foundry chassis or an interface module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and interface module will not function properly.

The interface modules are hot swappable, which means you can remove and replace them without powering down the system.

2-port 10 Gigabit Ethernet Module

Figure 2.6 shows the 2-port 10 Gigabit Ethernet module's front panel with XFP modules installed.

Figure 2.5 2-port 10 Gigabit Ethernet Module Front Panel



The front panel includes the following control features:

- Four LEDs
- Two 10 Gigabit Ethernet XFP slots

LEDs

The module's front panel includes two LEDs that indicate the status of each port.

Table 2.3 describes the LEDs on the 10 Gigabit Ethernet module's front panel.

Table 2.2: 10 Gigabit Ethernet Module LEDs

LED	Position	State	Meaning
Link	Left of each Ethernet port	On	A link is established with the remote port.
		Off	A link is not established with the remote port.
Active	Left of each Ethernet port	On or blinking	The port is transmitting and receiving packets.
		Off for an extended period	The port is not transmitting or receiving packets.

A two 10 Gigabit Ethernet module contain two physical ports, through which you can connect your BigIron RX Series Switch to other network devices at a speed of 10 Gigabits.

Into a physical port, you must insert a fiber-optic module provided by Foundry. The XFP-compliant fiber-optic modules provide an optical transceiver or physical medium dependent (PMD) interface for single mode fiber that can be used with the LAN physical layer (PHY).

The following optic modules versions are available from Foundry:

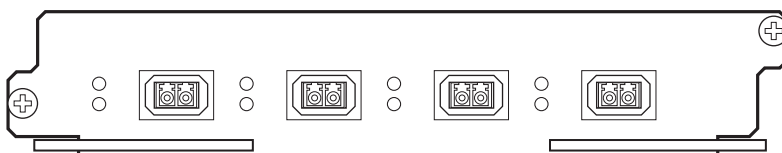
- Short wavelength (86 – 300 meters) – Foundry part number 10G-XFP-SR
- Long wavelength (10 kilometers) – Foundry part number 10G-XFP-LR
- Extra long wavelength (40 kilometers) – Foundry part number 10G-XFP-ER

For more information about the fiber-optic modules and the cabling associated with them, see Table 4.2 on page 4-6.

4- port 10 Gigabit Ethernet Interface Module

Figure 2.6 shows the 4-port 10 Gigabit Ethernet module's front panel with XFP modules installed.

Figure 2.6 4-port 10 Gigabit Ethernet Module Front Panel



The front panel includes the following control features:

- Eight LEDs
- Four 10 Gigabit Ethernet XFP slots

LEDs

The module's front panel includes two LEDs that indicate the status of each port.

Table 2.3 describes the LEDs on the 10 Gigabit Ethernet module's front panel.

Table 2.3: 10 Gigabit Ethernet Module LEDs

LED	Position	State	Meaning
Link	Left of each Ethernet port	On	A link is established with the remote port.
		Off	A link is not established with the remote port.
Active	Left of each Ethernet port	On or blinking	The port is transmitting and receiving packets.
		Off for an extended period	The port is not transmitting or receiving packets.

10 Gigabit Ethernet Ports

A 10 Gigabit Ethernet module contain four physical ports, through which you can connect your BigIron RX Series Switch to other network devices at a speed of 10 Gigabits.

Into a physical port, you must insert a fiber-optic module provided by Foundry. The XFP-compliant fiber-optic modules provide an optical transceiver or physical medium dependent (PMD) interface for single mode fiber that can be used with the LAN physical layer (PHY).

The following optic modules versions are available from Foundry:

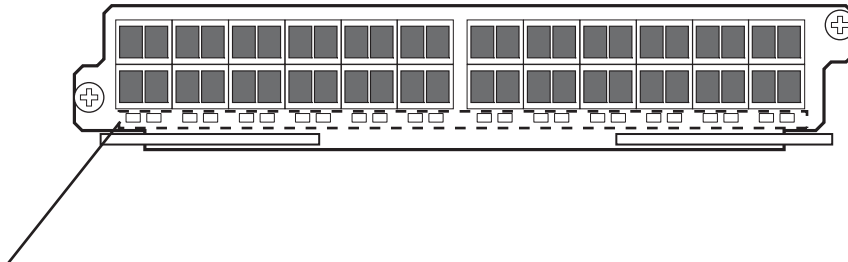
- Short wavelength (86 – 300 meters) – Foundry part number 10G-XFP-SR
- Long wavelength (10 kilometers) – Foundry part number 10G-XFP-LR
- Extra long wavelength (40 kilometers) – Foundry part number 10G-XFP-ER

For more information about the fiber-optic modules and the cabling associated with them, see Table 4.2 on page 4-6.

Gigabit Ethernet Interface Module (SFP)

Figure 2.8 shows the 24-port 1 Gigabit Ethernet mini-GBIC (or SFP) module's front panel.

Figure 2.7 24-port 1 Gigabit Ethernet SFP Module Front Panel



Port Status LEDs
 (In each pair, the left most LED supports the port in the top row directly above it and the right-most LED supports the port in the bottom directly above it)

The front panel includes the following control features:

- LEDs
- 24 1-Gigabit Ethernet mini-GBIC (SFP) ports

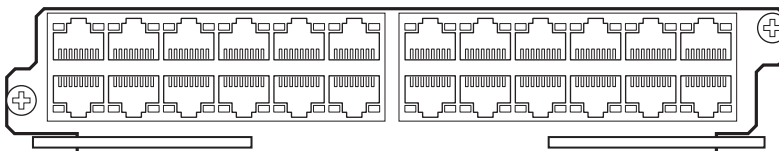
Table 2.4: Gigabit Ethernet Module LEDs

Position	State	Meaning
Below each Ethernet port	On or blinking	The port is transmitting and receiving packets.
(left-side LED supports port in top row while right-side LED supports port in bottom row)	Off for an extended period	The port is not transmitting or receiving packets.

Gigabit Ethernet Interface Module (RJ-45)

Figure 2.8 shows the 24-port 1 Gigabit Ethernet module's front panel.

Figure 2.8 24-port 1 Gigabit Ethernet Module Front Panel



The front panel includes the following control features:

- LEDs

- 24 1-Gigabit Ethernet ports

Table 2.5: Gigabit Ethernet Module LEDs

LED	Position	State	Meaning
Link	Left of each Ethernet port	On	A link is established with the remote port.
		Off	A link is not established with the remote port.
Active	Left of each Ethernet port	On or blinking	The port is transmitting and receiving packets.
		Off for an extended period	The port is not transmitting or receiving packets.

Switch Fabric Module

The switch fabric module switches user packets from one interface module installed in a chassis to another. The BigIron RX Series Switches can be configured with switch fabric modules as described:

- BigIron RX-4: Accommodates 3 switch fabric elements with 2 required and 1 redundant for a fully loaded system. It is shipped with 2 switch fabric elements. You must purchase an additional switch fabric element if you want your BigIron RX-4 equipped for redundancy.
- BigIron RX-8: Accommodates 3 switch fabric elements with 2 required and 1 redundant for a fully loaded system. It is shipped with 2 switch fabric elements. You must purchase an additional switch fabric element if you want your BigIron RX-8 equipped for redundancy.
- BigIron RX-16: Accommodates 4 switch fabric elements with 3 required and 1 redundant for a fully loaded system. It is shipped with 3 switch fabric elements. You must purchase an additional switch fabric element if you want your BigIron RX-16 equipped for redundancy.

NOTE: The switch fabric elements used for the BigIron RX-4 are a different part than those used on the BigIron RX-8 and BigIron RX-16.

NOTE: The BigIron RX Series switch fabric module is dedicated, which means that it functions properly in the BigIron RX Series chassis only. If you attempt to install a BigIron RX Series switch fabric module in another Foundry chassis or a switch fabric module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and switch fabric module will not function properly.

Figure 2.9 shows the switch fabric module's front panel.

Figure 2.9 Switch Fabric Module Front Panel

The front panel includes two LEDs, which Table 2.6 describes.

Table 2.6: Switch Fabric Module LEDs

LED	Position	State	Meaning
Pwr	Above Active LED	On	The module is receiving power.
		Off	The module is not receiving power.
Active	Below Pwr LED	On	The chassis switch fabric is active and ready to switch user packets.
		Off for an extended period	The chassis switch fabric is not active and cannot switch user packets.

Power Supplies

The NetIron XMR-Series Routers support the following power supply options:

- BigIron RX-4: Accommodates 3 power supplies (AC or DC) with 1 required and 2 redundant. It is shipped with 1 power supply. You must purchase one or two additional power supplies if you want your BigIron RX-4 equipped for redundancy.
- BigIron RX-8: Accommodates 4 power supplies (AC or DC) with 2 required and 2 redundant. Because power is supplied over a common power bus, any power supply purchased in addition to the two required will provide backup for any supply that fails. Equipping a BigIron RX-8 with two additional power supplies provides full redundancy for both of the required power supplies.
- BigIron RX-16: Accommodates 8 power supplies (AC or DC) with 4 required and 4 redundant. Because power is supplied over a common power bus, any power supply purchased in addition to the four required will provide backup for any supply that fails. Equipping a BigIron RX-16 with four additional power supplies provides full redundancy for all four of the required power supplies.

For power supply specifications, see “Power Specifications” on page 9-1.

In the BigIron RX-8 and BigIron RX-16, you install the power supplies (AC or DC) in the slots along the bottom of the chassis. In the BigIron RX-4, the power supplies (AC or DC) are installed in slots in the rear of the chassis. The installed power supplies provide power to all chassis components, sharing the workload equally and reporting their status to the management module. If the management module detects that one of these power supplies has failed or overheated, the management module will redistribute the failed power supply’s workload to the remaining power supplies.

Each power supply has three LEDs on its faceplate that provide status for the input power, output power and notification of alarms sent. If the input power and output power LEDs are on (a steady green), the power supply is providing power to the chassis components. The power supplies are hot swappable, which means you can remove and replace them without powering down the system. For information about replacing a power supply, see “Replacing a Power Supply” on page 7-9.

WARNING: The power supplies are hot swappable, which means they can be removed and replaced while the BigIron RX Series chassis is powered on and running. However, Foundry recommends that you disconnect a power supply from its power source before removing and replacing it. The BigIron RX Series chassis can be running while a power supply is being removed and replaced, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the power supply or other parts of the device could be damaged.

Cooling System

The cooling system of BigIron RX Series Switches is configured as described:

- BigIron RX-4: Is equipped with a fan module containing 4 four-speed fans.
- BigIron RX-8: Is equipped with a fan module containing 4 four-speed fans.
- BigIron RX-16: Is equipped with three fan assemblies. The fan tray located in the lower front of the chassis contains 6 four-speed fans. There are two fan assemblies located in the rear of the chassis. Each of these contain a four-speed fan that pulls air through the chassis.

As shown in Figure 2.10 and Figure 2.11, the fans are located in the front of the BigIron RX-4 and BigIron RX-8 chassis.

Figure 2.10 Fan Component Locations for the BigIron RX-4

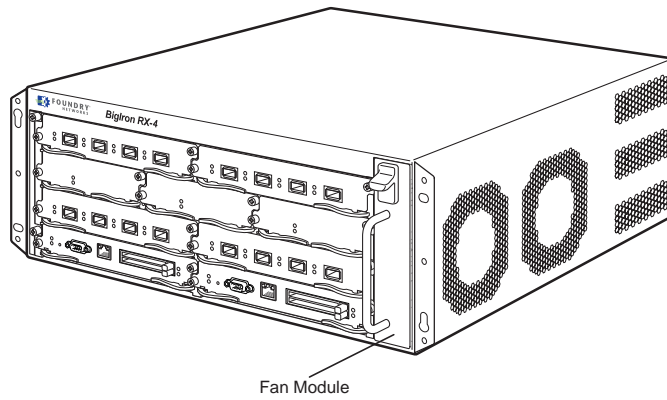


Figure 2.11 Fan Component Locations for the BigIron RX-8

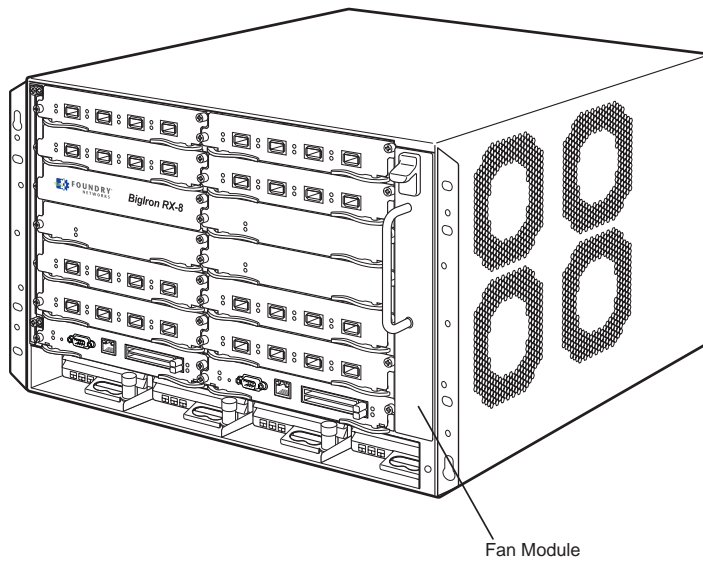


Figure 2.12 Front Fan Component Locations for the BigIron RX-16

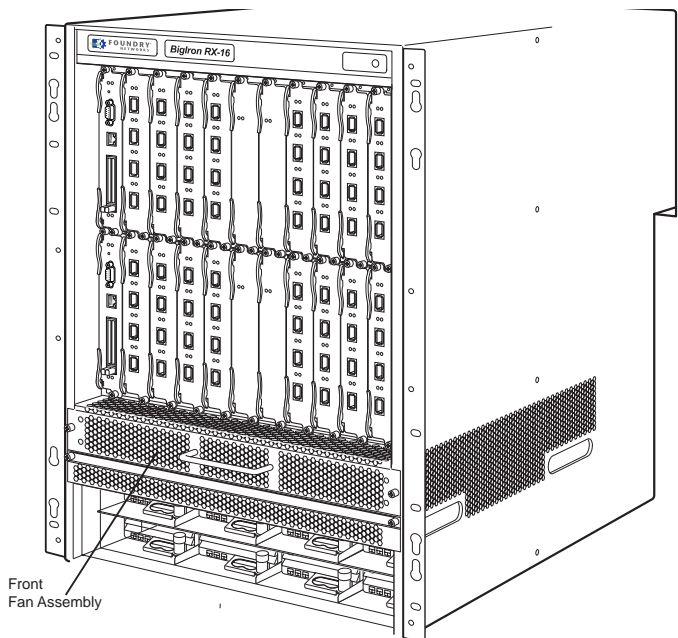
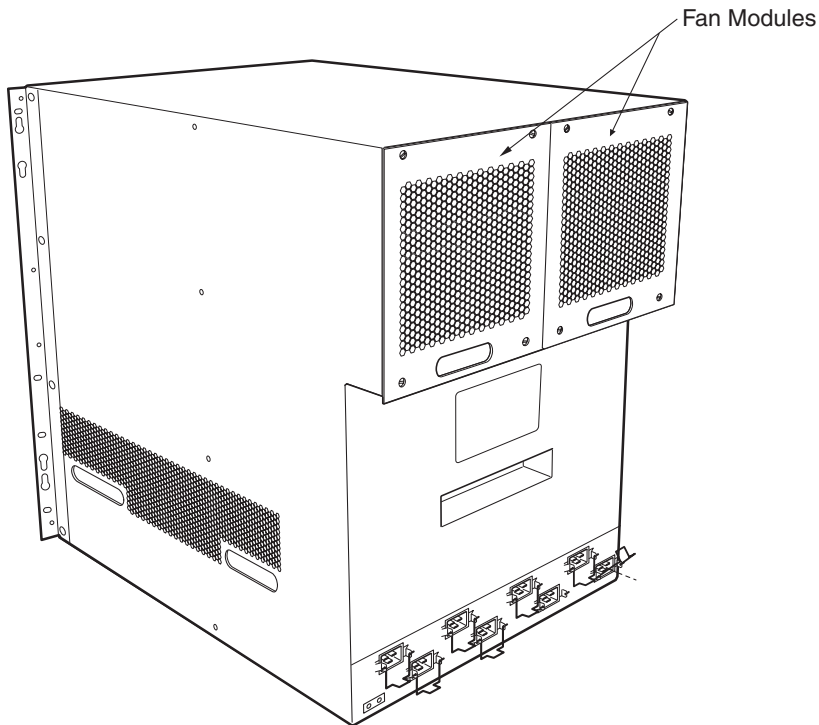


Figure 2.13 Rear Fan Component Locations for the BigIron RX-16



Upon system startup, the fans in the BigIron RX Series Switches operate at high speed, then the management module lowers the fan speed to low speed. .

By default, the BigIron RX Series Switch polls the temperature sensor on each module every 60 seconds to get a temperature reading. (For information about changing the default temperature polling interval, see “Changing the Temperature Polling Interval” on page 6-10.) Depending on the temperature readings for the modules, the system can do the following:

- Leave the fan speed as is
- Increase the fan speed
- Decrease the fan speed
- Shut down a module to prevent damage

If the temperature of a module exceeds specified high temperature thresholds, the system generates a Syslog message and SNMP trap. The system can also shut the module down if the temperature exceeds the highest threshold.

You can change default low and high temperature thresholds for modules and fan speeds. For more information, see “Changing Temperature Thresholds For Modules and Fan Speeds” on page 6-5.

The fan control modules include a bi-color LED, which indicates the status of the fans. Table 2.7 describes the LED.

Table 2.7: Fan Control Module LED

LED	Position	State	Meaning
Fan control module LED	Rear of chassis	Off	The fans are not receiving power.
		Green	The fans are working and responding to controls from the fan control module.
		Amber	The fans are not working and not responding to controls from the fan control module.

The BigIron RX Series chassis ships with all fan components fully installed. However, Foundry recommends that you replace the air filter every 6 months. For information about replacing the air filter and if necessary, other fan components, see “Maintaining a BigIron RX Series Switch” on page 7-1. The fan components are hot swappable, which means you can remove and replace them without powering down the system.

CAUTION: To avoid overheating of the BigIron RX Series chassis, remove only one fan at a time. Do not remove both fans from the chassis at one time.

Rack Mount Kit

The BigIron RX Series Switches are shipped equipped for mounting in a standard 19-inch (EIA310-D) rack as described:

- The BigIron RX-4 and BigIron RX-8 are equipped with built-in mounting brackets and are shipped with mounting screws.
- The BigIron RX-16 Switch ships with two L-shaped mounting brackets and mounting screws,.

In a rack, you can install the following number of BigIron RX Series chassis depending on the model:

- BigIron RX-16 – up to three BigIron RX-16 chassis
- BigIron RX-8 – up to six BigIron RX-8 chassis
- BigIron RX-4 – up to 11 BigIron RX-4 chassis

Supported Software Features

For a complete list of software features supported on the BigIron RX Series Switch, see the software release notes for this device. For information about configuring basic, non-protocol software features supported on this device, see the *Foundry BigIron RX Series Configuration Guide*.

Chapter 3

Installing a BigIron RX Series Switch

This chapter describes hardware installation tasks for the BigIron RX Series Switches. It discusses the following topics:

- Summary of hardware installation procedures.
- Unpacking the system.
- Hardware installation precautions.
- Preparing the installation site.
- Installing BigIron RX Series Switches in a rack.
- Removing slot panels.
- Installing modules.
- Installing power supplies.
- Attaching a management station.
- Powering on the BigIron RX Series Switch.
- Verifying the proper operation of the BigIron RX Series hardware.

For information about connecting the BigIron RX Series Switch to other network devices, see “Connecting a BigIron RX Series Switch to a Network Device” on page 4-1.

WARNING: The procedures in this manual are for qualified service personnel.

Summary of Installation Tasks

Table 3.1 lists the tasks you must perform to install your BigIron RX Series Switch and where to access detailed information that allows you to perform each task.

Table 3.1: BigIron RX Switch Installation Tasks

Task Number	Task	Where to Find More Information
Hardware installation		
1	Unpack the BigIron RX Series chassis, and verify that all contents you should receive are present.	"Unpacking a System" on page 3-3
2	Review the installation cautions and warnings.	"Installation Precautions" on page 3-3
3	Ensure that the physical environment that will host the BigIron RX Series chassis has proper cabling and ventilation.	"Preparing the Installation Site" on page 3-5
4	Install the BigIron RX Series chassis in a rack.	"Installing a Chassis in a Rack" on page 3-5
5	The BigIron RX Series Switches ship with a slot panel installed in all module slots that don't currently have a module installed. If you plan to install a module in a slot, you must remove the slot panel. CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.	"Removing the Slot Panels" on page 3-8
6	Install management, interface and switch fabric modules in the BigIron RX Series.	"Installing the BigIron RX Series Modules" on page 3-8
7	Install power supplies. (Do not power on the power source until step 9.)	"Installing Power Supplies" on page 3-11
8	Attach a management station to the management module's serial (Console) port or the 10BaseT/100BaseTX/1000BaseTX Ethernet (management) port.	"Attaching a Management Station" on page 3-17
9	Power on the power supplies.	"Powering On the Power Source" on page 3-18
10	After the BigIron RX Series chassis is powered on, observe the LEDs or display the status of the modules using the CLI to determine that the chassis is operating properly.	"Verifying Proper Operation" on page 3-19
Establishing Network Connectivity		
11	Secure access to the BigIron RX Series Switch's CLI by assigning passwords.	"Assigning Permanent Passwords" on page 4-1

Table 3.1: BigIron RX Switch Installation Tasks (Continued)

Task Number	Task	Where to Find More Information
12	Enable and configure IP addresses for the management, Ethernet, virtual, and loopback interfaces.	"Configuring IP Addresses" on page 4-2
13	Install a fiber-optic module into each Ethernet port, connect the port to another networking device, and troubleshoot any problems that can arise.	"Connecting a BigIron RX Series Switch" on page 4-5
14	Test a port for connectivity to other networking devices using the ping and traceroute commands.	"Testing Network Connectivity" on page 4-9

Unpacking a System

The BigIron RX Series Switch ships with several items. Review the list below, and verify the contents. If any items are missing, contact the place of purchase.

- BigIron RX Series chassis with the appropriate number of switch fabric modules already installed in the slot marked SF and a slot panel installed in all other module slots.
- Rack mount kit, including two L-shaped brackets and mounting screws. (BigIron RX-16 only.)
- CD-ROM containing software images and the user documentation (including this guide).
- Warranty card.
- An 115V AC power cable for each AC power supply you purchase from Foundry.

WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

The BigIron RX Series modules and power supplies are packaged separately.

Installation Precautions

Follow these precautions when installing the BigIron RX Series Switch.

General Precautions

WARNING: All fiber-optic interfaces use Class 1 Lasers.

CAUTION: Do not install the device in an environment where the operating ambient temperature might exceed 40° C (104° F).

CAUTION: Make sure the air flow around the front, sides, and back of the device is not restricted.

CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.

CAUTION: Never leave tools inside the chassis.

Lifting Precautions

WARNING: Do not use the handles on the power supply units to lift or carry Chassis devices.

WARNING: A fully populated chassis is heavy. TWO OR MORE PEOPLE ARE REQUIRED WHEN LIFTING, HANDLING, OR MOUNTING THESE DEVICES.

WARNING: Make sure the rack or cabinet housing the device is adequately secured to prevent it from becoming unstable or falling over.

WARNING: Mount the devices you install in a rack or cabinet as low as possible. Place the heaviest device at the bottom and progressively place lighter devices above.

Power Precautions

CAUTION: Use a separate branch circuit for each AC power cord, which provides redundancy in case one of the circuits fails.

WARNING: Make sure to choose the appropriate circuit device depending on the number of AC power supplies installed in the chassis. The maximum current draw is three AC power supplies.

WARNING: Disconnect the power cord from all power sources to completely remove power from the device.

WARNING: Make sure that the power source circuits are properly grounded, then use the power cord supplied with the device to connect it to the power source.

WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

CAUTION: Ensure that the device does not overload the power circuits, wiring, and over-current protection. To determine the possibility of overloading the supply circuits, add the ampere (amp) ratings of all devices installed on the same circuit as the device. Compare this total with the rating limit for the circuit. The maximum ampere ratings are usually printed on the devices near the input power connectors.

CAUTION: All devices with DC power sources are intended for installation in restricted access areas only. A restricted access area is where access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

CAUTION: For a DC system, use a grounding wire of at least 10 American Wire Gauge (AWG). The 10 AWG wire should be attached to an agency-approved crimp connector (provided on the BigIron RX chassis), crimped with the proper tool. The single crimp connector should allow for securement to both ground screws on the enclosure.

CAUTION: For the DC input circuit to the system, make sure there is a Listed 30 amp circuit, minimum -48Vdc, double pole, on the input to the terminal block. The input wiring for connection to the product should be Listed copper wire, 10 AWG, marked VW-1, and rated minimum 90 C.

Preparing the Installation Site

Cabling Infrastructure

Ensure that the proper cabling is installed in the site.

For information on cabling, see “Installing Power Supplies” on page 3-11, “Attaching a Management Station” on page 3-17, and “Connecting a BigIron RX Series Switch” on page 4-5.

Installation Location

Before installing the device, plan its location and orientation relative to other devices and equipment. Allow at least 3 inches of space at the front of the device for the fiber-optic and power cabling. Also, allow a minimum of 3 inches of space between the sides and the back of the device and walls or other obstructions.

Installing a Chassis in a Rack

Because of the weight of a fully loaded BigIron RX Series chassis, Foundry recommends mounting a chassis in a rack before installing the modules and AC power supplies if necessary.

In a standard 19-inch (EIA310-D) rack, you can install:

- BigIron RX-16 – up to three BigIron RX-16 chassis
- BigIron RX-8 – up to six BigIron RX-8 chassis
- BigIron RX-4 – up to 10 BigIron RX-4 chassis

Before performing this task, you should have an assembled rack and a #2 Phillips-head screwdriver.

This section describes the following tasks:

- Attaching mounting brackets to a chassis
- Mounting the chassis in a rack

Attaching Mounting Brackets to a BigIron RX-16 Chassis

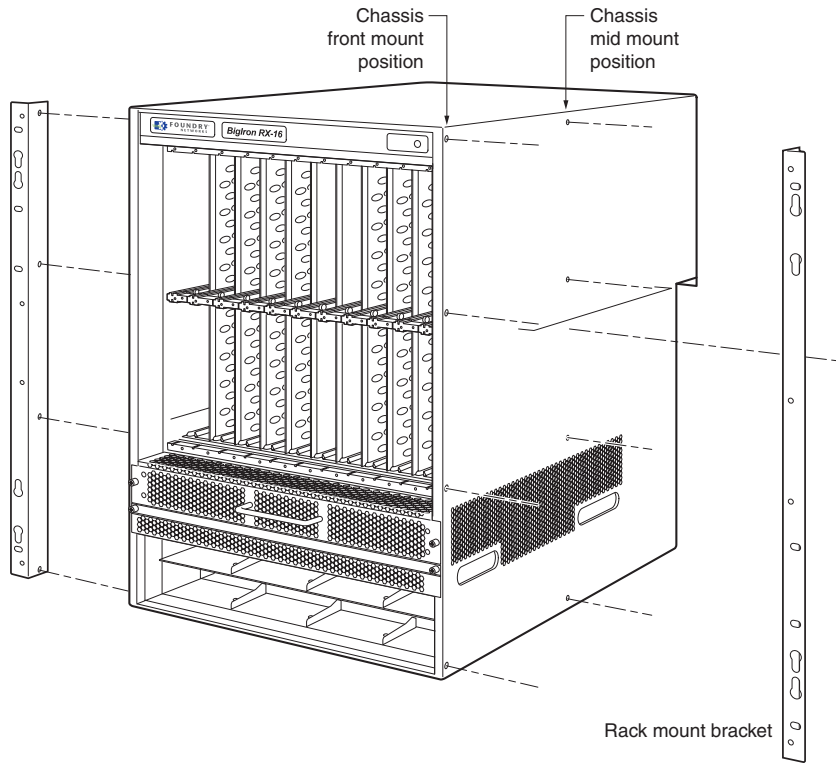
The BigIron RX-16 chassis ships with a rack mount kit. The kit includes two L-shaped mounting brackets and mounting screws.

The chassis sides have two sets of screw holes: one set for attaching the mounting brackets close to the chassis front and another set for attaching the brackets toward the chassis center.

Attach the mounting brackets to the sides of the chassis as illustrated in Figure 3.1.

NOTE: The diagram shows locations for attaching the mounting brackets for either front-mount or mid-mount.

Figure 3.1 Attaching mounting brackets to BigIron RX-16 chassis



Mounting the Chassis in a Rack

Keep the following in mind when mounting a BigIron RX Series chassis in a rack:

WARNING: The Chassis devices are very heavy, especially when fully populated with modules and power supplies. TWO OR MORE PEOPLE ARE REQUIRED WHEN LIFTING, HANDLING, OR MOUNTING THESE DEVICES.

WARNING: Do not use the handles on the power supply units to lift or carry Chassis devices.

WARNING: Make sure the rack or cabinet housing the device is adequately secured to prevent it from becoming unstable or falling over.

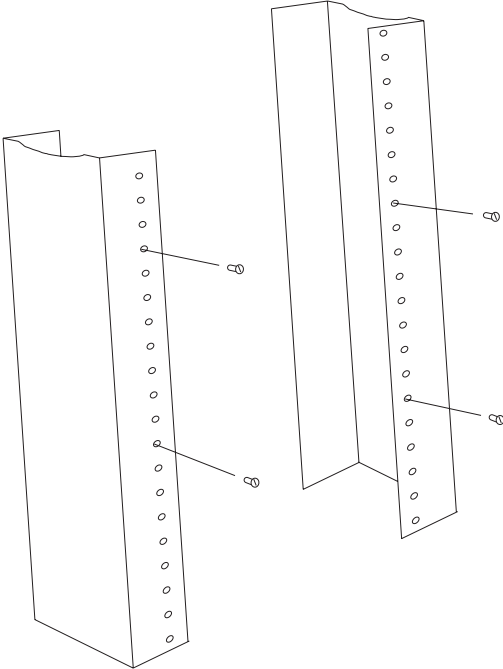
WARNING: Mount the devices you install in a rack or cabinet as low as possible. Place the heaviest device at the bottom and progressively place lighter devices above.

For each BigIron RX Series chassis that you install in a rack, you must provide four screws on which to mount and secure the chassis.

To mount a BigIron RX Series chassis in a rack, do the following:

1. Determine the position of each chassis in the rack, for example, a chassis with the fewest modules on top, a chassis with more modules than the top chassis in the middle, and a fully populated chassis on the bottom.
2. Position the four screws for each chassis according to the spacings of the keyhole slots on the mounting brackets as shown in Figure 3.2. Do not secure the screws completely; leave approximately 1/4 in of clearance between the back of the screw head and the rack.

Figure 3.2 Positioning the screws in a rack



- 3. Starting with the chassis that you want to mount in the lowest position in the rack, mount the chassis in the rack as shown in Figure 3.3. With two or more people lifting the chassis, slip the wide portion of each keyhole slot over the corresponding screw in the rack.

Figure 3.3 Mounting the BigIron RX-8 chassis in a rack

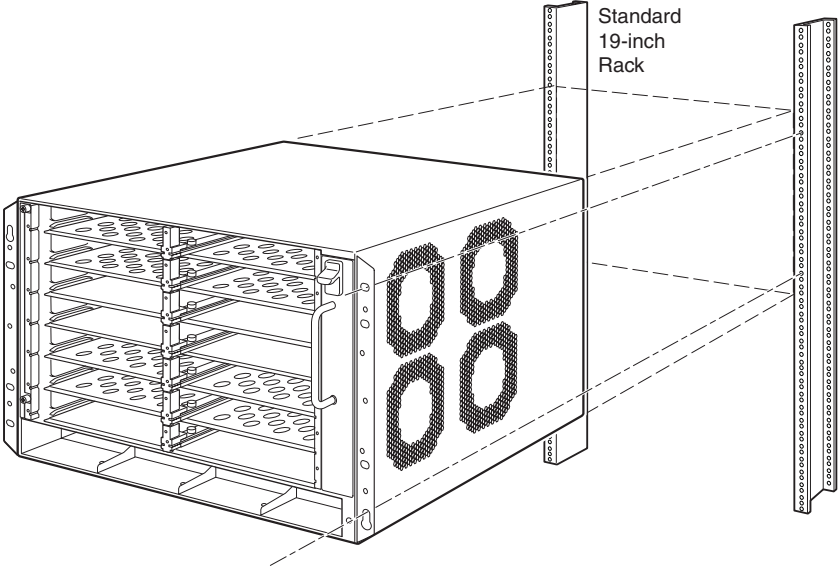
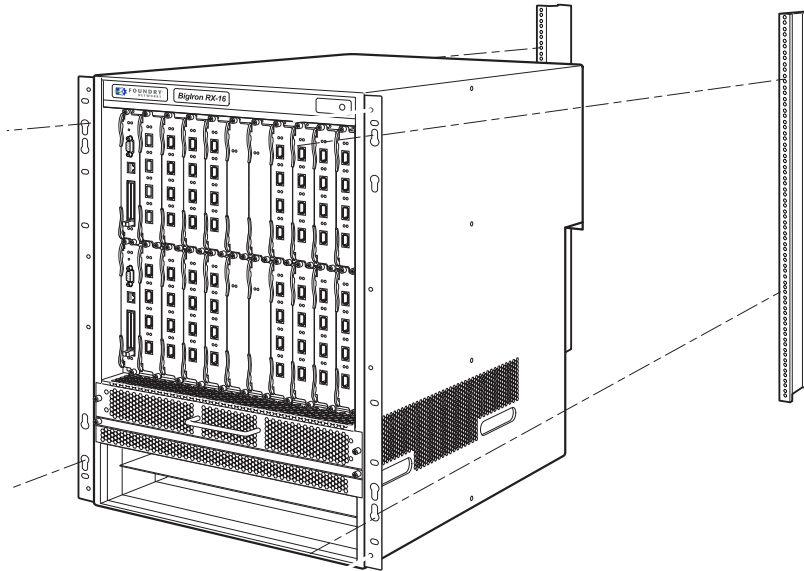


Figure 3.4 Mounting the BigIron RX-16 chassis in a rack



4. Slide the chassis down so that the screw heads are in the narrow portion of the keyhole slots.
5. Tighten the screws to secure the chassis in place.
6. Repeat Step 3 through Step 5 to mount each subsequent chassis in the same rack.

Removing the Slot Panels

The BigIron RX Series chassis ships with slot panels installed in all module slots. The slot panel covers a slot that does not currently have a module installed in it, ensuring proper airflow within the chassis. If you plan to install a module in a particular slot, you must remove the slot panel.

CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.

Although the slot panels are different in size, the procedure for removing them from the BigIron RX Series chassis is the same. Therefore, this section provides one procedure that applies to all slot panels.

You might need a flat-head screwdriver to perform this task.

To remove a slot panel, do the following:

1. Loosen the thumbscrews on either end of the slot panel by hand or with a flat-head screwdriver, if necessary.
2. Pull the slot panel out of the chassis, and store it in a safe place for future use.

Installing the BigIron RX Series Modules

Although the BigIron RX Series modules are different in size and function, the procedure for installing each of them into the BigIron RX Series chassis is the same. Therefore, this section provides one procedure that applies to all modules.

NOTE: The BigIron RX Series modules are dedicated, which means that you must install them in the BigIron RX Series chassis only. For example, if you attempt to install the BigIron RX Series management module in another Foundry chassis or a management module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and module will not function properly.

Table 3.2 provides the chassis slot number(s) into which you must install the modules. Markings for the chassis slots appear at the base of the slots.

Table 3.2: BigIron RX Series Module Installation

BigIron RX Series Module	Chassis Model	Chassis Slot Number
Management modules	BigIron RX-4	Active module – M1 (left). Redundant module – M2 (right).
	BigIron RX-8	Active module – M1 (left). Redundant module – M2 (right).
	BigIron RX-16	Active module – M1 (upper). Redundant module – M2 (lower).
Interface modules	BigIron RX-4	1 – 4
	BigIron RX-8	1 – 8
	BigIron RX-16	1 – 16
Switch Fabric modules	BigIron RX-4	SF1 – SF3 SF1 and SF2 required, SF3 is redundant.
	BigIron RX-8	SF1 – SF3 SF1 and SF2 required, SF3 is redundant.
	BigIron RX-16	SF1 – SF4 SF1, SF2 and SF3 required, SF4 is redundant.

The BigIron RX Series chassis ships with the required switch fabric modules installed.

CAUTION: If you do not install a module in a slot, you must leave the slot panel installed in the slot. If you run the BigIron RX Series chassis with an uncovered slot, the system will overheat.

If you are installing a redundant management module, see “Using a Redundant Management Module” on page 5-1 for information about the redundant module works, optional software configuration that you can perform, and how to manage the redundancy feature.

Before installing a module in the BigIron RX Series chassis, have the following on hand:

- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To install a module in the BigIron RX Series chassis, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Remove the module from its packaging.
3. Insert the module into the appropriate chassis slot and slide the card along the card guide until the ejectors on either side of the module move close to the module front panel.

NOTE: When inserting the module into the chassis, make sure that the faceplate doesn't overlap with the faceplate of an adjacent Interface module.

4. Push the ejectors in until they are flush with the module front panel. This action will fully seat the module in the backplane.
-

NOTE: Although the module shown in Figure 3.6 is an interface module, the installation instructions for installing it into a BigIron RX Series chassis are exactly the same for Management and Switch Fabric modules.

5. Tighten the two screws at either end of the module front panel by pushing them in and turning them clockwise. If desired, tighten the screws further using the flat-head screwdriver.

Figure 3.5 Installing a Module in an BigIron RX-4 chassis

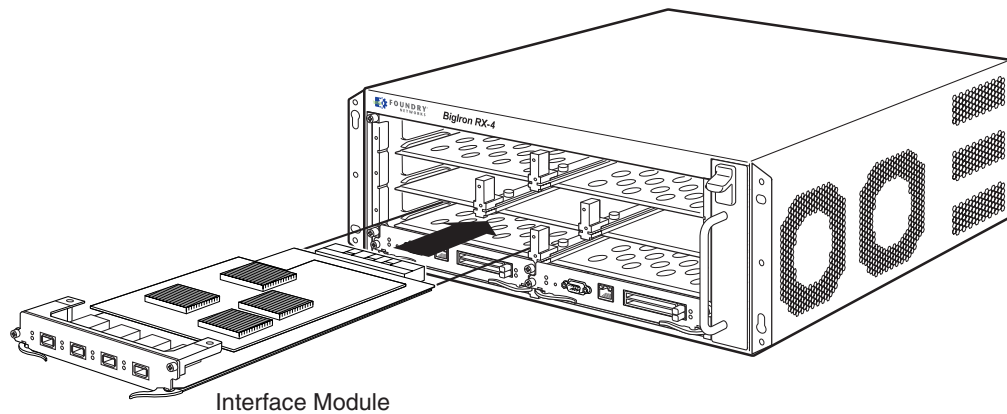


Figure 3.6 Installing a Module in an BigIron RX-8 chassis

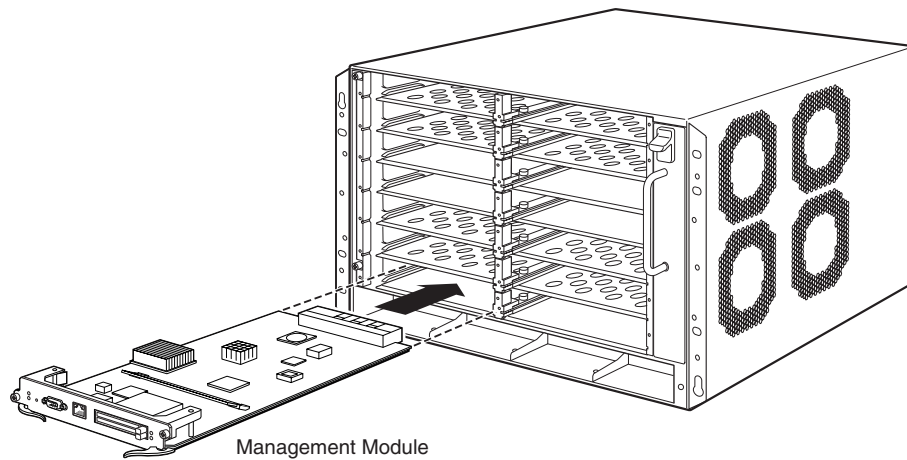
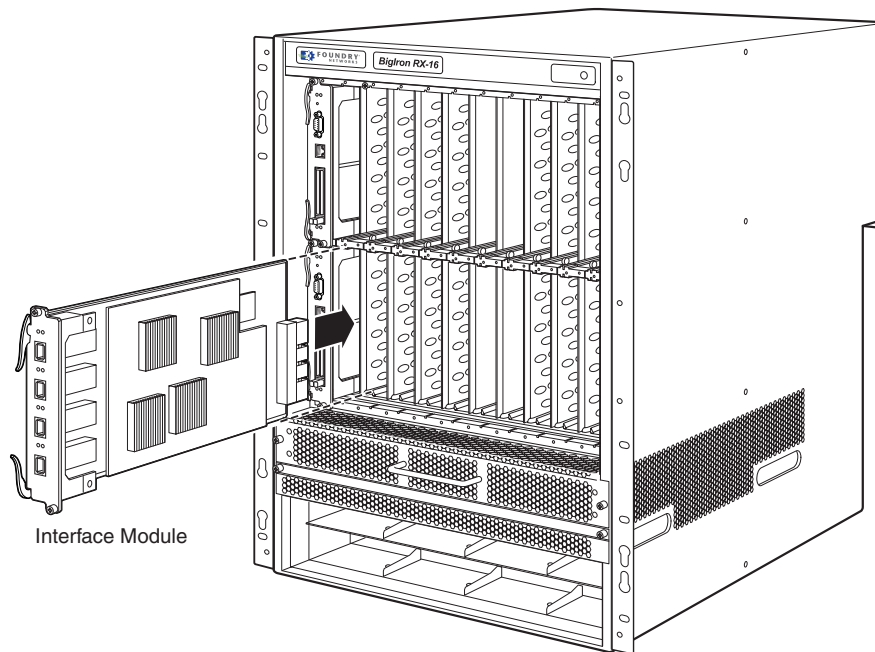


Figure 3.7 Installing a Module in an BigIron RX-16 chassis

Installing Power Supplies

This section describes how to install power supplies in a BigIron RX Series chassis.

- BigIron RX-4: Accommodates 3 power supplies (AC or DC) with 1 required and 2 redundant. It is shipped with 1 power supply. You must purchase one or two additional power supplies if you want your BigIron RX-4 equipped for redundancy.
- BigIron RX-8: Accommodates 4 power supplies (AC or DC) with 2 required and 2 redundant. Because power is supplied over a common power bus, any power supply purchased in addition to the two required will provide backup for any supply that fails. Equipping a BigIron RX-8 with two additional power supplies provides full redundancy for both of the required power supplies.
- BigIron RX-16: Accommodates 8 power supplies (AC or DC) with 4 required and 4 redundant. Because power is supplied over a common power bus, any power supply purchased in addition to the four required will provide backup for any supply that fails. Equipping a BigIron RX-16 with four additional power supplies provides full redundancy for all four of the required power supplies.

You can install the power supplies in any of the power supply slots. As you exceed the required number, you will provide redundancy to the chassis.

You need a small Phillips or flat-head screwdriver to perform this task.

WARNING: The front panel of the power supplies include a handle that locks the power supply in the chassis. This handle is a locking mechanism only and should not be used to lift and carry the power supply. You may sustain physical injury or harm if you attempt to lift and carry a power supply using the locking handle.

Installing Power Supplies in a BigIron RX-4 Chassis

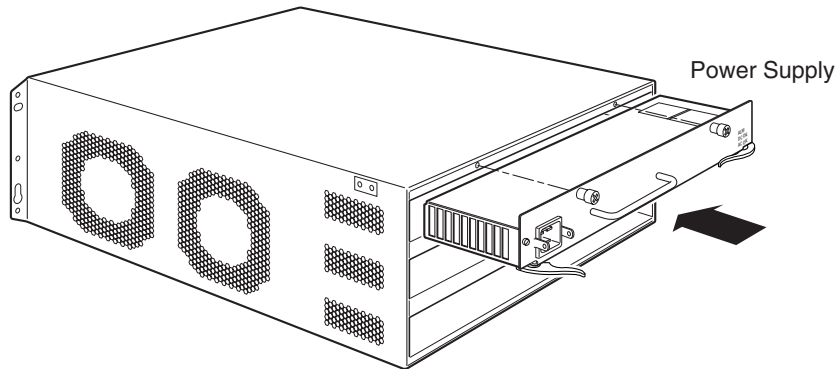
To install a power supply in the BigIron RX-4 chassis, do the following:

1. Remove the blank power supply faceplate, and expose the empty power supply slot.
2. Remove the power supply from its packaging.

3. Insert the power supply into the empty power supply slot, using the guides provided on either side of the slot and slide the card along the card guide until the ejectors on either side of the module move close to the module front panel.

CAUTION: Carefully follow the mechanical guides on each side of the power supply slot and make sure the power supply is properly inserted in the guides. Never insert the power supply upside down.

Figure 3.8 Installing a Power Supply in an BigIron RX-4 chassis



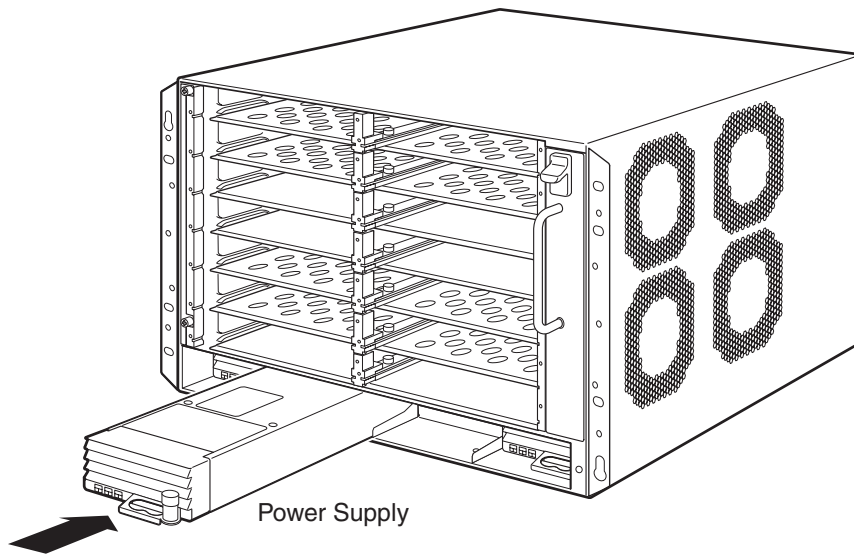
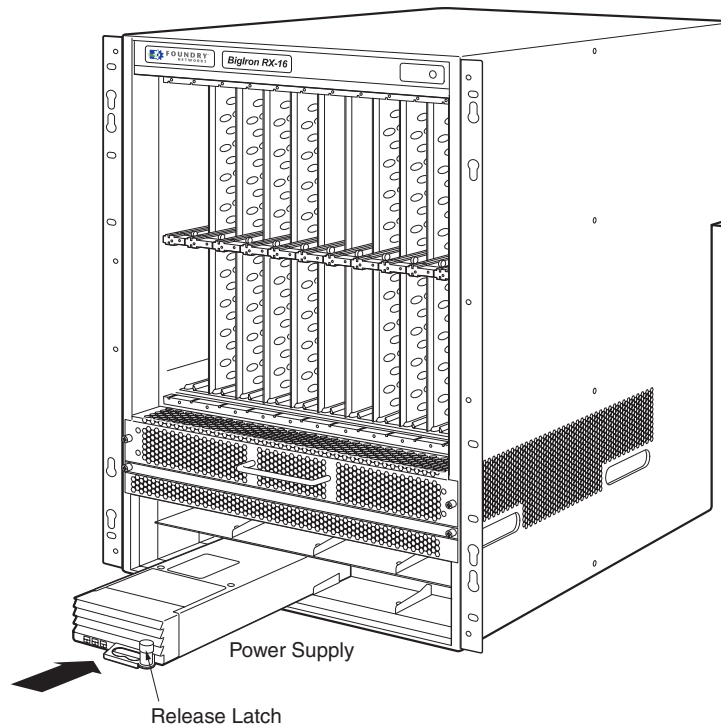
4. After the power supply is fully inserted, push the power supply front panel toward the back of the chassis. This action causes the power supply connector to lock into the backplane connector.
5. Push the ejectors in until they are flush with the face of the power supply. This action will fully seat the power supply in the backplane.
6. Tighten the two screws at either end of the power supply front panel by pushing them in and turning them clockwise. If desired, tighten the screws further using the flat-head screwdriver.
7. For information about connecting power to the chassis, see “Connecting AC Power to BigIron RX-4 Chassis” on page 3-14 or “Connecting DC Power to BigIron RX-4 Chassis” on page 3-16.

Installing Power Supplies in a BigIron RX-8 or BigIron RX-16 Chassis

To install a power supply in the BigIron RX-8 or BigIron RX-16 chassis, do the following:

1. Remove the blank power supply faceplate, and expose the empty power supply slot.
2. Remove the power supply from its packaging.
3. Insert the power supply into the empty power supply slot, using the guides provided on either side of the slot.

CAUTION: Carefully follow the mechanical guides on each side of the power supply slot and make sure the power supply is properly inserted in the guides. Never insert the power supply upside down.

Figure 3.9 Installing a Power Supply in an BigIron RX-8 chassis**Figure 3.10** Installing a Power Supply in an BigIron RX-16 chassis

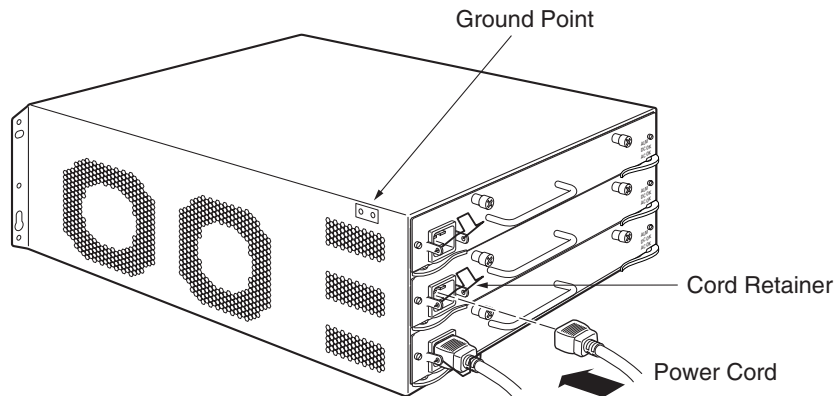
4. After the power supply is fully inserted, push the power supply front panel toward the back of the chassis. This action causes the power supply connector to lock into the backplane connector.
5. Gently pull the Release Latch on the power supply front panel upward and toward the top of the power supply front panel. This action locks the power supply in place.
6. For information about connecting power to the chassis, see "Connecting AC Power to BigIron RX-8 or BigIron RX-16 Chassis" on page 3-14 or "Connecting DC Power to BigIron RX-8 or BigIron RX-16 Chassis" on page 3-15.

Connecting AC Power to BigIron RX-4 Chassis

AC power is supplied through an AC power cord that is installed at the rear of the BigIron RX-4 chassis.

1. At the rear of the BigIron RX-4 chassis locate the power receptacle on the left side of the AC power supply.
2. Lift the cord-retainer and connect a Foundry-supplied AC power cord to the power supply.
3. Snap the cord-retainer over the power plug to hold it in place.

Figure 3.11 Connecting a Power Cord to the Power Supply in an BigIron RX-4 chassis



WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

4. For information about powering on the system, see “Powering On the Power Source” on page 3-18.

Connecting AC Power to BigIron RX-8 or BigIron RX-16 Chassis

AC power is supplied through an AC power cord that is installed at the rear of the BigIron RX Series chassis.

1. At the rear of the BigIron RX-8 or BigIron RX-16 chassis locate the power receptacle where the power supplies have been installed.
2. Lift the cord-retainer and connect a Foundry-supplied AC power cord to the power supply.
3. Snap the cord-retainer over the power plug to hold it in place.

Figure 3.12 Connecting a Power Cord to the Power Supply in an BigIron RX-8 chassis

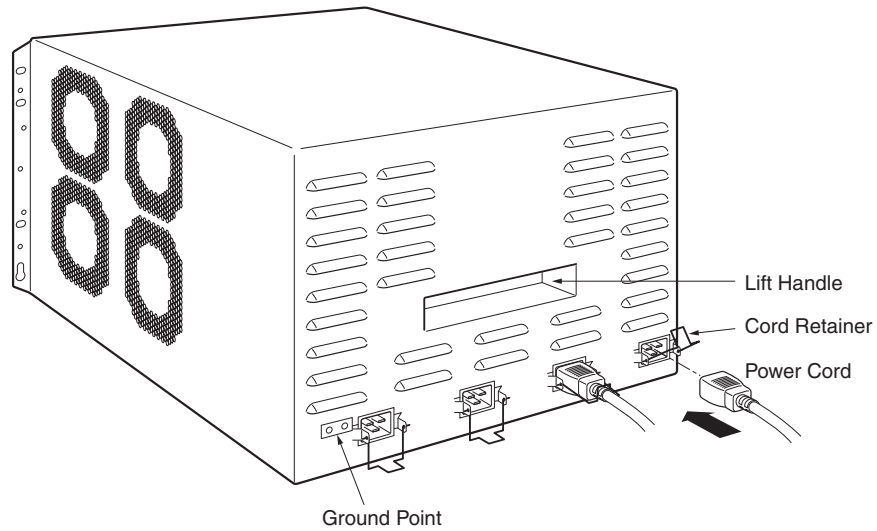
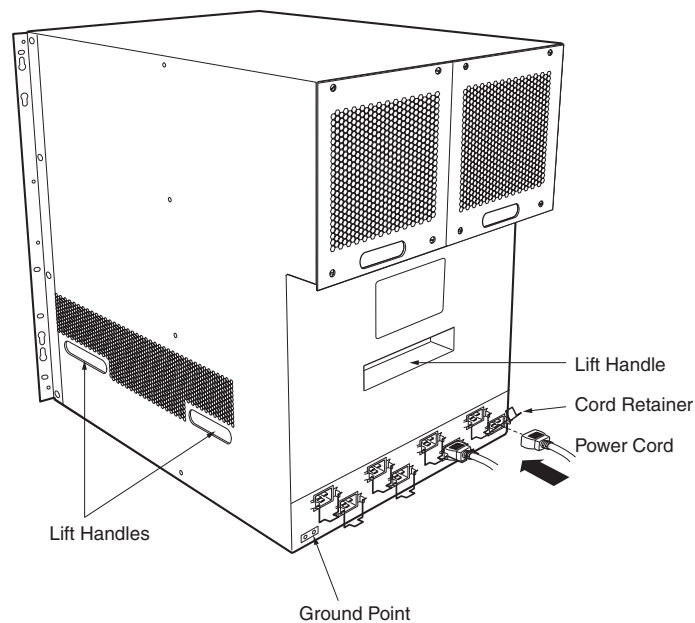


Figure 3.13 Connecting a Power Cord to the Power Supply in an BigIron RX-16 chassis



WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

- For information about powering on the system, see “Powering On the Power Source” on page 3-18.

Connecting DC Power to BigIron RX-8 or BigIron RX-16 Chassis

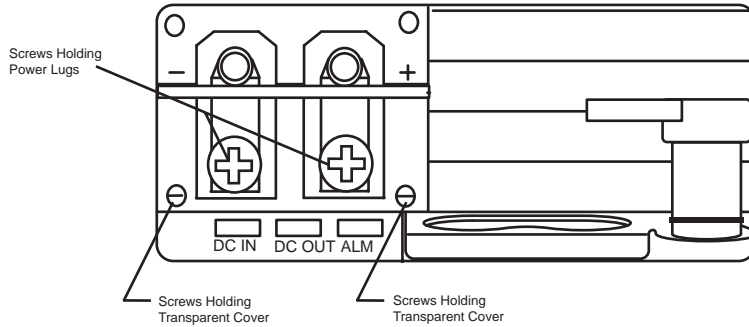
You can use a DC power source for the BigIron RX Series chassis. This is supported through use of a DC to DC power supply. DC power must be supplied at 48 V and 37 A . The DC to DC supply provides the DC power to the chassis at 12 V and 100 A.

WARNING: The procedure in this section is for qualified service personnel.

To connect a DC power source, you must use the following directions:

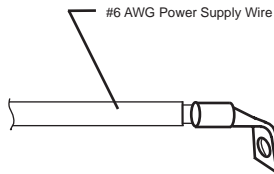
1. Use a flat-blade screwdriver to remove the two screws holding the transparent cover over the power supply lugs.

Figure 3.14 The BigIron RX-8 and BigIron RX-16 DC power supply



2. Use a phillips head screwdriver to remove each of the power lugs.
3. Crimp #6 AWG power supply wire into the power lugs and reconnect the power lugs to the power supply unit.

Figure 3.15 Crimping the Power Supply Wire in the Lug



4. Re-attach the transparent cover over the power supply lugs that was removed in Step 1.
5. Connect the wire to your DC power source making sure to connect the positive and negative supply wires to the correct location as marked on the power supply.

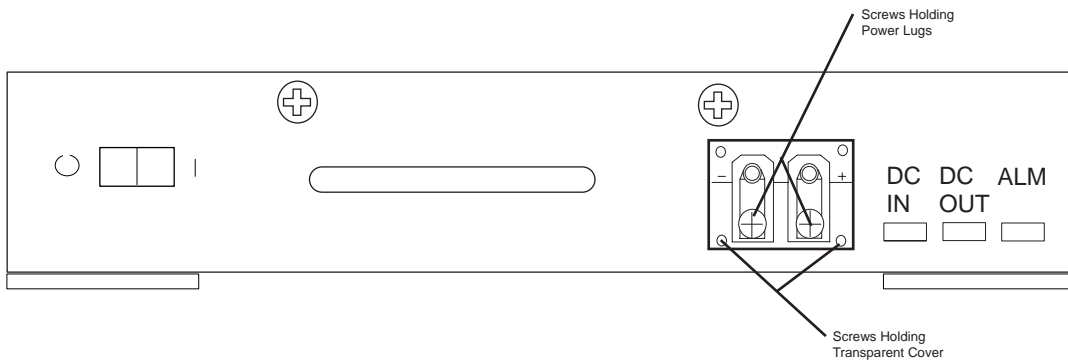
Connecting DC Power to BigIron RX-4 Chassis

You can provide your own DC power source for the BigIron RX-4 chassis. This is supported through use of a DC to DC power supply. DC power must be supplied at 48 V and 37 A . The DC to DC supply provides the DC power to the chassis at 12 V and 100 A.

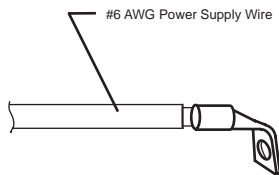
WARNING: The procedure in this section is for qualified service personnel.

To connect a DC power source, you must use the following directions:

1. Use a flat-blade screwdriver to remove the two screws holding the transparent cover over the power supply lugs.

Figure 3.16 The BigIron RX-4 DC power supply

2. Use a phillips head screwdriver to remove each of the power lugs.
3. Crimp #6 AWG power supply wire into the power lugs and reconnect the power lugs to the power supply unit.

Figure 3.17 Crimping the Power Supply Wire in the Lug

4. Re-attach the transparent cover over the power supply lugs that was removed in Step 1.
5. Connect the wire to your DC power source making sure to connect the positive and negative supply wires to the correct location as marked on the power supply.

Attaching a Management Station

You can manage the BigIron RX Series system in the following ways:

- You can connect a PC or terminal to the management module's serial (Console) port for a direct connection. From this interface, you can configure the 10BaseT/100BaseTX/1000BaseTx Ethernet (management) port with an IP address and either telnet or SSH. This enables you to manage the device through the 10BaseT/100BaseTX/1000BaseTX Ethernet (management) port using either telnet or SSH.
- You can connect the BigIron RX Series Switch to your existing management network and manage the switch, along with other network devices, from a management station. To do this, you can connect a switch to the management module's 10BaseT/100BaseTX/1000BaseTX Ethernet (management) port.

NOTE: The existing management network into which you can connect the 10/100 Ethernet port must be separate and isolated from the network over which user packets are switched and routed. For information about the management port's functionality, see "Understanding How the Management Port Functions" on page 4-5.

For information about connecting a PC or terminal to the management module's Console port or management port, see "Attaching a PC or Terminal to the Console Port or Ethernet Port" on page 3-17. For information about connecting a switch to the management port, see "Attaching a Switch to the Ethernet Port" on page 3-18.

Attaching a PC or Terminal to the Console Port or Ethernet Port

The management module's Console port, which has a male DB-9 serial connector, and 10BaseT/100Base TX Ethernet port, which has an RJ-45 UTP connector, allow you to attach a PC or terminal. From the Console port, you can access the BigIron RX Series Switch's CLI directly from the PC or terminal or via a Telnet connection to

the PC or terminal. From the Ethernet port, you can access the BigIron RX Series Switch's CLI or Web management interface directly from the PC or terminal or via a Telnet connection to the PC or terminal.

Before performing this task, you need the following items:

- PC running a terminal emulation application or a terminal.
- If connecting the PC or terminal to the Console port, a straight-through EIA/TIA DB-9 serial cable with one end terminated in a female DB-9 connector and the other end terminated in a male or female DB-9 or DB-25 connector, depending on the specifications of your PC or terminal. You can order the serial cable separately from Foundry Networks or build your own cable. If you prefer to build your own, see the pinout information in "Console Port Pin Assignments" on page 9-4.
- If connecting the PC or terminal to the Ethernet port, a category 5 UTP crossover cable, which you must supply. For information about the management port pin assignments, see "Management Port Pin Assignments" on page 9-5.

To attach a PC or terminal to the Console port or Ethernet port, do the following:

1. Connect a PC or terminal to the Console port or Ethernet port using the appropriate cable.
2. Open the terminal emulation program, and set the session parameters as follows:
 - Baud: 9600 bps
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: None

Attaching a Switch to the Ethernet Port

The management module's 10BaseT/100BaseTX/1000BaseTX Ethernet (management) port, which has an RJ-45 UTP connector, allows you to attach a 10BaseT/100BaseTX/1000BaseTX switch. A management station in your existing management network can then access a BigIron RX Series Switch using the IronView Network Manager.

To attach a 10BaseT/100BaseTX/1000BaseTX switch, you need a category 5 UTP straight-through cable, which you must supply. Connect one end of the straight-through cable to the management port and the other end to the switch.

Powering On the Power Source

After you complete the hardware installation, you can power on your power source:

1. Verify that all modules and power supplies are fully and properly installed and no module slots are uncovered.

CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.

2. If you are supplying a DC power source(s) to a BigIron RX chassis, attach the power cables to the DC power supply as described in "Connecting DC Power to BigIron RX-8 or BigIron RX-16 Chassis" on page 3-15 or "Connecting DC Power to BigIron RX-4 Chassis" on page 3-16 and connect the other end of the cables to the DC power source. Repeat this step for each installed DC power supply. Then switch on the power source(s).
3. If your power source is AC, attach one end of a Foundry-supplied AC power cord to the AC power supply as described in "Connecting AC Power to BigIron RX-4 Chassis" on page 3-14 or "Connecting AC Power to BigIron RX-8 or BigIron RX-16 Chassis" on page 3-14 and insert the other end into a 115V/120V wall outlet. Repeat this step for each installed AC power supply.

WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

NOTE: If the wall outlet is not rated 115/120V and 20A, stop and get the appropriate cable for the outlet. Make sure you obtain a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

NOTE: The BigIron RX Series Switch is designed to provide uninterrupted service even when you insert or remove the management module(s) and the interface modules. Therefore, the system does not have a separate on/off power switch. To turn the system off, simply unplug the power cord(s).

NOTE: The wall outlet should be installed near the equipment and should be easily accessible.

4. Verify that the BigIron RX Series Switch has initialized successfully. For information, see “Verifying Proper Operation” on page 3-19.

Verifying Proper Operation

To verify the proper operation of the BigIron RX Series chassis after power on, you can do the following:

- Observe the LEDs.
- Display the status of the modules using the CLI.

Observing the LEDs

After a BigIron RX Series chassis powers on, you can observe its LEDs to verify that it initialized successfully. Table 3.3 outlines the LEDs, the desired state of each LED, possible abnormal states of each LED, and what to do if an LED indicates an abnormal state.

Table 3.3: Desired and Abnormal LED States After System Power On

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Management Module				
Active	The Active LED on one of the installed management modules should be on.	The module is functioning as the active management module.	Off	Neither of the management module(s) is managing the switch fabric and interface modules. A problem could have occurred during initialization. Check your attached PC or terminal for possible error messages.

Table 3.3: Desired and Abnormal LED States After System Power On (Continued)

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Pwr	On	The module is receiving power.	Off	<p>The module is not receiving power. You can do the following:</p> <ul style="list-style-type: none"> • Make certain that the module is installed properly. For more information, see “Installing the BigIron RX Series Modules” on page 3-8. • If using AC power supplies, see the entry for the AC power supply LED in this table for more information.
10/100/1000 Ethernet Port	On (Green)	A link is established with the remote port.	Off	<p>A link is not established with the remote port. You can do the following:</p> <ul style="list-style-type: none"> • Verify that the connection to the other device has been properly made. Also, make certain that the other device is powered on and operating correctly. • Try using a different cable.
10/100/1000 Ethernet Port	On or blinking (Yellow)	The port is transmitting and receiving packets.	Off for an extended period	<p>The port is not transmitting or receiving packets.</p> <p>You can check the other 10/100/1000 Ethernet port LED to make sure a link is established with the remote port. If not, take the actions described in the Meaning/Action column for the other 10/100/1000 Ethernet port LED.</p>

Table 3.3: Desired and Abnormal LED States After System Power On (Continued)

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Interface Module				
Pwr	On	The module is receiving power.	Off	<p>The module is not receiving power. You can do the following:</p> <ul style="list-style-type: none"> • Make certain that the module is installed properly. For more information, see “Installing the BigIron RX Series Modules” on page 3-8. • The module may not be receiving enough power. Foundry recommends installing four AC power supplies (three primary and one for redundancy) for a fully loaded chassis. • Check the Pwr LED on the management module. If it is on, this module may be holding the power from the interface module. • Enter the show chassis command at any level of the CLI to determine if the management module recognizes the presence of all power sources. • If using AC power supplies, see the entry for the AC power supply LED in this table for more information.
Mgmt Act	During initialization: steady blinking. After initialization: occasional blinking.	The active management module’s processor and the interface module’s processor are communicating.	Off for an extended period.	The interface module may be in interactive mode. Check the status of the module by entering the show module command at any CLI prompt.
Link	On	A link is established with the remote port.	Off	<p>At this stage of the installation, you have not yet cabled the interface module ports, so this LED will be off.</p> <p>After cabling this port, if this LED is off, a link is not established with the remote port. For more information, see Table 4.3 on page 4-8.</p>

Table 3.3: Desired and Abnormal LED States After System Power On (Continued)

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Active	On or blinking	The port is transmitting and receiving user packets.	Off for an extended period.	At this stage of the installation, you have not yet cabled the interface module ports, so this LED will be off. After cabling this port, if this LED is off, the port is not transmitting or receiving user packets. For information about action you can take to troubleshoot the problem, see Table 4.3 on page 4-8.
Switch Fabric Module				
Pwr	On	The module is receiving power.	Off	The module is not receiving power. You can do the following: <ul style="list-style-type: none"> If using AC power supplies, see the entry for the AC power supply LED in this table for more information.
Active	On	The switch fabric module is active and ready to switch user packets.	Off for an extended period.	The switch fabric module is not active and user packets are not being switched from one interface module to another. You must replace the switch fabric module. For information about performing this task, see "Replacing a Switch Fabric Module" on page 7-6.
Power Supplies AC				
AC OK	Green (steady)	The power supply is receiving AC power from an AC power source.	Off	The power supply is not receiving power from an AC power source. You can do the following: <ul style="list-style-type: none"> Make sure that the power supply cord is connected securely to the wall outlet and the power supply. Make sure that the wall outlet is rated for 115/120V and 20A. If it is not, obtain a cable that is compatibly rated for the outlet. Make sure that the wall outlet has power.
DC OK	Green (steady)	The power supply is providing DC power to the BigIron RX Series chassis.	Off	The power supply is not supplying power to the chassis. If the AC OK LED is lit Green, then there is a problem with the power supply and it must be replaced.

Table 3.3: Desired and Abnormal LED States After System Power On (Continued)

LED	Desired State	Meaning	Abnormal State	Meaning/Action
ALM	ALM	The power supply is in normal operating condition.	Amber	The power supply is malfunctioning.
Power Supplies DC				
DC IN	Green (steady)	The power supply is receiving DC power from a DC power source.	Off	The power supply is not receiving power from a DC power source You can do the following: <ul style="list-style-type: none"> • Make sure that the power supply cables are connected securely to the power source and the power supply. • Make sure that the DC power source is 48 VDC @ 37.0 A • Make sure that the power source has power.
DC OK	Green (steady)	The power supply is providing DC power to the BigIron RX Series chassis.	Off	The power supply is not supplying power to the chassis. If the DC IN LED is lit Green, then there is a problem with the power supply and it must be replaced.
ALM	Off	The power supply is in normal operating condition.	Amber	The power supply is malfunctioning.

Table 3.3: Desired and Abnormal LED States After System Power On (Continued)

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Fan control module (two LEDs on rear panel of chassis)				
Unlabeled	Green (steady)	The fans are working and responding to controls from the fan control module.	Off or amber	<p>The fans are not receiving power (off), or the fans are not working and not responding to controls from the fan control module (amber). You can do the following:</p> <ul style="list-style-type: none"> If the LED is off, check the power LED on the other modules to make sure they are receiving power. <p>If using a DC power source, check your power source for problems.</p> <p>If using AC power supplies, take the actions described in the Meaning/Action column for the AC power supply LED. If these actions don't resolve the problem, check the LED on each power supply or enter the show chassis command at any CLI prompt to determine if a power supply has failed. If a power supply has failed, you need to replace it. For more information, see "Replacing a Power Supply" on page 7-9.</p> <ul style="list-style-type: none"> If the LED is amber, you need to replace the fan module. For information about performing these tasks, see .

If a problem persists after taking action described in this table, contact Foundry's technical support.

Displaying the Module Status

After you have attached a PC or terminal to the management module's Console port or Ethernet port and the BigIron RX Series Switch has initialized successfully, press Enter to display the following CLI prompt in the terminal emulation window:

```
BigIron RX>
```

If you do not see this prompt, do the following:

1. Make sure the cable is securely connected to your PC or terminal and the Console port or Ethernet port.
2. Check the settings in your terminal emulation program. In addition to the session settings listed in "Attaching a PC or Terminal to the Console Port or Ethernet Port" on page 3-17, make sure the terminal emulation session is running on the same serial port you attached to the Console port.

If you see this prompt (BigIron RX>), you are now connected to the system and can display the status of the modules using the CLI. Enter the following command at any CLI level:

```
BigIron RX# show module
      Module                               Status      Ports  Starting MAC
M1 (upper): BigIron RX Mgmt Module        Active
M2 (lower):
F0: BigIron RX Switch Fabric Module      Active
S1:
S2:
S3:
S4: BigIron RX 4-Port 10Gig Module        CARD_STATE_UP  4  000c.db80.0000
S5: BigIron RX 4-Port 10Gig Module        CARD_STATE_UP  4  000c.db80.0000
S6: BigIron RX 4-Port 10Gig Module        CARD_STATE_UP  4  000c.db80.0000
S7:
S8:
```

Syntax: show module

The Status column shows the module status. A management module can have one of the following statuses:

- ACTIVE – The module is currently the active management module.
- STANDBY – The module is currently the standby management module.
- COMING UP – The module is coming up as the standby module. This status occurs if the standby management module becomes the active module, which is called a switchover. For more information about switchovers, see “Management Module Switchover” on page 5-2.

The switch fabric module can have one of the following statuses:

- ACTIVE – The module is up and running.
- BAD – The management module cannot initialize the switch fabric module.

An interface module can have one of the following statuses:

- CARD_STATE_INIT – The system detects the module but the module is not up and running yet.
- CARD_STATE_BOOT – The module is booting.
- CARD_STATE_INTERACTIVE – The module is booting from interactive mode.
- CARD_STATE_LP_SYNC – The module’s IronWare images are synchronized between the management module and interface module.
- CARD_STATE_SYNC – The system is currently synchronizing the module’s IronWare images between the management module and interface module.
- CARD_STATE_SOFTWARE_LOADED – The module has loaded its IronWare image.
- CARD_STATE_STRIPE_SYNC – The module is synchronizing with other interface modules through the switch fabric module.
- CARD_STATE_POWER_OFF – The module does not have power.
- CARD_STATE_UP – The module is up and operating normally.
- CARD_STATE_FAILED – The management module was unable to bring up an interface module properly. If you observe this status, make certain that the interface module is installed properly. For more information, see “Installing the BigIron RX Series Modules” on page 3-8.
- CARD_DOWN_REASON_<explanation> – The module is in a nonfunctional state. This status appears with an explanation for why the module is down, for example, “CARD_DOWN_REASON_BOOT_FAILED.” If the explanation does not help you resolve the problem, you can contact Foundry Networks technical support and provide the explanation included with this status.

Chapter 4

Connecting a BigIron RX Series Switch to a Network Device

This chapter provides information about performing the following tasks:

- Securing access to the BigIron RX Series Switch's CLI by assigning passwords.
- Configuring IP addresses for the management, Ethernet, virtual, and loopback interfaces.
- Understanding how the management port functions.
- Connecting a BigIron RX Series Switch to another networking device.
- Testing network connectivity.

This chapter also includes information about troubleshooting a network connection in case a problem arises.

WARNING: The procedures in this manual are for qualified service personnel.

Assigning Permanent Passwords

By default, the BigIron RX Series Switch's CLI is not protected by passwords. To secure CLI access, Foundry strongly recommends assigning passwords. (For additional information on security, see the *Foundry BigIron RX Series User Guide*.)

The CLI contains the following access levels:

- User EXEC – The level you enter when you first start a CLI session. At this level, you can view some system information but you cannot configure system or port parameters.
- Privileged EXEC – This level is also called the Enable level and can be secured by a password. You can perform tasks such as manage files on the management module's flash memory or a PCMCIA flash card in the management module's slots 1 or 2, save the system configuration to flash memory, and clear caches at this level.
- CONFIG – The configuration level. This level lets you configure the system's IP address and configure routing features. To access the CONFIG mode, you must already be logged into the Privileged level of the EXEC mode.

NOTE: You cannot assign a password using the Web management interface. You can assign passwords using the IronView Network Manager if an Enable password for a Super User is already configured on the device.

You can set the following levels of Enable passwords:

- Super User – Allows complete read-and-write access to the system. This is generally for system administrators and is the only password level that allows you to configure passwords.

NOTE: You must set a super user password before you can set other types of passwords.

- Port Configuration – Allows read-and-write access for specific ports but not for global (system-wide) parameters.
- Read Only – Allows access to the Privileged EXEC mode and CONFIG mode but only with read access.

To set passwords:

1. At the opening CLI prompt, enter the following command to change to the Privileged level of the EXEC mode:

```
BigIron RX> enable
BigIron RX#
```

2. Access the CONFIG level of the CLI by entering the following command:

```
BigIron RX# configure terminal
BigIron RX(config)#
```

3. Enter the following command to set the super-user password:

```
BigIron RX(config)# enable super-user-password <text>
```

NOTE: You must set the super-user password before you can set other types of passwords.

4. Enter the following commands to set the port configuration and read-only passwords:

```
BigIron RX(config)# enable port-config-password <text>
BigIron RX(config)# enable read-only-password <text>
```

NOTE: If you forget your super-user password, see the Release Notes.

Syntax: enable super-user-password | read-only-password | port-config-password <text>

Passwords can be up to 48 characters long.

Configuring IP Addresses

The BigIron RX Series Switches implement separate data and control planes. This architecture affects how you assign IP addresses. Table 4.1 outlines the interfaces to which you can assign IP addresses.

In this table, “in band” refers to an interface over which user packets are routed, while “out of band” refers to an interface over which control packets related to system management are forwarded.

Table 4.1: Assigning IP Addresses

Interface	Associated Physical Port	Out of band/ In band
Management interface	Ethernet 10/100/1000 port on active or redundant management module	Out of band
Any interface over which user packets are routed	Any interface module port	In band

Table 4.1: Assigning IP Addresses (Continued)

Interface	Associated Physical Port	Out of band/ In band
Any virtual interface over which user packets are routed	Any interface port	In band
Loopback interface	–	In band

This section describes the following:

- BigIron RX Series support of sub-net masks.
- How to assign an IP address to a management interface.
- How to assign an IP address to an interface or virtual interface over which user packets are routed.

Support of Sub-Net Masks

The BigIron RX Series Switch supports both classical IP network masks (Class A, B, and C sub-net masks, and so on) and Classless Interdomain Routing (CIDR) network prefix masks.

- To enter a classical network mask, enter the mask in IP address format. For example, enter “209.157.22.99 255.255.255.0” for an IP address with a Class-C sub-net mask.
- To enter a prefix number for a network mask, enter a forward slash (/) and the number of bits in the mask immediately after the IP address. For example, enter “209.157.22.99/24” for an IP address that has a network mask with 24 significant (“mask”) bits.

Assigning an IP Address to a Management Interface

Instead of assigning a global IP address to the BigIron RX Series Switch for system management purposes, you now assign an IP address to the management interface. The IP address is assigned to the active management module port. If the active management module becomes unavailable and the redundant module becomes the active module, the IP address is assigned to the new active management module port.

For example, to assign the IP address 10.0.1.1 to the management interface, do the following:

1. At the opening CLI prompt, enter **enable**.

```
BigIron RX> enable
```

2. Enter the following command at the Privileged EXEC level prompt (for example, `BigIron RX#`), then press Enter. This command erases the factory test configuration if still present:

```
BigIron RX# erase startup-config
```

CAUTION: Use the **erase startup-config** command only for new systems. If you enter this command on a system you have already configured, the command erases the configuration. If you accidentally erase the configuration on a configured system, enter the **write memory** command to save the running configuration to the startup-config file.

3. Access the configuration level of the CLI by entering the following command:

```
BigIron RX# configure terminal          Privileged EXEC Level
BigIron RX(config)#                    Global CONFIG Level
```

4. Configure the IP address and mask for the management interface by entering the following commands:

```
BigIron RX(config)# interface management 1
BigIron RX(config-if-mgmt-1)# ip address 10.0.1.1 255.255.255.0
```

Syntax: enable [<password>]

Syntax: configure terminal

Syntax: interface management 1

Syntax: [no] ip address <ip-addr> <ip-mask>

or

Syntax: [no] ip address <ip-addr>/<mask-bits>

Assigning an IP Address to an Interface, Virtual Interface, or Loopback

As you have done with other Foundry devices, you must assign an IP address to each interface and virtual interface over which user packets are routed. You can also assign an IP address to a loopback interface, which is generally used for testing and diagnostic purposes.

You must use the serial connection to assign the first IP address. For subsequent addresses, you also can use the CLI through Telnet or the Web management interface. You can use IronView Network Manager Network Manager to assign IP addresses to virtual routing interfaces only.

By default, you can configure up to 24 IP interfaces on each interface, virtual interface, and loopback interface.

For example, to assign the IP address 192.22.3.44 and sub-net mask 255.255.255.0 to Ethernet interface 1/1, do the following.

1. At the opening CLI prompt, enter **enable**.

```
BigIron RX> enable
```

2. Enter the following command at the Privileged EXEC level prompt, then press Enter. This command erases the factory test configuration if still present:

```
BigIron RX# erase startup-config
```

CAUTION: Use the **erase startup-config** command only for new systems. If you enter this command on a system you have already configured, the command erases the configuration. If you accidentally erase the configuration on a configured system, enter the **write memory** command to save the running configuration to the startup-config file.

3. Access the configuration level of the CLI by entering the following command:

```
BigIron RX# configure terminal          Privileged EXEC Level
BigIron RX(config)#                   Global CONFIG Level
```

4. Configure the IP address and sub-net mask for Ethernet interface 1/1 by entering the following commands:

```
BigIron RX(config)# interface ethernet 1/1
BigIron RX(config-if-e10000-1/1)# ip address 192.22.3.44 255.255.255.0
```

Syntax: enable [<password>]

Syntax: configure terminal

Syntax: [no] ip address <ip-addr> <ip-mask> [secondary]

or

Syntax: [no] ip address <ip-addr>/<mask-bits> [secondary]

Use the **secondary** parameter if you have already configured an IP address within the same sub-net on the interface.

Enabling and Disabling the Interfaces

By default, all BigIron RX Series interfaces are disabled. To enable an interface, you must enter the **enable** command at the appropriate interface configuration level of the CLI. For example, to enable the management interface, enter the **enable** command at the management interface configuration level of the CLI:

```
BigIron RX(config-if-mgmt-1)# enable
```

Syntax: enable

You can disable each of these interfaces using the **disable** command at the appropriate interface configuration level of the CLI. For example, to disable the management port, enter the **disable** command at the management interface configuration level of the CLI:

```
BigIron RX(config-if-mgmt-1)# disable
```

Syntax: disable

Understanding How the Management Port Functions

You must be aware of how the BigIron RX Series system's management port functions as described in the following:

- The management port allows you to configure, monitor, and manage the BigIron RX Series system only. As a result, this port has the same limited functionality as an IP host port.
- You cannot enable and run routing protocols on the management port.
- The management port supports static routes and directly connected routes, which are installed in the management module's routing table. However, these routes are not installed in the interface module's routing table. Therefore, the interface modules are not aware of the management port's static or directly connected routes.
- If you configure the redistribution of directly connected or static routes for a particular routing protocol, the routing protocol will redistribute directly connected or static routes associated with the interface module ports but not those associated with the management port.
- On a BigIron RX Series system running Layer 2 Switch code, the management port does not support a default gateway. However, if you configure a default gateway for the management port, the BigIron RX Series system will convert the default gateway into a static route.
- On a BigIron RX Series system running Layer 2 Switch code, the management port supports multiple static routes. However, you cannot configure multiple static routes to the same destination for a management port.

To display configuration information and statistics about the management port, you can enter the **show interface management 1** command at any CLI level.

Connecting a BigIron RX Series Switch

You can connect a BigIron RX Series Switch to another 10 Gigabit Ethernet network device. The BigIron RX Series Switch supports connections to other vendors' as well as Foundry's network devices.

The 10 Gigabit Ethernet interface module includes four ports, into which you can install fiber-optic modules provided by Foundry. The SFP fiber-optic modules provide an optical transceiver or a physical medium dependent (PMD) interface for fiber that can be used with the LAN physical layer (PHY).

Table 4.2 outlines the fiber-optic modules (PMDs) provided by Foundry, the link distance associated with each, the cabling needed to connect the BigIron RX Series Switch to another network device, and the part number associated with the module.

Table 4.2: Fiber-Optic Modules and Cabling

Fiber-optic Modules (PMD)	Distance	Fiber-optic cabling	Foundry Part Number
Short wavelength 850 nm serial	86 meters 300 meters	50/125 micron multimode fiber (500 Mhz km) 50/125 micron multimode fiber (2000 Mhz km)	10G-XPF-SR
Long wavelength 1310 nm serial	10 km	9/125 micron single-mode fiber with SC connectors	10G-XPF-LR
Extra long wavelength 1550 nm serial	40 km	9/125 micron single-mode fiber with SC connectors	10G-XPF-ER

NOTE: Cable installation and network configuration will affect overall transmission capability. The numbers provided above represent the accepted recommendations of the various standards. For network-specific recommendations, consult your local Foundry reseller or system engineer.

To connect a BigIron RX Series Switch to another network device, you must do the following:

- Install the fiber-optic modules.
- Cable the fiber-optic modules.

The following sections provide information about performing these tasks as well as cleaning the fiber-optic connectors and troubleshooting network connections.

Installing a Fiber-Optic Module

You connect a BigIron RX Series Switch to another network device using a fiber port, you must do the following:

- Install a fiber optic module (SFP transceiver for Gigabit Ethernet ports or SFP-MSA transceiver for 10-Gigabit Ethernet ports)

WARNING: All fiber-optic interfaces use Class 1 Lasers.

NOTE: See “Installation Precautions” on page 3-3 for other hardware installation precautions.

Before installing a fiber-optic module, have the following on hand:

- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

To install a fiber-optic module into a 10 Gigabit Ethernet port, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Remove the module from its protective packaging.
3. Remove the metal cover from the port on the interface module’s control panel.
4. Gently insert the fiber-optic module into the port until the module clicks into place. The fiber-optic modules are keyed to prevent incorrect insertion.

Cabling a Fiber-Optic Module

To cable a fiber-optic module, do the following:

1. Remove the protective covering from the fiber-optic port connectors and store the covering for future use.
2. Before cabling a fiber-optic module, Foundry strongly recommends cleaning the cable connectors and the port connectors. For more information, see "Cleaning Fiber-Optic Modules".
3. Gently insert the two cable connectors (a tab on each connector should face upward) into the port connectors until the tabs lock into place.

Cleaning Fiber-Optic Modules

To avoid problems with the connection between the fiber-optic module port and the fiber cable connector, Foundry strongly recommends cleaning both connectors before making this connection. In particular, dust can accumulate in either connector and cause problems such as reducing the optic launch power.

To clean the fiber cable connectors, Foundry recommends using a fiber-optic reel-type cleaner. You can purchase this type of cleaner from the following Website:

http://www.fisfiber.com/Home_Page.asp

When not using a fiber-optic module port connector, make sure to keep the protective covering on.

Troubleshooting Network Connections

After you cable the fiber-optic modules, you can observe certain LEDs to determine if the network connections are functioning properly. Table 4.3 outlines the LEDs related to the network connections, the desired state of each LED, possible abnormal states of each LED, and what to do if an LED indicates an abnormal state.

Table 4.3: Network Connection-Related LED States

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Interface Module				
Link	On	A link is established with the remote port.	Off	<p>A link is not established with the remote port. You can do the following:</p> <ul style="list-style-type: none"> • Verify that the connection to the other network device has been properly made. Also, make certain that the other network device is powered on and operating correctly. • Verify that the transmit port on a BigIron RX Series Switch is connected to the receive port on the other network device, and that the receive port on the BigIron RX Series Switch is connected to the transmit port on the other network device. If you are not certain, remove the two cable connectors from the port connector and reinsert them in the port connector, reversing their order. • Dust may have accumulated in the cable connector or port connector. For information about cleaning the connectors, see “Cleaning Fiber-Optic Modules” on page 4-7. • If the other actions don’t resolve the problem, try using a different port or a different cable.
Active	On or blinking	The port is transmitting and receiving user packets.	Off for an extended period.	<p>The port is not transmitting or receiving user packets. You can do the following:</p> <ul style="list-style-type: none"> • Check the Link LED to make sure the link is still established with the remote port. If not, take the actions described in the Meaning/Action column for the Link LED. • Verify that the port has not been disabled through a configuration change. You can use the CLI. If you have configured an IP address on the device, you also can use the Web management interface or IronView Network Manager.

If a problem persists after taking these actions, contact Foundry’s technical support.

Testing Network Connectivity

After you cable the fiber-optic modules, you can test connectivity to other network devices by pinging those devices. You also can perform trace routes.

Pinging an IP Address

To verify that a BigIron RX Series Switch can reach another device through the network, enter a command such as the following at any level of the CLI on the BigIron RX Series Switch:

```
BigIron RX> ping 192.33.4.7
```

Syntax: ping <ip addr> | <hostname> [source <ip addr>] [count <num>] [timeout <msec>] [ttl <num>] [size <byte>] [quiet] [numeric] [no-fragment] [verify] [data <1-to-4 byte hex>] [brief]

See the *Foundry Switch and Router Command Line Interface Reference* for information about the parameters.

NOTE: If you address the ping to the IP broadcast address, the device lists the first four responses to the ping.

Tracing a Route

To determine the path through which a BigIron RX Series Switch can reach another network device, enter a command such as the following at any level of the CLI on the BigIron RX Series Switch:

```
BigIron RX> traceroute 192.33.4.7
```

Syntax: traceroute <host-ip-addr> [maxttl <value>] [minttl <value>] [numeric] [timeout <value>] [source-ip <ip addr>]

The CLI displays trace route information for each hop as soon as the information is received. Traceroute requests display all responses to a given TTL. In addition, if there are multiple equal-cost routes to the destination, the Foundry device displays up to three responses by default.

See the *Foundry BigIron RX Series User Guide* for information about the command syntax.

Chapter 5

Using a Redundant Management Module

You can install a redundant management module in slot M1 or M2 of the BigIron RX Series chassis. (By default, the system considers the module installed in slot M1 to be the active management module and the module installed in slot M2 to be the redundant or standby module. If the active module becomes unavailable, the standby module automatically takes over management of the system.

This chapter describes the redundant management module, how it works with the active module, and how to configure and manage it.

This chapter provides the following information:

- How management module redundancy works.
- Optional management module redundancy configurations that you can perform.
- How to manage and monitor the redundancy feature.
- Flash memory and PCMCIA flash card file management commands.

How Management Module Redundancy Works

This section explains the following:

- How management module redundancy works under normal operating conditions.
- Events that cause a standby management module to assume the role of the active module and how the switchover occurs as a result of each event.
- Implications that you should be aware of if a switchover occurs.

Management Module Redundancy Overview

When you power on or reload a BigIron RX Series chassis with two management modules installed, by default, the management module installed in slot M1 becomes the active module and the module installed in slot M2 becomes the standby module. (You can change the default active slot from M1 to M2 using the **active-management** command. For information about performing this task, see “Changing the Default Active Chassis Slot” on page 5-4.)

After the active and standby modules are determined, both modules boot from the source specified for the active module. The active management module can boot from the following sources:

- The active management module’s flash memory.
- A PCMCIA flash card inserted in one of the PCMCIA slots in the active management module’s front panel.

After the modules boot, the active module compares the standby module's flash code and system-config file to its own. If differences exist, the active module synchronizes the standby module's flash code and system-config file with its own.

During normal operation, the active module handles tasks such as obtaining network topology and reachability information and determining the best paths to known destinations. The active module also monitors the standby module.

The standby module functions in an active standby mode. Configuration changes made from the CLI to the active management module are also written to the standby management module even if they are not written to flash memory. Keeping the system-config and running-config files on both modules synchronized allows the standby module to assume the role of active module seamlessly if necessary.

NOTE: Since both the standby and active management modules run the same code, a command that brings down the active management module will most likely bring down the standby management module. Because all configuration commands are synchronized from active to standby management module in real time, both management modules will crash at almost the same time. This in turn causes the system to reset all interface modules (similar to the behavior when the 'reboot' command is executed) and causes packet loss associated with a system reboot.

The interface modules are not reset, as they are with the previous cold-restart redundancy feature. The interface modules continue to forward traffic while the standby management module takes over operation of the system. The new now-active management module receives updates from the interface modules and sends verification information to the interface modules to ensure that they are synchronized. If the new active management module becomes out-of-sync with an interface module, information on the interface module can be overwritten in some cases which can cause an interruption of traffic forwarding. Layer 3 hitless failover is not supported in this release. Consequently, a failover will result in a re-synchronization of Layer 3 data structures.

Management Module Switchover

The following events cause the standby management module to become the active module, which is called a **switchover**:

- The active module becomes unavailable.
- You perform a manual switchover.
- You remove and replace the active management module.

The following sections explain how the switchover occurs for each event.

Unavailable Active Module

The following events cause an active module to become unavailable and a switchover to occur:

- An active module experiences a problem significant enough to cause a reset of the module.
- The active module loses power.

Before a switchover occurs, the active module resets itself and sends an interrupt signal to the standby module. The standby module then becomes the active module and the interface modules continue to forward traffic.

The new active module begins to manage the system. When the original active module becomes available again or is replaced, it assumes the role of standby module.

Manual Switchover

In some situations, you may want to manually switch the role of active management module from the currently active module to the standby module. For example, if the module in slot M2 is the active module and the module in slot M1 is the standby module and you want the module in M1 to be the active module and the module in M2 to be the standby module, you can perform a manual switchover using the **switchover** command. For information about performing this task, see "Manually Switching Over to the Standby Management Module" on page 5-6.

When the switchover occurs, the standby module becomes the active module.

Removal and Replacement of a Management Module

For information about how to remove and replace a management module, see “Replacing a Management Module” on page 7-2.

This section explains how management module redundancy is affected when you remove and replace an active or standby management module.

Removal and Replacement of an Active Management Module

If you remove the active management module, the standby module automatically assumes the role of the active module. After you insert a replacement module in the slot from which the original active module was removed, the replacement module becomes the standby module. The module boots from the source specified for the active module. The active management module can boot from the following sources:

- The active management module’s flash memory.
- A PCMCIA flash card inserted in one of the PCMCIA slots in the active management module’s front panel.

After the replacement module boots, the active module compares the standby module’s flash code and system-config file to its own. If differences exist, the active module synchronizes the standby module’s flash code and system-config file with its own.

Removal and Replacement of a Standby Management Module

You can remove a standby management module without causing a switchover to occur. The active module continues to function as is. Communication between the active module and the removed module stops until the new module is installed in the BigIron RX Series chassis. After the new module is installed, it assumes the role of standby module. The module boots from the source specified for the active module. The active management modules can boot from the following sources:

- The active management module’s flash memory.
- A PCMCIA flash card inserted in one of the PCMCIA slots in the active management module’s front panel.

After the module boots, the active module compares the standby module’s flash code and system-config file to its own. If differences exist, the active module synchronizes the standby module’s flash code and system-config file with its own.

Switchover Implications

After the role of the active management module switches from one module to another, you must be aware of implications that affect the following areas:

- Management sessions
- Syslog and SNMP traps
- MAC addresses

The following sections explain the implications for these areas.

Management Sessions

You can establish management sessions with the active management module’s management port. If a switchover occurs, the management port on the original active module shuts down and all open CLI, Web management interface, and IronView Network Manager sessions with that port close. You can open new sessions with the new active module, provided that the new active module has the same management port connections. (For example, if you were accessing the Web management interface via a PC connected to the original active module’s management port, you can open a new session if a PC is connected to the new active module’s management port.)

In the scenario described above, you can open a new session using the same IP address you were using before the switchover. (You configure an IP address for the active module only; if a switchover occurs, the IP address is used by the new active module.)

Syslog and SNMP Traps

When a switchover occurs, the BigIron RX system sends a Syslog message to the local Syslog buffer and also to the Syslog server, if you have configured the system to use one. In addition, if you have configured an SNMP trap receiver, the system sends an SNMP trap to the receiver.

When the system is powered on or otherwise reset normally, the system sends a cold start message and trap. However, if the system is reset as the result of switchover to the standby management module, the system instead sends a warm start message and trap.

MAC Address Changes

The MAC addresses in the BigIron RX Series system are based on the MAC address of the BigIron RX Series chassis. During switchover, the system's MAC addresses change and the system sends out gratuitous ARP requests to flush the old MAC addresses from the ARP caches on attached IP devices, and update the caches with the system's new MAC addresses.

Management Module Redundancy Configuration

Configuring management module redundancy consists of performing one optional task (changing the default active chassis slot). The section explains how to perform this task.

Changing the Default Active Chassis Slot

By default, the BigIron RX Series system considers the module installed in slot M1 to be the active management module. If desired, you can change the default active chassis slot to M2.

To change the default active chassis slot to M2, enter the following commands:

```
BigIron RX(config)# redundancy
BigIron RX(config-redundancy)# active-management mgmt-1
```

Syntax: active-management <mgt-module>

The <mgt-module> parameter specifies the management module, which can be mgmt-1 or mgmt-2.

Managing Management Module Redundancy

The BigIron RX Series Switch allows you to perform the following management tasks related to management module redundancy:

- Perform immediate synchronization of files.
- Perform a manual switchover to the standby module.
- Reboot the standby module.

File Synchronization Between the Active and Standby Management Modules

Each active and standby management module contains the following files that can be synchronized between the two modules:

- Flash code – The flash code can include the following files:
 - monitor, which contains the management module's Real Time Operating System (RTOS).
 - primary, which contains the management module's primary RX series IronWare image.
 - secondary, which contains the management module's secondary RX series IronWare image.

A RX series IronWare image contains the layer 1 – 3 software run by the management module.

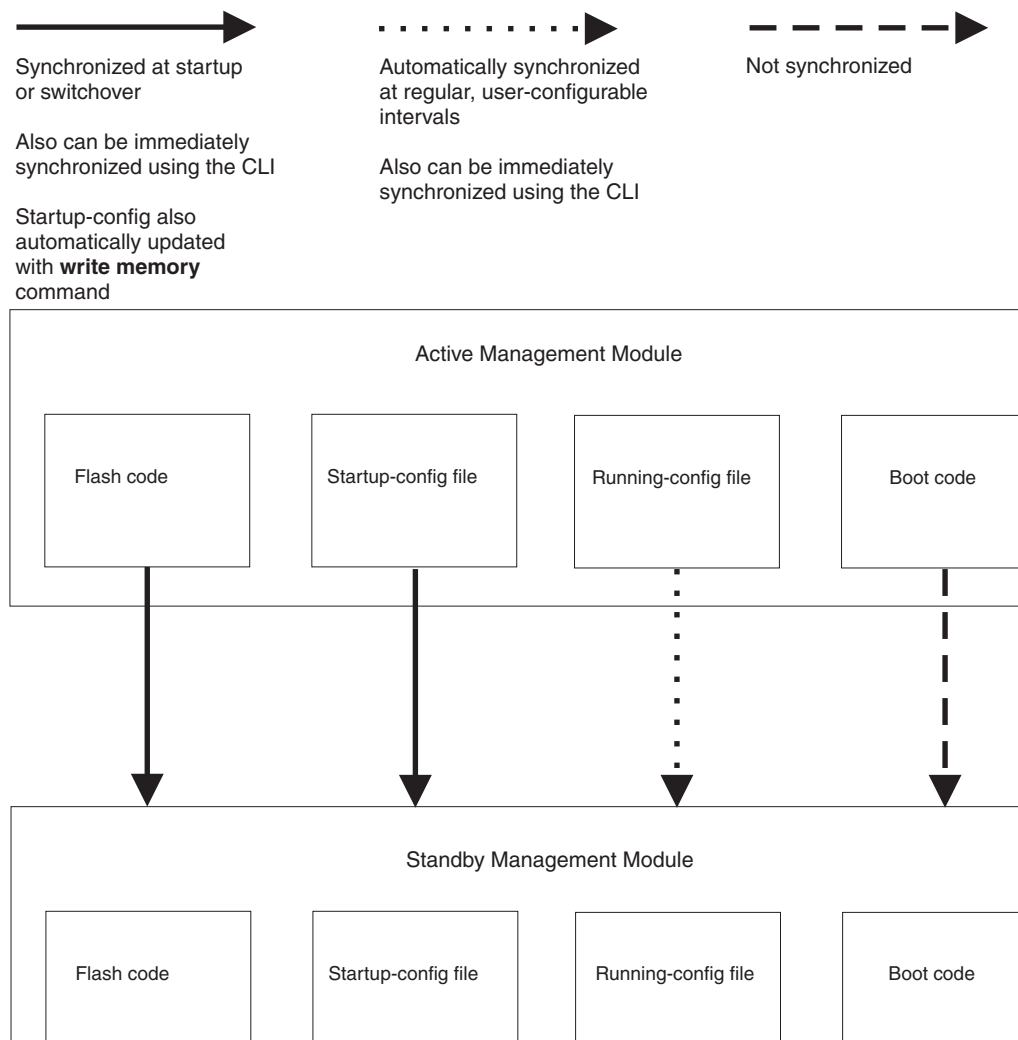
During startup or switchover, the active module compares the standby module's flash code to its own. If differences exist, the active module synchronizes the standby module's flash code with its own. If you update the flash code on the active module, the active module automatically synchronizes (without comparison) the standby module's flash code with its own.

- **System-config file** – The flash code also includes the system-config file. During startup or switchover, the active module compares the standby module's system-config file to its own. If differences exist, the active module synchronizes the standby module's system-config file with its own. When you save changes to the system-config file on the active module, the active module automatically synchronizes (without comparison) the standby module's system-config file with its own.
- **Running-config** – The running-config file resides in the BigIron RX Series system's memory. The running-config file is automatically synchronized (without comparison) from the active module to the standby module at regular intervals. The default interval is 7 seconds.

Each active and standby management module also includes boot code, which is the code a module runs when it first starts up. The boot code resides in each module's boot flash. The boot code is not synchronized between the two modules. The unsynchronized boot code allows the system to run using an older version of boot code on the standby module if desired.

Figure 5.1 shows how the files are synchronized between the active module and the standby module.

Figure 5.1 Active and Standby Management Module File Synchronization



The BigIron RX Series system allows you to do the following related to file synchronization:

- Compare files on the active module with files on the standby module and immediately synchronize any files

that are different.

- Immediately synchronize all files between the active and standby modules.

The following sections explain how to perform these tasks.

Comparing and Synchronizing Files

You can initiate a comparison of the flash code, system-config file, and running-config file on the active management module with the same files on the standby module and synchronize the files immediately if differences exist. When you synchronize the files, the active module copies its files to the standby module, replacing the files on the standby module.

To compare and immediately synchronize files between the active and standby modules if differences exist, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# sync-standby
```

Syntax: sync-standby

Synchronizing Files Without Comparison

You can synchronize the flash code, system-config file, and running-config file immediately without comparison. When you synchronize the files, the active module copies its files to the standby module, replacing the files on the standby module.

To immediately synchronize the files between the active and standby modules, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# force-sync-standby
```

Syntax: force-sync-standby

Manually Switching Over to the Standby Management Module

You can cause the BigIron RX Series system to switch over to the standby module (and thus make it the active module). To do so, you can enter either the **switchover** or the **reset** commands at the Privileged EXEC level:

```
BigIron RX# switchover
```

or

```
BigIron RX# reset
```

Syntax: switchover

Syntax: reset

Rebooting the Active and Standby Management Modules

You can reboot the management modules, maintaining the active and standby roles currently performed by each module, using the **boot system** or **reload** commands. You can also reboot the standby module only, maintaining its current standby role, using the **reboot-standby** command.

For example, to reboot the active and standby management modules from the primary RX series IronWare image in the management module's flash memory, enter the following command at the Privileged EXEC level:

```
BigIron RX# boot system flash primary
```

Syntax: boot system bootp | [flash primary | flash secondary] | slot <number> <filename> | tftp <ip-address> <filename>

The **flash primary** keyword specifies the primary RX series IronWare image in the management module's flash memory, while the **flash secondary** keyword specifies the secondary RX series IronWare image in the flash memory.

For the <number> parameter, specify 1 for PCMCIA slot 1 on the active management module and 2 for PCMCIA slot 2 on the active management module. For the <filename> parameter, specify the name of the image on the PCMCIA flash card.

The **tftp** keyword directs the BigIron RX Series Switch to boot from an RX series IronWare image on a TFTP server located at <ip-address> with the specified <filename>.

For example, to reboot the active and standby management modules, enter the following command at the Privileged EXEC level:

```
BigIron RX# reload
```

Syntax: reload

To reboot the standby module only, enter the following command at the Privileged EXEC level:

```
BigIron RX# reboot-standby
```

Syntax: reboot-standby

Monitoring Management Module Redundancy

You can monitor the following aspects of management module redundancy:

- The status of the management modules (if a module is the active or standby module).
- The switchover history for the management modules.

The following sections explain how you can monitor the management modules.

Determining Management Module Status

You can determine the status of a management module in the following ways:

- LEDs – The management module's LEDs indicate whether a module is the active module or the standby module, and if the module has power.
- Module information in software – The module information displayed by the software indicates whether a module is the active module or the standby module.

Status LED

If you are located near the BigIron RX Series chassis, you can determine which management module is currently the active module and which is the standby module by observing the Active LED on each module. If this LED is on (green), the module is the active module. If this LED is off, the module is the standby module.

You can also observe the Pwr LED on each module. If this LED is on (green), the module is receiving power. If this LED is off, the module is not receiving power. (A module without power will not function as the active or standby module.)

For information about what to do if these LED indicators are not what you expect, see Table 3.3 on page 3-19.

Software

To display the status of the management modules, enter the following command at any CLI level:

```
BigIron RX# show module
```

Module	Status	Ports	Starting MAC
M1 (upper): BigIron BI-RXMR Management Module	Active		
M2 (lower): BigIron BI-RXMR Management Module	Standby (Ready)		
...			

Syntax: show module

The Status column indicates the module status. The management modules can have one of the following statuses:

- ACTIVE – The module is currently the active management module.

- STANDBY – The module is the standby management module. The status of the standby module can be one of the following:
 - Init – The module is currently initializing as the standby module.
 - Ready – The module is ready to take over as the active module, if necessary.
 - Wait – The module is awaiting boot information from the active management module.
 - Sync – The active module is currently synchronizing files between itself and the standby module.

Displaying Temperature Information

Each management module contains a temperature sensor. By default, the BigIron RX system polls the temperature of each management module every 60 seconds. You can display the current temperature of the management modules (and all other modules) by entering the following command at any CLI level:

```
BigIron RX# show chassis
...
Active Mgmt Module: 28.43C 57.500C (CPU)
Standby Mgmt Module: 29.15C 57.500C (CPU)...
Temperature Monitoring Poll Period is 60 seconds
...
```

Syntax: show chassis

The output displays the temperature of the management modules in the BigIron RX chassis and also indicates that the temperature readings were provided within the last 60 seconds. For information about all output generated by the **show chassis** command, see “Displaying Chassis Status and Temperature Readings” on page 6-1.

Displaying Switchover Information

You can display the following related to a switchover:

- Redundancy parameter settings and statistics, which include the number of switchover that have occurred.
- System log or the traps logged on an SNMP trap receiver, which includes information about whether a switchover has occurred.

To view the redundancy parameter settings and statistics, enter the following command at any level of the CLI:

```
BigIron RX# show redundancy

=== MP Redundancy Settings ===
Default Active Slot = 17
Running-Config Sync Period = 7 seconds

=== MP Redundancy Statistics ===
Current Active Session:
Active Slot = 9, Standby Slot = 10 (Ready State), Switchover Cause = No Switchover
Start Time = 0-0-17 19:47:39 (Wednesday)

Previous Active Session #1:
Active Slot = 10, Standby Slot = 9, Switchover Cause = Active Rebooted
Start Time = 0-0-17 19:46:9 (Wednesday), End Time = 0-0-17 19:47:39 (Wednesday)

Previous Active Session #2:
Active Slot = 9, Standby Slot = 10, Switchover Cause = Active Rebooted
Start Time = 0-0-17 19:44:14 (Wednesday), End Time = 0-0-17 19:46:9 (Wednesday)
...
```

This output displays that the default active chassis slot is configured as slot 9 (M1) and the automatic synchronization interval is configured for 7 seconds. It also displays that in the current active session, the module installed in slot 9 (M1) is the active module, the module installed in slot 10 (M2) is the standby module, which is in Ready state, and no switchovers have occurred.

However, in two previous sessions, switchovers occurred because the active module was rebooted. In session #2, the module installed in slot 9 (M1) was the active module, while the module installed in slot 10 (M2) was the standby module. In session #1, the module installed in slot 10 (M2) was the active module, while the module installed in slot 9 (M1) was the standby module.

To view the system log or the traps logged on an SNMP trap receiver, enter the following command at any level of the CLI:

```
BigIron RX# show log

Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 24 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
              I=informational N=notification W=warning

Static Log Buffer:
Sep 28 11:31:25:A:Power Supply 1, 1st left, not installed
Sep 28 11:31:25:A:Power Supply 3, middle left, not installed
Sep 28 11:31:25:A:Power Supply 4, middle right, failed
Sep 28 11:31:25:A:Power Supply 5, 2nd right, not installed

Dynamic Log Buffer (50 lines):
Sep 27 18:06:58:I:Interface ethernet6/2, state up
Sep 27 18:06:57:I:Interface ethernet3/2, state up
Sep 27 15:39:42:I:Interface ethernet3/2, state up
Sep 27 15:39:42:I:Interface ethernet6/2, state up
...
Sep 27 14:23:45:N:Module up in slot 6
Sep 27 14:23:45:N:Module up in slot 3

Sep 27 14:23:27:A:Management module at slot 9 state changed from standby to active
```

This output displays that one switchover occurred.

Flash Memory and PCMCIA Flash Card File Management Commands

The BigIron RX Series system supports file systems in the following locations:

- The management module's flash memory.
- A PCMCIA flash card inserted in the management module's slots 1 or 2.

Table 5.1 outlines the root directory for each file system.

Table 5.1: BigIron RX File System Root Directories

File System	Root Directory
Flash memory	/flash/
PCMCIA flash card in slot 1	/slot1/
PCMCIA flash card in slot 2	/slot2/

This section describes commands that manage the files in flash memory and on the flash cards. You can use the file management commands to perform the following tasks:

- Format a flash card.
- Determine the current management focus.
- Switch the management focus.
- Display a directory of the files.

- Display the contents of a file.
- Display the hexadecimal output of a file.
- Create a subdirectory.
- Remove a subdirectory.
- Rename a file.
- Change the read-write attribute of a file.
- Delete a file.
- Recover or “undelete” a file.
- Append one file to another (join two files).
- Perform copy operations using the **copy** command.
- Perform copy operations using the **cp** command.
- Load the system software from flash memory, a flash card, or other sources during system reboot.
- Change the save location of the startup-config file from the default location (flash memory) to a flash card in slot 1 or 2.

In the CLI, you can access all the file management commands at the Privileged EXEC level of the CLI.

CAUTION: Do not add or remove a flash card while a file operation involving the flash card's slot is in progress. Doing so can result in corruption of the flash card. If this occurs, you may need to reformat the flash card to make it usable again. Reformatting the card erases all data stored on the card.

Management Focus

The **management focus** determines the default file system (flash memory or the flash card inserted in slot 1 or 2) to which a file management operation applies. When you power on or reload a BigIron RX Series system, by default, the management focus is on flash memory.

You can change the current management focus from flash memory to a slot and subdirectory using the **cd** or **chdir** command. (For more information about these commands, see “Switching the Management Focus” on page 5-14.)

To determine the slot and subdirectory that have the current management focus, enter the **pwd** command. (For more information about this command, see “Determining the Current Management Focus” on page 5-14.)

Most file management commands provide the option of specifying the file system to which the command applies. If you want the command to apply to the file system that has the current management focus, you do not need to specify the file system. If you want the operation to apply to the file system that does not have the current management focus, you must specify one of the following keywords:

- **flash** – indicates flash memory
- **slot1** – indicates the flash card inserted in slot 1
- **slot2** – indicates the flash card inserted in slot 2

For example, if you want to display a directory of files in flash memory and flash memory has the current management focus, you do not need to specify the **flash** keyword. However, if you want to display a directory of files for slot 1 and flash memory has the current focus, you must specify the **slot1** keyword.

Flash Memory File System

The flash memory file system is flat, which means that it does not support subdirectories. As a result, you cannot create or delete subdirectories in this file system using the **md/mkdir** and **rd/rmdir** commands, respectively. Also, when specifying the syntax for the various file management commands, you will not need to specify a pathname to a subdirectory because it is not possible for a subdirectory to exist.

File Naming Conventions

A file name in the flash memory file system can be a maximum of 31 characters. File names are case sensitive. The flash memory file system does not accept spaces as part of a file name.

The following characters are valid in file names:

- All upper and lowercase letters
- All digits
- Any of the following special characters:
 - \$
 - %
 - '
 - -
 - _
 - @
 - ~
 - `
 - !
 - (
 -)
 - {
 - }
 - ^
 - #
 - &

PCMCIA Flash Card File System

The PCMCIA flash card file system is hierarchical, which means that it supports subdirectories. Therefore, you can create or delete subdirectories in this file system using the **md/mkdir** and **rd/rmdir** commands, respectively. Also, when specifying the syntax for the various file management commands, you may need to specify a pathname to a subdirectory as appropriate to manipulate a file in a subdirectory.

PCMCIA Flash Card Subdirectories

The full path name for a file's location can be a maximum of 256 characters. You can nest subdirectories as deep as you want as long as the full path name is 256 characters or less.

When you include a subdirectory path in a file management command, use a slash between each level. For example, to create a subdirectory for flash code and copy a flash image file to the subdirectory, enter commands such as the following:

```
BigIron RX# mkdir slot1 /switchCode/initial-release
```

These commands create two levels of subdirectories on the flash card in PCMCIA slot 1.

File and Subdirectory Naming Conventions

The PCMCIA slots supports file names of up to . File names are not case sensitive. Thus, the software considers the name "test.cfg" and "TEST.CFG" to be the same.

Files and subdirectory names can be up to 32 characters long, including spaces and the special characters listed. The following characters are valid in file and subdirectory names:

- All upper and lowercase letters
- All digits
- Spaces
- Any of the following special characters:
 - \$
 - %
 - '
 - -
 - _
 - @
 - ~
 - `
 - !
 - (
 -)
 - {
 - }
 - ^
 - #
 - &

You can use spaces in a file or subdirectory name if you enclose the name in double quotes. For example, to specify a subdirectory name that contains spaces, enter a string such as the following: "a long subdirectory name".

A subdirectory or file name can be a maximum of 256 characters long. A complete subdirectory path name cannot contain more than 256 characters.

There is no maximum file size. A file can be as large as the available flash card space.

Wildcards

Commands to display a directory of files, to change the read-write attribute of a file, or to delete files accept wildcards in the file name (<file-name>). When using these commands, you can use "*" (asterisk) as a wildcard for any part of the name. For example, all the following values are valid for <file-name>:

- teststartup.cfg
- test*.cfg
- nmb02200.bin
- *.bin
- m*.bin
- m*.*

Formatting a Flash Card

The flash cards are not shipped with a management module. If you want to use a flash card, you must format it for the 16 FAT file system before you can store files on the card.

CAUTION: Make sure the flash card is empty or does not contain files you want to keep. Formatting a flash card completely erases all files on the card.

CAUTION: Once you start the formatting process, you cannot stop it. Even if you enter CTRL-C to stop the CLI output and a new prompt appears, the formatting continues. Make sure you want to format the card before you enter the command.

For example, to reformat a flash card in the management module's slot 2, enter the following command:

```
BigIron RX# format slot2
.....
.....
.....
.....
80809984 bytes total card space.
80809984 bytes available on card.
    2048 bytes in each allocation unit.
    39458 allocation units available on card.
```

Syntax: format slot1 | slot2

The **slot1 | slot2** keyword specifies the PCMCIA slot that contains the flash card you are formatting.

Determining the Current Management Focus

For conceptual information about management focus, see “Management Focus” on page 5-11.

If you are not sure which file system has the current management focus, enter the following command:

```
BigIron RX# pwd
Flash /flash/
```

Syntax: pwd

In this example, the management focus is the flash memory.

In the following example, the management focus is the root directory of the flash card in slot 1:

```
BigIron RX# pwd
/slot1/
```

In the following example, the management focus is a subdirectory called “test” on the flash card in slot 1.

```
BigIron RX# pwd
/slot1/test/
```

Switching the Management Focus

The effect of file management commands depends on the file system that has the current management focus. For example, if you enter a command to delete a file and do not specify the location of the file, the software attempts to delete the file from the location that currently has the management focus.

By default, the management focus is on the management module's flash memory. You can switch the focus from flash memory to the management module's slot 1 or slot 2 using the **cd** or **chdir** commands, which have the same syntax and function exactly the same.

For example, to switch the focus from flash memory to the flash card in slot 2, enter the following command:

```
BigIron RX# cd /slot2
BigIron RX#
```

When you enter this command, the software changes the management focus to slot 2 then displays a new command prompt. If a slot you specify does not contain a flash card, the software displays the message shown in the following example.

```
BigIron RX# cd /slot1
Device not present
```

Syntax: cd <directory-pathname>

Syntax: chdir <directory-pathname>

For the <directory-pathname> parameter for both **cd** and **chdir** commands, you can specify /slot1 or /slot2 to switch the focus to slot 1 or slot 2, respectively. Specify /flash to switch the focus to flash memory.

After you have switched the focus to a slot 2, you can specify the <directory-pathname> parameter to switch the focus to a subdirectory on a flash card inserted in slot 2. For example, to switch the focus from the root directory level (/) of slot 2 to the subdirectory named "PLOOK," enter the following command:

```
BigIron RX# cd /PLOOK
```

If you specify an invalid subdirectory path, the CLI displays a message such as the following:

```
BigIron RX# cd /PLOOK
Path not found
```

If you are certain the path you specified exists, make sure you are at the correct level for reaching the path. For example, if you are already at the PLOOK level, the CLI cannot find the subdirectory "/PLOOK" because it is not a subdirectory from the level that currently has the management focus.

To change the management focus back to flash memory, enter the following command:

```
BigIron RX# cd /flash
BigIron RX#
```

Displaying a Directory of the Files

You can display a directory of the files in the management module's flash memory or on a flash card inserted in the management module's slot 1 or slot 2 using the **dir** or **ls** commands.

The software displays the directory of the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to list the files on the file system that does not currently have management focus. In this case, you can specify the /<path-name>/ parameter with the **dir** or **ls** commands to display the directory of the desired file system.

For example, to display a directory of the files in flash memory, if flash memory has the management focus, enter the following command:

```
BigIron RX# dir
Directory of /flash/

07/28/2003 15:57:45          3,077,697 1060.tmp
07/28/2003 15:56:10          3,077,697 14082.tmp
07/28/2003 16:00:08          3,077,697 2084.tmp
07/25/2003 18:00:23           292,701 boot
00/00/00   00:00:00              12 boot.ini
07/28/2003 14:40:19          840,007 lp-primary-0
07/28/2003 15:18:18          840,007 lp-secondary-0
07/28/2003 09:56:16          391,524 monitor
07/28/2003 15:08:12          3,077,697 primary
07/28/2003 16:02:23           1,757 startup-config
07/25/2003 18:02:14           1,178 startup.sj2
07/28/2003 14:28:47           1,662 startup.spa
07/26/2003 12:16:29           1,141 startup.vso
07/25/2003 18:11:01           1,008 startup.vsr
07/28/2003 09:40:54           1,554 startup.vsrp.ospf

                15 File(s)          14,683,339 bytes
                0 Dir(s)           15,990,784 bytes free
```

Syntax: dir | ls [<path-name>]

You can enter either **dir** or **ls** for the command name.

Specify the <path-name> parameter to display the following:

- The files that match the value for a flash memory directory, or flash card directory/subdirectory you specify.
- The files that match the value for a name you specify.

For example, to list only files that contain a .tmp suffix in flash memory, if flash memory is the current management focus, enter a command such as the following:

```
BigIron RX# dir *.tmp
Directory of /flash/

07/28/2003 15:57:45          3,077,697 1060.tmp
07/28/2003 15:56:10          3,077,697 14082.tmp
07/28/2003 16:00:08          3,077,697 2084.tmp

                3 File(s)          9,292,701 bytes
                0 Dir(s)           15,990,784 bytes free
```


For example, to display a directory of the files on the flash card in slot 2, if flash memory has the management focus, enter the following command:

```
BigIron RX# dir /slot2/
Directory of /slot2/

08/01/2003 18:25:28          3,092,508 PRIMARY
08/01/2003 18:28:06          3,092,508 primary.1234
08/01/2003 18:28:24           389,696 MONITOR
08/01/2003 18:28:30           389,696 MONITOR1
08/01/2003 18:28:01           389,696 MONITOR2
08/01/2003 18:28:03           389,696 MONITOR3
08/01/2003 18:29:04           389,696 MONITOR4
08/01/2003 18:29:12   <DIR>          DIR1
08/01/2003 18:32:03           389,696 1234567890.12345
08/01/2003 18:32:08           389,696 123456.123
08/01/2003 18:32:11           389,696 123456.123
08/01/2003 18:32:14           389,696 123456.123
08/01/2003 18:32:17           389,696 123456.123

                12 File(s)          10,081,976 bytes
                 1 Dir(s)           114,577,408 bytes free
```

The following information is displayed for each file.

Table 5.2: CLI Display of Directory Information

This Field...	Displays...
File date	The date on which the file was placed in the flash memory or card, if the Foundry device's system clock is set.
Time of day	The time of day at which the file was placed in the flash memory or card, if the Foundry device's system clock is set.
File size	The number of bytes in the file.
Read-write attribute	If you have set the file's read-write attribute to read-only, "R" appears before the file name. If the file's read-write attribute is read-write (the default), no value appears in this column. For information, see "Changing the Read-Write Attribute of a File" on page 5-21.
File name	The file name.
Long file name	This field applies to files on a flash card only. The longer file name if the file was created on a PC and the name is longer than the 8.3 format.

The directory also lists the total number of files that match the parameters you specified, the total number of bytes used by all the files, and the number of bytes still free.

Displaying the Contents of a File

You can display the contents of a file in the management module's flash memory or on a flash card inserted in the management module's slot 1 or slot 2.

The software attempts to display the specified file in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to display the file in a file system that does not currently have management focus. In this case, you can specify the `/<directory>/<path-name>` parameter with the **more** command to display the file in the desired file system.

For example, to display the contents of a file in flash memory, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# more cfg.cfg
```

Syntax: more `[/<directory>/<file-name>`

Use the `<directory>` parameter to specify a directory in a file system that does not have current management focus.

Use the `<path-name>` parameter to specify the file you want to display.

For example, to display the contents of a file on the flash card in slot 2, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# more /slot2/cfg.cfg
```

Displaying the Hexadecimal Output of a File

You can display the hexadecimal output of a file in the management module's flash memory or on a flash card inserted in the management module's slot 1 or slot 2.

The software attempts to display the hexadecimal output of a specified file in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to display the hexadecimal output of the file in a file system that does not currently have management focus. In this case, you can specify the `/<directory>/<file-name>` parameter with the **hd** command to display the output of the file in the desired file system.

For example, to display the hexadecimal output of a file in flash memory, if flash memory has the current management focus, enter the following command:

```
BigIron RX# hd cfg.cfg
```

Syntax: hd `[/<directory>/<file-name>`

Use the `<directory>` parameter to specify a directory in a file system that does not have current management focus.

Use the `<file-name>` parameter to specify a file for which you want to display the hexadecimal output.

For example, to display the hexadecimal output of a file in a flash card inserted in slot 2, if flash memory has the current management focus, enter the following command:

```
BigIron RX# hd /slot2/cfg.cfg
```

Creating a Subdirectory

You can create a subdirectory in the flash card file system using the **md** and **mkdir** commands, which have the same syntax and function exactly the same.

NOTE: You cannot create subdirectories in the flash memory file system. Therefore, the **md** and **mkdir** commands do not apply to the flash memory file system.

The software attempts to create a subdirectory in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to create a subdirectory in a file system that does not currently have management focus. In this case, you can specify the **slot1** or **slot2** keyword with the **md** or **mkdir** command to create the subdirectory in the desired file system.

For example, to create a subdirectory on the flash card inserted in slot 2, if the flash memory has current management focus, enter a command such as the following:

```
BigIron RX# mkdir slot2 TEST
```

Syntax: md | mkdir [slot1 | slot2] <dir-name>

You can enter either **md** or **mkdir** for the command name.

Specify the **slot1** or **slot2** keyword to create a subdirectory on the flash card in slot 1 or slot 2, respectively. If you do not specify one of these parameters, the command applies to the file system that currently has the management focus.

The <dir-name> parameter specifies the subdirectory name. You can enter a name that contains any combination of the following characters. Do not enter a slash “/” in front of the name. Remember, a file name preceded by a slash represents the absolute path name (/flash, /slot1, or /slot2).

- All upper and lowercase letters
- All digits
- Spaces
- Any of the following special characters:
 - \$
 - %
 - ‘
 - -
 - _
 - @
 - ~
 - `
 - !
 - (
 -)
 - {
 - }
 - ^
 - #
 - &

You can use spaces in a subdirectory name if you enclose the name in double quotes. For example, to specify a subdirectory name that contains spaces, enter a string such as the following: “a long subdirectory name”.

A subdirectory name can be a maximum of 256 characters long. A complete subdirectory path name cannot contain more than 260 characters.

The name is not case sensitive. You can enter upper- or lowercase letters. The CLI displays the name using uppercase letters.

To verify successful creation of the subdirectory, enter a command such as the following to change to the new subdirectory level:

```
BigIron RX# chdir /slot2/TEST
Current directory of slot2 is: /TEST
```

For information about changing the directory using the **cd** and **chdir** commands, see “Switching the Management Focus” on page 5-14.

Removing a Subdirectory

You can remove a subdirectory from the flash card file system using the **rd** and **rmdir** commands, which have the same syntax and function exactly the same.

NOTE: You cannot remove subdirectories from the flash memory file system. Therefore, the **rd** and **rmdir** commands do not apply to the flash memory file system.

NOTE: You can remove a subdirectory only if the subdirectory does not contain files or other subdirectories.

The software attempts to remove a subdirectory from the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to remove a subdirectory from a file system that does not currently have management focus. In this case, you can specify the **slot1** or **slot2** keyword with the **rd** or **rmdir** command to remove the subdirectory from the desired file system.

For example, to remove a subdirectory from the flash card inserted in slot 2, if the flash memory has current management focus, enter a command such as the following:

```
BigIron RX# rmdir slot2 TEST
```

Syntax: **rd** | **rmdir** [slot1 | slot2] <dir-name>

You can enter either **rd** or **rmdir** for the command name.

Specify the **slot1** or **slot2** keyword to remove a subdirectory on the flash card in slot 1 or slot 2, respectively. If you do not specify one of these parameters, the command applies to the file system that currently has the management focus.

The <dir-name> parameter specifies the subdirectory you want to delete. You can enter a path name if the subdirectory is not in the current directory.

If you receive a message such as the following, enter the **pwd** command to verify that the management focus is at the appropriate level of the directory tree.

```
BigIron RX# rmdir TEST
rmdir /slot1/test/dir1/temp failed - File not found
```

For information about using the **pwd** command, see “Determining the Current Management Focus” on page 5-14.

Renaming a File

You can rename a file in the management module’s flash memory or on a flash card inserted in the management module’s slot 1 or slot 2 using the **rename** or **mv** command.

The software attempts to rename the file in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to rename the file in a file system that does not currently have management focus. In this case, you can specify the /<directory>/<old-file-name> /<directory>/<new-file-name> parameter with the **rename** or **mv** command to rename the file in the desired file system.

For example, to rename a file in flash memory, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# rename oldname newname
```

If the command is successful, the CLI displays a new command prompt.

Syntax: **rename** | **mv** [/<directory>]/<old-file-name> [/<directory>]/<new-file-name>

You can enter either **rename** or **mv** for the command name.

The /<directory>/ parameter specifies a directory in a file system that does not have current management focus.

The <old-file-name> parameter specifies the original filename that you want to change.

The <new-file-name> parameter specifies the new filename that you want to assign to the original file.

For example, to rename a file on the flash card inserted in slot 2, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# rename /slot2/oldname /slot2/newname
```

Changing the Read-Write Attribute of a File

You can specify the read-write attribute of a file on a flash card as follows:

- Read-only – You can display or copy the file but you cannot replace (copy over) or delete the file.
- Read-write – You can replace (copy over) or delete the file. This is the default.

NOTE: The read-write attribute of all files in flash memory is set to read-write. You cannot change this attribute for the files in flash memory. Therefore, the **attrib** command does not apply to the flash memory file system.

To determine the current setting of the read-write attribute for a file, use the **dir** command to list the directory information for the file. Files set to read-only are listed with “R” in front of the file name. For information about the **dir** command, see “Displaying a Directory of the Files” on page 5-15.

The software attempts to change the read-write attribute of the file in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to change this attribute of the file in a file system that does not currently have management focus. In this case, you can specify the **slot1** or **slot2** keyword with the **attrib** command to change the attribute of the file in the desired file system.

For example, to change the attribute of a file in slot2 to read-only, if flash memory has the management focus, enter a command such as the following:

```
BigIron RX# attrib slot2 ro goodcfg.cfg
```

Syntax: `attrib [slot1 | slot2] ro | rw <file-name>`

Specify the **slot1** or **slot2** keyword to change the attribute of a file on the flash card in slot 1 or slot 2, respectively. If you do not specify one of these keywords, the command applies to the file system that currently has the management focus.

The **ro** parameter specifies that the attribute of the file is set to read-only. The **rw** parameter specifies that the attribute of the file is set to read-write.

The <file-name> parameter specifies the file(s) for which to change the attribute.

For example, to change the attribute of all files on the flash card in slot 2 to read-only, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# attrib slot2 ro *.*
```

Deleting a File

You can delete a file from flash memory or a flash card inserted in slot 1 or slot 2 using the **delete** or **rm** command.

NOTE: The **delete** or **rm** command deletes all files in a file system unless you explicitly specify the file(s) you want to delete.

NOTE: The software does not support an undelete option for the flash memory file system. When deleting a file from flash memory, make sure you really want to delete the file.

The software attempts to delete the file in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to delete the file in a file system that does not currently have management focus. In this case, you can specify the `/<directory>/<file-name>` parameter with the **delete** or **rm** command to delete the file in the desired file system.

For example, to delete a file in flash memory, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# delete cfg.cfg
```

If the command is successful, the CLI displays a new command prompt.

Syntax: `delete | rm [slot1 | slot2] [<directory>] [<file-name>]`

You can enter either **delete** or **rm** for the command name.

Specify the **slot1** or **slot2** keywords to delete all files on the flash card in slot 1 or slot 2, respectively.

The `<directory>` parameter specifies the directory in a file system that does not have the current management focus.

The `<file-name>` parameter specifies the file(s) that you want to delete.

For example, to delete all files with names that start with “test” from flash memory, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# delete test*.*
```

For example, to delete all files on the flash card in slot 2, if flash memory has the current management focus, you can enter one of the following commands:

```
BigIron RX# delete /slot2/
```

or

```
BigIron RX# delete slot2
```

Recovering (“Undeleting”) a File

You can recover or undelete a file you have deleted from a flash card file system.

NOTE: You cannot recover or undelete a file from the flash memory file system. Therefore, the **undelete** command does not apply to the flash memory file system.

The software attempts to recover the file in the file system that has the current management focus. By default, flash memory has the management focus. If you want to recover a file in a file system that does not have the current management focus, you must switch the management focus to the desired file system using the **cd** command. For more information about switching the management focus, see “Switching the Management Focus” on page 5-14.

For example, to undelete a file on the flash card in slot 2, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# cd slot2
BigIron RX# undelete
Undelete file ?RIMARY ? (enter y or n) :y
Input one character: P
File recovered successfully and named to PRIMARY
```

For each file that can be undeleted from the flash card in slot 2, the CLI displays the remaining name entry in the file directory and prompts you for the first character of the file name. You can enter any valid file name character. You do not need to enter the character that was used before in the deleted file name.

Once you enter a character and the CLI undeletes the file, the CLI continues with the next file that can be undeleted. For each file, specify “y” or “n”, and specify a first character for the files that you select to undelete.

NOTE: When you delete a file from a flash card, the CLI leaves the file intact but removes the first letter in the file name from the file directory. However, if you save file changes or new files that use part of the space occupied by the deleted file, you cannot undelete the file. The **undelete** command lists only the files that can be undeleted.

To end the undelete process, enter the CTRL + C key combination.

Syntax: undelete

Appending a File to Another File

You can append a file in flash memory or on a flash card to the end of another file in one of these file systems.

The software attempts to append one file to another in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to append one file to another in a file system that does not currently have management focus. In this case, you can specify the `/<source-dir-path>/` or `/<dest-dir-path>/` parameters with the **append** command to append one file to another in the desired file system.

To append one file to another in flash memory, if flash memory has the current management focus, enter a command such as the following:

```
BigIron RX# append newacIs.cfg startup-config.cfg
```

Syntax: append [`<source-file-system>` `<dest-file-system>`] [`/<source-dir-path>/<source-file-name>`] [`/<dest-dir-path>/<dest-file-name>`]

Specify the `<source-file-system>` and `<dest-file-system>` parameters when you are appending a file on one file system to a file on another file system.

The `/<source-dir-path>/<source-file-name>` parameter specifies the file you are appending to the end of another file. If the file is not located in the current subdirectory (the subdirectory that currently has the management focus), specify the subdirectory path in front of the file name.

The `/<dest-dir-path>/<dest-file-name>` parameter specifies the file to which you are appending the other file. If the file is not located in the current subdirectory, specify the subdirectory path in front of the file name.

For example, to append a file in the root directory of slot 1 to another file in a subdirectory of slot 2, enter a command such as the following:

```
BigIron RX# append slot1 slot2 newacIs.cfg /TEST/startup-config.cfg
```

Copying Files Using the copy Command

For information about copying files using the **copy** command while upgrading software images, see “Basic Tasks in the Software Upgrade Process” on page 8-9.

You can perform the following additional copy operations using the **copy** command:

- Copy files from one flash card to the other.
- Copy files between a flash card and the management module’s flash memory.
- Copy software images between active and standby management modules.
- Copy files from a management module to an interface module.
- Copy management module RX series IronWare images from flash memory to a TFTP server.
- Copy files between a flash card and a TFTP server.
- Copy a startup-config file between a flash card and the management module’s flash memory.
- Copy a startup-config file between the management module’s flash memory and a TFTP server.
- Copy the running-config to a flash card or a TFTP server.
- Load a running-config from a flash card or TFTP server into the device’s running-config (loading ACLs only)

NOTE: The copy options require you to explicitly specify the flash card. Therefore, you can perform a copy regardless of the flash card that currently has the management focus.

Copying Files from One Flash Card to the Other

To copy a file from one flash card to the other, enter the following command:

```
BigIron RX# copy slot1 slot2 sales.cfg
```

Syntax: copy <from-card> <to-card> [/<from-dir-path>]/<from-name> [/<to-dir-path>]/[<to-name>]

For the <from-card> and <to-card> parameters, you can specify **slot1** or **slot2**.

The command shown in the example copies a file from the flash card in slot 1 to the flash card in slot 2. In this case, the software uses the same name for the original file and for the copy. Optionally, you can specify a different file name for the copy.

Copying Files Between a Flash Card and Flash Memory

To copy a file from a flash card to the primary area in flash memory, enter a command such as the following:

```
BigIron RX# copy slot1 flash nmpr02200.bin primary
```

Syntax: copy slot1 | slot2 flash [/<from-dir-path>]/<from-name> monitor | primary | secondary

To copy a file from flash memory to a flash card, enter a command such as the following:

```
BigIron RX# copy flash slot2 nmpr02200.bin primary
```

Syntax: copy flash slot1 | slot2 <source-name> monitor | primary | secondary | startup-config [<dest-name>]

The command in this example copies a RX series IronWare image file from the primary area in flash memory onto the flash card in slot 2. In this case, the software uses the same name for the source file and for the destination file. Optionally, you can specify a different file name for the destination file.

Copying Software Images Between Active and Standby Management Modules

To copy the monitor image from flash memory of the active management module to flash memory of the standby module, enter the following command:

```
BigIron RX# copy flash flash monitor standby
```

Syntax: copy flash flash monitor standby

To copy the RX series IronWare image from the secondary location in the active management module's flash memory to the primary location in the active module's flash memory, enter the following command:

```
BigIron RX# copy flash flash primary
```

Syntax: copy flash flash primary [standby]

Specify the optional **standby** keyword to copy the RX series IronWare image from the secondary location in the active management module's flash memory to the primary location in the standby module's flash memory.

To copy the RX series IronWare image from the primary location in the active management module's flash memory to the secondary location in the active module's flash memory, enter the following command:

```
BigIron RX# copy flash flash secondary
```

Syntax: copy flash flash secondary [standby]

Specify the optional **standby** keyword to copy the RX series IronWare image from the primary location in the active management module's flash memory to the secondary location in the standby module's flash memory.

Copying Files From a Management Module to an Interface Module

You can copy a software image or other type of file from the management module's flash memory to the flash memory of one or all interface modules.

For example, to copy the interface module's monitor image from the management module to all interface modules, enter a command such as the following:

```
BigIron RX# copy flash lp nlb02200.bin monitor all
```

Syntax: copy flash lp <source-file> monitor | primary | secondary <slot-number> | all

For example, to copy a file called test.cfg from the management module to the interface module in chassis slot 1, enter a command such as the following:

```
BigIron RX# copy flash lp test.cfg lptest.cfg 1
```

Syntax: copy flash lp <source-file> <dest-file> <slot-number> | all

Copying RX series IronWare Images from Flash Memory to a TFTP Server

You can copy the management module's RX series IronWare images from the primary and secondary locations in flash memory to a TFTP server.

For example, to copy the RX series IronWare image in the secondary location in flash memory to a TFTP server, enter a command such as the following:

```
BigIron RX# copy flash tftp 10.10.10.1 secondary.bak secondary
```

Syntax: copy flash tftp <ip-addr> <dest-file-name> primary | secondary

Copying Files Between a Flash Card and a TFTP Server

You can use the following methods to copy files between a flash card and a TFTP server.

NOTE: The BigIron RX Series system must have network access to the TFTP server.

To copy a file from a flash card to a TFTP server, enter a command such as the following:

```
BigIron RX# copy slot1 tftp 192.168.1.17 notes.txt
```

Syntax: copy slot1 | slot2 tftp <ip-addr> [/<from-dir-path>]/<source-file> [<dest-file>]

The command in this example copies a file from slot 1 to a TFTP server. In this case, the software uses the same name for the source file and for the destination file. Optionally, you can specify a different file name for the destination file.

To copy a software image from a TFTP server to a flash card, enter a command such as the following:

```
BigIron RX# copy tftp slot1 192.168.1.17 nmpr02200.bin primary
```

Syntax: copy tftp slot1 | slot2 <ip-addr> [/<from-dir-path>]/<source-file> <path-name> | monitor | primary | secondary

The command in this example copies the primary RX series IronWare image from a TFTP server to a flash card in slot 1.

Copying the Startup-Config File Between a Flash Card and Flash Memory

Use the following methods to copy a startup-config file between flash memory and a flash card. By default, the BigIron RX Series Switch uses the startup-config in the primary area of flash memory to configure itself when you boot or reload the device.

NOTE: The BigIron RX Series Switch cannot use a startup-config file on a flash card to configure itself. You cannot boot or reload from a flash card.

To copy a startup-config file from a flash card to flash memory, enter a command such as the following:

```
BigIron RX# copy slot1 startup-config test2.cfg
```

Syntax: copy slot1 | slot2 startup-config [/<from-dir-path>]/<file-name>

This command copies a startup configuration named test2.cfg from the flash card in slot 1 into the device's flash memory. The next time you reboot or reload the device, it uses the configuration information in test2.cfg.

To copy the device's startup-config file from flash memory onto a flash card, enter a command such as the following:

```
BigIron RX# copy startup-config slot1 mfgtest.cfg
```

Syntax: copy startup-config slot1 | slot2 [/<to-dir-path>]/<to-name>

This command copies the startup configuration from the device's flash memory to a flash card in slot 1 and names the file mfgtest.cfg.

Copying the Startup-Config File Between Flash Memory and a TFTP Server

Use the following methods to copy a startup-config between flash memory and a TFTP server to which the BigIron RX Series system has access. By default, the device uses the startup-config in the primary area of flash memory to configure itself when you boot or reload the device.

To copy the device's startup-config from flash memory to a TFTP server, enter a command such as the following:

```
BigIron RX# copy startup-config tftp 10.10.10.1 /backups/startup.cfg
```

Syntax: copy startup-config tftp <ip-addr> [/<to-dir-path>]<to-name>

To copy a startup-config file from a TFTP server to flash memory, enter a command such as the following:

```
BigIron RX# copy tftp startup-config 10.10.10.1 test.cfg
```

Syntax: copy tftp startup-config <ip-addr> [/<from-dir-path>]<from-name>

Copying the Running-Config to a Flash Card or a TFTP Server

Use the following method to copy the BigIron RX Series Switch's running-config to a flash card or a TFTP server. The running-config contains the device's currently active configuration information. When you copy the running-config to a flash card or TFTP server, you are making a copy of the device's current configuration, including any configuration changes you have not saved to the startup-config.

To copy the device's running configuration into a file on a flash card, enter a command such as the following:

```
BigIron RX# copy running-config slot1 runip.1
```

Syntax: copy running-config slot1 | slot2 [/<to-dir-path>]<to-name>

To copy the device's running configuration into a file on a TFTP server, enter a command such as the following:

```
BigIron RX# copy running-config tftp 10.10.10.1 runip.1
```

Loading a Running-Config from a Flash Card or a TFTP Server

Use the following method to load configuration commands into the BigIron RX Series Switch's active configuration.

NOTE: A configuration file that you create must follow the same syntax rules as the startup-config the device creates. See "Dynamic Configuration Loading" on page 8-16.

To copy a running-config from a flash card, enter a command such as the following:

```
BigIron RX# copy slot2 running-config runacl.2
```

Syntax: copy slot1 | slot2 running-config [/<from-dir-path>]<from-name>

The command in this example changes the device's active configuration based on the information in the file.

To copy a running-config from a TFTP server, enter a command such as the following:

```
BigIron RX# copy tftp running-config 10.10.10.1 run.cfg overwrite
```

Syntax: copy tftp running-config <ip-addr> [/<from-dir-path>]<from-name> [overwrite]

This command copies a running-config from a TFTP server and overwrites the device's active configuration.

Copying Files Using the cp Command

Using the **cp** command, you can do the following:

- Copy files from flash memory to flash memory.
- Copy files from flash memory to a flash card or vice versa.
- Copy files from one flash card to another flash card.

The software attempts to copy a file in a file system to another location in the file system that has the current management focus. By default, flash memory has the management focus. However, you do not need to change the focus to copy a file from one location to another in a file system that does not currently have management focus. In this case, you can specify the `/<source-dir-path>/` or `/<dest-dir-path>/` parameters with the **cp** command to copy a file to or from a file system that does not have current management focus.

For example, to copy a file from flash memory, which has the current management focus, to flash memory, enter a command such as the following:

```
BigIron RX# cp primary primary2
```

For example, to copy a file from flash memory, which has the current management focus, to the flash card in slot 2, enter a command such as the following:

```
BigIron RX# cp new.cfg /slot2/cfg/new.cfg
```

Syntax: `cp [<source-dir-path>]<source-file-name> [<dest-dir-path>]<dest-file-name>`

The `<source-dir-path>` parameter specifies the directory pathname of the source file. Specify this parameter if the source file is in a file system that does not have current management focus. The `<source-file-name>` specifies the name of the file you want to copy.

The `<dest-dir-path>` parameter specifies the directory pathname of the destination file. Specify this parameter if you want to copy the source file to a file system that does not have current management focus. The `<dest-file-name>` specifies the name of the file you copied to a new destination.

For example, to copy a file from a flash card in slot 2 to flash memory, which has current management focus, enter the following command:

```
BigIron RX# cp /slot2/cfg/new.cfg new.cfg
```

For example, to copy a file from a flash card in slot 1 to a flash card in slot 2, neither of which has current management focus, enter the following command:

```
BigIron RX# cp /slot1/cfg/new.cfg /slot2/cfg/new.cfg
```

Loading the Software

By default, the management module loads its RX series IronWare image from the primary location in flash memory. You can change the system's RX series IronWare image source to one of the following sources for one reboot or for all future reboots:

- The secondary location in flash memory.
- A flash card inserted in slot 1 or 2.
- A TFTP server.
- A BOOTP server.

If you specify a source other than the primary location in flash memory and for some reason, the source or the RX series IronWare image is unavailable, the system uses the primary location in flash memory as a default backup source.

Rebooting from the System

To use another source instead of the RX series IronWare image in the primary location in flash memory for one reboot, enter a command such as the following at the Privileged EXEC level of the CLI:

```
BigIron RX# boot system slot1 /slot1/nmpr02200.bin
```

The command in this example reboots the system using the image nmpr02200.bin located on the flash card in slot 1. This example assumes that the flash card in slot 1 is not the management focus.

Syntax: boot system slot1 | slot2 [/<dir-path>]/<file-name>

The **slot1** | **slot2** keywords specify the flash card slot.

The <file-name> parameter specifies the file name. If the file is in a subdirectory, specify the subdirectory path in front of the file name. If the file name you specify is not a full path name, the CLI assumes that the name (and path, if applicable) you enter are relative to the subdirectory that currently has the management focus.

NOTE: This command also is supported at the boot PROM.

For example, to reboot the system using the image nmpr02200.bin on a TFTP server, enter a command such as the following:

```
BigIron RX# boot system tftp 10.10.10.1 nmpr02200.bin
```

Syntax: boot system tftp <ip-address> <file-name>

The <ip-address> parameter specifies the address of the TFTP server on which the desired image resides.

The <file-name> parameter specifies the name of the RX series IronWare image on the TFTP server.

For example, to reboot the system using the secondary location in flash memory, enter the following command:

```
BigIron RX# boot system flash secondary
```

Syntax: boot system flash secondary

To reboot the system from a BOOTP server, enter the following command:

```
BigIron RX# boot system bootp
```

Syntax: boot system bootp

Configuring the Boot Source for Future Reboots

To change the RX series IronWare image source from the primary location in flash memory to another source for future reboots, enter a command such as the following at the global CONFIG level of the CLI:

```
BigIron RX(config)# boot system slot1 nmpr02200.bin
```

The command in this example sets PCMCIA slot 1 as the primary boot source for the BigIron RX Switch. When you reload the software or power cycle the device, the device will look for the RX series IronWare image on the flash card in slot 1.

Syntax: boot system slot1 <file-name> | slot2 <file-name> | flash secondary | tftp <ip-address> <file-name> | bootp

NOTE: The command syntax is the same for immediately reloading and for changing the primary source, except the <file-name> must be the full path name. You cannot specify a relative path name. If the first character in the path name is not a slash (/), the CLI treats the name you specify as relative to the root directory.

The device's response to the command depends on whether you enter the command at the Privileged EXEC level or the global CONFIG level.

If you enter multiple **boot system** commands at the global CONFIG level, the software places them in the running-config in the order you enter them, and saves them to the startup-config in the same order when you save the configuration. When you reload or power cycle the device, the device tries the boot sources in the order they appear in the startup-config and running-config.

Saving Configuration Changes

You can configure the BigIron RX Series system to save configuration changes to a startup-config in flash memory or on a flash card in slot 1 or 2.

Displaying the Current Location for Saving Configuration Changes

Enter the following command at the Privileged EXEC level of the CLI to display the current save location for the startup-config:

```
BigIron RX# locate startup-config
Startup-config data location is flash memory
```

Syntax: locate startup-config

Specifying the Location for Saving Configuration Changes

By default, when you save configuration changes, the changes are saved to the startup-config in flash memory. If you want to change the save location to a flash card in slot 1 or 2, enter a command such as the following:

```
BigIron RX# locate startup-config slot1 switch1.cfg
BigIron RX# write memory
```

The first command in this example sets the device to save configuration changes to the file named "switch1.cfg" in the flash card in slot 1. The second command saves the running-config to the switch1.cfg file on the flash card in slot 1.

NOTE: In this example, after you save the configuration changes using the **write memory** command, the switch1.cfg file will include the command that designates slot 1 as the save location for configuration changes.

Syntax: locate startup-config [slot1 | slot2 | flash-memory] [/<dir-path-name>/]<file-name>

The **slot1**, **slot2**, and **flash-memory** keywords specify the flash card in slot 1 or slot 2 or flash memory as the save location for configuration changes.

Specify the <dir-path-name> parameter if you want to save the configuration changes to a directory other than the root directory of a flash card file system.

The <file-name> parameter indicates the name of the saved configuration file.

To change the save location back to flash memory, enter a command such as the following:

```
BigIron RX# locate startup-config flash-memory switch1.cfg
BigIron RX# write memory
```

File Management Messages

The following table lists the messages the CLI can display in response to file management commands.

Table 5.3: Flash Card File Management Messages

This Message...	Means...
File not found	You specified a file name that the software couldn't find. Verify the command you entered to make sure the command matches the source and destination you intended for the file operation.
Current directory is: <dir-path>	You have successfully changed the management focus to the slot and subdirectory indicated by the message.
Path not found	You specified an invalid path.
There is not enough space on the card	The flash card does not have enough space to hold the file you are trying to copy to it.
Access is denied	You tried to copy or delete a file that has the read-only attribute.
A duplicate file name exists	You tried to rename a file using a name that is already in use by another file.

Table 5.3: Flash Card File Management Messages (Continued)

This Message...	Means...
Fatal error, can not read or write media	A hardware error has occurred. One possible cause of this message is if you removed the flash card while a file operation involving the card was in progress.
There is sharing conflict between format command and other read/write operations	The flash card is currently undergoing formatting. This message also can show up if you enter a command to format the card while the card is being accessed for another file operation.
Invalid DOS file name	A filename you entered contains an invalid character (for example, “.” or “\”).
File recovered successfully and named <file-name>	A file you tried to recover was successfully recovered under the name indicated in the message

Chapter 6

Managing the BigIron RX Series Chassis and Modules

This chapter contains information about refining the configuration of, monitoring, and managing the following BigIron RX Series hardware components:

- BigIron RX Series chassis
- Cooling system (fans)
- Interface modules
- Switch fabric module

This chapter also provides information about the following tasks:

- Enabling and disabling management module CPU usage calculations
- Displaying management module CPU usage
- Enabling and disabling packet logging for management and interface modules
- Removing MAC address entries

Managing the BigIron RX Series Chassis

You can perform the following management tasks for the BigIron RX Series chassis:

- Display chassis status and temperatures of all hardware components.
- Display the Syslog configuration and static and dynamic buffers.

Displaying Chassis Status and Temperature Readings

You can display the following information related to the BigIron RX Series chassis:

- Slot power-on priority.
- Status of the fans.
- Temperature readings of the management, switch fabric, interface, and fan control modules and the interval at which the system reads the temperature of these modules.
- The MAC address of the BigIron RX Series chassis.

To display this information, enter the following command at any level of the CLI:

```
BigIron RX# show chassis
*** BigIron RX-4 CHASSIS ***

---POWERS ---
AC Powers Are Used.
Power 1: Installed (OK)
Power 2: not present
Power 3: not present

Slot Power-On Priority:
Slot1 (pri=1)
Slot2 (pri=1)
Slot3 (pri=1)
Slot4 (pri=1)

--- FANS ---
Right Fan Tray: Fan 5: Status = OK, Speed = LOW (50%) (RPM 3333)
Right Fan Tray: Fan 6: Status = OK, Speed = LOW (50%) (RPM 3409)

--- TEMPERATURE READINGS ---
Active Mgmt Module: 32.500C 54.625C (CPU)
SNM1: 27.5C
SNM2: 30.5C
SNM3: 30.5C
LP2 Sensor1: 41.0C
Temperature Monitoring Poll Period is 60 seconds

--- MISC INFO ---
Backplane EEPROM MAC Address: 000a.80a0.2000
```

The display shows the following information:

Table 6.1: Chassis Status and Temperature Information

This Field...	Displays...
Powers	
Power BigIron RX-4: 1 – 3 BigIron RX-8: 1 – 4 BigIron RX-16: 1 – 8	Indicates whether an AC power supply is installed in the specified power supply slot and the status of the power supply, which can be one of the following: <ul style="list-style-type: none"> • Installed (OK) – The power supply is functioning properly and supplying power to the chassis and installed modules. • Failed – The power supply is not functioning and is not supplying power to the chassis and installed modules. • not present – There is no power supply installed in the slot.
Slot Power-On Priority	The configured power-on priority of each interface modules installed in a chassis slot.

Table 6.1: Chassis Status and Temperature Information (Continued)

This Field...	Displays...
Slot1 – Slot16 BigIron RX-4: Slot1 – Slot4 BigIron RX-8: Slot1 – Slot8 BigIron RX-16: Slot1 – Slot16	The priority of each chassis slot as configured by the lp-slot-priority command. The priority can be 1 – 8, where 1 is the lowest priority and 8 is the highest priority. (The default priority is 1.) If the supply of power to the chassis falls below a minimum threshold, the chassis slots with the lowest priority will likely lose power. For information about using the lp-slot-priority command, see “Changing Priority of Chassis Slots for Interface Modules” on page 6-17.
Fans	
Fan <number>	Information about fans in the BigIron RX Series chassis.
Status	The status of a fan can be one of the following: <ul style="list-style-type: none"> OK – The fan is functioning properly and is keeping the temperature of each module within an acceptable temperature range. Failed – The fan is not functioning properly or the fan control module cannot control the fan.
Speed	The speed of a fan can be one of the following: <ul style="list-style-type: none"> Low – The fan is functioning at 50 percent of capacity. Medium – The fan is functioning at 75 percent of capacity. Medium-high – The fan is functioning at 90 percent of capacity. High – The fan is functioning at 100 percent of capacity.
Temperature Readings	
Active and Standby Mgmt Module	The temperature of the active and standby management modules.
Fan <number>	The temperature of fan0 and fan1.
SNM<number>	The temperature of the switch fabric module.
Temperature Monitoring Poll Period	The interval at which the system reads the temperature sensor on the management, switch fabric, interface, and fan control modules.
Misc Info	
Backplane EEPROM MAC Address	The MAC address of the BigIron RX Series chassis.

Displaying the Syslog Configuration and Static and Dynamic Buffers

For information about configuring Syslog, see the *Foundry BigIron RX Series Configuration Guide*

To display the Syslog parameters currently in effect on a BigIron RX Series Switch, enter the following command from any level of the CLI:

```
BigIron RX> show logging
Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
  Buffer logging: level ACDMEINW, 7 messages logged
  level code: A=alert C=critical D=debugging M=emergency E=error
               I=informational N=notification W=warning
  ...
```

Syntax: show logging

The Syslog display shows the following configuration information, in the rows above the log entries themselves.

Table 6.2: Syslog Buffer Configuration

This Field...	Displays...
Syslog logging	The state (enabled or disabled) of the Syslog buffer.
messages dropped	The number of Syslog messages dropped due to user-configured filters. By default, the software logs messages for all Syslog levels. You can disable individual Syslog levels, in which case the software filters out messages at those levels. Each time the software filters out a Syslog message, this counter is incremented.
flushes	The number of times the Syslog buffer has been cleared by the clear logging command. For information about clearing the Syslog buffer, see “Static and Dynamic Buffers” on page 6-4.
overruns	The number of times the dynamic log buffer has filled up and been cleared to hold new entries. For example, if the buffer is set for 100 entries, the 101st entry causes an overrun. After that, the 201st entry causes a second overrun.
level	The message levels that are enabled. Each letter represents a message type and is identified by the key (level code) below the value. If you disable logging of a message level, the code for that level is not listed.
messages logged	The total number of messages that have been logged since the software was loaded.
level code	The message levels represented by the one-letter codes.

Static and Dynamic Buffers

The software provides two separate buffers:

- Static – logs power supply failures, fan failures, and temperature warning or shutdown messages
- Dynamic – logs all other message types

In the static log, new messages replace older ones, so only the most recent message is displayed. For example, only the most recent temperature warning message will be present in the log. If multiple temperature warning messages are sent to the log, the latest one replaces the previous one. The static buffer is not configurable.

The message types that appear in the static buffer do not appear in the dynamic buffer. The dynamic buffer contains up to the maximum number of messages configured for the buffer (50 by default), then begins removing the oldest messages (at the bottom of the log) to make room for new ones.

The static and dynamic buffers are both displayed when you display the log.

```
BigIron RX(config)# show logging
...

Static Log Buffer:
Aug 27 12:42:42:A:Power Supply 6, 1st right, failed

Dynamic Log Buffer (50 lines):
Aug 27 12:19:04:I:Interface ethernet3/4, state up
Aug 27 12:19:04:I:Interface ethernet6/3, state up
Aug 27 12:19:04:I:Interface ethernet3/2, state up
Aug 27 12:19:04:I:Interface ethernet6/1, state up
Aug 27 12:19:00:N:Module up in slot 6
Aug 27 12:19:00:N:Module up in slot 3
Aug 27 12:18:43:I:Warm start
```

When you clear log entries, you can selectively clear the static or dynamic buffer, or you can clear both. For example, to clear only the dynamic buffer, enter the following command at the Privileged EXEC level:

```
BigIron RX# clear logging dynamic-buffer
```

Syntax: clear logging [dynamic-buffer | static-buffer]

You can specify the **dynamic-buffer** keyword to clear the dynamic buffer or the **static-buffer** keyword to clear the static buffer. If you do not specify a buffer, both buffers are cleared.

Managing the Cooling System

This section provides configuration, management, and monitoring information about the BigIron RX Series cooling system.

Configuring the Cooling System

The BigIron RX Series Switch provides default settings for all cooling system parameters. Therefore, no initial configuration of the cooling system is necessary. If desired, you can change the settings of the following cooling system parameters:

- Low and high temperature thresholds for modules and fan speeds
- Interval at which the system polls the temperature sensors on the module for a reading

Changing Temperature Thresholds For Modules and Fan Speeds

The BigIron RX Series cooling system includes two four-speed fans. The fans operate at speeds of low, medium, medium-high, and high. In general, each fan speed, except for low, has a low and high temperature threshold associated with it as shown in Figure 6.1. The low fan speed has a high temperature threshold only.

Figure 6.1 Fan Speeds and Temperature Thresholds

- HIGH
- High temperature threshold

- Low temperature threshold
- MEDIUM-HIGH
- High temperature threshold

The low and high temperature thresholds enable the BigIron RX Series system to determine at which speed the fans should operate. In general, the fans operate as follows:

- If the temperature of all modules falls between the low and high thresholds for a fan speed, the fan continues to operate at that fan speed.
- If the temperature of a management module or the switch fabric module or two interface modules exceeds the high threshold specified for a fan speed, the fan increases its speed to the next higher speed. If the temperature of any of these module(s) exceeds the high threshold for the high speed for 3 minutes (the actual number of polls is determined by the setting of the **temp-poll-period** command), the system shuts down the module(s) to prevent damage. (For information about **temp-poll-period** command, see “Changing the Temperature Polling Interval” on page 6-10.)
- If the temperature of a management module, the switch fabric module, and all interface modules falls below the low threshold for a fan speed, the fan decreases its speed to the next lower speed. If the temperature of all modules falls below the high threshold for the low speed, the fan operates at the low speed.

If the temperature of a management module or the switch fabric module or two interface modules exceeds the high temperature threshold for any of the fan speeds, the system sends a warning message to the system log and an SNMP trap. For information about viewing the warning messages, see “Displaying Temperature Warnings” on page 6-11.

Table 6.3 outlines the default low and high temperature thresholds for each module and fan speed.

Table 6.3: Default Low and High Temperature Thresholds For Modules and Fan Speeds

Fan Speed	Low Temperature Threshold	High Temperature Threshold
Management modules		
High	77° C	85° C
Medium-high	67° C	80° C
Medium	57° C	70° C
Low	–	60° C
Interface modules		
High	72° C	85° C
Medium-high	67° C	80° C
Medium	62° C	75° C
Low	–	70° C
Switch fabric module		
High	72° C	85° C
Medium-high	67° C	80° C
Medium	62° C	75° C
Low	–	70° C

For information about checking the current settings of the low and high temperature thresholds for modules and fan speeds, see “Displaying Temperature Thresholds for Modules and Fan Speeds” on page 6-9.

If desired, you can change the default low and high temperature thresholds for a particular module and fan speed. For example, to change the low and high thresholds of the medium fan speed for the management modules to 56° C and 72° C, respectively, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# fan-threshold mp med 56 72
```

Syntax: fan-threshold <module> [low <high-threshold>] [med <low-threshold> <high-threshold>] [med-hi <low-threshold> <high-threshold>] [hi <low-threshold> <high-threshold>]

For the <module> parameter, you can specify the following:

- lp – Changes low and high temperature thresholds for the Interface modules.
- mp – Changes low and high temperature thresholds for the management modules.
- mp-cpu – Changes low and high temperature thresholds for the management module’s CPU.
- switch fabric – Changes low and high temperature thresholds for the switch fabric module.

For the <low-threshold> and <high-threshold> parameters, you can specify any temperature in Centigrade. However, when changing low and high temperature thresholds for a module's fan speeds, remember that the low temperature threshold of a higher fan speed must be lower than the high temperature threshold of the lower fan speed. Foundry establishes this guideline to ensure the fan speed stability.

For example, if you are changing the temperature thresholds for a management module's high and medium-high fans speeds, the BigIron RX Series system will accept the following values because the low temperature threshold for the high speed (79° C) is lower than the high temperature threshold (82° C) for the medium-high speed.

Fan Speed	Low Temperature Threshold	High Temperature Threshold
High	79° C	87° C
Medium-high	69° C	82° C

However, the BigIron RX Series system will not accept the following values because the low temperature threshold for the high speed (83° C) is higher than the high temperature threshold (82° C) for the medium-high speed.

Fan Speed	Low Temperature Threshold	High Temperature Threshold
High	83° C	87° C
Medium-high	69° C	82° C

Displaying Temperature Thresholds for Modules and Fan Speeds

To check the current settings of the low and high temperature thresholds for modules and fan speeds, you can enter the following command at any level of the CLI:

```
BigIron RX# show fan-threshold
=== Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_MP) ===
Fan Speed Low: -1 - 60
Fan Speed Med: 57 - 70
Fan Speed Med-Hi: 67 - 80
Fan Speed Hi: 77 - 85
state = 0 (FAN_STATE_LOW)
max_ts_shut_off_count = 3
shut_off_count = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
=== Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_SNM) ===
Fan Speed Low: -1 - 60
Fan Speed Med: 57 - 70
Fan Speed Med-Hi: 67 - 80
Fan Speed Hi: 72 - 85
state = 0 (FAN_STATE_LOW)
max_ts_shut_off_count = 3
shut_off_count = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
=== Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_LP) ===
Fan Speed Low: -1 - 50
Fan Speed Med: 46 - 55
Fan Speed Med-Hi: 51 - 60
Fan Speed Hi: 56 - 85
state = 0 (FAN_STATE_LOW)
max_ts_shut_off_count = 3
shut_off_count = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
=== Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_STANDBY_MP) ===
Fan Speed Low: -1 - 60
Fan Speed Med: 57 - 70
Fan Speed Med-Hi: 67 - 80
Fan Speed Hi: 77 - 85
state = 0 (FAN_STATE_LOW)
max_ts_shut_off_count = 3
shut_off_count = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
=== Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_MP_CPU) ===
Fan Speed Low: -1 - 60
Fan Speed Med: 57 - 70
Fan Speed Med-Hi: 67 - 80
Fan Speed Hi: 77 - 85
state = 0 (FAN_STATE_LOW)
max_ts_shut_off_count = 3
shut_off_count = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
=== Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_STANDBY_MP_CPU) ===
Fan Speed Low: -1 - 60
Fan Speed Med: 57 - 70
Fan Speed Med-Hi: 67 - 80
Fan Speed Hi: 77 - 85
state = 0 (FAN_STATE_LOW)
max_ts_shut_off_count = 3
shut_off_count = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Syntax: show fan-threshold

The display shows the following information:

Table 6.4: Temperature Threshold Information for Modules and Fan Speeds

This Field...	Displays...
Thermal Sensor Control Block (THERMAL_SENSOR_TEST_RULE_ <module>)	The temperature threshold information for the various modules. The <module> parameter indicates the following: <ul style="list-style-type: none"> • MP – The active management module. • STANDBY_MP – The standby management module. • SNM – The switch fabric module. • LP – An interface module.
Fan Speed Low/Med/Med-Hi/Hi	The current setting of the low and high temperature thresholds for the low, medium, medium-high, and high fan speeds. NOTE: As indicated in Table 6.3 on page 6-7, the low fan speed for each module does not have a default low temperature threshold value, nor can you configure this value. The “-1” value that appears in the Fan Speed Low field for each module is a Foundry internal value only.
State = 0 (FAN_STATE_LOW)	For Foundry internal use only.
max_ts_shut_off_count	
shut_off_count = 0 0 0 0 0 0 0	For Foundry internal use only.

Changing the Temperature Polling Interval

By default, the BigIron RX Series system reads the temperature sensor on each module every 60 seconds. To change the interval at which the system reads the temperature sensors on each module, enter a command such as the following at the global CONFIG level of the CLI:

```
BigIron RX(config)# temp-poll-period 120
```

Syntax: temp-poll-period <seconds>

For the <seconds> parameter, you can specify a value from 30 – 120. You can also specify 0, which disables the system from polling the temperature sensor on each module.

Manually Setting the Fan Speed

Typically, the management module, in conjunction with default settings of low and high temperature thresholds, determines the speed of the two four-speed fans. (For information about changing the low and high temperature thresholds, see “Changing Temperature Thresholds For Modules and Fan Speeds” on page 6-5.) If desired, you can manually set the speed of the fans. The **set-fan-speed** command in the Privileged EXEC level of the CLI allows you to manually set the speed of the fans.

For example, to set the speed of fan 0 to medium-high, enter the following command:

```
BigIron RX(config)# set-fan-speed med-hi
```

Syntax: set-fan-speed <fan-speed>

For the <fan-speed> parameter, you can specify the following:

auto – The system is adjusted by the monitoring system.

hi – The system sets the fan speed to high.

low – The system sets the fan speed to low.

med – The system sets the fan speed to medium.

med-high – The system sets the fan speed to medium-high.

Monitoring the Cooling System

You can monitor the following aspects of the BigIron RX Series cooling system:

- The temperature of the fan control modules.
- The status and speed of the fans.
- The temperature warnings sent to the system log and that generate an SNMP trap.

Displaying Fan Tray Status and Speed

The CLI provides two commands that allow you to display the status and speed of the four-speed fans in the BigIron RX Series chassis. To display this information, you can enter the following command at any level of the CLI:

```
BigIron RX# show chassis
...
--- FANS ---
Right Fan Tray: Fan 5: Status = OK, Speed = LOW (50%) (RPM 3333)
Right Fan Tray: Fan 6: Status = OK, Speed = LOW (50%) (RPM 3488)...
```

Syntax: show chassis

For information about all output generated by the **show chassis** command, see “Displaying Chassis Status and Temperature Readings” on page 6-1.

Table 6.5: Fan Status and Speed Fields

This Field...	Displays...
Status	<p>The status can be one of the following:</p> <ul style="list-style-type: none"> • OK – The fan is functioning properly and is keeping the temperature of each module within an acceptable temperature range. • Failed – The fan is not functioning properly or the fan control module cannot control the fan.
Speed	<p>The speed can be one of the following:</p> <ul style="list-style-type: none"> • LOW – The fan is functioning at 50 percent of capacity. • MEDIUM – The fan is functioning at 75 percent of capacity. • MEDIUM-HIGH – The fan is functioning at 90 percent of capacity. • HIGH – The fan is functioning at 100 percent of capacity.

Displaying Temperature Warnings

If the temperature of a module exceeds the high temperature threshold for any of the fan speeds, the system sends a warning message to the system log and an SNMP trap. (For more information about the low and high temperature thresholds, see “Changing Temperature Thresholds For Modules and Fan Speeds” on page 6-5.) This section describes how to view the system log. If you have configured the BigIron RX Series system to use a Syslog server or SNMP trap receiver, see the documentation for the server or receiver.

To display the system log, enter the following command at any CLI level:

```
BigIron RX# show log
```

Syntax: show log

Managing the Interface Modules

This section contains the following information:

- Configuring interface module boot parameters.
- Changing the priority of chassis slots for interface modules.
- Disabling and reenabling power to the interface modules.

Configuring Interface Module Boot Parameters

The Ethernet interface module has its own system software and boots after the management module boots. By default, the following boot-related events occur:

- The BigIron RX Series system synchronizes or prompts you to synchronize the interface modules' IronWare images between the management module and the interface modules.
- The interface modules boot from a source specified by the management module (the default source is a primary IronWare image in the interface modules' flash memory).

If desired, you can change the following:

- Disable the synchronization of IronWare images between the management and all interface modules. You can also initiate an immediate synchronization.
- Change the boot source of one or all interface modules.

Synchronizing the Interface Module's IronWare Images Between Management and Interface Modules

An interface module can have two IronWare images: primary and secondary. These images contain the layer 1 – 3 software that the interface modules run. These images reside in the interface module's flash memory. Either the primary or secondary image is run by the interface module from this location.

If you copy the primary and/or secondary IronWare image to all interface modules using the **copy** command with the **all** keyword, the management module makes a copy of the file and stores it in its code flash under the names `lp-primary-0` or `lp-secondary-0`. The images are stored in this location only and are not run by the management module or the interface modules. If you copy the primary and/or secondary IronWare image to a specified chassis slot using the **copy** command with the `<chassis-slot-number>` parameter, the management module does not make a copy of the file.

If the management module has a copy of the primary and/or secondary IronWare image in its code flash, by default, the BigIron RX Series system synchronizes or prompts you to synchronize the interface modules' IronWare images between the management module and the interface modules during bootup. When the BigIron RX Series system synchronizes the IronWare images, the management module copies the IronWare images from its code flash to the interface modules' code flash (the interface modules' default boot source).

The system allows you to manage synchronization of the IronWare images between management and interface modules in the following situations:

- You are prompted to synchronize the IronWare images during bootup.
- You want to initiate an immediate synchronization; for example, you want an immediate update of the IronWare images on one or all interface modules.
- You want to disable synchronization; for example, you have upgraded the IronWare image of one interface

module but want to continue running the older image on all other interface modules.

The following section discuss how to manage the IronWare image synchronization in these situations.

Synchronizing the Interface Modules' IronWare Images During Bootup

By default, the BigIron RX Series system checks the IronWare images in the interface module's flash memory during boot to ensure they are the same as the IronWare images in the management module's flash memory. If an interface module does not have a IronWare image, the system automatically downloads the image from the management module's flash memory to the interface module's flash memory.

If an interface module has different IronWare images, the system prompts you to do the following:

- If you want to update the primary and secondary IronWare images in the interface module's flash memory with the images in the management module's flash memory, enter the **lp cont-boot sync <slot-number>** command at the Privileged EXEC prompt.
- If you want to retain the IronWare images in the interface module's flash memory, enter the **lp cont-boot no-sync <slot-number>** command at the Privileged EXEC prompt.

Specifying an Immediate Synchronization

You can immediately synchronize the IronWare images between the management module and one or all interface modules. For example, to immediately synchronize the IronWare images between the management module and all interface modules, enter the following command at the Privileged EXEC level:

```
BigIron RX# lp sync all
```

Syntax: lp sync all | <slot-number>

The **all** keyword indicates that the immediate synchronization applies to all interface modules in the BigIron RX Series chassis.

The <slot-number> parameter specifies the BigIron RX Series chassis slot number that contains the interface module to which the immediate synchronization applies. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Disabling or Reenabling an Automatic Check and Synchronization

By default, the BigIron RX Series system checks the IronWare images in the interface module's flash memory during bootup to ensure it is the same as the IronWare images in the management module's flash memory. For information about what the system does if the interface module does not currently have a IronWare image or if the image is different from that of the management module, see "Synchronizing the Interface Modules' IronWare Images During Bootup" on page 6-13.

To disable the automatic check and synchronization during bootup, enter the following command at the global CONFIG level:

```
BigIron RX(config)# lp disable-lp-sync-check
```

Syntax: lp disable-lp-sync-check

Provided that you save this configuration by entering the **write memory** command, the system will disable the automatic check and synchronization of the IronWare images starting with the next software reload or system reset and each reload or reset after that.

To re-enable the automatic check and synchronization of the IronWare images during bootup, enter the following command at the global CONFIG level:

```
BigIron RX(config)# no lp disable-lp-sync-check
```

Syntax: no lp disable-lp-sync-check

Changing the Boot Source

By default, the interface modules boot from the primary IronWare image located in the interface modules' flash memory. If desired, you can change the boot source of one or all interface modules to one of the following sources:

- Management module

- PCMCIA flash card in slot 1 or 2
- Primary or secondary IronWare image in the management module's flash memory
- Interface module
 - Secondary IronWare image in interface module's flash memory
- TFTP server

You can also specify an interactive boot, which allows you to enter a separate command after the interface module comes up. The command specifies the source from which one or all interface modules should boot.

When changing the boot source for one or all interface modules, you can specify one of the following:

- An immediate boot for one interface module from a specified source.
- An automatic boot for one or all interface modules from a specified source starting with the next software reload or system reset and each reload or reset after that.

The CLI command for specifying an immediate boot for one interface module is the same as that for specifying an automatic boot for one or all modules. The only difference is the CLI level from which you specify the command. You must specify the command for an immediate boot in the Privileged EXEC level and the command for an automatic boot in the global CONFIG level.

The following sections explain how to specify an immediate boot and an automatic boot.

Specifying an Immediate Boot

You can specify an immediate boot for one interface module from a specified source by entering the **lp boot system** command in the Privileged EXEC level. The entered command will override the default or configured boot source one time only.

Specifying an Immediate Boot from the Management Module's PCMCIA Slots

For example, to specify an immediate boot for the interface module installed in slot 1 from the management module's PCMCIA slot 1, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# lp boot system slot1 primary 1
```

Syntax: lp boot system slot1 | slot2 <filename> <slot-number>

The **slot1** and **slot2** keywords indicate the management module's PCMCIA slot from which to boot the interface module.

The <filename> parameter specifies the name of the image from which to boot the interface module.

The <slot-number> parameter specifies the BigIron RX chassis slot number that contains the interface module that will undergo an immediate boot. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Specifying an Immediate Boot from the Management Module's Flash Memory

For example, to specify an immediate boot from the primary IronWare image in the management module's flash memory for the interface module installed in slot 1, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# lp boot system mp primary 1
```

Syntax: lp boot system mp primary | secondary <slot-number>

The **primary** and **secondary** keywords specify the primary or secondary IronWare image in the management module's flash memory.

The <slot-number> parameter specifies the BigIron RX Series chassis slot number that contains the interface module that will undergo an immediate boot. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Specifying an Immediate Boot from the Interface Module's Flash Memory

For example, to specify an immediate boot from the primary IronWare image in the interface module's flash memory for the interface module installed in slot 1, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# lp boot system flash primary 1
```

Syntax: lp boot system flash primary | secondary <slot-number>

The **primary** and **secondary** keywords specify the primary or secondary IronWare image in the interface module's flash memory.

The <slot-number> parameter specifies the BigIron RX Series chassis slot number that contains the interface module that will undergo an immediate boot. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Specifying an Immediate Boot from a TFTP Server

For example, to specify an immediate boot for the interface module installed in slot 1 from a TFTP server, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# lp boot system tftp 123.123.123.123 primary 1
```

Syntax: lp boot system tftp <ip-address> <filename> <slot-number>

The <ip-address> parameter specifies the IP address of the TFTP server from which the interface module will be booted.

The <filename> parameter specifies the name of the image from which to boot the interface module.

The <slot-number> parameter specifies the BigIron RX Series chassis slot number that contains the interface module that will undergo an immediate boot. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16..

Specifying an Immediate Interactive Boot

To specify an immediate interactive boot for the interface module installed in slot 1, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# lp boot system interactive 1
```

Syntax: lp boot system interactive <slot-number>

The <slot-number> parameter specifies the BigIron RX Series chassis slot number that contains the interface module that will undergo an immediate boot. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

After you enter this command, the system enters the interface module's monitor mode. For example, to boot from the primary IronWare image in the interface module's flash memory, enter the following command at the monitor prompt:

```
LP MONITOR> boot system flash primary
```

Configuring an Automatic Boot

You can configure an automatic boot for one or all interface modules from a specified source by entering the **lp boot system** command in the global CONFIG level. Provided that you save this configuration by entering the **write memory** command, the system will implement the automatic boot starting with the next software reload or system reset and each reload or reset after that.

Configuring an Automatic Boot from the Management Module's PCMCIA Slot

For example, to configure an automatic boot for all interface modules from the management module's PCMCIA slot 1, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# lp boot system slot1 primary all
```

Syntax: lp boot system slot1 | slot2 <filename> all | <slot-number>

The **slot1** and **slot2** keywords indicate the management module's PCMCIA slot from which to boot the interface modules.

The <filename> parameter specifies the name of the image from which to boot the interface modules.

The **all** | <slot-number> parameter specifies that the automatic boot applies to all interface modules in the BigIron RX Series chassis or to an interface module in the specified chassis slot number only. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Configuring an Automatic Boot from the Management Module's Flash Memory

For example, to configure an automatic boot from the primary IronWare image in the management module's flash memory for all interface modules, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# lp boot system mp primary all
```

Syntax: lp boot system mp primary | secondary all | <slot-number>

The **primary** and **secondary** keywords specify the primary or secondary IronWare image in the management module's flash memory.

The **all** | <slot-number> parameter specifies that the automatic boot applies to all interface modules in the BigIron RX Series chassis or to an interface module in the specified chassis slot number only. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Configuring an Automatic Boot from the Interface Module's Flash Memory

For example, to configure an automatic boot from the primary IronWare image in the interface module's flash memory for all interface modules, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# lp boot system flash primary all
```

Syntax: lp boot system flash primary | secondary all | <slot-number>

The **primary** and **secondary** keywords specify the primary or secondary IronWare image in the interface module's flash memory.

The **all** | <slot-number> parameter specifies that the automatic boot applies to all interface modules in the BigIron RX Series chassis or to an interface module in the specified chassis slot number only. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Configuring an Automatic Boot from a TFTP Server

For example, to configure an automatic boot for all interface modules from a TFTP server, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# lp boot system tftp 123.123.123.123 primary all
```

Syntax: lp boot system tftp <ip-address> <filename> all | <slot-number>

The <ip-address> parameter specifies the IP address of the TFTP server from which the interface modules will be booted.

The <filename> parameter specifies the name of the image from which to boot the interface modules.

The **all** | <slot-number> parameter specifies that the automatic boot applies to all interface modules in the BigIron RX Series chassis or to an interface module in the specified chassis slot number only. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Configuring an Automatic Interactive Boot

For example, to configure an automatic interactive boot for all interface modules, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# lp boot system interactive all
```

Syntax: lp boot system interactive all | <slot-number>

The **all** | <slot-number> parameter specifies that the automatic boot applies to all interface modules in the BigIron RX Series chassis or to an interface module in the specified chassis slot number only. You can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

After you enter this command, the system enters the interface module's monitor mode. For example, to boot from the primary IronWare image in the interface module's flash memory, enter the following command at the monitor prompt:

```
LP MONITOR> boot system flash primary
```

Changing Priority of Chassis Slots for Interface Modules

You can prioritize the BigIron RX Series chassis slots in which the interface modules are installed. The priority range is 1 – 8, where 1 is the lowest priority and 8 is the highest priority. You can set one, some, or all chassis slots to the same priority or each chassis slot to a different priority. If you assign the same priority to all slots, the lowest-number slot has the highest priority, while the highest-numbered slot has the lowest priority.

By default, the priority of all chassis slots is 1, which is the lowest priority. If the supply of power to the chassis falls below a minimum threshold, the chassis slots will likely lose power because of their low priority. In this scenario for an BigIron RX-8 chassis, slot 8 will lose power first, then slot 7, slot 6, and so on until slot 1 loses power.

For example, to set the priority of chassis slot 1 to the highest priority (8), enter the following command:

```
BigIron RX(config)# lp-slot-priority 1 8
```

Syntax: lp-slot-priority <slot-number> <priority>

The <slot-number> parameter indicates that the chassis slot number for which you are changing the priority. You can specify slots 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

The <priority> parameter indicates that the priority of the chassis slot if the chassis loses power. You can specify a value of 1 – 8, where 1 is the lowest priority and 8 is the highest priority. You can set one, some, or all chassis slots to the same priority or each chassis slot to a different priority.

Disabling and Reenabling Power to the Interface Modules

If needed, you can disable power to a specified interface module and then reenabling it. For example, to disable power to the interface module in chassis slot 1, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# power-off lp 1
```

Syntax: power-off lp <slot-number>

The <slot-number> parameter indicates the chassis slot number for which you are disabling the power. You can specify slots 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

For example, to reenabling power to the interface module in chassis slot 1, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# power-on lp 1
```

Syntax: power-on lp <slot-number>

The <slot-number> parameter indicates the chassis slot number for which you are reenabling the power. You can specify slots 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Enabling and Disabling Management Module CPU Usage Calculations

You can enable the BigIron RX Series system to perform usage averaging calculations on tasks handled by the management module's CPU. If you enable the calculation performance, you can display usage averages for all tasks performed by the management module's CPU for an interval of up to 1 hour. You can display these statistics using the **show cpu** command. Typically, these statistics are used for debugging purposes.

By default, the performance of the calculations is disabled. When disabled, you can use the **show cpu** command without optional parameters to display usage averages for all tasks performed by the management module's CPU in the last 1 second.

To enable the performance of the usage averaging calculations, enter the following command at the global CONFIG level of the CLI:

BigIron RX(config)# cpu-usage on

Syntax: cpu-usage on

To disable the performance of the usage averaging calculations, enter the following command at the global CONFIG level of the CLI:

BigIron RX(config)# cpu-usage off

Syntax: cpu-usage off

NOTE: When finished gathering statistics for debugging purposes, Foundry recommends disabling the usage averaging calculations, which are CPU-intensive and can affect the performance of the management module.

Displaying Management Module CPU Usage

You can display the tasks handled by the management module and the amount of the management module's CPU used by each task. To do so, enter the following command at any level of the CLI:

```
BigIron RX# show tasks
Task Name  Pri  State  PC      Stack    Size  CPU Usage(%)  task id  task vid
-----  ---  -----  -----  -----  -----  -----  -----  -----
      idle  0    run    00001904  040560a0  256    66            0        0
    monitor 20    susp   0000c658  0404bd80  8192    0            0        0
      int   16    susp   0000c658  04051f90  16384   0            0        0
    timer  15    susp   0000c658  04055f90  16384   0            0        0
      dbg   30    susp   0000c658  0404df10  8192    0            0        0
    flash  17    susp   0000c658  0409cf98  8192    0            0        0
      wd    31    susp   0000c658  0409af80  8192    0            0        0
    boot   17    susp   0000c658  041dbe30  65536   0            0        0
    main    3    susp   0000c658  2060cf38  65536   0            0        1
      itc    6    susp   0000c658  20610af0  16384   0            0        1
    tmr     5    susp   0000c658  206a7638  16384   0            0        1
    ip_rx   5    susp   0000c658  206aef48  16384   0            0        1
      scp    5    susp   0000c658  206b3638  16384   0            0        1
    console 5    susp   0000c658  206bf628  32768   0            0        1
      vlan  5    susp   0000c658  206c6628  16384   0            0        1
    mac_mgr 5    susp   0000c658  206d5638  16384   0            0        1
    mrp_mgr 5    susp   0000c658  206db638  16384   0            0        1
      vsrp   5    susp   0000c658  206e1630  16384   0            0        1
    snms    5    susp   0000c658  206e5638  16384   0            0        1
      rtm    5    susp   0000c658  20756638  16384   0            0        1
    ip_tx   5    run    0000c658  20763638  16384   0            0        1
    mcast   5    susp   0000c658  20767638  16384   0            0        1
      l4     5    susp   0000c658  2076b630  16384   0            0        1
      stp    5    susp   0000c658  20970628  16384   0            0        1
    gvrp_mgr 5    susp   0000c658  20979638  16384   0            0        1
      snmp   5    susp   0000c658  20982638  32768   0            0        1
      web    5    susp   0000c658  2098d638  32768   0            0        1
      lacp   5    susp   0000c658  20991638  16384   0            0        1
    hw_access 5    susp   0000c658  20996638  16384   0            0        1
    telnet_0 5    run    0000c658  209db638  32768   0            0        1
```

Syntax: show tasks

Examine the CPU Usage (%) field to determine the percentage of the management module's CPU used by each task.

NOTE: The total CPU usage may not add up to 100 percent. The total may not include resources used by the management processes.

A problem could exist if the CPU usage is distributed unevenly to one task, other than the idle task, for a prolonged period. If this situation occurs, contact Foundry's technical support for assistance.

Enabling and Disabling Packet Logging for Management and Interface Modules

You can enable the logging of packets transmitted, received, or both transmitted and received by a management or interface module in the BigIron RX Series chassis. If you enable packet logging, you can display the packet log using the **show packet-logging** command. (For information about displaying the contents of the packet log, see "Displaying a Packet Log" on page 6-20.) Typically, the packet log is used for debugging purposes.

By default, packet logging is disabled for all management and interface modules. For example, to enable packet logging of packets transmitted and received by the interface module installed in chassis slot 1, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# packet-logging 1 start 0
```

Syntax: packet-logging <slot-number> start <packet-direction>

For the <slot-number> parameter, you can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Specify the **start** keyword to start packet logging and write the log to the system's memory. You must also specify the direction of packets that you want logged by entering one of the following for the <packet-direction> parameter:

- 0 – Logs packets transmitted and received by the specified module.
- 1 – Logs packets received by the specified module.
- 2 – Logs packets transmitted by the specified module.

After enabling packet logging using the **start** keyword, you can optionally specify the **flash** keyword to copy the packet log in the system's memory to the management module's flash memory. The name of the packet log in the management module's flash memory is pktlog.txt. For example, to copy a log of packets transmitted and received by the interface module installed in chassis slot 1 to the management module's flash memory, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# packet-logging 1 flash 0
```

Syntax: packet-logging <slot-number> flash <packet-direction>

For the <slot-number> parameter, you can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

You must specify the direction of packets that you want logged:

- 0 – Logs packets transmitted and received by the specified module.
- 1 – Logs packets received by the specified module.
- 2 – Logs packets transmitted by the specified module.

For example, to disable packet logging for the interface module installed in chassis slot 1, enter the following command at the global CONFIG level of the CLI:

```
BigIron RX(config)# packet-logging 1 stop
```

Syntax: packet-logging <slot-number> stop

For the <slot-number> parameter, you can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

Specify the **stop** keyword to stop packet logging.

NOTE: When finished gathering packet logging information for debugging purposes, Foundry recommends disabling the generation of a packet log, which is CPU-intensive and can affect the performance of the management module.

Displaying a Packet Log

You can use the following methods to display the contents of a packet log:

- You can use the **show packet-logging** command, which is discussed in this section.
- If you decided to write the log (pktlog.txt) to the management module flash memory, in addition to using the **show packet-logging** command, you can access and view the log using flash memory file management commands. For more information, see “Flash Memory and PCMCIA Flash Card File Management Commands” on page 5-10.

For example, to display a packet log for the interface module in chassis slot 1 that has been written to the system’s memory, enter the following command at any CLI level:

```
BigIron RX# show packet-logging 1 memory
..Total 31 packet records...
-----
--> TX
(Assist Header 0x11f: ver-0, priority-0, pkt_type-ARP packet)
(Foundry Header: fid-0x82, priority-3, sac-0, monitor-0, ipc_flag-0x1f, reserved-
0, pri_tagged-0, multicast_vid-0, protocol_type-0x2, us-0, brd-0, dav-0, sav-0,
dpv-0, sv-0, error-0, txa-0, sas-0, tagged-0, offset-16, vlan_prio-0, cfi- 0,
vlan_id-1)

011f0082 cf820010 000107c0 0060800b 020000e0 52eaf00 000cdb80 32820806
00010800 06040002 000cdb80 32820101 010100e0 52eaf00 01010102 5204ab10
-----
--> RX
(Assist Header 0x0: ver-0, priority-0, pkt_type-IP packet)
(LP2MP_ALT_FDRY_HDR 10 bytes: data-8 bytes, source_port-130, pkt_data_offset-30,
virtual_src_int-130)

0000bfff cf808810 00012087 80824de9 4001000c db803282 00e052ea 1f000800
4500002c 28e40000 40014de9 01010102 01010101 08003916 abcd0001 61626364
-----
==> TX
(Assist Header 0xf: ver-0, priority-0, pkt_type-IP packet)
(Foundry Header: fid-0x82, priority-3, sac-0, monitor-0, ipc_flag-0x1f, reserved-
0, pri_tagged-0, multicast_vid-0, protocol_type-0x1, us-0, brd-0, dav-0, sav-0,
dpv-0, sv-0, error-0, txa-0, sas-1, tagged-0, offset-16, vlan_prio-0, cfi- 0,
vlan_id-1)

000f0082 cf810090 000107c0 004c800b 020000e0 52eaf00 000cdb80 32820800
4500002c 86a20000 4001f02a 01010101 01010102 00004116 abcd0001 61626364
-----
...
```

Syntax: show packet-logging <slot-number> memory | flash pktlog.txt

For the <slot-number> parameter, you can specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16.

The **memory | flash pktlog.txt** keyword specifies that the packet log is written to the system’s memory or to a file (pktlog.txt) written to the system’s flash memory.

The display shows the following information:

Table 6.6: Packet Log Fields

This Field...	Displays...
...Total <number> packet records...	The total number of packets recorded in the packet log for a specified module.
TX or RX	TX indicates the packet was transmitted by the module, while RX indicates the packet was received by the module.
Assist Header <number>	A Foundry header associated with the packet.
pkt_type	The packet type, which can be one of the following: <ul style="list-style-type: none"> • IP – An IP packet. • ARP – An ARP packet. • STP – An STP packet. • TCP – A TCP packet. • UDP – A UDP packet. • IPC packet – An interprocessor communication packet. • ITC packet – An intertask communication packet.
<hexadecimal numbers>	The contents of the packet.

Removing MAC Address Entries

You can remove learned MAC address entries from the BigIron RX Series system's MAC address table. You can remove the following:

- All MAC address entries.
- All MAC address entries for a specified interface module.
- All MAC address entries for a specified Ethernet port.
- All MAC address entries for a specified VLAN.
- A specified MAC address entry in all VLANs.

For example, to remove entries for the MAC address 000d.cb80.00d in all VLANs, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# clear mac-address 000d.cb80.00d0
```

Syntax: clear mac-address <mac-address> | ethernet <slot>/<port> | module <slot> | vlan <number>

If you enter the **clear mac-address** command without any parameters, the software removes all MAC entries.

Use the <mac-address> parameter to remove a specified MAC address from all VLANs. Specify the MAC address in the following format: HHHH.HHHH.HHHH.

Use the **ethernet** <slot>/<port> parameter to remove all MAC addresses for a specified Ethernet port. For the <slot> parameter, enter the number of the chassis slot in which the Ethernet interface module is installed. For the <port> parameter, enter the Ethernet port for which to remove all MAC addresses.

Use the **module** <slot> parameter to remove all MAC addresses for an interface module in a specified chassis slot.

Use the **vlan** <number> parameter to remove all MAC addresses for a specified VLAN.

Chapter 7

Maintaining a BigIron RX Series Switch

This chapter provides the following information:

- A recommended hardware maintenance schedule
- Cleaning the fiber-optic connectors
- Replacing a management module
- Replacing an interface module
- Replacing a switch fabric module
- Replacing a fiber-optic module
- Replacing an AC power supply
- Replacing cooling system components

WARNING: The procedures in this manual are for qualified service personnel.

Hardware Maintenance Schedule

The BigIron RX Series Switches require minimal maintenance for its hardware components. Foundry recommends doing the following:

- Cleaning the fiber-optic connectors on a fiber-optic port and the connected fiber cable each time you disconnect the cable.

Otherwise, you can replace the following hardware components as needed:

- All modules (management, interface, and switch fabric)
- Fiber-optic modules
- AC power supplies
- Cooling system:

NOTE: The BigIron RX Series management, interface, and switch fabric modules are dedicated, which means that you must install them in the BigIron RX Series chassis only. If you attempt to install the BigIron RX Series modules in another Foundry chassis or a module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and modules will not function properly.

Cleaning the Fiber-Optic Connectors

To avoid problems with the connection between the fiber-optic module connectors and the fiber cable connectors, Foundry strongly recommends cleaning both connectors each time you disconnect and reconnect them. In particular, dust can accumulate in the connectors and cause problems such as reducing the optic launch power.

To clean the fiber cable connectors, Foundry recommends using a fiber-optic reel-type cleaner. You can purchase this type of cleaner from the following Website:

http://www.fisfiber.com/Home_Page.asp

When not using a fiber-optic module connector, make sure to keep the protective covering on.

Replacing a Management Module

You can remove a management module and replace it with a new one while the BigIron RX Series chassis is powered on and running.

NOTE: The BigIron RX Series management module is dedicated, which means that you must install it in the BigIron RX Series chassis only. If you attempt to install the BigIron RX Series management module in another Foundry chassis or a management module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and module will not function properly.

This section provides information about the following tasks:

- Removing a management module
- Installing a new management module

Removing a Management Module

You can remove a management module while the BigIron RX Series chassis is powered on and running.

NOTE: Before removing and replacing an active or standby management module, you need to understand how these actions affect management module redundancy. For more information, see “Removal and Replacement of a Management Module” on page 5-3.

Before removing a management module from the BigIron RX Series chassis, have the following on hand:

- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To remove a management module from the BigIron RX Series chassis, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located on the chassis front.
2. Using the flathead screwdriver if necessary, loosen the two thumbscrews on the ends of the module.
3. Pull the card ejectors towards you, and away from the module front panel. This action unseats the module from the backplane.
4. Pull the module out of the chassis, and place in an anti-static bag for storage if desired.
5. Install a new module in the slot. For information about performing this task, see “Installing a New Management Module”.

CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.

Installing a New Management Module

You can install a management module while the BigIron RX Series chassis is powered on and running.

NOTE: The BigIron RX Series management module is dedicated, which means that you must install it in the BigIron RX Series chassis only. If you attempt to install the BigIron RX Series management module in another Foundry chassis or a management module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and module will not function properly.

Before installing a module into the BigIron RX Series chassis, have the following on hand:

- A new management module, which you can order from Foundry.
- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To install a new management module in the BigIron RX Series chassis, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Remove the module from its packaging.
3. Insert the module into the chassis slot, and slide the card along the card guide until the ejectors on either side of the module move close to the module front panel.
4. Push the ejectors even closer until they are flush with the module front panel. This action will fully seat the module in the backplane.
5. Tighten the two screws at either end of the module front panel by pushing them in and turning them clockwise. If desired, tighten the screws further using the flat-head screwdriver.

Replacing an Interface Module

You can remove an interface module and replace it with a new one while the BigIron RX Series chassis is powered on and running.

NOTE: A BigIron RX Series interface module is dedicated, which means that you must install it in the BigIron RX Series chassis only. If you attempt to install a BigIron RX Series interface module in another Foundry chassis or an interface module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and interface module will not function properly.

This section provides information about the following tasks:

- Removing an interface module
- Installing a new interface module

Removing an Interface Module

You can remove an interface module while the BigIron RX Series chassis is powered on and running.

Before removing an interface module from the BigIron RX Series chassis, you must disable the module, which prevents the remaining interface modules in the chassis from dropping user packets.

To perform this task, you must have the following on hand:

- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To remove an interface module from the BigIron RX Series chassis, do the following:

1. Disable the module by entering the **power-off lp <slot-number>** command at the Privileged EXEC level of the CLI. For the <slot-number> parameter, specify 1 – 4 for BigIron RX-4, 1 – 8 for BigIron RX-8 or 1 – 16 for BigIron RX-16..
2. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
3. Using the flathead screwdriver if necessary, loosen the two thumbscrews on the ends of the module.
4. Pull the card ejectors towards you, and away from the module front panel. This action unseats the module from the backplane.
5. Pull the module out of the chassis, and place in an anti-static bag for storage if desired.
6. Install a new module in the slot. For information about performing this task, see “Installing a New Interface Module”.

CAUTION: If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.

Installing a New Interface Module

You can install a new interface module while the BigIron RX Series chassis is powered on and running.

NOTE: A BigIron RX Series interface module is dedicated, which means that you must install it in a BigIron RX Series chassis only. If you attempt to install a BigIron RX Series interface module in another Foundry chassis or an interface module intended for another Foundry chassis in a BigIron RX Series chassis, the chassis and interface module will not function properly.

Before installing one of these modules into the BigIron RX Series chassis, have the following on hand:

- A new interface module, which you can order from Foundry.
- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To install a new interface module in the BigIron RX Series chassis, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Remove the module from its packaging.
3. Insert the module into the chassis slot, and slide the card along the card guide until the ejectors on either side of the module move close to the module front panel.
4. Push the ejectors in the directions shown in Figure 7.2 until they are flush with the module front panel. This action will fully seat the module in the backplane.
5. Tighten the two screws at either end of the module front panel by pushing them in and turning them clockwise. If desired, tighten the screws further using the flat-head screwdriver.

Figure 7.1 Installing a Module in an BigIron RX-4 Chassis

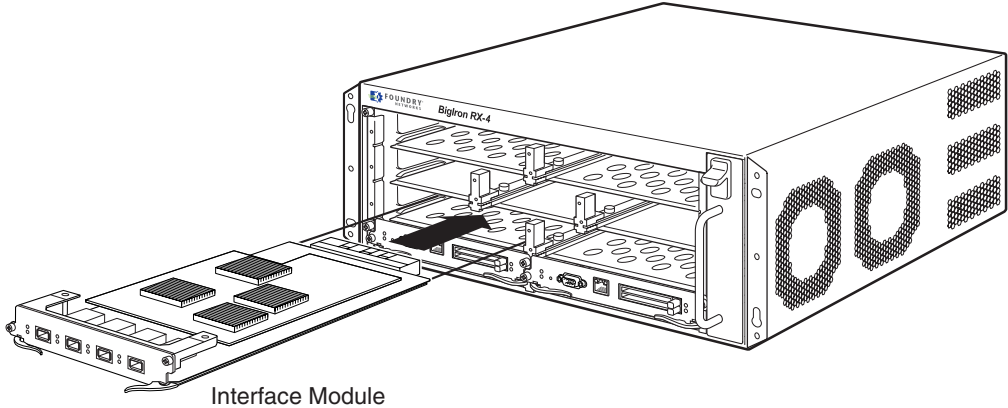


Figure 7.2 Installing a Module in an BigIron RX-8 Chassis

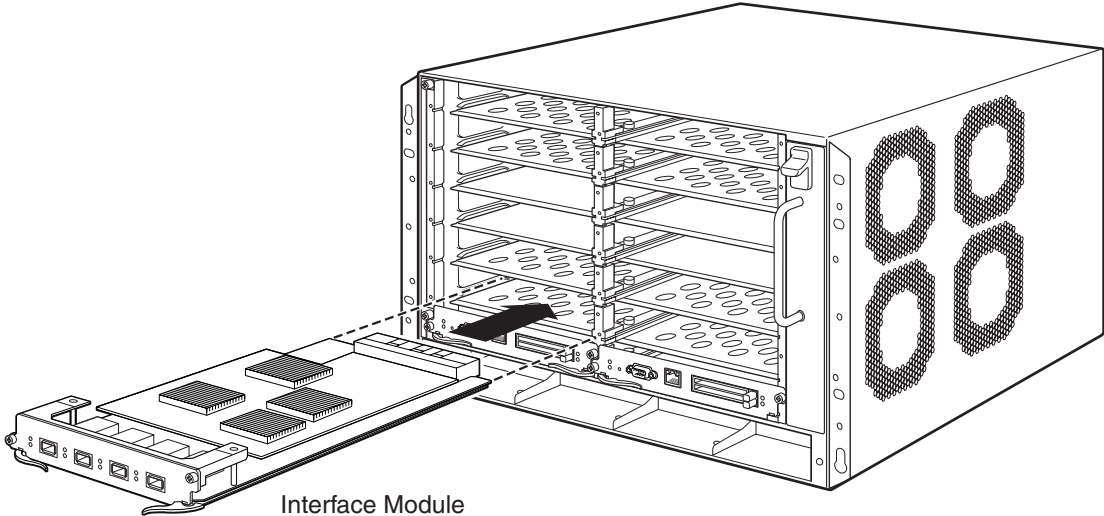
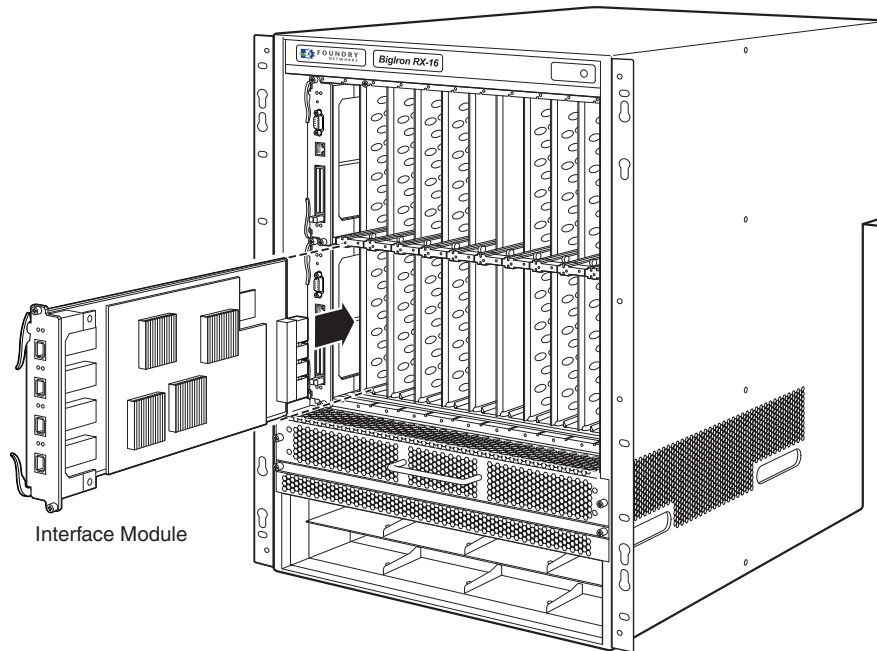


Figure 7.3 Installing a Module in an BigIron RX-16 Chassis



Replacing a Switch Fabric Module

You can remove a switch fabric module while it is powered on and running and replace it with a new one.

NOTE: A BigIron RX SeriesG switch fabric module is dedicated, which means that it functions properly in the BigIron RX Series chassis only. If you attempt to install a BigIron RX Series switch fabric module in another Foundry chassis or a switch fabric module intended for another Foundry chassis in a BigIron RX Series chassis, the chassis and switch fabric module will not function properly.

This section provides information about the following tasks:

- Removing a switch fabric module
- Installing a new switch fabric module

Removing a Switch Fabric Module

Before removing a switch fabric module from the BigIron RX Series chassis, have the following on hand:

- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To remove a switch fabric module from the BigIron RX Series chassis, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Using the flathead screwdriver if necessary, loosen the two thumbscrews on the ends of the module.
3. Pull the card ejectors towards you, and away from the module front panel. This action unseats the module from the backplane.
4. Pull the module out of the chassis, and place in an anti-static bag for storage if desired.

5. Install a new switch fabric module in the slot. For information about performing this task, see “Installing a New Switch Fabric Module” on page 7-7.

Installing a New Switch Fabric Module

The switch fabric modules on the BigIron RX Series switches are hot-swappable. This means that you can install a new switch fabric module without powering off the BigIron RX Series chassis.

NOTE: A BigIron RX Series switch fabric module is dedicated, which means that it functions properly in the BigIron RX Series chassis only. If you attempt to install a BigIron RX Series switch fabric module in another Foundry chassis or a switch fabric module intended for another Foundry chassis in the BigIron RX Series chassis, the chassis and switch fabric module will not function properly.

Before installing a new switch fabric module into the BigIron RX Series chassis, have the following on hand:

- A new switch fabric module, which you can order from Foundry.
- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A large flat-head screwdriver.

To install a new switch fabric module in a BigIron RX Series chassis, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into an ESD connector located on the chassis front.
2. Remove the new module from its packaging.
3. Insert the module into the chassis slot, and slide the card along the card guide until the ejectors on either side of the module move close to the module front panel.
4. Push the ejectors even closer until they are flush with the module front panel. This action will fully seat the module in the backplane.
5. Tighten the two screws at either end of the module front panel by pushing them in and turning them clockwise. If desired, tighten the screws further using the flat-head screwdriver.

Replacing a Fiber-Optic Module

You can remove a fiber-optic module from a 10 Gigabit Ethernet port and replace it with a new one while the BigIron RX Series chassis is powered on and running.

This section provides information about the following tasks:

- Removing the fiber-optic module
- Installing a new fiber-optic module
- Cabling a fiber-optic module

Removing a Fiber-Optic Module

You can remove a fiber-optic module from a 10 Gigabit Ethernet port while the BigIron RX Series chassis is powered on and running.

Before removing a fiber-optic module, have the following on hand:

- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- The protective covering that you removed from the fiber-optic module port when you initially installed the

module.

- A small flathead screwdriver.

To remove a fiber-optic module from a 10 Gigabit Ethernet port, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Disconnect the two fiber cable connectors from the port connectors.
3. Insert the protective covering into the port connectors.
4. Using the flathead screwdriver if necessary, loosen the two thumbscrews on the ends of the module.
5. Pull the module out of the port, and place it in an anti-static bag for storage if desired.
6. Install a new fiber-optic module in the port. For information about performing this task, see “Installing a New Fiber-Optic Module”.

Installing a New Fiber-Optic Module

You can install a new fiber-optic module in a 10 Gigabit Ethernet port while the BigIron RX Series chassis is powered on and running.

Before installing one of these modules into the port, have the following on hand:

- A new fiber-optic module, which you can order from Foundry.
- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- A small flathead screwdriver.

To install a fiber-optic module into a 10 Gigabit Ethernet port, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis front.
2. Remove the new module from its protective packaging.
3. Gently insert the fiber-optic module into the port until the module clicks into place. The fiber-optic modules are keyed to prevent incorrect insertion.
4. Secure the fiber-optic module by tightening the two thumb-screws. If desired, you can further tighten the thumb-screws using the flathead screwdriver.

Cabling a Fiber-Optic Module

To cable a fiber-optic module, do the following:

1. Remove the protective covering from the fiber-optic port connectors and store the covering for future use.
2. Before cabling a fiber-optic module, Foundry strongly recommends cleaning the cable connectors and the port connectors. For more information, see “Cleaning the Fiber-Optic Connectors” on page 7-2.
3. Gently insert the two cable connectors (a tab on each connector should face upward) into the port connectors until the tabs lock into place.
4. Observe the link and active LEDs to determine if the network connections are functioning properly. For more information about the LED indicators, see Table 4.3 on page 4-8.

Replacing a Power Supply

You can replace a power supply while the BigIron RX Series chassis is powered on and running. The power supplies are located in slots along the bottom of the BigIron RX Series chassis.

This section provides information about the following topics:

- Determining which AC or DC power supply has failed, if necessary.
- Replacing a AC or DC power supply.

Determining Which Power Supply Failed

To determine which power supply has failed, enter the following command at any CLI command prompt:

```
BigIron RX# show chassis
```

This command displays status information for the fans and power supplies, and temperature readings for various components in the chassis. The power supplies are numbered in the display.

If the display indicates “Installed (Failed)” for any of the slots, the power supply installed in that particular slot has failed.

Replacing a Power Supply

To replace a power supply, you need the following:

- A new power supply (AC or DC), which you can order from Foundry
- A small flathead or Phillips screwdriver

WARNING: The power supplies are hot swappable, which means they can be removed and replaced while the BigIron RX Series chassis is powered on and running. However, Foundry recommends that you disconnect the power supply from its power source before removing and replacing the supply. The BigIron RX Series chassis can be running while a power supply is being removed and replaced, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the power supply or other parts of the device could be damaged.

WARNING: The front panel of a power supply includes a handle that locks the power supply in the chassis. This handle is a locking mechanism only and should not be used to lift and carry the power supply. You may sustain physical injury or harm if you attempt to lift and carry a power supply using the locking handle.

To replace a power supply, do the following:

1. Disconnect the power supply from its power source.
2. Disconnect the power cables from the power supply.
3. In the BigIron RX-4 use the screwdriver to loosen the two screws on both sides of the power supply front panel. Then pull the ejectors forward until the power supply is pulled from its connection to the backplane.
4. In the BigIron RX-8 and In the BigIron RX-16, pull up on the release latch and slip your fingers under the handle on the power supply faceplate. Pull handle down toward you. This action unlocks the power supply from its position in the chassis.
5. Continue to pull the power supply until it is removed from the chassis.
6. Insert the new power supply into the empty power supply slot, using the guides provided on either side of the slot.

CAUTION: Carefully follow the mechanical guides on each side of the power supply slot and make sure the power supply is properly inserted in the guides. Never insert the power supply upside down.

7. After the power supply is fully inserted, push the power supply front panel toward the back of the chassis until the power supply is fully seated.
8. Gently pull the handle on the power supply front panel upward and toward the top of the power supply front panel. This action locks the power supply in place.
9. In the BigIron RX-4, use the screwdriver to secure the two screws on either side of the power supply front panel.
10. Connect the AC power cord or DC power lugs to the power supply front panel.
11. Connect the power to its AC or DC source.
12. Observe the LEDs on the power supply front panel.
 - For a DC Supply, the DC IN and DC OK LEDs should be green which indicates the power supply is providing power to the chassis components.
 - For an AC Supply, the AC OK and DC OK LEDs should be green which indicates the power supply is providing power to the chassis components.
 - If the ALM LED is On (Amber) then the power supply has failed.

For information about troubleshooting this problem, see Table 3.3 on page 3-19.

Replacing Cooling System Components

The BigIron RX Series cooling systems are described in the following sections:

- “Replacing Fan Assemblies in the BigIron RX-16” on page 7-10
- “Replacing the Fan Assembly in the BigIron RX-4 and BigIron RX-8” on page 7-12

You can replace a fan or a fan control module while the BigIron RX Series chassis is powered on and running. The fans and fan control modules are located on rear panel of the BigIron RX Series chassis.

The following sections provide more information about replacing these components.

Replacing Fan Assemblies in the BigIron RX-16

The BigIron RX-16 has three fan assemblies: one accessible from the front of the chassis and two accessible from the rear. The front assembly pushes air into the chassis and the rear fans pull air out.

You can remove and replace a fan assembly while the BigIron RX-16 chassis is powered on and running.

CAUTION: To avoid overheating of the BigIron RX-16 chassis, remove only one fan assembly at a time. Do not remove all fans from the chassis at one time.

To replace a fan, you need the following:

- A new fan assembly, which you can order from Foundry
- A small flathead screwdriver
- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

Replacing the Rear Fan Assemblies in the BigIron RX-16

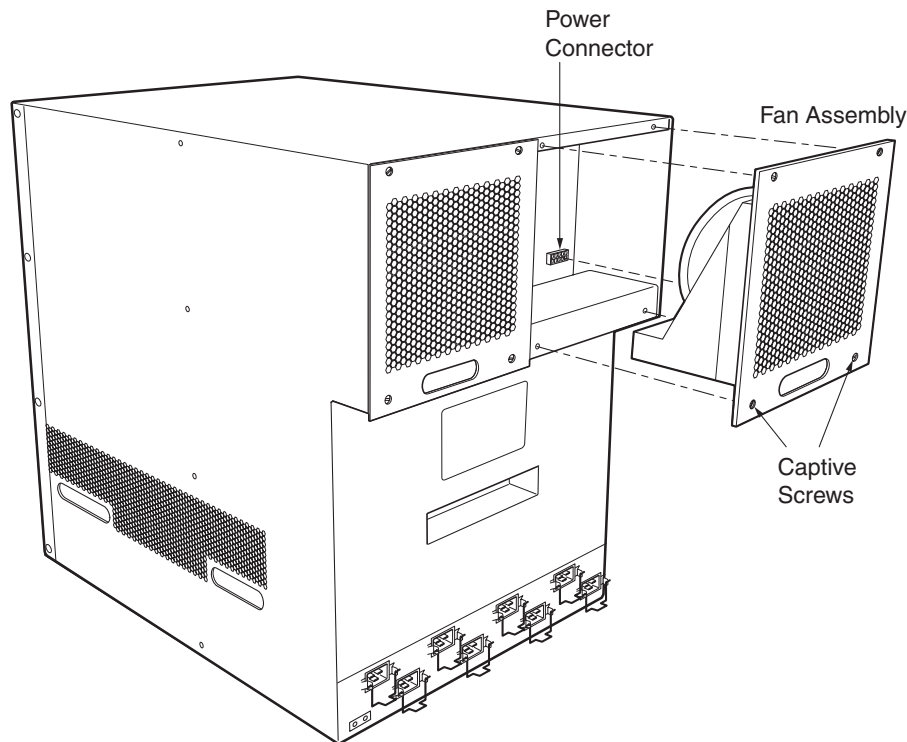
To replace a fan assembly, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis rear.
2. Using the flathead screwdriver, loosen the four captive screws that secure the fan (marked “Fan A” or “Fan B”) to the chassis rear.

- Remove the fan from the chassis by inserting your fingers underneath the fan enclosure and pulling the enclosure toward you as shown in Figure 7.4. Pulling the enclosure unseats the fan connector from a chassis connector.

WARNING: Be careful not to accidentally insert your fingers into the fan while removing it from the chassis. The fan may still be spinning at a high speed.

Figure 7.4 Removing a Fan



- Insert the new fan into the fan slot and push the enclosure in until the face plate is flush with the chassis. Pushing the enclosure in seats the fan connector with the chassis connector.
- Secure the fan to the chassis by tightening the four captive screws.
- Access the CLI, and enter the **show chassis** command to verify that both fans are operating normally.

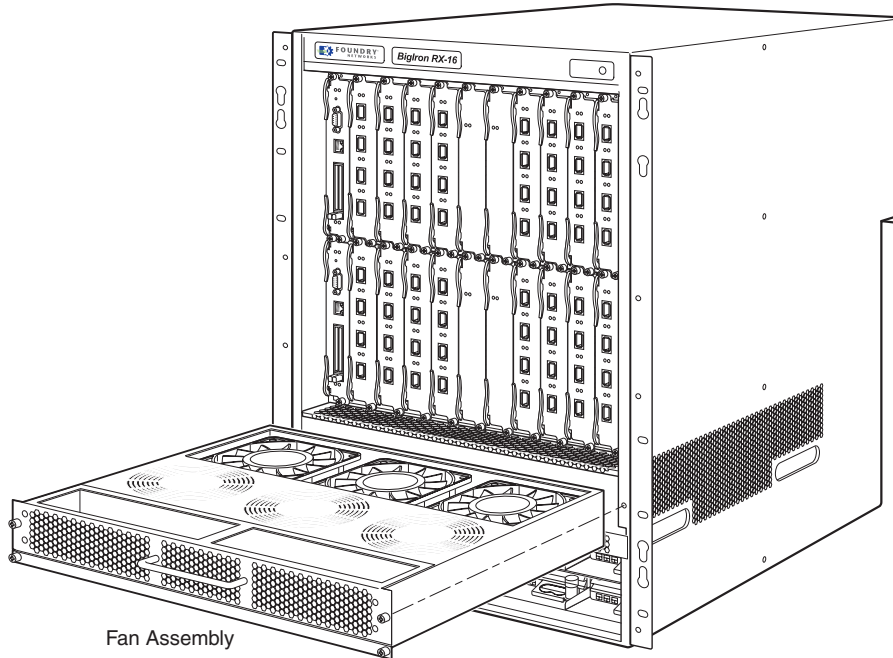
Replacing the Front Fan Assembly in the BigIron RX-16

To replace a fan, do the following:

- Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis rear.
- Using the flathead screwdriver, loosen the four captive screws that secure the fan assembly to the chassis front.
- Remove the fan assembly from the chassis by grabbing the handle on the fan assembly and pulling it toward you as shown in Figure 7.5. Pulling the enclosure unseats the fan assembly connector from a chassis connector.

WARNING: Be careful not to accidentally insert your fingers into the fan while removing it from the chassis. The fan may still be spinning at a high speed.

Figure 7.5 Removing a Fan



4. Insert the new fan assembly into the fan slot and push the enclosure in until the face plate is flush with the chassis. Pushing the enclosure in seats the fan connector with the chassis connector.
5. Secure the fan to the chassis by tightening the four captive screws.
6. Access the CLI, and enter the **show chassis** command to verify that the fans are operating normally.

Replacing the Fan Assembly in the BigIron RX-4 and BigIron RX-8

The BigIron RX-4 and BigIron RX-8 have a fan assembly accessible from the front of the chassis. The fan assembly pulls air out of the chassis.

You can remove and replace a fan assembly while the BigIron RX-4 and BigIron RX-8 chassis are powered on and running.

To replace a fan, you need the following:

- A new fan assembly, which you can order from Foundry
- A small flathead screwdriver
- An ESD wrist strap with a plug for connection to the ESD connector on the BigIron RX Series chassis

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

To replace a fan assembly in the BigIron RX-4 and BigIron RX-8, do the following:

1. Put on the ESD wrist strap and ground yourself by inserting the plug into the ESD connector located in the upper right corner of the chassis rear.
2. Using the flathead screwdriver, loosen the four captive screws that secure the fan assembly to the chassis front.

3. Remove the fan assembly from the chassis by grabbing the handle on the fan assembly and pulling it toward you as shown in Figure 7.6 and Figure 7.7. Pulling the enclosure unseats the fan assembly connector from a chassis connector.

WARNING: Be careful not to accidentally insert your fingers into the fan while removing it from the chassis. The fan may still be spinning at a high speed.

Figure 7.6 Removing a Fan from an BigIron RX-4 Switch

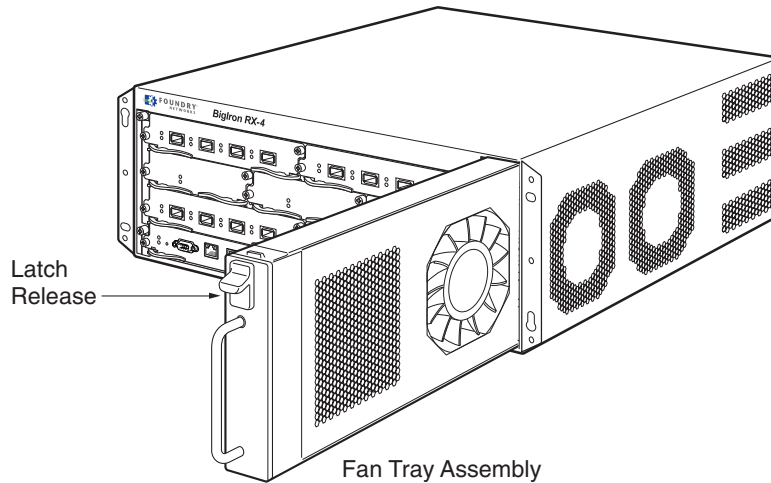
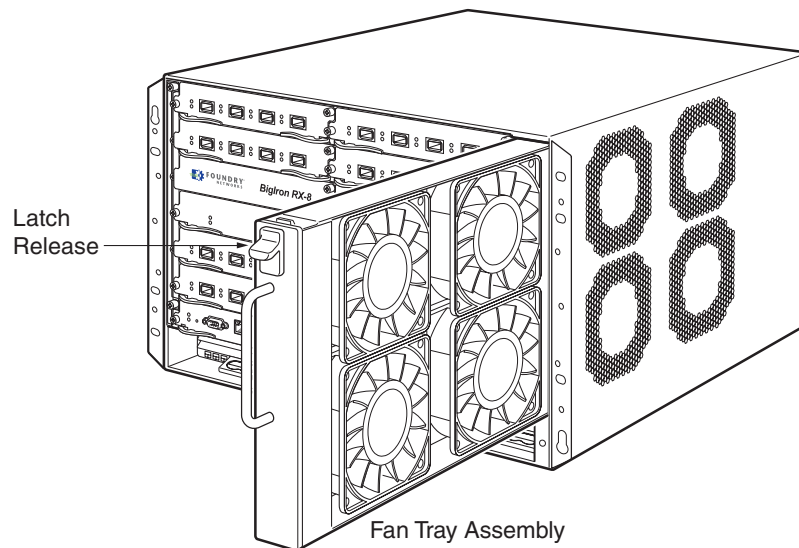


Figure 7.7 Removing a Fan from an BigIron RX-8 Switch



4. Insert the new fan assembly into the fan slot and push the enclosure in until the face plate is flush with the chassis. Pushing the enclosure in seats the fan connector with the chassis connector.
5. Secure the fan to the chassis by tightening the four captive screws.
6. Access the CLI, and enter the **show chassis** command to verify that the fans are operating normally.

Chapter 8

Upgrading Software Images and Configuration Files

This chapter describes the software images required to operate a BigIron RX Series Switch and how to load them on the switch. The images required are described in Table 8.1.

Table 8.1: Software Image Files

Module	Image Type	Image name
Management Module	Boot and Monitor	rmb<xxxxx> ^a
	Ironware	rmpr<xxxxx>
	FPGA	mbridge
Interface Module	Boot and Monitor	rlb<xxxxx>
	Ironware	rlp<xxxxx>

- a. <xxxxx> is a variable that refers to the release-specific information as described in “Software Image Naming Conventions” on page 8-3. Specific contents of this field are determined by release and are available in the relevant release notes.

The remaining sections of this chapter describe the following:

- The Images Required – This section describes each of the images required to operate a BigIron RX Series Switch. It describes images are installed on the Management and Interface modules. It also describes
- Image Naming Convention – This section describes the alpha-numeric scheme used to define the names of the image files used to operate a BigIron RX Series Switch.
- Displaying the Flash Memory and Version Information – This section describes the commands that allow you to determine the contents of the BigIron RX Series Switch’s flash memory.
- Upgrading the RX-Series Software – This section describes the procedures required for upgrading the Management and Interface module software images.
- Dynamic Configuration Loading – This section describes how to dynamically load configuration commands from a file on a TFTP server into the BigIron RX Series Switch’s running configuration.
- Using SNMP to San and Load Configuration Information – This section describes how to use an SNMP

management application to save and load a BigIron RX Series Switch's configuration.

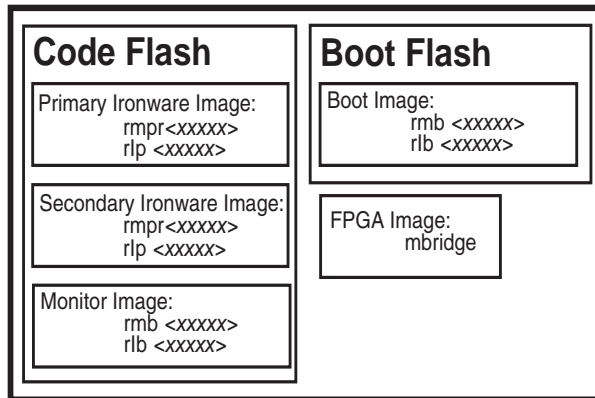
- Erasing Image and Configuration Files – This section describes how to erase software images and configuration files.
- File Synchronization – This section provides details for synchronizing the files on the Management and Interface modules.
- Scheduling a System Reload – This section describes how to configure a BigIron RX Series Switch to reload itself at a specific time or after a specific amount of time has passed.
- Diagnostic Error Codes and Remedies for TFTP Transfers – This section provides a table that describes the error codes that can be generated during problems with TFTP transfers.

Software Images Required

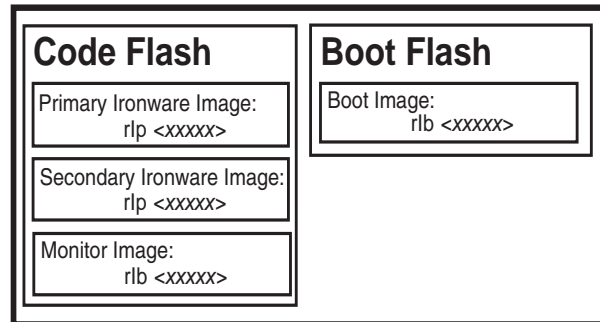
This section describes each of the software images required to operate a BigIron RX Series Switch by as described in Table 8.1. Figure 8.1 illustrates how each of the files are stored on the Management and Interface modules.

Figure 8.1 Management and Interface Modules Flash Images

Management Module Flash Memory



Interface Module Flash Memory



The software images are described in the following:

IronWare Image

An IronWare image, also known as the *software image*, contains the application software; the network protocols and features that define the characteristics of the device. Ironware images can be loaded in the Primary or Secondary location of Code Flash on the modules. Ironware images are named as described in Table 8.1. There is one Ironware image for the Management Module and another for the Interface module.

NOTE: The IronWare image for interface modules is loaded on both the the interface and management modules. The reason for this redundancy is to verify that the same image is loaded on all the interface modules. The management module does not run the interface module code, it only compares the code with the code on the other interface modules. If the code is not the same, the files are synchronized and updated to match the interface code on the management module.

Monitor Image

A Monitor image, also known as the *real time operating system*, allows hardware to run multiple, parallel, distributed functions. The Monitor Image delegates low-level functions to the smaller processor on each interface

module. Monitor images are loaded in the Code Flash and Boot Flash on the Interface and Management modules. Monitor images are named as described in Table 8.1.

Boot Image

The Boot image, which is packaged with the Monitor image, contains initialization instructions for the hardware startup. Boot images are named as described in Table 8.1.

FPGA Image

The FPGA image is named "MBRIDGE" and serves as the interface between the Management module and the backplane. It is loaded on the management module only.

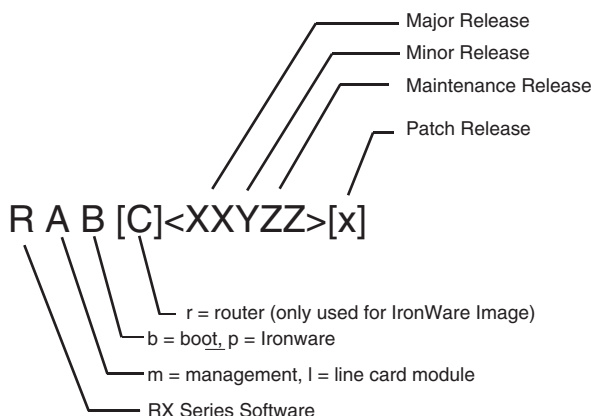
Startup Configuration File

The Startup Configuration file contains a default configuration that is loaded at the factory and appended with commands for the user. It is loaded on the management module only.

Software Image Naming Conventions

This section describes the alpha-numeric scheme used to define the names of the image files used to operate a BigIron RX Series Switch. Figure 8.2 illustrates the structure of the image names and Table describes what each of the fields in the image name represents.

Figure 8.2 Software Naming Syntax



To identify the software image, the naming conventions encode a specific meaning for each of the variables in the following syntax:

R indicates the software image is used on BigIron RX Series Switches.

A indicates the *module* type:

- If the value of A is **m**, the image supports a management module.
- If the value of A is **l**, the image supports an interface module.

B indicates the *software* type:

- If the value of B is **r**, the image contains Management IronWare application software.
- If the value of B is **p**, the image contains Interface IronWare application software.
- If the value of B is **b**, the image contains Boot-Monitor system software.

C is only used with IronWare Management Images. it indicates:

- If the value of C is **r**, the image contains IronWare Management application software.

Release Types

XX contains the major release number, for example, **01** or **02**.

Y contains the minor release number, for example, **1** or **2**.

ZZ contains the maintenance release number, for example, **00** or **01**.

x = is an optional field; it indicates the patch release, for example, **c**.

Release Number

To be supported, a BigIron RX Series chassis must have a software version number **<XXYZZ>x** that is consistent across hardware modules and software types. The following examples are the software images for the first release of BigIron RX Series Switches.

- **rmb022000**—BigIron RX Series MP boot-monitor image
- **rmr022000**—BigIron RX Series MP image
- **rlb02200**—BigIron RX Series LP boot-monitor image
- **rlp02200**—BigIron RX Series LP IronWare image

Displaying Flash Memory and Version Information

The Ironware image for the management module is loaded with the Ironware image for the interface module in the Primary location on the code flash.

The switch Ironware image for the management module is loaded with the Ironware image for the interface module in the Secondary location on the code flash.

The monitor image for the management module is loaded with the monitor image for the interface module in the Monitor file on the code flash.

The monitor image for the management module is also on the boot flash.

Displaying flash Information

You can display information concerning the contents of an BigIron RX Series Switch using the **show flash** command as shown in the following:

```
BigIron RX#show flash
=====
Active Management Module (Bottom Slot)
Code Flash - Type MT28F128J3, Size 32 MB
  o IronWare Image (Primary)
    Version 2.2.0T143, Size 5031659 bytes, Check Sum 5620
    Compiled on Jul 18 2005 at 19:36:07 labeled as rmpr02200
  o IronWare Image (Secondary)
    Version 2.2.0T143, Size 5031610 bytes, Check Sum 594d
    Compiled on Jul 15 2005 at 21:25:42 labeled as rmpr02200|
  o LP Kernel Image (Monitor for LP Image Type 0)
    Version 2.2.0T155, Size 209007 bytes, Check Sum 2ad8
    Compiled on Jul 18 2005 at 18:52:35 labeled as rlb02200
  o LP IronWare Image (Primary for LP Image Type 0)
    Version 2.2.0T157, Size 2286454 bytes, Check Sum edeb
    Compiled on Jul 18 2005 at 19:57:19 labeled as rlp02200
  o LP IronWare Image (Secondary for LP Image Type 0)
    Version 2.2.0T157, Size 2286007 bytes, Check Sum b313
    Compiled on Jul 15 2005 at 21:46:46 labeled as rlp02200
  o Boot-Monitor Image
    Version 2.2.0T145, Size 342853 bytes, Check Sum df07
    Compiled on Jul 18 2005 at 18:53:23 labeled as rmb02200
  o Startup Configuration
    Size 13412 bytes, Check Sum 0292
```

```

Modified on Jul 18 2005 at 18:47:09
Boot Flash - Type AM29LV040B, Size 512 KB
  o Boot-Monitor Image
    Version 2.2.0T145, Size 342853 bytes, Check Sum df07
    Compiled on Jul 18 2005 at 18:53:23 labeled as rmb02200
=====
Line Card Slot 1
Code Flash: Type MT28F640J3, Size 16 MB
  o IronWare Image (Primary)
    Version 2.2.0T157, Size 2286454 bytes, Check Sum edeb
    Compiled on Jul 18 2005 at 19:57:19 labeled as rlp02200
  o IronWare Image (Secondary)
    Version 2.2.0T157, Size 2286007 bytes, Check Sum b313
    Compiled on Jul 15 2005 at 21:46:46 labeled as rlp02200
  o Boot-Monitor Image
    Version 2.2.0T155, Size 209007 bytes, Check Sum 2ad8
    Compiled on Jul 18 2005 at 18:52:35 labeled as rlb02200
Boot Flash: Type AM29LV040B, Size 512 KB
  o Boot-Monitor Image
    Version 2.2.0T155, Size 209007 bytes, Check Sum 2ad8
    Compiled on Jul 18 2005 at 18:52:35 labeled as rlb02200
FPGA Version: NO FPGA
=====
....
All show flash done

```

Table 8.2: Code Flash and Boot Flash Information

This Field...	Displays...
Management Modules	
<type> Management Module (<location>)	The management module for which flash information is displayed. The <type> parameter indicates an active or standby management module. The <location> parameter indicates the top or bottom slot (M1 or M2, respectively).
Code Flash	The model number and size of the management module's code flash.
IronWare Image (Primary or Secondary)	Indicates the IronWare image installed in the primary or secondary location in the management module's code flash. The image name format is described in "Software Image Naming Conventions" on page 8-3. The actual image name depends on the version of software you have running on your BigIron RX Series Switch. The output displays the following information about the image: <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.

Table 8.2: Code Flash and Boot Flash Information (Continued)

This Field...	Displays...
LP Kernel Image (Monitor for LP Image Type 0)	<p>Indicates the interface modules Boot-Monitor image stored in the management module's code flash. The management module stores these images only; it does not run the images. The image name format is described in "Software Image Naming Conventions" on page 8-3. The output displays the following information about the image:</p> <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.
LP IronWare Image (Primary or Secondary for Module Type 0)	<p>Indicates the interface modules' primary and/or secondary IronWare image stored in the management module's code flash if you copied the primary and/or secondary IronWare image to all interface modules using the copy command with the all keyword. The management module stores these images only; it does not run the images. The image name format is described in "Software Image Naming Conventions" on page 8-3. The output displays the following information about the image:</p> <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.
Boot-Monitor Image	<p>Indicates the monitor image installed in the management module's code flash. The image name format is described in "Software Image Naming Conventions" on page 8-3.. The output displays the following information about the image:</p> <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.

Table 8.2: Code Flash and Boot Flash Information (Continued)

This Field...	Displays...
Startup Configuration	<p>The output displays the following information about the startup configuration, which is saved in the management module's code flash:</p> <ul style="list-style-type: none"> • Size – Size, in bytes, of the startup configuration. • Check sum – A unique ID for the file. If the contents of the file change, the check sum changes also. • Modification date and time – Date and time that the startup configuration was last saved.
Boot Flash	The model number and size of the management module's boot flash.
Boot-Monitor Image	<p>Indicates the boot image installed in the management module's boot flash. The image name format is described in "Software Image Naming Conventions" on page 8-3. The output displays the following information about the image:</p> <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.
Interface Modules	
Line Card Slot <number>	<p>The interface module for which flash information is displayed.</p> <p>The <number> parameter indicates the number of the chassis slot, 1 – 16, in which the interface module is installed.</p>
Code Flash	The model number and size of the interface module's code flash.
IronWare Image (Primary or Secondary)	<p>Indicates the IronWare image installed in the primary or secondary location in the interface module's code flash. The image name format is described in "Software Image Naming Conventions" on page 8-3. The output displays the following information about the image:</p> <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.
Boot Flash	The model number and size of the interface module's boot flash.

Table 8.2: Code Flash and Boot Flash Information (Continued)

This Field...	Displays...
Boot-Monitor Image	<p>Indicates the boot image installed in the interface module's boot flash. The image name format is described in "Software Image Naming Conventions" on page 8-3. The output displays the following information about the image:</p> <ul style="list-style-type: none"> • Version – "2.2.0Txy" indicates the image version number. The "Txy" is used by Foundry for record keeping. The "xx" indicates the hardware type, while the "y" indicates the image type. • Size – The size, in bytes, of the image. • Check sum – A unique ID for the image. If the contents of the image change, the check sum changes also. • Compilation date and time – The date and time that Foundry compiled the image.

Displaying Version Information

You can display version information for a BigIron RX Series Switch using the **show version** command as shown in the following:

```
BigIron RX# show version
HW: BigIron RX Router
BI-RX-4-S Backplane (Serial #: Not Exist, Part #: Not Exist)
RX-SFM1 Switch Fabric Module 1 (Serial #: Not Exist, Part #: Not Exist)
RX-SFM1 Switch Fabric Module 2 (Serial #: Not Exist, Part #: Not Exist)
RX-SFM1 Switch Fabric Module 3 (Serial #: Not Exist, Part #: Not Exist)
=====
SL M2: BI-RXMR Management Module Active (Serial #: Not Exist, Part #: 31524-000A):
Boot      : Version 2.2.0T145 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 18:53:23 labeled as rmb02200
(342853 bytes) from boot flash
Monitor   : Version 2.2.0T145 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 18:53:23 labeled as rmb02200
(342853 bytes) from code flash
IronWare  : Version 2.2.0T143 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 19:36:07 labeled as rmpr02200
(5031659 bytes) from Primary
Board ID : 00 MBRIDGE Revision : 12
913 MHz Power PC processor (version 8003/0101) 166 MHz bus
512 KB Boot Flash (AM29LV040B), 32 MB Code Flash (MT28F128J3)
512 MB DRAM
Active Management uptime is 5 hours 5 minutes 15 seconds
=====
SL 1: RX-BI24F 24-port 1 GbE Module (Serial #: Not Exist, Part #: Not Exist)
Boot      : Version 2.2.0T155 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 18:52:35 labeled as rlb02200
(209007 bytes) from boot flash
Monitor   : Version 2.2.0T155 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 18:52:35 labeled as rlb02200
(209007 bytes) from code flash
IronWare  : Version 2.2.0T157 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 19:57:19 labeled as rlp02200
(2286454 bytes) from Primary
GMAC 0 version: N/A
GMAC 1 version: N/A
```

```

GMAC 2 version:
GMAC 3 version:
660 MHz Power PC processor 440GP (version 8020/0020) 330 MHz bus
512 KB Boot Flash (AM29LV040B), 16 MB Code Flash (MT28F640J3)
512 MB DRAM, 8 KB SRAM, 0 Bytes BRAM
LP Slot 1 uptime is 5 hours 3 minutes 35 seconds
=====...
All show version done

```

Syntax: show version

The highlighted lines in the output indicate the versions currently running boot, monitor, IronWare and FPGA images for the management and interface modules. The fields are described in Figure 8.2 except for the following:

- **Board ID : 00 MBRIDGE Revision : 12** – This field in the Management module output indicates the revision of the MBRIDGE FPGA image.

Upgrading the RX-Series Software

This section describes the procedures for upgrading the software images on a BigIron RX Series Switch:

- Basic Tasks in the Software Upgrade Process
- Upgrading the Management Module's Monitor and Boot Images
- Upgrading the Management Module's IronWare Image
- Upgrading the Interface Module's Monitor and Boot Images
- Rebooting the Management Module
- Upgrading MBRIDGE FPGA on the Management Module

Basic Tasks in the Software Upgrade Process

To upgrade all or some of the BigIron RX Series software images, you must perform the following general steps:

1. Determine the versions of the software images currently installed and running on the BigIron RX Series system.
2. Copy the new software image from a source to a destination.

The source from which to copy the new image is usually a TFTP server to which the BigIron RX Series system has access or a PCMCIA flash card inserted in the management module's slot 1 or 2. The destination to which to copy the new image is either the management module's code flash or a flash card inserted in slot 1 or 2, or all or one specified interface module.

3. Reboot the management module.

For information about performing this task, see "Rebooting the Management Module" on page 8-12.

- Rebooting the Management Module

Upgrading the Management Module's Monitor and Boot Images

You can upgrade the management module's monitor and boot images simultaneously.

NOTE: Foundry Networks highly recommends that the interface monitor and boot images be upgraded at the same time as the management's module images to keep both code images synchronized on the same version. The procedure for doing this is described in "Upgrading the Interface Module's Monitor and Boot Images" on page 8-11.

To upgrade the management module's monitor and boot images simultaneously, perform the following steps:

1. Place the new monitor and boot images on a TFTP server to which the BigIron RX Series system has access or on a PCMCIA flash card inserted in slot 1 or 2.

2. Copy the new monitor and boot images to the BigIron RX Series. Enter one of the following commands at the Privileged EXEC level of the CLI (example: BigIron RX#):

Table 8.3: Command Syntax for Upgrading Monitor and Boot Images on the Management Module

Command Syntax	Description
copy tftp flash <ip-addr> <image-name> monitor copy-boot	Copies the latest monitor and boot images from the TFTP server to flash.
copy slot1 slot2 flash <image-name> monitor copy-boot	Copies the latest monitor and boot images from a flash card in slot 1 or 2 to flash.

For information about the image name to specify, see Table 8.1.

3. Verify that the new monitor and boot images have been successfully copied to flash or slot 1 or 2 by entering one of the following commands at the Privileged EXEC level of the CLI:

- **show flash**
- **dir /<path-name>/** (if the destination is slot 1 or 2)

Check for the boot image, monitor image, and the date and time at which the new images were built.

4. If you want to upgrade other software images, go to the appropriate upgrade section for information. If you have completed upgrading the software images, you must reboot the management module to complete the upgrade process. For more information, see “Rebooting the Management Module” on page 8-12.

Upgrading the Management Module’s IronWare Image

To upgrade the management module’s IronWare image (primary or secondary), you must perform the following steps:

1. Place the new IronWare image on a TFTP server to which the BigIron RX Series system has access or on a PCMCIA flash card inserted in slot 1 or 2.
2. Copy the new IronWare image from the TFTP server or a flash card in slot 1 or 2 to the management module’s code flash or a flash card in slot 1 or 2. To perform this step, enter one of the following commands at the Privileged EXEC level of the CLI:
 - **copy tftp flash** <ip-addr> <image-name> **primary | secondary**
 - **copy tftp slot1 | slot2** <ip-addr> <image-name> **primary | secondary**
 - **copy slot1 | slot2 flash** <image-name> **primary | secondary**
 - **copy slot1 | slot2 slot1 | slot2** <image-name> <dest-name>

For information about the image name to specify, see Table 8.1.

3. Verify that the new IronWare image has been successfully copied to the specified destination by entering one of the following commands at the Privileged EXEC level of the CLI:

- **show flash** (if the destination was code flash)
- **dir /<path-name>/** (if the destination was slot 1 or 2)

Check for the primary or secondary image and the date and time that it was placed in the directory.

4. If you want to upgrade other software images, go to the appropriate upgrade section for information. If you have completed upgrading the software images, you must reboot the management module to complete the upgrade process. For more information, see “Rebooting the Management Module” on page 8-12.

Upgrading the Interface Module's Monitor and Boot Images

NOTE: We recommend that you perform this upgrade procedure from a PC or terminal that is directly connected to the management module's Console port. You can also perform this procedure via a Telnet or SSHv2 session.

To upgrade an interface's monitor and boot images simultaneously, perform the following steps:

1. Place the new monitor and boot images on a TFTP server to which the BigIron RX Series system has access or on a PCMCIA flash card inserted in slot 1 or 2.
2. Copy the new monitor and boot images to the BigIron RX Series. Enter one of the following commands at the Privileged EXEC level of the CLI (example: BigIron RX#):

Table 8.4: Command Syntax for Upgrading the Monitor and Boot Images on the Interface Module

Command Syntax	Description
copy tftp lp <ip-addr> <image-name> monitor all <slot-number>	Copies the latest monitor image from the TFTP server to all interface modules or to the specified interface module (slot-number).
copy tftp lp <ip-addr> <image-name> monitor copy-boot all <slot-number>	Copies the latest monitor and boot images from the TFTP server to all interface modules or to the specified interface module (slot-number).

For information about the image name to specify, see Table 8.1.

3. Verify that the new images were successfully copied to code flash by entering the following command at the Privileged EXEC level of the CLI:
 - **show flash**

Check for the monitor image, boot image, and the date and time at which the new images were built.
4. If you want to upgrade other software images, go to the appropriate upgrade section for information. If you have completed upgrading the software images, you must reboot the management module to complete the upgrade process. For more information, see "Rebooting the Management Module" on page 8-12.

Upgrading the Interface Module's IronWare Image

To upgrade the IronWare image (primary or secondary) on all interface modules or an interface module in a specified chassis slot, you must perform the following steps:

1. Place the new IronWare image on a TFTP server to which the BigIron RX Series system has access or on a PCMCIA flash card inserted in slot 1 or 2.
2. Copy the new IronWare image from the TFTP server or a flash card in slot 1 or 2 to all interface modules or an interface module in a specified chassis slot. To perform this step, enter one of the following commands at the Privileged EXEC level of the CLI (example: BigIron RX#):
 - **copy tftp lp** <ip-addr> <image-name> **primary** | **secondary all**
 - **copy tftp lp** <ip-addr> <image-name> **primary** | **secondary** <chassis-slot-number>
 - **copy slot1** | **slot2 lp** <image-name> **primary** | **secondary all**
 - **copy slot1** | **slot2 lp** <image-name> **primary** | **secondary** <chassis-slot-number>

For information about the image name to specify, see Table 8.1.

NOTE: If you copy the new IronWare image to all interface modules using the **all** keyword, the management module makes a copy of the image (called lp-primary-0 or lp-secondary-0) and stores it in its code flash, thereby synchronizing the new IronWare image on both the interface and management modules.

If you copy the new IronWare image to a specified chassis slot, the management module does not make a copy of the image or store it. In this case, the new IronWare image on the interface module is unsynchronized or different from the IronWare image on the management module.

For more information about synchronizing the new IronWare image or retaining unsynchronized versions of the IronWare image on the interface and management modules, see “Rebooting the Management Module” on page 8-12.

3. Verify that the new IronWare image has been successfully copied by entering the following command at any level of the CLI:

show flash

Check for the IronWare image and the date and time at which the image was built.

If you want to upgrade other software images, go to the appropriate upgrade section for information. If you have completed upgrading the software images, you must reboot the management module to complete the upgrade process. For more information, see “Rebooting the Management Module” on page 8-12.

Rebooting the Management Module

After upgrading one or more software images on the management or interface modules, you must reboot the management module. After the management module reboots, it in turn reboots the interface modules.

To reboot the management module, enter one of the following commands:

- **reload** (this command boots from the default boot source, which is the primary code flash)
- **boot system flash primary | secondary**

During the management module reboot, the following synchronization events occur:

- If you have a standby management module, the active management module compares the standby module’s monitor, primary, and secondary images to its own. If you have updated these images on the active module, the active module automatically synchronizes the standby module’s images with its own.
- If you copied the primary and/or secondary IronWare image to all interface modules using the **copy** command with the **all** keyword, the management module made a copy of the image and stored it in its code flash under the names lp-primary-0 or lp-secondary-0. By default, the BigIron RX Series system checks the interface modules’ IronWare images, which reside in the code flash of the interface modules and the management module to make sure they are the same in both locations. (These IronWare images are stored on the management module only and are not run by the management or interface modules.) If the IronWare images on the interface and management modules are different, the system prompts you to do the following:
 - If you want to update the IronWare images in the interface module’s code flash with the images in the management module’s code flash, enter the **lp cont-boot sync <slot-number>** command at the Privileged EXEC prompt.
 - If you want to retain the IronWare images in the interface module’s code flash, enter the **lp cont-boot no-sync <slot-number>** command at the Privileged EXEC prompt.

After the management module finishes booting, do the following:

- Enter the **show module** command at any CLI level, and verify that the status of all interface modules is CARD_STATE_UP.
- Enter the **show version** command at any CLI level, and verify that all management and interface modules are running the new software image version.

If you find that an interface module is in a waiting state or is running an older software image, then you may have forgotten to enter the **lp cont-boot sync <slot-number>** command at the Privileged EXEC prompt.

Upgrading MBRIDGE FPGA on the Management Module

BigIron RX Series Management modules contain an upgradable FPGA image called MBRIDGE.

The MBRIDGE image installed must be compatible with the software version you are running on the BigIron RX Series. See the Software Release Notes for compatibility information.

Overview of Tasks in the FPGA Image Upgrade Process

To upgrade the MBRIDGE FPGA image on a BigIron RX Series Management module, you must perform the following general steps:

1. Determine the versions of the images currently installed on the BigIron RX Series Management module.
For information about performing this task, see “Determining the MBRIDGE Image Versions” on page 8-13.
2. Copy the new image from a source to a destination.
The source from which to copy the new image is usually a TFTP server to which the BigIron RX Series system has access or a flash card in the management module’s slot 1 or 2. The destination to which to copy the new image is all or one specified interface module.
For information about performing this task, see “Upgrading the MBRIDGE FPGA Image” on page 8-13.
3. Reboot the interface module upon which you upgraded the MBRIDGE images.

Determining the MBRIDGE Image Versions

To display the versions of the MBRIDGE images currently installed on the Gigabit Ethernet modules, enter the **show version** command at any level of the CLI:

```
BigIron RX-16 Switch>show version
HW: BigIron RX Switch
BI-RX-16-S Backplane (Serial #: SERI_BACK, Part #: BACK_PART_KAO)
RX-SFM3 Switch Fabric Module 1 (Serial #: Not Exist, Part #: 000)

=====
SL M2: BI-RXMR Management Module Active (Serial #: Not Exist, Part #: 31524-000A):
Boot      : Version 2.2.0T145 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 18:53:23 labeled as rmb02200
(342853 bytes) from boot flash

Monitor   : Version 2.2.0T145 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 18:53:23 labeled as rmb02200
(342853 bytes) from code flash

IronWare  : Version 2.2.0T143 Copyright (c) 1996-2003 Foundry Networks, Inc.
Compiled on Jul 18 2005 at 19:36:07 labeled as rmpr02200
(5031659 bytes) from Primary

Board ID : 00 MBRIDGE Revision : 12

913 MHz Power PC processor (version 8003/0101) 166 MHz bus
512 KB Boot Flash (AM29LV040B), 32 MB Code Flash (MT28F128J3)
512 MB DRAM

Active Management uptime is 5 hours 12 minutes 39 seconds
```

The highlighted lines in the output indicate that the management module currently has MBRIDGE Revision: 12 installed. .

Upgrading the MBRIDGE FPGA Image

To upgrade one or more MBRIDGE FPGA images on a BigIron RX Series Management module, perform the following steps:

1. Place the new MBRIDGE FPGA image on a TFTP server to which the BigIron RX Series system has access or on a PCMCIA flash card inserted in slot 1 or 2.

2. Copy the MBRIDGE FPGA image from the TFTP server or a flash card in slot 1 or 2 to all management modules or a management module in a specified chassis slot. To perform this step, enter one of the following commands at the Privileged EXEC level of the CLI (example: BigIron RX#):
 - **copy tftp mbridge** <ip-addr> <image-name> **MBRIDGE**
 - **copy slot1 | slot2 mbridge** <image-name> **MBRIDGE**
3. After the MBRIDGE upgrade is complete, the Management Module must be reloaded.
4. Verify that the MBRIDGE image(s) have been successfully copied to the specified interface module(s) by entering the following command at any level of the CLI:
 - **show version**

Check for the MBRIDGE image version numbers in the output.

Loading and Saving Configuration Files

For easy configuration management, the BigIron RX Series Switch supports both the download and upload of configuration files between the switch and a TFTP server on the network. You can also copy the startup configuration file locally between the management module's code flash and a PCMCIA flash card inserted in the management module's slot 1 or 2.

You can upload either the startup configuration file or the running configuration to the TFTP server, code flash, or a flash card for backup and use in booting the system.

- **Startup configuration file** – This file (startup-config) contains the configuration information that is currently saved in the management module's code flash. To display this file, enter the **show configuration** command at any CLI prompt.
- **Running configuration** – This active configuration is in the system RAM but not yet saved to code flash. These changes could represent a short-term requirement or general configuration change. To display this configuration, enter the **show running-config** or **write terminal** command at any CLI prompt.

Each device can have one startup configuration file and one running configuration. The startup configuration file is shared by both flash modules. The running configuration resides in DRAM.

Replacing the Startup Configuration with the Running Configuration

After you make configuration changes to the active system, you can save those changes by writing them to code flash. When you write configuration changes to code flash, you replace the startup configuration with the running configuration.

To replace the startup configuration with the running configuration, enter the following command at any Enable or CONFIG command prompt:

```
BigIron RX# write memory
```

Replacing the Running Configuration with the Startup Configuration

If you want to back out of the changes you have made to the running configuration and return to the startup configuration, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# reload
```

When the system detects differences between the running and startup configurations, it prompts you as follows:

```
Are you sure? (enter 'y' or 'n'):
```

Enter y, and press the Enter key.

Logging Changes to the Startup-Config File

You can configure a BigIron RX Series to generate a Syslog message when the startup-config file is changed. The trap is enabled by default.

The following Syslog message is generated when the startup-config file is changed:

```
startup-config was changed
```

If the startup-config file was modified by a valid user, the following Syslog message is generated:

```
startup-config was changed by <username>
```

To disable or re-enable Syslog messages when the startup-config file is changed, use the following command at the global CONFIG level of the CLI:

Syntax: [no] logging enable config-changed

Copying a Configuration File to or from a TFTP Server

To copy the startup-config or running-config file to or from a TFTP server, use one of the following methods.

NOTE: You can name the configuration file when you copy it to a TFTP server. However, when you copy a configuration file from the server to a BigIron RX Series, the file is always copied as “startup-config” or “running-config”, depending on which type of file you saved to the server.

To initiate transfers of configuration files to or from a TFTP server, enter one of the following commands at the Privileged EXEC level of the CLI:

- **copy startup-config tftp** <tftp-ip-addr> <filename> – Use this command to upload a copy of startup-config from the BigIron RX Series to a TFTP server.
- **copy running-config tftp** <tftp-ip-addr> <filename> – Use this command to upload a copy of the running configuration from the BigIron RX Series to a TFTP server.
- **copy tftp startup-config** <tftp-ip-addr> <filename> – Use this command to download a copy of the startup-config from a TFTP server to a switch.
- **copy tftp running-config** <tftp-ip-addr> <filename> [**overwrite**] – Use this command to download the running configuration from the system’s runtime memory to a TFTP server. The running configuration is then appended to the current configuration of a BigIron RX Series.

Making Local Copies of the Startup Configuration File

You can copy the startup-config file in code flash to another location in code flash or to a PCMCIA flash card inserted in a the management module’s slot 1 or 2.

For example, to make a backup copy of the startup-config file and save the backup file in code flash, enter a command such as the following at the Privileged EXEC level in the CLI:

```
BigIron RX# cp startup-config startup-config.bak
```

Syntax: cp <source-file-name> <dest-file-name>

For example, to make a backup copy of the startup-config file and save the backup file on a flash card in slot 2, enter a command such as the following at the Privileged EXEC level in the CLI:

```
BigIron RX# cp startup-config /slot2/backups/startup-config.bak
```

Syntax: cp [/<source-dir-path>]/<source-file-name> [/<dest-dir-path>]/<dest-file-name>

NOTE: These example assume that code flash has the current management focus. For information about this topic, see “*Management Focus*” on page 5-11.

Specify the <source-dir-path> parameter if the source file is in a file system that does not have current management focus. The <source-file-name> specifies the name of the file you want to copy.

Specify the <dest-dir-path> parameter if you want to copy the source file to a file system that does not have current management focus. The <dest-file-name> specifies the name of the file you copied to a new destination.

Dynamic Configuration Loading

You can load dynamic configuration commands (commands that do not require a reload to take effect) from a file on a TFTP server into the BigIron RX Series Switch's running-config. You can make configuration changes off-line, then load the changes directly into the device's running-config, without reloading the software.

Usage Considerations

- Use this feature only to load configuration information that does not require a software reload to take effect. For example, you cannot use this feature to change statically configured memory (**system-max** command).
- Do not load port configuration information for secondary ports in a trunk group. Since all ports in a trunk group use the port configuration settings of the primary port in the group, the software cannot implement the changes to the secondary port.

Preparing the Configuration File

A configuration file that you create must follow the same syntax rules as the startup-config file the device creates.

- The configuration file is a script containing CLI configuration commands. The CLI reacts to each command entered from the file in the same way the CLI reacts to the command if you enter it. For example, if the command results in an error message or a change to the CLI configuration level, the software responds by displaying the message or changing the CLI level.
- The software retains the running-config that is currently on the device, and changes the running-config only by adding new commands from the configuration file. If the running config already contains a command that is also in the configuration file you are loading, the CLI rejects the new command as a duplicate and displays an error message. For example, if the running-config already contains a command that configures ACL 1, the software rejects ACL 1 in the configuration file, and displays a message that ACL 1 is already configured.
- The file can contain global CONFIG commands or configuration commands for interfaces, routing protocols, and so on. You cannot enter User EXEC or Privileged EXEC commands.
- The default CLI configuration level in a configuration file is the global CONFIG level. Thus, the first command in the file must be a global CONFIG command or "!". The ! (exclamation point) character means "return to the global CONFIG level".

NOTE: You can enter text following "!" as a comment. However, the "!" is not a comment marker. It returns the CLI to the global configuration level.

NOTE: The CLI changes to the global CONFIG level if you load the configuration as a startup-config file instead of the running-config (using the **copy tftp startup-config** <ip-addr> <filename> command or **ncopy tftp** <ip-addr> <from-name> **startup-config** command).

NOTE: If you copy-and-paste a configuration into a management session, the CLI ignores the "!" instead of changing the CLI to the global CONFIG level. As a result, you might get different results if you copy-and-paste a configuration instead of loading the configuration using TFTP.

- Make sure you enter each command at the correct CLI level. Since some commands have identical forms at both the global CONFIG level and individual configuration levels, if the CLI's response to the configuration file results in the CLI entering a configuration level you did not intend, then you can get unexpected results.

For example, if a trunk group is active on the device, and the configuration file contains a command to disable STP on one of the secondary ports in the trunk group, the CLI rejects the commands to enter the interface configuration level for the port and moves on to the next command in the file you are loading. If the next command is a spanning-tree command whose syntax is valid at the global CONFIG level as well as the interface configuration level, then the software applies the command globally. Here is an example:

The configuration file contains these commands:

```
interface ethernet 4/2
```

```
no spanning-tree
```

The CLI responds like this:

```
BigIron RX(config)# interface ethernet 4/2
Error - cannot configure secondary ports of a trunk
BigIron RX(config)# no spanning-tree
BigIron RX(config)#
```

- If the file contains commands that must be entered in a specific order, the commands must appear in the file in the required order. For example, if you want to use the file to replace an IP address on an interface, you must first remove the old address using “no” in front of the **ip address** command, then add the new address. Otherwise, the CLI displays an error message and does not implement the command. Here is an example:

The configuration file contains these commands:

```
interface ethernet 3/1
ip address 10.10.10.1/24
```

The running-config already has a command to add an address to 3/1, so the CLI responds like this:

```
BigIron RX(config)# interface ethernet 3/1
BigIron RX(config-if-e1000-3/1)# ip add 10.10.10.69/24
Error: can only assign one primary ip address per subnet
BigIron RX(config-if-e1000-3/1)#
```

To successfully replace the address, enter commands into the file as follows:

```
interface ethernet 3/1
no ip address 10.10.10.1/24
ip address 10.10.10.69/24
```

This time, the CLI accepts the command, and no error message is displayed:

```
BigIron RX(config)# interface ethernet 3/1
BigIron RX(config-if-e1000-3/1)# no ip add 10.10.10.1/24
BigIron RX(config-if-e1000-3/1)# ip add 10.10.10.69/24
BigIron RX-if-e1000-3/1)
```

- Always use the **end** command at the end of the file. The **end** command must appear on the last line of the file, by itself.

Loading the Configuration Information into the Running-Config

You can load the configuration information from a TFTP server. To load the file from a TFTP server, use either of the following commands:

- **copy tftp running-config** <ip-addr> <filename> [**overwrite**]
- **ncopy tftp** <ip-addr> <filename> **running-config**

Using SNMP to Save and Load Configuration Information

You can use a third-party SNMP management application such as HP OpenView to save and load a BigIron RX Series Switch’s configuration. To save and load configuration information using HP OpenView, use the following procedure.

NOTE: The syntax shown in this section assumes that you have installed HP OpenView in the “/usr” directory.

1. Configure a read-write community string on the Foundry device, if one is not already configured. To configure a read-write community string, enter the following command from the global CONFIG level of the CLI:

```
snmp-server community <string> ro | rw
```

where <string> is the community string and can be up to 32 characters long.

2. On the Foundry device, enter the following command from the global CONFIG level of the CLI:

no snmp-server pw-check

This command disables password checking for SNMP set requests. If a third-party SNMP management application does not add a password to the password field when it sends SNMP set requests to a Foundry device, by default the Foundry device rejects the request.

3. From the command prompt in the UNIX shell, enter the following command:

```
/usr/OV/bin/snmpset -c <rw-community-string> <-ip-addr> 1.3.6.1.4.1.1991.1.1.2.1.5.0  
ipaddress <tftp-ip-addr> 1.3.6.1.4.1.1991.1.1.2.1.8.0 octetstringascii <config-file-name>  
1.3.6.1.4.1.1991.1.1.2.1.9.0 integer <command-integer>
```

where:

<rw-community-string> is a read-write community string configured on the Foundry device.

<fdry-ip-addr> is the Foundry device's IP address.

<tftp-ip-addr> is the TFTP server's IP address.

<config-file-name> is the configuration file name.

<command-integer> is one of the following:

20 – Upload the startup-config file from the Foundry device's code flash to the TFTP server.

21 – Download a startup-config file from a TFTP server to the Foundry device's code flash.

22 – Upload the running-config from the Foundry device's code flash to the TFTP server.

23 – Download a configuration file from a TFTP server into the Foundry device's running-config.

NOTE: Command option **23** adds configuration information to the running-config on the device, and does not replace commands. If you want to replace configuration information in the device, use "no" forms of the configuration commands to remove the configuration information, then use configuration commands to create the configuration information you want.

Erasing Image and Configuration Files

To erase software images or configuration files, use the commands described below. These commands are valid at the Privileged EXEC level of the CLI.

- **erase flash primary** erases the image stored in primary flash of the system.
- **erase flash secondary** erases the image stored in secondary flash of the system.
- **erase startup-config** erases the configuration stored in the startup configuration file; however, the running configuration remains intact until system reboot.

File Synchronization

This section provides details for synchronizing the files on the Management and Interface modules.

File Synchronization Between the Active and Standby Management Modules

Each active and standby management module contains the following files that can be synchronized between the two modules:

- Flash code – The flash code can include the following files:
 - monitor, which contains the management module's Real Time Operating System (RTOS).
 - primary, which contains the management module's primary IronWare image.
 - secondary, which contains the management module's secondary IronWare image.

(An IronWare image contains the layer 1 – 3 software run by the management module.) During startup or switchover, the active module compares the standby module's flash code to its own. If differences exist, the active module synchronizes the standby module's flash code with its own. If you update the flash code on the active module, the active module automatically synchronizes (without comparison) the standby module's flash code with its own.

- System-config file – The flash code also includes the system-config file. During startup or switchover, the active module compares the standby module's system-config file to its own. If differences exist, the active module synchronizes the standby module's system-config file with its own. When you save changes to the system-config file on the active module, the active module automatically synchronizes (without comparison) the standby module's system-config file with its own.
- Running-config – The running-config file resides in the BigIron RX Series's system memory.

The BigIron RX Series Switches allow you to do the following related to file synchronization:

- Compare files on the active module with files on the standby module and immediately synchronize any files that are different.
- Immediately synchronize all files between the active and standby modules.
- Change the default automatic synchronization interval for the running-config file.

The following sections explain how to perform these tasks.

Comparing and Synchronizing Files

You can initiate a comparison of the flash code, system-config file, and running-config file on the active management module with the same files on the standby module and synchronize the files immediately if differences exist. When you synchronize the files, the active module copies its files to the standby module, replacing the files on the standby module.

To compare and immediately synchronize files between the active and standby modules if differences exist, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# sync-standby
```

Syntax: sync-standby

Synchronizing Files Without Comparison

You can synchronize the flash code, system-config file, and running-config file immediately without comparison. When you synchronize the files, the active module copies its files to the standby module, replacing the files on the standby module.

To immediately synchronize the files between the active and standby modules, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# force-sync-standby
```

Syntax: force-sync-standby

File Synchronization Between the Management and Interface Modules

An interface module can have two IronWare images: primary and secondary. These images contain the layer 1 – 3 software that the interface modules run. These images reside in the interface module's flash memory. Either the primary or secondary image is run by the interface module from this location.

If you copy the primary and/or secondary IronWare image to all interface modules using the **copy** command with the **all** keyword, the management module makes a copy of the file and stores it in its code flash under the names lp-primary-0 or lp-secondary-0. The images are stored in this location only and are not run by the management

module or the interface modules. If you copy the primary and/or secondary IronWare image to a specified chassis slot using the **copy** command with the <chassis-slot-number> parameter, the management module does not make a copy of the file.

If the management module has a copy of the primary and/or secondary IronWare image in its code flash, by default, the BigIron RX Series system synchronizes or prompts you to synchronize the interface modules IronWare images between the management module and the interface modules during bootup. When the BigIron RX Series synchronizes the IronWare images, the management module copies the IronWare images from its code flash to the interface modules' code flash (the interface modules' default boot source).

The system allows you to manage synchronization of the IronWare images between management and interface modules in the following situations:

- You are prompted to synchronize the IronWare images during bootup.
- You want to initiate an immediate synchronization; for example, you want an immediate update of the IronWare images on one or all interface modules.
- You want to disable synchronization; for example, you have upgraded the IronWare image of one interface module but want to continue running the older image on all other interface modules.

The following section discuss how to manage the IronWare image synchronization in these situations.

Synchronizing the Interface Modules IronWare Images During Bootup

By default, the BigIron RX Series checks the IronWare images in the interface module's flash memory during boot to ensure they are the same as the IronWare images in the management module's flash memory. If an interface module does not have an IronWare image, the system automatically downloads the image from the management module's flash memory to the interface module's flash memory.

If an interface module has different IronWare images, the system prompts you to do the following:

- If you want to update the primary and secondary IronWare images in the interface module's flash memory with the images in the management module's flash memory, enter the **lp cont-boot sync <slot-number>** command at the Privileged EXEC prompt.
- If you want to retain the IronWare images in the interface module's flash memory, enter the **lp cont-boot no-sync <slot-number>** command at the Privileged EXEC prompt.

Specifying an Immediate Synchronization

You can immediately synchronize the IronWare images between the management module and one or all interface modules. For example, to immediately synchronize the IronWare images between the management module and all interface modules, enter the following command at the Privileged EXEC level:

```
BigIron RX# lp sync all
```

Syntax: lp sync all | <slot-number>

The **all** keyword indicates that the immediate synchronization applies to all interface modules in the BigIron RX Series.

The <slot-number> parameter specifies the BigIron RX Series slot number that contains the interface module to which the immediate synchronization applies. You can specify 1 – 16.

Disabling or Re-enabling an Automatic Check and Synchronization

By default, the BigIron RX Series checks the IronWare images in the interface module's flash memory during bootup to ensure it is the same as the IronWare images in the management module's flash memory. For information about what the system does if the interface module does not currently have a IronWare image or if the image is different from that of the management module, see "Synchronizing the Interface Modules IronWare Images During Bootup" on page 8-20.

To disable the automatic check and synchronization during bootup, enter the following command at the global CONFIG level:

```
BigIron RX(config)# lp disable-lp-sync-check
```

Syntax: lp disable-lp-sync-check

Provided that you save this configuration by entering the **write memory** command, the system will disable the automatic check and synchronization of the IronWare images starting with the next software reload or system reset and each reload or reset after that.

To re-enable the automatic check and synchronization of the IronWare images during bootup, enter the following command at the global CONFIG level:

```
BigIron RX(config)# no lp disable-lp-sync-check
```

Syntax: no lp disable-lp-sync-check

Scheduling a System Reload

In addition to reloading the BigIron RX Series system manually, you can configure the system to reload itself at a specific time or after a specific amount of time has passed.

NOTE: The scheduled reload feature requires the system clock. You can use a Simple Network Time Protocol (SNTP) server to set the clock or you can set the device clock manually.

Reloading at a Specific Time

To schedule a system reload for a specific time, use one of the following methods.

To schedule a system reload from the primary flash module for 6:00:00 AM, January 19, 2004, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# reload at 06:00:00 01-19-04
```

Syntax: reload at <hh:mm:ss> <mm-dd-yy> [primary | secondary]

<hh:mm:ss> is the hours, minutes, and seconds.

<mm-dd-yy> is the month, day, and year.

primary | secondary specifies whether the reload is to occur from the primary code flash module or the secondary code flash module. The default is **primary**.

Reloading after a Specific Amount of Time

To schedule a system reload to occur after a specific amount of time has passed on the system clock, use one of the following methods.

To schedule a system reload from the secondary flash one day and 12 hours later, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# reload after 01:12:00 secondary
```

Syntax: reload after <dd:hh:mm> [primary | secondary]

<dd:hh:mm> is the number of days, hours, and minutes.

primary | secondary specifies whether the reload is to occur from the primary code flash module or the secondary code flash module.

Displaying the Amount of Time Remaining Before a Scheduled Reload

To display how much time is remaining before a scheduled system reload takes place, use one of the following methods.

To display how much time is remaining before a scheduled system reload, enter the following command from any level of the CLI:

```
BigIron RX# show reload
```

Canceling a Scheduled Reload

To cancel a scheduled system reload, enter the following command at the Privileged EXEC level of the CLI:

```
BigIron RX# reload cancel
```


Diagnostic Error Codes and Remedies for TFTP Transfers

If an error occurs with a TFTP transfer to or from a BigIron RX Series Switch, one of the following error codes are displayed.

Error code	Message	Explanation and action
1	Flash read preparation failed.	A flash error occurred during the download. Retry the download. If it fails again, contact customer support
2	Flash read failed.	
3	Flash write preparation failed.	
4	Flash write failed.	
5	TFTP session timeout.	TFTP failed because of a time out. Check IP connectivity and make sure the TFTP server is running.
6	TFTP out of buffer space.	The file is larger than the amount of space on the device or TFTP server. If you are copying an image file to flash, first copy the other image to your TFTP server, then delete it from flash. (Use the erase flash... CLI command at the Privileged EXEC level to erase the image in the flash.) If you are copying a configuration file to flash, edit the file to remove unneeded information, then try again.
7	TFTP busy, only one TFTP session can be active.	Another TFTP transfer is active on another CLI session, SNMP, or Web management session. Wait, then retry the transfer.
8	File type check failed.	You accidentally attempted to copy the incorrect image code into the system. Retry the transfer using the correct image.
16	TFTP remote - general error.	The TFTP configuration has an error. The specific error message describes the error. Correct the error, then retry the transfer.
17	TFTP remote - no such file.	
18	TFTP remote - access violation.	
19	TFTP remote - disk full.	
20	TFTP remote - illegal operation.	
21	TFTP remote - unknown transfer ID.	
22	TFTP remote - file already exists.	
23	TFTP remote - no such user.	

Chapter 9

Hardware Specifications

This chapter provides the following specifications for the BigIron RX Series chassis:

- Hardware specifications
- Port specifications

Hardware Specifications

This section contains the following hardware specifications for the BigIron RX Series chassis:

- Power specifications
- Physical dimensions
- Operating environment
- Storage environment
- Safety agency approvals

Power Specifications

This section contains the power specifications for the BigIron RX Series chassis.

Table 9.1 and Table 9.2 provide the maximum power calculations for the BigIron RX Series chassis..

Table 9.1: Maximum Power Calculations @ 100 VAC

BigIron RX Series Chassis	Current Amps	Watts	BTU Per Hour
BigIron RX-4	16	1550	5,290
BigIron RX-8	27	2695	9,198
BigIron RX-16	49	4830	16,485

Table 9.2: Maximum Power Calculations @ 200 VAC

BigIron RX Series Chassis	Current Amps	Watts	BTU Per Hour
BigIron RX-4	7.8	1550	5,290
BigIron RX-8	13.5	2695	9,198
BigIron RX-16	24.2	4830	16,485

Table 9.3 lists the maximum power consumption, in watts, for BigIron RX Series modules.

Table 9.3: Wattage Consumed by Individual Components

Module	Maximum Power Consumption, in Watts
Management	30W
Switch fabric	
1 Switch Fabric Module	19W
3 Switch Fabric Modules	53W
4-port 10 Gigabit Ethernet interface with fiber-optic modules installed	191W
24-port Gigabit Ethernet Fiber Interface with fiber-optic modules installed	101W
24-port Gigabit Ethernet Copper Interface	102W
Fan Components	
BigIron RX-4 Fan Tray	66W
BigIron RX-8 Fan Tray	132W
BigIron RX-16 Front Fan Tray	202W
BigIron RX-16 Rear Fan Module (2 are required)	144W

Physical Dimensions

Table 9.4 provides the physical dimensions for the BigIron RX Series chassis.

Table 9.4: BigIron RX Series Physical Dimensions

BigIron RX Series Chassis	Height	Width	Depth	Weight
BigIron RX-4	6.96" (17.7 cm)	17.45" (44.3 cm)	20.53" (52.1 cm)	78 lbs (35 kg)

Table 9.4: BigIron RX Series Physical Dimensions

BigIron RX Series Chassis	Height	Width	Depth	Weight
BigIron RX-8	12.21" (31 cm)	17.45" (44.3 cm)	21" (53.3 cm)	131 lbs (60 kg)
BigIron RX-16	24.47" (62.2 cm)	17.2" (43.7 cm)	25" (63.5 cm)	236 lbs (107 kg)

Operating Environment

Table 9.5 provides the operating environment specifications for the BigIron RX Series chassis.

Table 9.5: BigIron RX Series Operating Environment

Operating Temperature	Relative Humidity	Operating Altitude
32° – 104° F (0° – 40° C)	5 to 90%, @ 104° F (40° C), non-condensing	0 – 10,000 ft (0 – 3048 meters)

Storage Environment

Table 9.6 provides the storage environment specifications for the BigIron RX Series chassis.

Table 9.6: BigIron RX Series Storage Environment

Storage Temperature	Storage Humidity	Storage Altitude
-13° – 158° F (-25° – 70° C)	95% maximum relative humidity, non-condensing	0 – 15,000 ft (0 – 4500 meters)

Safety Agency Approvals

- CAN/CSA-C22.2 No. 60950-1-03/UL60950-1 – Third Edition, Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products – Part 1: Equipment Classification, Requirements and User's Guide
- EN 60825-2 Safety of Laser Products – Part 2: Safety of Optical Fibre Communications Systems
- EN 60950-1:2001/IEC 60950-1 Safety of Information Technology Equipment

Electromagnetic Approvals

- FCC Class A
- EN 55022 Class A
- CISPR 22 Class A
- VCCI Class A
- ICES Emission Certification (Interference Causing Equipment Standard) - Canada

Port Specifications

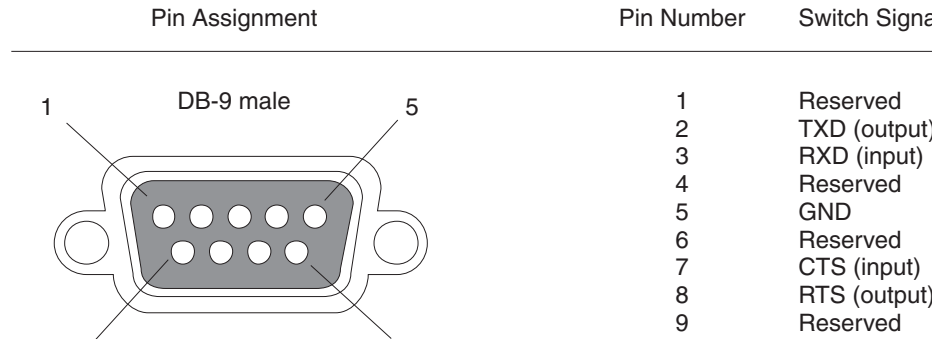
This section provides pin assignments for the following ports:

- Management module's Console port (serial connector)
- Management module's management port (RJ-45 unshielded twisted pair (UTP) connector)

Console Port Pin Assignments

The Console port is a standard male DB-9 connector, as shown in Figure 9.1. For information about how you can use this port, see “Console Port” on page 2-6.

Figure 9.1 Console Port Pin and Signalling Details

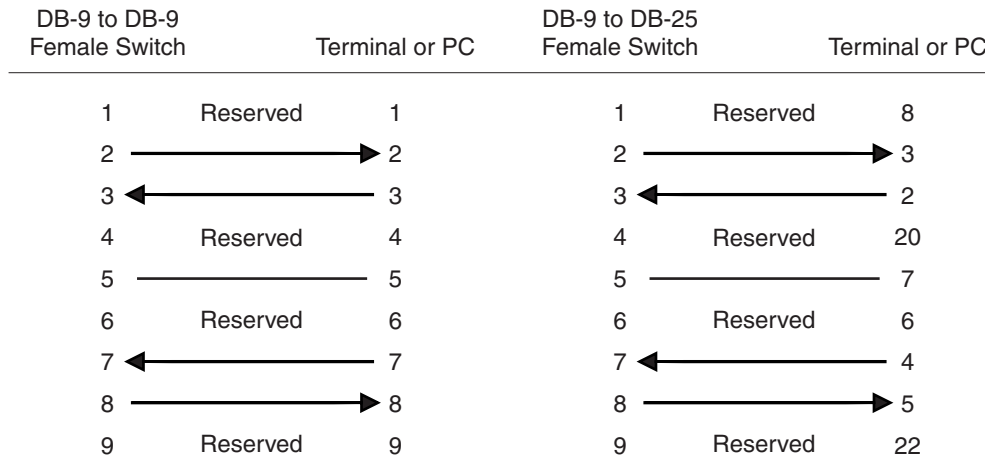


Most PC serial ports require a cable with a female DB-9 connector. However, terminal connections will vary, requiring a cable with either a DB-9 or DB-25 connector, male or female.

Serial cable options between the BigIron RX Series chassis and a PC or terminal are shown in Figure 9.2.

NOTE: As indicated in Figure 9.1 and Figure 9.2, some of the wires should not be connected. If you do connect the wires that are labeled “Reserved”, you might get unexpected results with some terminals.

Figure 9.2 Console Port Pin Assignments Showing Cable Connection Options to a Terminal or PC



Management Port Pin Assignments

The management port is an RJ-45 UTP connector. Table 9.7 describes the connector's pin assignments. For information about how you can use this port, see "10/100/1000 Ethernet Port" on page 2-6.

Table 9.7: Management Port Pin Assignments

Pin Number	MDI-X Ports
1	TD+
2	TD-
3	RD+
4	Not used (10BaseT) CMT (100BaseTX)
5	Not used (10BaseT) CMT (100BaseTX)
6	RD-
7	Not used (10BaseT) CMT (100BaseTX)
8	Not used (10BaseT) CMT (100BaseTX)

Appendix A

Regulatory Statements

U.S.A.

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

Industry Canada Statement

This Class A digital apparatus complies with Canadian ICES-003.

Europe and Australia

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

Japan

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス 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。

English Translation of above statement

This is Class A product based on the standard of the Voluntary Control Council For Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Appendix B

Cautions and Warnings

The cautions and warnings that appear in this manual are listed below in English, German, French, and Spanish.

Cautions

A caution calls your attention to a possible hazard that can damage equipment.

"Vorsicht" weist auf eine mögliche Beschädigung des Geräts hin. Sie finden die folgenden Vorsichtshinweise in diesem Handbuch.

Une mise en garde attire votre attention sur un risque possible d'endommagement de l'équipement. Ci-dessous, vous trouverez les mises en garde utilisées dans ce manuel.

Un mensaje de precaución le advierte sobre un posible peligro que pueda dañar el equipo. Las siguientes son precauciones utilizadas en este manual.

CAUTION:	All devices with DC power supplies are intended for installation in restricted access areas only. A restricted access area is where access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.
VORSICHT:	Alle Geräte mit DC-Netzteil sind nur für die Installation in Bereichen mit beschränktem Zugang gedacht. Ein Bereich mit beschränktem Zugang ist ein Bereich, zu dem nur Wartungspersonal mit Spezialwerkzeug, Schlüssel oder anderen Sicherheitsvorrichtungen Zugang hat. Dieser Zugang wird von für den Bereich zuständigen Personen überwacht.
MISE EN GARDE:	Tous les dispositifs avec bloc d'alimentation C.C. sont conçus pour l'installation dans des zones à accès réglementé uniquement. Une zone à accès réglementé est une zone dont l'accès n'est possible qu'au personnel de service utilisant un verrou, une clé ou un outil spécial, ou d'autres moyens de sécurité, et qui est contrôlée par les autorités responsables du site.
PRECAUCIÓN:	Todos los instrumentos con suministros de corriente continua han sido diseñados únicamente para instalación en áreas restringidas. Se entiende como área de acceso restringido un lugar al que solo puede acceder personal de servicio mediante el uso de una herramienta especial, llave y cerrojo u otro medio de seguridad similar, y que esté controlado por la autoridad responsable de esa ubicación.

CAUTION:	For a DC system, use a grounding wire of at least 6 American Wire Gauge (AWG). The 6 AWG wire should be attached to an agency-approved crimp connector (provided on the BigIron RX 16 chassis), crimped with the proper tool. The crimp connector should allow for
-----------------	--

securement to both ground screws on the enclosure. For the BigIron RX 8 and BigIron RX 4, use a grounding wire of at least 6 American Wire Gauge (AWG). For the ground lug use UL listed Panduit crimp connector, P/N LCD6-10A, and two 10-32, PPH, 1/2 screws to secure crimp connector to chassis. Grounding position is located on the side of the chassis adjacent to the ground symbol.

VORSICHT: Für ein Gleichstromsystem ist ein Erdungsdraht (wenigstens 10 AWG) erforderlich. Der 8 AWG-Draht sollte an einen behördlich genehmigten Crimpverbinder (an der Rückseite des BigIron RX-Gehäuses) angebracht werden, der mit einem ordnungsgemäßen Werkzeug gecrimpt wurde. Der einzelne Crimpverbinder dient der Sicherung beider Erdungsschrauben am Gehäuse.

MISE EN GARDE: Pour les systèmes C.C., utilisez un fil de mise à la terre de calibre 8 AWG (American Wire Gauge) minimum. Ce fil doit être relié à un connecteur à sertir homologué (fourni à l'arrière du châssis BigIron RX), serti avec l'outil approprié. Le connecteur à sertir unique devrait permettre le rattachement aux deux vis de borne de terre sur l'enveloppe.

PRECAUCIÓN: Para un sistema de corriente continua, utilice cable de conexión a tierra de calibre 8 AWG (Calibración de cables americana), por lo menos. El cable de AWG deberá acoplarse a un conector ondulado normalizado (que se provee en la parte posterior del chasis BigIron RX), ondulado con la herramienta apropiada. El conector ondulado simple deberá permitir fijación a los dos tornillos de conexión a tierra en el armario.

CAUTION: For the DC input circuit to the system, make sure there is a 30 amp circuit on the input to the terminal block.

VORSICHT: Für den Eingangs-Gleichstromkreis zum System ist ein 30 A-Leistungsschalter am Eingang zur Reihenklemme zu installieren.

MISE EN GARDE: Pour le circuit d'alimentation C.C. du système, assurez-vous de la présence d'un disjoncteur de 30 ampères sur l'entrée vers le bloc d'alimentation.

PRECAUCIÓN: Para el circuito de entrada de corriente continua al sistema, verifique que exista un cortacircuitos de 30 amperios en la entrada al bloque terminal.

CAUTION: Carefully follow the mechanical guides on each side of the power supply slot and make sure the power supply is properly inserted in the guides. Never insert the power supply upside down.

VORSICHT: Beachten Sie mechanischen Führungen an jeder Seite des Netzteils, das ordnungsgemäß in die Führungen gesteckt werden muss. Das Netzteil darf niemals umgedreht eingesteckt werden.

MISE EN GARDE: Suivez attentivement les repères mécaniques de chaque côté du slot du bloc d'alimentation et assurez-vous que le bloc d'alimentation est bien inséré dans les repères. N'insérez jamais le bloc d'alimentation à l'envers.

PRECAUCIÓN: Siga cuidadosamente las guías mecánicas de cada lado de la ranura del suministro de energía y verifique que el suministro de energía está insertado correctamente en las guías. No inserte nunca el suministro de energía de manera invertida.

CAUTION: Do not add or remove a flash card while a file operation involving the flash card's slot is in progress. Doing so can result in corruption of the flash card. If this occurs, you may need to reformat the flash card to make it usable again. Reformatting the card erases all data stored on the card.

VORSICHT: Eine Flash-Karte darf nur dann eingesteckt oder herausgenommen werden, wenn keine Dateifunktion läuft, die der Flash-Karte bedarf. Wenn dies nicht beachtet wird, kann dies zur Korruption der Flash-Karte führen. Die Karte kann dann erst nach Neuformatierung wieder

benutzt werden. Bei Neuformatierung gehen alle auf der Karte gespeicherten Daten verloren.

MISE EN GARDE: N'ajoutez pas ou ne supprimez pas une carte mémoire au cours d'une opération de fichier dans laquelle le slot de carte mémoire est impliqué. Vous risquez sinon de corrompre la carte mémoire. Si cela se produit, vous devrez peut-être reformater la carte mémoire pour qu'elle soit à nouveau utilisable. Le reformatage de la carte efface toutes les données qui y sont stockées.

PRECAUCIÓN: No añada ni quite una tarjeta flash mientras una operación de archivo que conlleve el uso de una ranura de tarjeta flash se encuentre en uso. De hacerlo así se podría dar lugar a la corrupción de la tarjeta flash. Si esto ocurriera, podría ser necesario que vuelva a formatear la tarjeta flash para hacer que vuelva sea utilizable. Cuando se formatea la tarjeta se borran todos los datos almacenados en la tarjeta.

CAUTION: Do not install the device in an environment where the operating ambient temperature might exceed 40o C (104o F).

VORSICHT: Das Gerät darf nicht in einer Umgebung mit einer Umgebungsbetriebstemperatur von über 40° C (104° F) installiert werden.

MISE EN GARDE: N'installez pas le dispositif dans un environnement où la température d'exploitation ambiante risque de dépasser 40° C (104° F).

PRECAUCIÓN: No instale el instrumento en un entorno en el que la temperatura ambiente de operación pueda exceder los 40oC (104oF).

CAUTION: Ensure that the device does not overload the power circuits, wiring, and over-current protection. To determine the possibility of overloading the supply circuits, add the ampere (amp) ratings of all devices installed on the same circuit as the device. Compare this total with the rating limit for the circuit. The maximum ampere ratings are usually printed on the devices near the input power connectors.

VORSICHT: Stromkreise, Verdrahtung und Überlastschutz dürfen nicht durch das Gerät überbelastet werden. Addieren Sie die Nennstromleistung (in Ampere) aller Geräte, die am selben Stromkreis wie das Gerät installiert sind. Somit können Sie feststellen, ob die Gefahr einer Überbelastung der Versorgungsstromkreise vorliegt. Vergleichen Sie diese Summe mit der Nennstromgrenze des Stromkreises. Die Höchstnennströme (in Ampere) stehen normalerweise auf der Geräterückseite neben den Eingangstromanschlüssen.

MISE EN GARDE: Assurez-vous que le dispositif ne risque pas de surcharger les circuits d'alimentation, le câblage et la protection de surintensité. Pour déterminer le risque de surcharge des circuits d'alimentation, additionnez l'intensité nominale (ampères) de tous les dispositifs installés sur le même circuit que le dispositif en question. Comparez alors ce total avec la limite de charge du circuit. L'intensité nominale maximum en ampères est généralement imprimée sur chaque dispositif près des connecteurs d'entrée d'alimentation.

PRECAUCIÓN: Verifique que el instrumento no sobrecargue los circuitos de corriente, el cableado y la protección para sobrecargas. Para determinar la posibilidad de sobrecarga en los circuitos de suministros, añada las capacidades nominales de corriente (amp) de todos los instrumentos instalados en el mismo circuito que el instrumento. Compare esta suma con el límite nominal para el circuito. Las capacidades nominales de corriente máximas están generalmente impresas en los instrumentos, cerca de los conectores de corriente de entrada.

- CAUTION:** Make sure the air flow around the front, sides, and back of the device is not restricted.
- VORSICHT:** Stellen Sie sicher, dass an der Vorderseite, den Seiten und an der Rückseite der Luftstrom nicht behindert wird.
- MISE EN GARDE:** Vérifiez que rien ne restreint la circulation d'air devant, derrière et sur les côtés du dispositif et qu'elle peut se faire librement.
- PRECAUCIÓN:** Asegúrese de que el flujo de aire en las inmediaciones de las partes anterior, laterales y posterior del instrumento no esté restringido.
-

- CAUTION:** Make sure the flash card is empty or does not contain files you want to keep. Formatting a flash card completely erases all files on the card.
- VORSICHT:** Stellen Sie sicher, dass die Flash-Karte leer ist oder keine Dateien auf ihr gespeichert sind, die Sie behalten möchten. Die Formatierung einer Flash-Karte löscht alle Dateien auf der Karte.
- MISE EN GARDE:** Vérifiez que la carte mémoire est vide ou ne contient pas de fichiers que vous voulez conserver. Le reformatage de la carte mémoire efface tous les fichiers qui s'y trouvent.
- PRECAUCIÓN:** Verifique que la tarjeta flash esté vacía o que no contenga archivos que desee conservar. Al formatear una tarjeta flash todos los archivos de ésta se borran.
-

- CAUTION:** Never leave tools inside the chassis.
- VORSICHT:** Lassen Sie keine Werkzeuge im Chassis zurück.
- MISE EN GARDE:** Ne laissez jamais d'outils à l'intérieur du châssis.
- PRECAUCIÓN:** No deje nunca herramientas en el interior del chasis.
-

- CAUTION:** Once you start the formatting process, you cannot stop it. Even if you enter CTRL-C to stop the CLI output and a new prompt appears, the formatting continues. Make sure you want to format the card before you enter the command.
- VORSICHT:** Wenn Sie mit dem Formattieren beginnen, können Sie diesen Prozess nicht anhalten. Selbst wenn zum Anhalten der CLI-Ausgabe Strg-C drücken und eine neue Aufforderung gezeitigt wird, wird mit dem Formattieren fortgefahren. Stellen Sie sicher, dass Sie die Karte formattieren wollen, bevor Sie den Befehl eingeben.
- MISE EN GARDE:** Une fois le processus de formatage commencé, vous ne pouvez pas l'interrompre. Même si vous appuyez sur CTRL-C pour arrêter la sortie CLI et si une nouvelle invite apparaît, le formatage continue. Soyez bien sûr de vouloir formater la carte avant d'entrer la commande.
- PRECAUCIÓN:** Una vez que empieza con el proceso de formateado, no se puede detener. Incluso si pulsa CTRL-C para detener la salida de CLI y aparece un nuevo indicador, el formateado continuará. Está seguro que desea formatear la tarjeta antes de introducir el comando.
-

- CAUTION:** Use the erase startup-config command only for new systems. If you enter this command on a system you have already configured, the command erases the configuration. If you accidentally do erase the configuration on a configured system, enter the write memory command to save the running configuration to the startup-config file.
- VORSICHT:** Verwenden Sie den Befehl "Erase startup-config" (Löschen Startup-Konfig) nur für neue Systeme. Wenn Sie diesen Befehl in ein bereits konfiguriertes System eingeben, löscht der Befehl die Konfiguration. Falls Sie aus Versehen die Konfiguration eines bereits konfigurierten
-

Systems löschen, geben Sie den Befehl "Write Memory" (Speicher schreiben) ein, um die laufende Konfiguration in der Startup-Konfig-Datei zu speichern.

MISE EN GARDE: N'utilisez la commande erase startup-config que pour les nouveaux systèmes. Si vous entrez cette commande sur un système que vous avez déjà configuré, elle efface la configuration. Si vous effacez la configuration par accident sur un système configuré, entrez la commande write memory pour enregistrer la configuration actuelle dans le fichier startup-config.

PRECAUCIÓN: Use el comando erase startup-config (borrar configuración de inicio) para sistemas nuevos solamente. Si usted introduce este comando en un sistema que ya ha configurado, el comando borrará la configuración. Si usted borra accidentalmente la configuración en un sistema ya configurado, introduzca el comando write memory (escribir memoria) para guardar la configuración en ejecución en el archivo startup-config.

CAUTION: Do not remove the switch fabric module while the BigIron RX Series chassis is powered on and running. If you attempt to remove this module while the chassis is powered on and running, all traffic being handled by the system will stop.

VORSICHT: Wenn das BigIron RX-Gehäuse eingeschaltet ist und sich im Betrieb befindet, darf die Rückwand-Schaltmodul aus Hartgewebe nicht entfernt werden. Wenn dieses Modul bei eingeschaltetem und laufendem Gehäuse entfernt wird, kommt der gesamte, vom System gehandhabte Verkehr zum Stillstand.

MISE EN GARDE: Ne retirez pas le module d'interrupteur de la face arrière lorsque le châssis BigIron RX est allumé et en cours de fonctionnement. Si vous essayer de retirer ce module lorsque le châssis est allumé et en cours de fonctionnement, tout le trafic traité par le système sera interrompu.

PRECAUCIÓN: No desmonte el módulo de conmutación de la tarjeta base mientras el chasis del BigIron RX esté activado y en funcionamiento. Si trata de desmontarlo mientras el chasis está activado y en funcionamiento, todo el tráfico que esté manejando el sistema se detendrá.

CAUTION: To avoid overheating of the BigIron RX chassis, remove only one fan tray at a time. Do not remove both fan trays from the chassis at one time.

VORSICHT: Es darf nur ein Ventilatorblech zur Zeit entfernt werden, um ein Überhitzen des BigIron RX-Gehäuses zu vermeiden. Es dürfen nicht beide Ventilatorbleche auf einmal entfernt werden.

MISE EN GARDE: Pour éviter la surchauffe du châssis BigIron RX, n'enlevez qu'un seul boîtier de ventilateur à la fois. N'enlevez pas les deux boîtiers du châssis en même temps.

PRECAUCIÓN: Para evitar el sobrecalentamiento del chasis BigIron RX, desmonte solamente una bandeja de ventilador a la vez. No retire las dos bandejas de ventilador del chasis a la vez.

CAUTION: Foundry recommends using a separate branch circuit for each AC power cord, which provides redundancy in case one of the circuits fails.

VORSICHT: Foundry empfiehlt die Installation eines separaten Stromkreisweiges für jede Wechselstrom-Elektroschnur als Redundanz im Fall des Ausfalls eines Stromkreises.

MISE EN GARDE: Foundry conseille l'utilisation d'un circuit de dérivation différent pour chaque cordon d'alimentation C.A. Ainsi, il y aura un circuit redondant en cas de panne d'un des circuits.

PRECAUCIÓN: Foundry recomienda usar un circuito derivado por separado para cada cable de corriente continua, que proporciona redundancia en caso de fallas en los circuitos.

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- CAUTION:** If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.
- VORSICHT:** Falls kein Modul im Steckplatz installiert wird, muss die Steckplatztafel angebracht werden. Wenn ein Steckplatz nicht abgedeckt wird, läuft das System heiß.
- MISE EN GARDE:** Si vous n'installez pas de module dans un slot, vous devez laisser le panneau du slot en place. Si vous faites fonctionner le châssis avec un slot découvert, le système surchauffera.
- PRECAUCIÓN:** Si no instala un módulo en la ranura, deberá mantener el panel de ranuras en su lugar. Si pone en funcionamiento el chasis con una ranura descubierta, el sistema sufrirá sobrecalentamiento.
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Warnings

A warning calls your attention to a possible hazard that can cause injury or death. The following are the warnings used in this manual.

"Achtung" weist auf eine mögliche Gefährdung hin, die zu Verletzungen oder Tod führen können. Sie finden die folgenden Warnhinweise in diesem Handbuch:

Un avertissement attire votre attention sur un risque possible de blessure ou de décès. Ci-dessous, vous trouverez les avertissements utilisés dans ce manuel.

Una advertencia le llama la atención sobre cualquier posible peligro que pueda ocasionar daños personales o la muerte. A continuación se dan las advertencias utilizadas en este manual.

WARNING:	The procedures in this manual are for qualified service personnel.
ACHTUNG:	Die Verfahren in diesem Handbuch sind nur für qualifiziertes Wartungspersonal gedacht.
AVERTISSEMENT:	Les procédures décrites dans ce manuel doivent être effectuées par le personnel de service qualifié uniquement.
ADVERTENCIA:	Los procedimientos de este manual se han hecho para personal de servicio cualificado.

WARNING:	Before beginning the installation, see the precautions in "Power Precautions" on page 3-4.
ACHTUNG:	Vor der Installation siehe Vorsichtsmaßnahmen unter " Power Precautions " (Vorsichtsmaßnahmen in Bezug auf elektrische Ablagen) auf den Seiten 3 - 4.
AVERTISSEMENT:	Avant de commencer l'installation, consultez les précautions décrites dans " Power Precautions " (Précautions quant à l'alimentation), pages 3-4.
ADVERTENCIA:	Antes de comenzar la instalación, consulte las precauciones en la sección " Power Precautions " (Precauciones sobre corriente) que se encuentra en las páginas 3-4.

WARNING:	Disconnect the power cord from all power sources to completely remove power from the device.
ACHTUNG:	Ziehen Sie das Stromkabel aus allen Stromquellen, um sicherzustellen, dass dem Gerät kein Strom zugeführt wird.
AVERTISSEMENT:	Débranchez le cordon d'alimentation de toutes les sources d'alimentation pour couper complètement l'alimentation du dispositif.
ADVERTENCIA:	Para desconectar completamente la corriente del instrumento, desconecte el cordón de corriente de todas las fuentes de corriente.

WARNING:	If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.
ACHTUNG:	Falls für die Installation ein anderes Stromkabel erforderlich ist (wenn das mit dem Gerät gelieferte Kabel nicht passt), müssen Sie sicherstellen, dass Sie ein Stromkabel mit dem Siegel einer Sicherheitsbehörde verwenden, die für die Zertifizierung von Stromkabeln in Ihrem Land zuständig ist. Das Siegel ist Ihre Garantie, dass das Stromkabel sicher mit Ihrem Gerät verwendet werden kann.
AVERTISSEMENT:	Si l'installation nécessite un cordon d'alimentation autre que celui fourni avec le dispositif, assurez-vous d'utiliser un cordon d'alimentation portant la marque de l'organisation responsable de la sécurité qui définit les normes et réglementations pour les cordons d'alimentation dans votre pays. Cette marque vous assure que vous pouvez utiliser le cordon d'alimentation avec le dispositif en toute sécurité.

ADVERTENCIA: Si la instalación requiere un cordón de corriente distinto al que se ha suministrado con el instrumento, verifique que usa un cordón de corriente que venga con la marca de la agencia de seguridad que defina las regulaciones para cordones de corriente en su país. Esta marca será su garantía de que el cordón de corriente puede ser utilizado con seguridad con el instrumento.

WARNING: Make sure that the power source circuits are properly grounded, then use the power cord supplied with the device to connect it to the power source.

ACHTUNG: Stellen Sie sicher, dass die Stromkreise ordnungsgemäß geerdet sind. Benutzen Sie dann das mit dem Gerät gelieferte Stromkabel, um es an die Stromquelle anzuschließen.

AVERTISSEMENT: Vérifiez que les circuits de sources d'alimentation sont bien mis à la terre, puis utilisez le cordon d'alimentation fourni avec le dispositif pour le connecter à la source d'alimentation.

ADVERTENCIA: Verifique que circuitos de la fuente de corriente están conectados a tierra correctamente; luego use el cordón de potencia suministrado con el instrumento para conectarlo a la fuente de corriente.

WARNING: Make sure the rack or cabinet housing the device is adequately secured to prevent it from becoming unstable or falling over.

ACHTUNG: Stellen Sie sicher, dass das Gestell oder der Schrank für die Unterbringung des Geräts auf angemessene Weise gesichert ist, so dass das Gestell oder der Schrank nicht wackeln oder umfallen kann.

AVERTISSEMENT: Vérifiez que le bâti ou le support abritant le dispositif est bien fixé afin qu'il ne devienne pas instable ou qu'il ne risque pas de tomber.

ADVERTENCIA: Verifique que el bastidor o armario que alberga el instrumento está asegurado correctamente para evitar que pueda hacerse inestable o que caiga.

WARNING: Mount the devices you install in a rack or cabinet as low as possible. Place the heaviest device at the bottom and progressively place lighter devices above.

ACHTUNG: Montieren Sie die Geräte im Gestell oder Schrank so tief wie möglich. Platzieren Sie das schwerste Gerät ganz unten, während leichtere Geräte je nach Gewicht (je schwerer desto tiefer) darüber untergebracht werden.

AVERTISSEMENT: Montez les dispositifs que vous installez dans un bâti ou support aussi bas que possible. Placez le dispositif le plus lourd en bas et le plus léger en haut, en plaçant tous les dispositifs progressivement de bas en haut du plus lourd au plus léger.

ADVERTENCIA: Monte los instrumentos que instale en un bastidor o armario lo más bajos posible. Ponga el instrumento más pesado en la parte inferior y los instrumentos progresivamente más livianos más arriba.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

ACHTUNG: Aus Sicherheitsgründen sollte ein EGB-Armband zum Schutz von elektronischen gefährdeten Bauelementen mit einem 1 Megaohm-Reihenwiderstand ausgestattet sein.

AVERTISSEMENT: Pour des raisons de sécurité, la dragonne ESD doit contenir une résistance de série 1 méga ohm.

ADVERTENCIA: Por razones de seguridad, la correa de muñeca ESD deberá contener un resistor en serie de 1 mega ohmio.

- WARNING:** The AC power supplies are hot swappable, which means they can be removed and replaced while the BigIron RX chassis is powered on and running. However, Foundry recommends that you disconnect the AC power supply from wall outlet before removing and replacing the supply. The BigIron RX chassis can be running while a power supply is being removed and replaced, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the AC power supply or other parts of the device could be damaged.
- ACHTUNG:** Die Wechselstrom-Netzteile können während des Betriebs des BigIron RX-Gehäuse abgenommen und ausgetauscht werden. Allerdings empfiehlt Foundry, den Stecker des Wechselstrom-Netzteils aus der Steckdose zu ziehen, bevor das Netzteil abgenommen und ausgetauscht wird. Ein Netzteil kann während des Betriebs des BigIron RX-Gehäuses abgenommen und ausgetauscht werden. Allerdings sollte das Netzteil nicht an eine Stromquelle angeschlossen sein. Bei Nichtbeachtung könnte dies zu Verletzungen des Bedieners oder Beschädigung des Wechselstrom-Netzteils oder anderer Geräteteile führen.
- AVERTISSEMENT:** Les blocs d'alimentation C.A. peuvent être changés à chaud, ce qui signifie qu'ils peuvent être enlevés et remplacés pendant que le châssis BigIron RX est allumé et en cours de fonctionnement. Cependant, Foundry vous conseille de débrancher le bloc d'alimentation C.A. de l'alimentation avant d'enlever ou de remplacer le bloc d'alimentation. Le châssis BigIron RX peut être en cours de fonctionnement pendant que vous enlevez et remplacez un bloc d'alimentation, mais le bloc d'alimentation lui-même ne doit pas être connecté à une source d'alimentation. Sinon, vous risquez d'être blessé ou le bloc d'alimentation ou d'autres pièces du dispositif risquent d'être endommagés.
- ADVERTENCIA:** Los suministros de corriente alterna pueden desmontarse y reemplazarse cuando el chasis del BigIron RX está activado y en funcionamiento. No obstante, Foundry recomienda que se desconecte el suministro de corriente alterna del tomacorriente antes de desmontar y reemplazar el suministro. El chasis del BigIron RX puede estar en funcionamiento cuando un suministro de corriente esté siendo desmontado y reemplazado, pero el suministro de corriente en sí no deberá estar conectado a la corriente. De lo contrario, podría sufrir daños personales o el suministro de corriente alterna u otras partes del dispositivo podrían sufrir desperfectos.

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- WARNING:** All fiber-optic interfaces use Class 1 Lasers.
- ACHTUNG:** Alle Glasfaser-Schnittstellen verwenden Laser der Klasse 1.
- AVERTISSEMENT:** Toutes les interfaces en fibres optiques utilisent des lasers de classe 1.
- ADVERTENCIA:** Todas las interfaces de fibra óptica utilizan láser de clase 1.

-
- WARNING:** The front panel of a power supply includes a handle that locks the power supply in the chassis. This handle is a locking mechanism only and should not be used to lift and carry the power supply. You may sustain physical injury or harm if you attempt to lift and carry a power supply using the locking handle.
- ACHTUNG:** Die Vorderabdeckung eines Wechselstrom-Netzteils verfügt über einen Griff, mit dem das Netzteil im Gehäuse verriegelt werden kann. Dieser Griff dient nur der Verriegelung. Mit ihm sollte das Netzteil weder angehoben noch getragen werden. Anheben und Tragen eines Netzteils mit dem Verriegelungsgriff kann zu Verletzungen führen.
- AVERTISSEMENT:** Le panneau avant d'un bloc d'alimentation C.A. comprend une poignée qui permet de verrouiller le bloc d'alimentation dans le châssis. Cette poignée est un mécanisme de verrouillage uniquement, elle ne doit pas être utilisée pour soulever et transporter le châssis. Vous risquez d'être blessé si vous essayez de soulever et de transporter un bloc d'alimentation avec la poignée de verrouillage.

ADVERTENCIA: El panel delantero de un suministro de corriente alterna incluye un mango que bloquea el suministro de corriente al chasis. El mango es un mecanismo de bloqueo solamente y no deberá usarse para alzar ni transportar el suministro de corriente. De hacerlo así, podría sufrir daños personales.

WARNING: A fully populated chassis is heavy. TWO OR MORE PEOPLE ARE REQUIRED WHEN LIFTING, HANDLING, OR MOUNTING THESE DEVICES.

ACHTUNG: Ein voll bestücktes Gehäuse ist schwer. ZUM ANHEBEN, HANDHABEN ODER MONTIEREN DIESER GERÄTE SIND MINDESTENS ZWEI PERSONEN ERFORDERLICH.

AVERTISSEMENT: Les châssis sont lourds quand ils sont entièrement remplis. POUR SOULEVER, MANIPULER OU MONTER CES DISPOSITIFS, DEUX PERSONNES MINIMUM SONT NÉCESSAIRES.

ADVERTENCIA: Un chasis muy concurrido es muy pesado. SE REQUIEREN DOS O MÁS PERSONAS CUANDO SE VAYA A ALZAR, MANEJAR O MONTAR ESTE DISPOSITIVO.

WARNING: Make sure to choose the appropriate circuit device depending on the number of AC power supplies installed in the chassis. The maximum current draw is three AC power supplies.

ACHTUNG: Je nach Anzahl der Wechselstrom-Netzteile im Gehäuse muss das passende Stromgerät ausgewählt werden. Es sollte nicht mehr als der von drei Wechselstrom-Netzteilen bereitgestellte Strom entnommen werden.

AVERTISSEMENT: Assurez-vous de choisir le dispositif de circuit approprié selon le nombre de blocs d'alimentation C.A. installés dans le châssis. L'appel de courant maximum est de trois blocs d'alimentation C.A.

ADVERTENCIA: Asegúrese de que elige el dispositivo de circuitos apropiado dependiendo del número de suministros de corriente alterna instalados en el chasis. La llamada de corriente máxima es de tres suministros de corriente alterna.

WARNING: Be careful not to accidentally insert your fingers into the fan tray while removing it from the chassis. The fan may still be spinning at a high speed.

ACHTUNG: Die Finger dürfen nicht versehentlich in das Ventilatorblech gesteckt werden, wenn dieses vom Gehäuse abgenommen wird. Der Ventilator kann sich unter Umständen noch mit hoher Geschwindigkeit drehen.

AVERTISSEMENT: Faites attention de ne pas accidentellement insérer vos doigts dans le boîtier du ventilateur lorsque vous l'enlevez du châssis. Il est possible que le ventilateur tourne encore à grande vitesse.

ADVERTENCIA: Procure no insertar los dedos accidentalmente en la bandeja del ventilador cuando esté desmontando el chasis. El ventilador podría estar girando a gran velocidad.

Appendix C

Software Specifications

This appendix lists the following information for the BigIron RX Series Switch:

- IEEE compliance
- RFC support
- Internet draft support

IEEE Compliance

The BigIron RX Series Switch supports the following standards:

- 802.1d Bridging
- 802.1q VLAN Tagging
- 802.1w Rapid Spanning Tree (RSTP)
- 802.1x User Authentication
- 802.3, 10BaseT
- 802.3ad Link Aggregation
- 802.3ae 10000BaseX
- 802.3u, 100BaseTX, 100BaseFX
- 802.3z 1000BaseSX, 1000BaseLX
- 802.3x Flow Control

RFC Support

The following sections list the RFCs supported by the BigIron RX Series Switch.

General Protocols

- 791 – Internet Protocol (IP)
- 792 – Internet Control Message Protocol (ICMP)
- 793 – Transmission Control Protocol (TCP)
- 783 – Trivial File Transfer Protocol (TFTP)

- 768 – User Datagram Protocol (UDP)
- 826 – Ethernet Address Resolution Protocol (ARP)
- 854, 855, and 857 – TELNET
- 894 – IP over Ethernet
- 903 – RARP
- 906 – Bootstrap loading using TFTP
- 919 – Broadcast Internet datagrams
- 920 – Domain requirements
- 922 – Broadcast Internet datagrams in the presence of subnets
- 950 – Internet standard subnetting procedure
- 951 – Bootstrap Protocol (BootP)
- 1027 – Proxy ARP
- 1042 – IP datagrams over IEEE 802 networks (for Ethernet)
- 1122 and 1123 – Requirements for Internet Hosts (routers)
- 1141 – Incremental updating of the Internet checksum
- 1256 – ICMP Router Discovery Protocol (IRDP)
- 1267 – Border Gateway Protocol version 3
- 1321 – The MD5 Message-Digest Algorithm
- 1340 – Assigned numbers (where applicable)
- 1377 – The PPP OSI Network Layer Control Protocol (OSINLCP)
- 1519 – Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy
- 1541 and 1542 – Dynamic Host Configuration Protocol (DHCP)
- 1591 – Domain Name System Structure and Delegation
- 1812 – Requirements for IP version 4 routers
- 2131 – Dynamic Host Configuration Protocol (BootP/DHCP Helper)
- 2338 – Virtual Routing Redundancy Protocol (VRRP)

BGP

- 1269 – Definitions of Managed Objects for the Border Gateway Protocol: Version 3
- 1745 – OSPF interactions
- 1771 – Border Gateway Protocol version 4 (BGPv4)
- 1997 – BGP Communities Attributes
- 2283 – Multiprotocol Extensions for BGP-4
- 2385 – TCP MD5 Signature Option (for BGP4)
- 2439 – BGP Route Flap Dampening
- 2796 – BGP Route Reflection
- 2842 – BGP Capability Advertisement
- 2918 – Route Refresh Capability for BGP4
- 3065 – BGP Confederations

OSPF

- 1583 – Open Shortest Path First (OSPF)
- 1587 – OSPF Not-So-Stubby Areas (NSSAs)
- 1745 – OSPF Interactions
- 1765 – OSPF Database Overflow
- 1850 – Open Shortest Path First (OSPF) version2 MIB
- 2154 – OSPF with Digital Signatures (Password, MD-5)
- 2178 – Open shortest Path First (OSPF)
- 2328 – Open Shortest Path First (OSPF) version 2
- 2370 – OSPF Opaque LSA Option

RIP

- 1058 – Routing Information Protocol (RIP) version 1
- 1723 – RIP version 2
- 1812 – Requirements for IP version 4 routers

IP Multicast

- 1075 – Distance Vector Multicast Routing Protocol
- 1112 – Internet Gateway Management Protocol (IGMP)
- 2236 – Internet Group Management Protocol (IGMP) version 2
- 2362 – IP Multicast PIM Sparse
- 2336 – IGMP v2

Management

- 1155 – Structure and Identification of Management Information (SMI)
- 1157 – Simple Network Management Protocol (SNMP) version 1
- 1212 – Concise MIB Definitions
- 1215 – SNMP generic traps
- 1398 – Ethernet-Like MIB
- 1492 – An Access Control Protocol, Sometimes Called TACACS
- 1493 – Bridge MIB (excluding filtering of objects)
- 1657 – Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2
- 1724 – RIP Version 2 MIB Extension
- 1757 – Remote Monitoring (RMON) Groups 1,2,3,9
- 1850 – OSPF Version 2 Management Information Base
- 1905 – Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)
- 1906 – Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)
- 1966 – BGP Route Reflection
- 2011 – SNMPv2 Management Information Base for the Internet Protocol using SMIv2

- 2012 – SNMPv2 Management Information Base for the Transmission Control Protocol using SMIv2
- 2013 – SNMPv2 Management Information Base for the User Datagram Protocol using SMIv2
- 2030 – Simple Network Time Protocol (SNTP)
- 2068 – HTTP
- 2096 – IP Forwarding MIB
- 2138 – Remote Authentication Dial In User Server (RADIUS)
- 2139 – RADIUS Accounting
- 2233 – The Interfaces Group MIB using SMIv2
- 2529 – Transmission of IPv6 over IPv4 Domains without Explicit Tunnels
- 2570 – Introduction to Version 3 of the Internet-standard Network Management Framework
- 2571 – An Architecture of Describing SNMP Management Frameworks
- 2572 – Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- 2574 – User-based Security (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
- 2575 – View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)
- 2578 – Structure of Management Information Version 2 (SMIv2)
- 2580 – Conformance Statements for SMIv2
- 2665 – Ethernet Like MIB (incorporates RFC 1398)
- 2674– Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions
- 2787 – Definitions of Managed Objects for the Virtual Router Redundancy Protocol
- 2869 – RADIUS Extensions
- 2932 – IPv4 Multicast Routing MIB
- 2933 – Internet Group Management Protocol MIB
- 2934 – Protocol Independent Multicast MIB for IPv4
- 3176 – InMon Corporation's sFlow: A Method for Monitoring Traffic in Switched and Routed Networks
- 3411 – Simple Network Management Protocol (SNMP) Management Frameworks
- 3412 – Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
- 3414 – User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
- 3415 – View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)
- 3418 – Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)

Internet Drafts

In addition to the RFCs listed in “RFC Support” on page C-1, the BigIron RX Series Switch supports the following Internet drafts:

- ietf-idmr-dvmp version 3.05, obsoletes RFC 1075
- draft-ietf-pim-dm-05 (V1)
- draft-ietf-pim-v2-dm-03 (V2)
- The TACACS+ Protocol version 1.78