**JUNOS® Software with Enhanced Services**

# Hardware Guide for J-series Services Routers

*Release 9.2*

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# Abbreviated Table of Contents

# Table of Contents

## Part 2 Installing a Services Router

## Part 4 J-series Requirements and Specifications

## Part 5 Index

# About This Guide

This preface provides the following guidelines for using the *JUNOS Software with Enhanced Services Hardware Guide*:



## Objectives

This guide contains an overview, basic instructions, and specifications for J2320, J2350, J4350, and J6350 Services Routers running JUNOS software with enhanced services. It explains how to prepare your site for installation, unpack and install J-series Services Router and its components, power on the router, and establish basic connectivity.

**NOTE:** This manual documents Release 9.2 of JUNOS software. For additional information—either corrections to or information that might have been omitted from this manual—see the *JUNOS Software with Enhanced Services Release Notes* or *JUNOS Software for SRX-series Services Gateways Release Notes* at http://www.juniper.net.

## Audience

This manual is designed for anyone who installs, sets up, configures, monitors, or administers a J-series Services Router running JUNOS software with enhanced services or an SRX-series services gateway running JUNOS software. The manual is intended for the following audiences:

- Customers with technical knowledge of and experience with networks and network security, the Internet, and Internet routing protocols
- Network administrators who install, configure, and manage Internet routers

Personnel operating the equipment must be trained and competent; must not conduct themselves in a careless, willfully negligent, or hostile manner; and must abide by the instructions provided by the documentation.

## Supported Routing Platforms

This manual describes features supported on J-series Services Routers running JUNOS software with enhanced services and SRX-series services gateways running JUNOS software.

## How to Use This Manual

This manual and the other manuals in this set explain how to install, configure, and manage:

- JUNOS software with enhanced services for J-series Services Routers
- JUNOS software for SRX-series services gateways

Table 1 on page xvi identifies the tasks required to configure and manage these devices and shows where to find task information and instructions.

For an annotated list of the documentation referred to in Table 1 on page xvi, see "JUNOS Software Documentation for J-series Services Routers and SRX-series Services Gateways" on page xx. All documents are available at http://www.juniper.net/techpubs/.

**Table 1: Tasks and Related Documentation**

| Task | Related Documentation |
|---|---|
| **Basic Device Installation and Setup** | |
| ■ Reviewing safety warnings and compliance statements<br>■ Installing hardware and establishing basic connectivity<br>■ Initially setting up a device | J-series Services Routers:<br>■ *JUNOS Software with Enhanced Services Quick Start*<br>■ *JUNOS Software with Enhanced Services Hardware Guide*<br>■ *JUNOS Software with Enhanced Services Release Notes*<br><br>SRX-series services gateways: the appropriate *Services Gateway Getting Started Guide* |
| **Migration from ScreenOS or JUNOS Software to JUNOS Software with Enhanced Services (if necessary)** | |
| ■ Migrating from JUNOS Release 8.3 or later to JUNOS software with enhanced services<br>■ Migrating from ScreenOS Release 5.4 or later JUNOS software with enhanced services | *JUNOS Software with Enhanced Services Migration Guide* (J-series Services Routers only) |
| **Context—Changing to Secure Context or Router Context** | |
| Changing the device from one context to another and understanding the factory default settings | *JUNOS Software Administration Guide* |
| **Interface Configuration** | |

**Table 1: Tasks and Related Documentation** *(continued)*

| Task | Related Documentation |
|---|---|
| Configuring device interfaces | ■ *JUNOS Software Interfaces and Routing Configuration Guide*<br>■ *JUNOS Software CLI Reference* |
| **Deployment Planning and Configuration** | |
| ■ Understanding and gathering information required to design network firewalls and IPsec VPNs<br>■ Implementing a JUNOS software with enhanced services firewall from a sample scenario<br>■ Implementing a policy-based IPsec VPN from a sample scenario | *JUNOS Software with Enhanced Services Design and Implementation Guide* (J-series Services Routers only) |
| **Security Configuration** | |
| Configuring and managing the following security services:<br>■ Stateful firewall policies<br>■ Zones and their interfaces and address books<br>■ IPsec VPNs<br>■ Firewall screens<br>■ Interface modes: Network Address Translation (NAT) mode and Router mode<br>■ Public Key Cryptography (PKI)<br>■ Application Layer Gateways (ALGs)<br>■ Chassis clusters<br>■ Intrusion Detection and Prevention (IDP) | ■ *JUNOS Software Security Configuration Guide*<br>■ *JUNOS Software CLI Reference* |
| **Routing Protocols and Services Configuration** | |
| ■ Configuring routing protocols, including static routes and the dynamic routing protocols RIP, OSPF, BGP, and IS-IS<br>■ Configuring class-of-service (CoS) features, including traffic shaping and policing<br>■ Configuring packet-based stateless firewall filters (access control lists) to control access and limit traffic rates<br>■ Configuring MPLS to control network traffic patterns | ■ *JUNOS Software Interfaces and Routing Configuration Guide*<br>■ *JUNOS Software CLI Reference* |
| **WAN Acceleration Module Installation (Optional)** | |
| Installing and initially configuring a WXC Integrated Services Module (ISM 200) | *WXC Integrated Services Module Installation and Configuration Guide* (J-series Services Routers only) |
| **User and System Administration** | |

**Table 1: Tasks and Related Documentation** *(continued)*

| Task | Related Documentation |
|---|---|
| ■ Administering user authentication and access<br>■ Monitoring the device, routing protocols, and routing operations<br>■ Configuring and monitoring system alarms and events, real-time performance (RPM) probes, and performance<br>■ Monitoring the firewall and other security-related services<br>■ Managing system log files<br>■ Upgrading software<br>■ Diagnosing common problems | *JUNOS Software Administration Guide* |
| **User Interfaces** | |
| ■ Understanding and using the J-Web interface<br>■ Understanding and using the CLI configuration editor | ■ *JUNOS Software with Enhanced Services Quick Start* (J-series Services Routers only)<br>■ *JUNOS Software Administration Guide* |

## Document Conventions

Table 2 on page xviii defines the notice icons used in this guide.

**Table 2: Notice Icons**

| Icon | Meaning | Description |
|---|---|---|
|  | Informational note | Indicates important features or instructions. |
|  | Caution | Indicates a situation that might result in loss of data or hardware damage. |
|  | Warning | Alerts you to the risk of personal injury or death. |
|  | Laser warning | Alerts you to the risk of personal injury from a laser. |

Table 3 on page xviii defines the text and syntax conventions used in this guide.

**Table 3: Text and Syntax Conventions**

| Convention | Description | Examples |
|---|---|---|
| Bold text like this | Represents text that you type. | To enter configuration mode, type the **configure** command:<br><br>user@host> **configure** |

**Table 3: Text and Syntax Conventions** *(continued)*

| Convention | Description | Examples |
|---|---|---|
| `Fixed-width text like this` | Represents output that appears on the terminal screen. | `user@host> show chassis alarms`<br>`No alarms currently active` |
| *Italic text like this* | ■ Introduces important new terms.<br>■ Identifies book names.<br>■ Identifies RFC and Internet draft titles. | ■ A policy *term* is a named structure that defines match conditions and actions.<br>■ *JUNOS System Basics Configuration Guide*<br>■ RFC 1997, *BGP Communities Attribute* |
| *Italic text like this* | Represents variables (options for which you substitute a value) in commands or configuration statements. | Configure the machine's domain name:<br>[edit]<br>root@# **set system domain-name** *domain-name* |
| Plain text like this | Represents names of configuration statements, commands, files, and directories; IP addresses; configuration hierarchy levels; or labels on routing platform components. | ■ To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.<br>■ The console port is labeled CONSOLE. |
| < > (angle brackets) | Enclose optional keywords or variables. | stub <default-metric *metric*>; |
| \| (pipe symbol) | Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity. | broadcast \| multicast<br>(*string1* \| *string2* \| *string3*) |
| # (pound sign) | Indicates a comment specified on the same line as the configuration statement to which it applies. | rsvp { # Required for dynamic MPLS only |
| [ ] (square brackets) | Enclose a variable for which you can substitute one or more values. | community name members [ *community-ids* ] |
| Indention and braces ( { } ) | Identify a level in the configuration hierarchy. | [edit]<br>routing-options {<br>  static {<br>  route default {<br>  nexthop *address*;<br>  retain;<br>  }<br>  }<br>} |
| ; (semicolon) | Identifies a leaf statement at a configuration hierarchy level. | |
| **J-Web GUI Conventions** | | |
| **Bold text like this** | Represents J-Web graphical user interface (GUI) items you click or select. | ■ In the Logical Interfaces box, select **All Interfaces**.<br>■ To cancel the configuration, click **Cancel**. |

**Table 3: Text and Syntax Conventions** *(continued)*

| Convention | Description | Examples |
|---|---|---|
| > (bold right angle bracket) | Separates levels in a hierarchy of J-Web selections. | In the configuration editor hierarchy, select **Protocols > Ospf**. |

## JUNOS Software Documentation for J-series Services Routers and SRX-series Services Gateways

Table 4 on page xx lists the software manuals and release notes for J-series Services Routers running JUNOS software with enhanced services and SRX-series services gateways running JUNOS software.

All documents are available at http://www.juniper.net/techpubs/.

**Table 4: JUNOS Software Documentation for J-series Services Routers and SRX-series Services Gateways**

| Book | Description |
|---|---|
| **All Platforms** | |
| *JUNOS Software Interfaces and Routing Configuration Guide* | Explains how to configure J-series and SRX-series interfaces for basic IP routing with standard routing protocols, ISDN service, firewall filters (access control lists), and class-of-service (CoS) traffic classification. |
| *JUNOS Software Security Configuration Guide* | Explains how to configure and manage J-series and SRX-series security services such as stateful firewall policies, IPsec VPNs, firewall screens, Network Address Translation (NAT), Public Key Cryptography, chassis clusters, Application Layer Gateways (ALGs), and Intrusion Detection and Prevention (IDP). |
| *JUNOS Software Administration Guide* | Shows how to monitor J-series and SRX-series devices and routing operations, firewall and security services, system alarms and events, and network performance. This guide also shows how to administer user authentication and access, upgrade software, and diagnose common problems. |
| *JUNOS Software CLI Reference* | Provides the complete configuration hierarchy available on J-series and SRX-series devices. This guide also describes the configuration statements and operational mode commands unique to these devices. |
| *JUNOS Network Management Configuration Guide* | Describes enterprise-specific MIBs for JUNOS software. The information in this guide is applicable to M-series, T-series, EX-series, J-series, and SRX-series devices. |
| *JUNOS System Log Messages Reference* | Describes how to access and interpret system log messages generated by JUNOS software modules and provides a reference page for each message. The information in this guide is applicable to M-series, T-series, EX-series, J-series, and SRX-series devices. |

**Table 4: JUNOS Software Documentation for J-series Services Routers and SRX-series Services Gateways** *(continued)*

| Book | Description |
|---|---|
| **J-series Services Routers Only** | |
| *JUNOS Software with Enhanced Services Design and Implementation Guide* | Provides guidelines and examples for designing and implementing IPsec VPNs, firewalls, and routing on J-series Services Routers running JUNOS software with enhanced services. |
| *JUNOS Software with Enhanced Services Quick Start* | Explains how to quickly set up a J-series Services Router. This document contains router declarations of conformity. |
| *JUNOS Software with Enhanced Services Hardware Guide* | Provides an overview, basic instructions, and specifications for J-series Services Routers. This guide explains how to prepare a site, unpack and install the router, replace router hardware, and establish basic router connectivity. This guide contains hardware descriptions and specifications. |
| *JUNOS Software with Enhanced Services Migration Guide* | Provides instructions for migrating an SSG device running ScreenOS software or a J-series Services Router running the JUNOS software to JUNOS software with enhanced services. |
| *WXC Integrated Services Module Installation and Configuration Guide* | Explains how to install and initially configure a WXC Integrated Services Module in a J-series Services Router for application acceleration. |
| *JUNOS Software with Enhanced Services Release Notes* | Summarizes new features and known problems for a particular release of JUNOS software with enhanced services on J-series Services Routers, including J-Web interface features and problems. The release notes also contain corrections and updates to the manuals and software upgrade and downgrade instructions for JUNOS software with enhanced services. |
| **SRX-series Services Gateways Only** | |
| *JUNOS Software for SRX-series Services Gateway Release Notes* | Summarizes new features and known problems for a particular release of JUNOS software on SRX-series services gateways, including J-Web interface features and problems. The release notes also contain corrections and updates to the manuals and software upgrade and downgrade. |

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- Document name
- Document part number

- Page number
- Software release version (not required for *Network Operations Guides [NOGs])*

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### Self-Help Online Tools and Resources

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- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
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### Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Manager tool in the CSC at http://www.juniper.net/cm/ .
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, visit us at http://www.juniper.net/support/requesting-support.html.

# Part 1
# Services Router Overview

Chapter 1

# Overview of Services Routers

J-series Services Routers running JUNOS software with enhanced services provide stable, reliable, and efficient IP routing, WAN and LAN connectivity, and management services for small to medium-sized enterprise networks. These routers also provide network security features, including a stateful firewall with access control policies and screens to protect against attacks and intrusions, and IPSec VPNs. J-series Services Routers securely connect small, branch, and regional offices to a central site router across Internet service provider (ISP) networks.

J-series Services Routers run JUNOS software with enhanced services, which offers many advanced routing and security services.

You can use two user interfaces to monitor, configure, troubleshoot, and manage a Services Router:

- J-Web interface—A Web-based graphical interface that allows you to operate a router without commands. The J-Web interface provides access to all JUNOS functionality and features. Quick Configuration wizards simplify basic configuration and minimize the risk of operator error.
- JUNOS command-line interface—A Juniper Networks command shell that runs on top of a UNIX-based operating system kernel. The CLI is a straightforward command interface. On a single line, you type commands that are executed when you press the Enter key. The CLI provides command Help and command completion.

For an introduction to the J-Web and CLI interfaces, see the *JUNOS Software Administration Guide*. For more information, see the *J-Web Interface User Guide* and the *JUNOS CLI User Guide*

This chapter contains the following topics:



## J2320 Services Router Overview

The J2320 Services Router is primarily designed for remote and branch offices. It has a small chassis that is 1 U (rack unit) in size with a nonredundant AC power

supply, an external compact flash and two universal serial bus (USB) ports for external storage, and an optional Crypto Accelerator Module.

J2320 routers ordered with the optional Crypto Accelerator Module come standard with 1 GB of memory, while those ordered without the Crypto Accelerator Module come standard with 256 MB of memory. The memory on J2320 routers can be upgraded to 1 GB. For instructions on upgrading memory, see “Replacing DRAM Modules” on page 136.

Each J2320 chassis contains four built-in Gigabit Ethernet ports with link speeds of 10/100/1000 Mbps over a copper interface. The chassis also contains three slots for field-replaceable Physical Interface Modules.

The J2320 Services Router supports the following field-replaceable PIMs:

- Gigabit Ethernet uPIM (1-port, 6-port, 8-port, and 16-port)
- Dual-Port Serial PIM
- Dual-Port E1 PIM
- Dual-Port T1 PIM
- Dual-Port Channelized T1/E1/ISDN PRI PIM
- 4-port ISDN BRI S/T or U PIM
- ADSL 2/2 + Annex A PIM (1 port)
- ADSL 2/2 + Annex B PIM (1 port)
- G.SHDSL PIM (2 ports)

## J2350 Services Router Overview

The J2350 Services Router is primarily designed for branch offices. It has a chassis that is 1.5 U (rack unit) in size with a nonredundant AC or DC power supply, an external compact flash and two universal serial bus (USB) ports for external storage, and an optional Crypto Accelerator Module.

J2350 routers ordered with the optional Crypto Accelerator Module come standard with 1 GB of memory, while those ordered without the Crypto Accelerator Module come standard with 256 MB of memory. The memory on J2350 routers can be upgraded to 1 GB. For instructions on upgrading memory, see “Replacing DRAM Modules” on page 136.

Each J2350 chassis contains four built-in Gigabit Ethernet ports with link speeds of 10/100/1000 Mbps over a copper interface. The chassis also contains five slots for field-replaceable Physical Interface Modules (PIMs).

The J2350 Services Router supports the following field-replaceable PIMs and modules:

- Gigabit Ethernet uPIM (1–port, 6-port, 8-port, and 16-port)
- Dual-Port Serial PIM
- Dual-Port E1 PIM

- Dual-Port T1 PIM
- Dual-Port Channelized T1/E1/ISDN PRI PIM
- 4-port ISDN BRI S/T or U PIM
- ADSL 2/2 + Annex A PIM (1 port)
- ADSL 2/2 + Annex B PIM (1 port)
- G.SHDSL PIM (2 ports)
- WXC Integrated Services Module

## J4350 Services Router Overview

The J4350 Services Router is designed primarily for regional and branch offices. It has a chassis that is 2 U (rack units) in size with a nonredundant AC or DC power supply, and a universal serial bus (USB) port for external storage.

J4350 routers ordered with the optional Crypto Accelerator Module come standard with 1 GB of memory, while those ordered without the Crypto Accelerator Module come standard with 256 MB of memory. J4350 routers can contain between 256 MB and 2 GB of memory. For instructions on adding memory, see “Replacing DRAM Modules” on page 136.

Each J4350 chassis contains four built-in Gigabit Ethernet ports with link speeds of 10/100/1000 Mbps over a copper interface, and six slots for field-replaceable Physical Interface Modules (PIMs). Two of the six slots (slots 3 and 6) support high-speed interfaces (ePIMs).

The J4350 Services Router supports the following field-replaceable PIMs and modules:

- Gigabit Ethernet uPIM (1-port, 6-port, 8-port, and 16-port)
- SFP Gigabit Ethernet ePIM (1 port)
- Copper Gigabit Ethernet ePIM (1 port)
- Dual-Port Serial PIM
- Dual-Port E1 PIM
- Dual-Port T1 PIM
- Dual-Port Channelized T1/E1/ISDN PRI PIM
- E3 PIM (1 port)
- DS3 (T3) PIM (1 port)
- Dual-Port Fast Ethernet PIM
- 4-port Fast Ethernet ePIM
- 4-port ISDN BRI S/T or U PIM
- ADSL 2/2 + Annex A PIM (1 port)
- ADSL 2/2 + Annex B PIM (1 port)

- G.SHDSL PIM (2 ports)
- WXC Integrated Services Module

## J6350 Services Router Overview

The J6350 Services Router is designed primarily for regional and central offices. It has a chassis that is 2 U (rack units) in size with an optional redundant AC or DC power supply, up to 2 GB of memory, and two universal serial bus (USB) ports for external storage. The J6350 Services Router is a higher-performance system than the J4350 Services Router.

J6350 routers come standard with 1 GB of memory and can be upgraded to 2 GB of memory. For instructions on adding memory, see “Replacing DRAM Modules” on page 136.

Each J6350 chassis contains four built-in Gigabit Ethernet ports with link speeds of 10/100/1000 Mbps over a copper interface, and six slots for field-replaceable Physical Interface Modules (PIMs). Four of the six slots (slots 2, 3, 5, and 6) support high-speed interfaces (ePIMs).

The J6350 Services Router supports the following field-replaceable PIMs and modules:

- Gigabit Ethernet uPIM (1–port, 6-port, 8-port, and 16-port)
- SFP Gigabit Ethernet ePIM (1 port)
- Copper Gigabit Ethernet ePIM (1 port)
- Dual-Port E1 PIM
- Dual-Port T1 PIM
- E3 PIM (1 port)
- DS3 (T3) PIM (1 port)
- Dual-Port Fast Ethernet PIM
- Dual-Port Channelized T1/E1/ISDN PRI PIM
- 4-port Fast Ethernet ePIM
- 4-port ISDN BRI S/T or U PIM
- Dual-Port Serial PIM
- ADSL 2/2 + Annex A PIM (1 port)
- ADSL 2/2 + Annex B PIM (1 port)
- G.SHDSL PIM (2 ports)
- WXC Integrated Services Module

Chapter 2

# J-series Services Router Hardware Features

J-series Services Routers running JUNOS software with enhanced services have chassis that are similar but with important differences. J2320, J2350, and J4350 routers have a single nonredundant power supply and an optional Crypto Accelerator Module. J6350 routers have redundant power supplies and a standard Crypto Accelerator Module.

For field-replaceable PIMs, the J2320 has three slots, the J2350 has five slots, and the J4350 and J6350 have six slots. Of the six slots, two on the J4350 and four on the J6350 are enhanced (high-speed) slots.

All J-series routers run JUNOS software with enhanced services, which offers advanced routing and security features.

This chapter contains the following topics:



## J2320 and J2350 Services Router Hardware Features

This section contains the following topics:

## *J2320 and J2350 Chassis*

The J2320 and J2350 chassis is a rigid sheet metal structure that houses all the other router components (see Figure 1 on page 8 through Figure 7 on page 11). The chassis can be installed in many types of racks or cabinets. For information about acceptable rack types, see "Rack Requirements" on page 64.

In addition to the components described in subsequent sections, the chassis includes the following components:

- Mounting brackets—One pair of metal brackets can be mounted at the front or center of the chassis for mounting the chassis in a rack or cabinet.
- Earthing terminal—A protective earthing terminal and a PEM nut at the rear of the chassis ensure safe dissipation of static electricity in all situations.
- ESD point—One electrostatic discharge (ESD) point, a banana plug receptacle at the front of the chassis, minimizes the risk of electrical discharge in potentially hazardous environments.

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**CAUTION:** Before removing or installing components of a functioning router, attach an ESD strap to an ESD point and place the other end of the strap around your bare wrist. Failure to use an ESD strap could result in damage to the router.

The router must be connected to earth ground during normal operation. The protective earthing terminal on the rear of the chassis is provided to connect the router to ground (see Figure 3 on page 9). Additional grounding is provided to an AC-powered router when you plug its power supply into a grounded AC power receptacle.

For additional safety information, see "Safety and Regulatory Compliance Information" on page 197.

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**Figure 1: Front of J2320 Chassis**

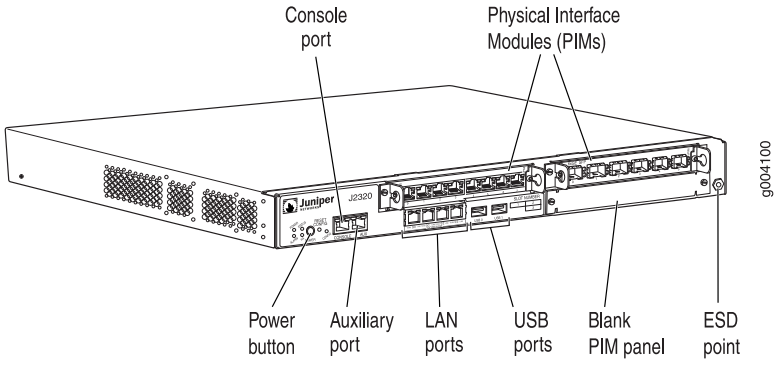


**Figure 2: Front of J2350 Chassis**

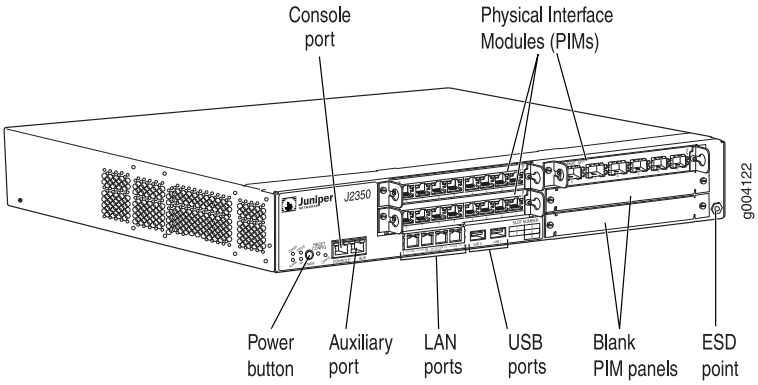



**Figure 3: Rear of J2320 Chassis**

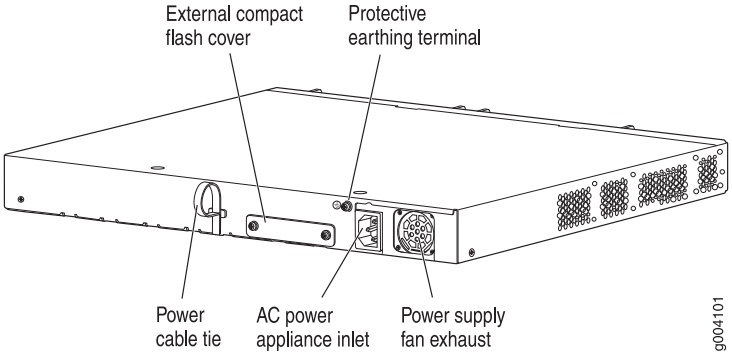



**Figure 4: Rear of J2350 AC-Powered Chassis**

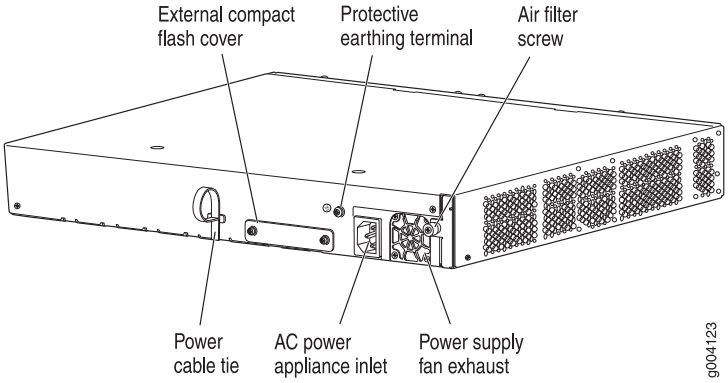


**Figure 5: Rear of J2350 DC-Powered Chassis**

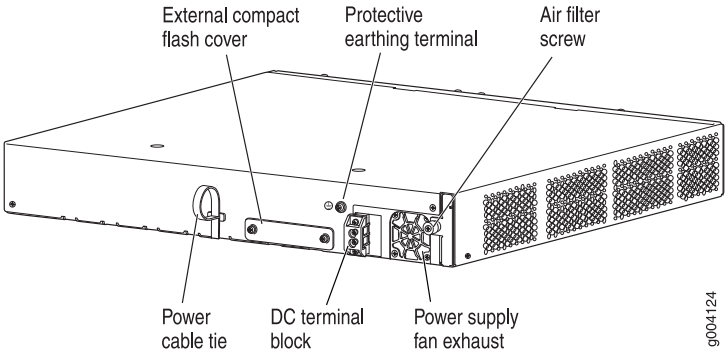



**Figure 6: J2320 Hardware Components**

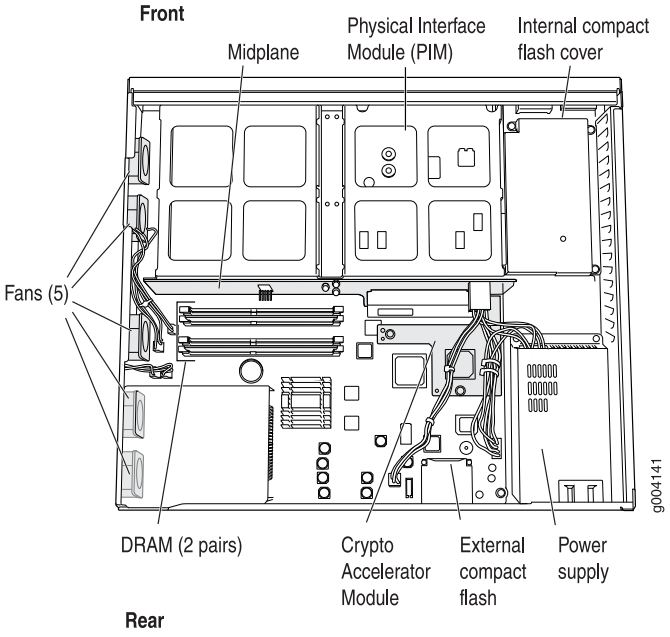


**Figure 7: J2350 Hardware Components**

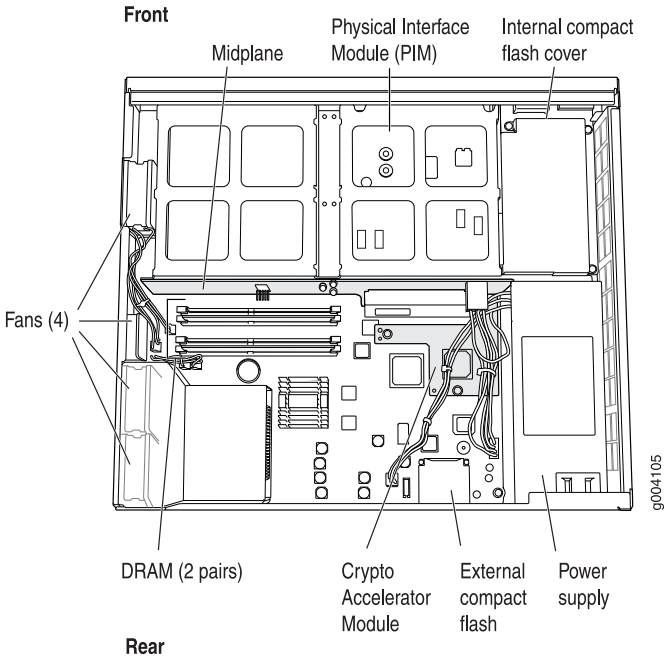



Table 5 on page 11 summarizes the physical specifications for the router chassis.

**Table 5: J2320 and J2350 Physical Specifications**

| Description | Value |
|---|---|
| Chassis dimensions | ■ J2320 Services Router<br>■ 1.75 in. (4.45 cm) high<br>■ 17.51 in. (44.48 cm) wide—18.9 in. (48.01 cm) wide with mounting brackets attached<br>■ 15.1 in. (38.35 cm) deep—plus 0.78 in. (1.98 cm) of hardware that protrudes from the chassis front<br>■ J2350 Services Router<br>■ 2.61 in. (6.63 cm) high<br>■ 17.51 in. (44.48 cm) wide—18.9 in. (48.01 cm) wide with mounting brackets attached<br>■ 15.1 in. (38.35 cm) deep—plus 0.78 in. (1.98 cm) of hardware that protrudes from the chassis front |
| Router weight | ■ J2320 Services Router<br>■ Minimum (no PIMs): 14.8 lbs (6.7 kg)<br>■ Maximum (three PIMs): 15.9 lbs (7.2 kg)<br>■ J2350 Services Router<br>■ Minimum (no PIMs): 16.3 lbs (7.4 kg)<br>■ Maximum (five PIMs): 18.2 lbs (8.3 kg) |

## J2320 and J2350 Midplane

The J2320 and J2350 midplane is located in the center of the chassis and forms the rear of the PIM card cage (see Figure 6 on page 10 and Figure 7 on page 11). You install the PIMs into the midplane from the front of the chassis. Data packets are transferred across the midplane from the PIM to the Routing Engine, and from the Routing Engine across the midplane to the destination PIM.

## J2320 and J2350 Routing Engine Hardware

The Routing Engine consists of the following components:

- Processor—Creates the packet forwarding switch fabric for the router and runs JUNOS software to maintain the router's routing tables and routing protocols.
- DRAM—Buffers incoming packets and provides storage for the routing and forwarding tables and for other Routing Engine processes.

  To view the amount of DRAM installed on your router, issue the show chassis routing-engine command.
- EPROM—Stores the serial number of the Routing Engine.

  To view the serial number of the Routing Engine, issue either the show chassis routing-engine command or the show chassis hardware command.
- Crypto Accelerator Module—Processor card that enhances performance of cryptographic algorithms used in IP security (IPSec) services. The cryptographic algorithms supported include Advanced Encryption Standard (AES), Data Encryption Standard (DES), triple DES (3DES), Hashed Message Authentication Code-Message Digest 5 (HMAC-MD5), and HMAC-Secure Hash Algorithm 1 (SHA-1). The Crypto Module is an optional feature of J2320 and J2350 Services Routers.

  To determine whether there is a Crypto Accelerator Module installed on your router, issue the show chassis hardware command.
- Compact flash—Provides primary storage for software images, configuration files, and microcode. J-series routers have a primary or internal compact flash located on the system board. For information about replacing the internal compact flash, see "Replacing Internal Compact Flashes on J2320 and J2350 Routers" on page 126.

  J2320 and J2350 Services Routers also provide a slot in the rear of the chassis into which you can insert an additional external compact flash. For information about external compact flashes, see "J2320 and J2350 External Compact Flashes" on page 18.

## J2320 and J2350 Boot Devices

J2320 and J2350 Services Routers can boot from three devices:

- Internal compact flash
- External compact flash (also known as the removable compact flash)

- USB storage device

Normally, a J2320 or J2350 Services Router boots from the internal compact flash. If the internal compact flash fails, the router attempts to boot from the external compact flash if it is installed. If the external compact flash is not present or fails, the router attempts to boot from the USB storage device.

## *J2320 and J2350 Front Panel*

The front panel of a J2320 or J2350 Services Router (see Figure 8 on page 13 and Figure 9 on page 13) allows you to install or remove PIMs, view router status LEDs, access the console port, and perform simple control functions.

**Figure 8: Front of J2320 Chassis**

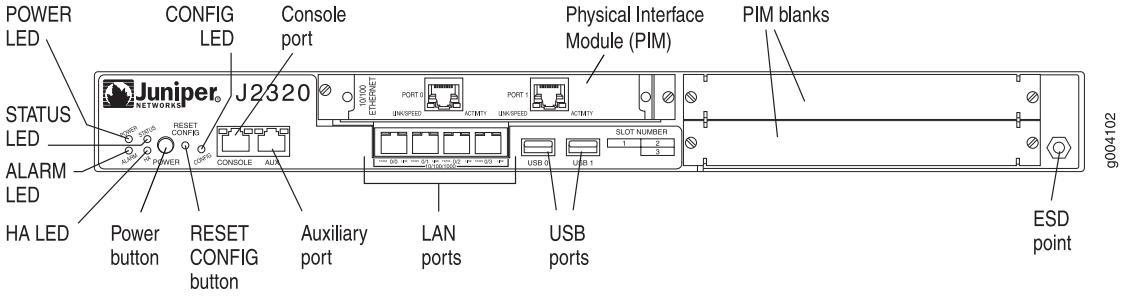
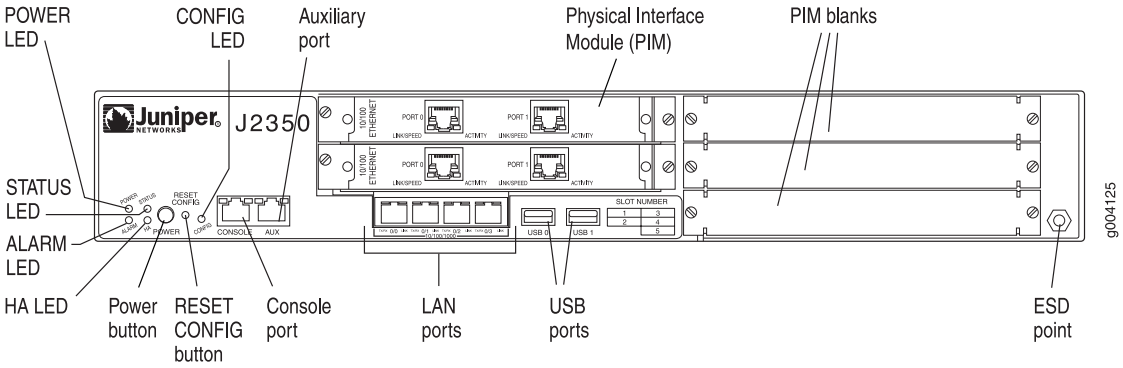



**Figure 9: Front of J2350 Chassis**




The components of the front panel, are described in the following sections:

- Physical Interface Modules (PIMs) on page 14
- Power Button and POWER LED on page 14
- STATUS LED on page 15
- ALARM LED on page 15
- HA LED on page 16
- RESET CONFIG Button on page 16
- Built-In Gigabit Ethernet Ports on page 17

- Console Port on page 17
- AUX Port on page 17
- USB Port on page 17

## Physical Interface Modules (PIMs)

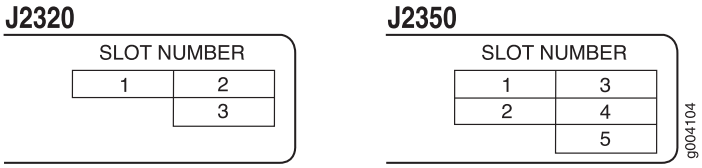
Physical Interface Modules (PIMs) provide the physical connection to various network media types. For information about individual PIMs, see “Field-Replaceable PIMs” on page 38.

For pinouts of PIM cable connectors, see “Network Cable Specifications and Connector Pinouts” on page 179. For PIM replacement instructions, see “Replacing a PIM” on page 120.

The J2320 front panel has three slots and the J2350 front panel has five slots for field-replaceable PIMs. These slots are numbered from top to bottom and from left to right as shown in Figure 10 on page 14.

Slot 0 is a fixed interface module that contains four built-in Gigabit Ethernet ports. For more information, see “Built-In Gigabit Ethernet Ports” on page 17.

**Figure 10: Slot Number Diagram on J2320 and J2350**




## Power Button and POWER LED

The power button is located on the left side of the front panel (see Figure 1 on page 8). You can use the power button to power the Services Router on and off. When you power on the router, the Routing Engine boots as the power supply completes its startup sequence.

The POWER LED is located to the upper left of the LED dashboard. Table 6 on page 14 describes the POWER LED.

**Table 6: J2320 and J2350 POWER LED**

| Color | State | Description |
|---|---|---|
| Green | On steadily | Power is functioning correctly. |
| | Blinking | Power button has been pressed and quickly released, and the router is gracefully shutting down. |
| Unlit | Off | Router is not receiving power. |

After the router is powered on, status indicators—such as LEDs on the front panel and show chassis command output—can take up to 60 seconds to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

If you need to power off the router after the Routing Engine finishes booting, use the J-Web interface or the CLI to halt the Services Router first. For instructions, see the *JUNOS Software Administration Guide*. Alternatively, you can press and release the power button to gracefully shut down the router. For more information, see "Powering a Services Router On and Off" on page 89.

### STATUS LED

When the system is powered on, the STATUS LED changes from off to blinking green. Startup takes approximately 90 seconds to complete. If you want to turn the system off and on again, we recommend waiting a few seconds between shutting it down and powering it back up. Table 7 on page 15 describes the STATUS LED.

**Table 7: J2320 and J2350 STATUS LED**

| Color | State | Description |
|---|---|---|
| Green | Blinking | Router is starting up or performing diagnostics. |
| | On steadily | Router is operating normally. |
| Red | Blinking | Error has been detected. |

### ALARM LED

The ALARM LED lights amber to indicate a minor condition that requires monitoring or maintenance and lights red to indicate a major condition that can result in a system shutdown. When the condition is corrected, the light turns off. Table 8 on page 15 describes the ALARM LED.

**Table 8: J2320 and J2350 ALARM LED**

| Color | State | Description |
|---|---|---|
| Red | On steadily | Major alarm indicates a critical situation on the router that has resulted from one of the following conditions. A red alarm condition requires immediate action:<br>■ One or more hardware components have failed.<br>■ One or more hardware components have exceeded temperature thresholds.<br>■ An alarm condition configured on an interface has triggered a critical warning. |

**Table 8: J2320 and J2350 ALARM LED** *(continued)*

| Color | State | Description |
|---|---|---|
| Yellow | On steadily | Minor alarm condition requires monitoring or maintenance:<br>■ Indicates a noncritical condition on the router that, if left unchecked, might cause an interruption in service or degradation in performance.<br>■ A missing rescue configuration or software license generates an amber system alarm. |
| Unlit | Off | No alarms. |

For information about alarm conditions and corrective actions, see “Monitoring and Correcting Chassis Alarm Conditions” on page 157. For additional information, see the *JUNOS Software Administration Guide*.

## HA LED

The HA (high availability) LED is located in the front panel near the power status LED of the LED dashboard. The LED lights when the router starts, but otherwise remains unlit.Table 9 on page 16 describes the HA LED.

**Table 9: J2320 and J2350 HA LED**

| Color | State | Description |
|---|---|---|
| Green | On steadily | All cluster members and monitored links are available. |
| Red | On steadily | A cluster member is missing or unreachable, or the other node is no longer part of a cluster because it has been disabled by the dual membership and detection recovery process in reaction to a control link or fabric link failure. |
| Amber | On steadily | All cluster members are present, but one or more monitored links are down. |
| Unlit | Off | The node is not configured for clustering or it has been disabled by the dual membership and detection recovery process in reaction to a control link or fabric link failure. |

## RESET CONFIG Button

Use the RESET CONFIG button to return the router to a previous valid configuration or to the factory default configuration, or a rescue configuration. The button is recessed to prevent it from being pressed accidentally. For details about the RESET CONFIG button, see “Resetting the Configuration File When the Router Is Inaccessible” on page 160.

### Built-In Gigabit Ethernet Ports

Four built-in Gigabit Ethernet ports provide LAN connections over copper interfaces to hubs, switches, local servers, and workstations. You can also designate an Ethernet port for management traffic. When configuring one of these ports, you use the interface name that corresponds to the port's location. From left to right on the front panel, the interface names for the ports are ge-0/0/0, ge-0/0/1, ge-0/0/2, and ge-0/0/3.

For Gigabit Ethernet port pinout information, see "Gigabit Ethernet uPIM RJ-45 Connector Pinout" on page 189.

Each port has two LEDs, a TX/RX LED on the left side and a LINK LED on the right side. Table 10 on page 17 describes the built-in Ethernet port LEDs.

**Table 10: Gigabit Ethernet Port LEDs**

| Function | Color | State | Description |
|---|---|---|---|
| LINK | Green | On steadily | Port is online. |
| | Unlit | Off | Port is offline. |
| TX/RX | Green | Blinking | Port is transmitting or receiving data. |
| | Unlit | Off | Port might be online, but it is not receiving data. |

### Console Port

You can use the console port on the chassis front panel to connect to the Routing Engine through an RJ-45 serial cable. From the chassis console port, you can use the CLI to configure the router. The console port is configured as data terminal equipment (DTE) and supports the RS-232 (EIA-232) standard.

For information about securing the chassis console port, see the *JUNOS Software Administration Guide*.

For pinout information, see "Chassis Console Port Pinouts" on page 190.

### AUX Port

The port labeled AUX on the front panel of the J-series Services Router is for future use and is not activated.

### USB Port

The USB ports on the front panel of the router (see Figure 8 on page 13 and Figure 9 on page 13) accept a USB storage device or USB storage device adapter with a compact flash installed, as defined in the *CompactFlash Specification* published by the CompactFlash Association. When a USB storage device is installed and configured, it automatically acts as a secondary boot device if the internal compact flash fails on startup. Depending on the size of the USB storage device, you can also configure it

to receive any core files generated during a failure. For information about configuring a USB storage device, see the *JUNOS Software Administration Guide*.

**NOTE:** For a list of supported USB storage devices, see the *JUNOS Software with Enhanced Services Release Notes* at http://www.juniper.net.

### J2320 and J2350 External Compact Flashes

On J2320 and J2350 routers, an external compact flash, also known as removable compact flash, accepts a type I or II compact flash, as defined in the *CompactFlash Specification* published by the CompactFlash Association. The J2320 and J2350 chassis has a slot on the rear for external compact flashes (see Figure 3 on page 9). When the external compact flash is installed and configured, it automatically acts as the secondary boot device if the internal compact flash fails on startup.

Depending on the capacity of the external compact flash, you can also configure it to receive any core files generated during a failure. For information about configuring an external compact flash, see the *JUNOS Software Administration Guide*.

### J2320 Power System

The J2320 Services Router uses AC power (see Figure 3 on page 9). The autosensing power supply distributes the different output voltages to the router components according to their voltage requirements. The power supply is fixed in the chassis, and is not field-replaceable.

The AC power supply has a single AC appliance inlet that requires a dedicated AC power feed.

The J2320 AC-powered chassis has a power switch and does not include a power LED.

For information about site power preparations, see “Power Guidelines, Requirements, and Specifications” on page 67. For information about connecting the router to power and ground, see “Connecting Power” on page 84.

### J2350 Power System

The J2350 Services Router uses either AC or DC power. The autosensing power supply (see Figure 4 on page 9 or Figure 5 on page 10) distributes the different output voltages to the router components according to their voltage requirements. The power supply is fixed in the chassis, and is not field-replaceable.

The AC power supply has a single AC appliance inlet that requires a dedicated AC power feed. The DC power supply has a terminal block that provides a single DC input (–48 VDC and return) and requires a dedicated 15 A (–48 VDC) circuit breaker.

The J2350 AC-powered or DC-powered chassis has a power switch and does not include a power LED.

For information about site power preparations, see “Power Guidelines, Requirements, and Specifications” on page 67. For information about connecting the router to power and ground, see “Connecting Power” on page 84.

**NOTE:** You cannot mix DC and AC power supplies in the same chassis.

**WARNING:** DC-powered Services Routers are intended for installation only in a restricted access location.

## *J2320 and J2350 Cooling System*

The cooling system in J2320 and J2350 routers is from side to side. The J2320 router has five cooling fans and the J2350 router has four cooling fans. The fans draw air through vents along the left side of the chassis and exhaust it through vents on the right side of the chassis. The airflow produced by these fans keeps router components within the acceptable temperature range (see Figure 11 on page 20 and Figure 12 on page 20). The speed of the fans is adjusted automatically according to the current temperature.

On J2350 routers that comply with Network Equipment Building System (NEBS) criteria, an air filter protects the air intake opening at the front of the chassis and must be replaced periodically. To verify that the system is a NEBS-compliant system, run the show chassis hardware command. A NEBS-compliant system displays the term *NEBS* in the output. For instructions on how to replace air filters, see “Replacing Air Filters on J2350 Routers” on page 153.

The Routing Engine monitors the temperature of the router components. If the maximum temperature specification, as measured at the CPU junction, is exceeded and the router cannot be adequately cooled, the Routing Engine shuts down the hardware components.

J2320 and J2350 routers shut down when the CPU temperature reaches 80°C (176°F). There is no alarm for temperature. You can view the CPU junction temperature using the show chassis routing-engine command. The CPU temperature runs a few degrees higher than the routing engine temperature displayed on the Monitor > Chassis page of the J-Web interface.

An additional fan is part of each power supply. This fan is not regulated by the operating system.

**Figure 11: Airflow Through the J2320 Chassis**

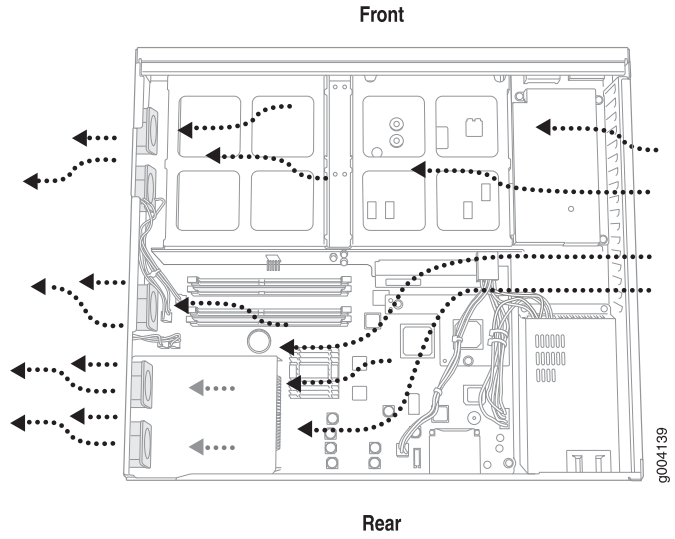
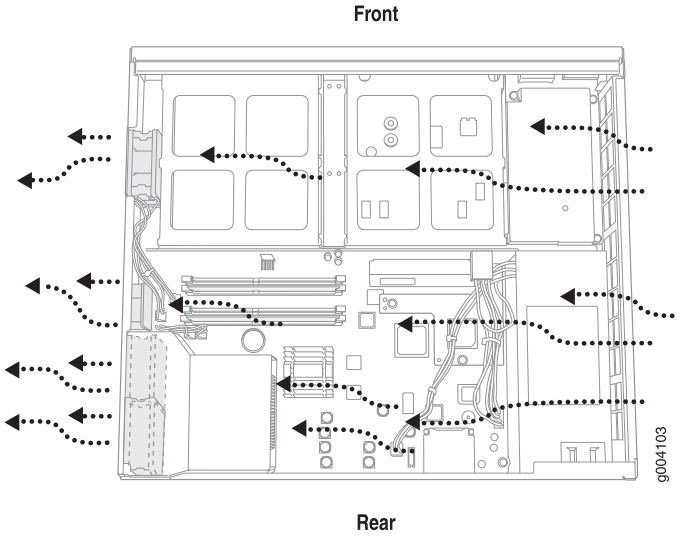



**Figure 12: Airflow Through the J2350 Chassis**




## J4350 and J6350 Services Router Hardware Features

This section contains the following topics:

- J6350 Power System on page 31
- J4350 and J6350 Cooling System on page 32


## J4350 and J6350 Chassis

The J4350 and J6350 chassis is a rigid sheet metal structure that houses all the other router components (see Figure 13 on page 22 through Figure 18 on page 24). The chassis can be installed in many types of racks or cabinets. For information about acceptable rack types, see "Rack Requirements" on page 64.

In addition to the features described in subsequent sections, the chassis includes the following features:

- Mounting brackets—One pair of metal brackets can be mounted at the front or center of the chassis. Use the brackets for mounting the chassis in a rack or cabinet.
- Earthing terminals—Two protective earthing terminals, PEM nuts at the rear of the chassis ensure safe dissipation of static electricity in all situations.
- ESD point—One electrostatic discharge (ESD) point, a banana plug receptacle at the front of the chassis, minimizes the risk of electrical discharge in potentially hazardous environments.

**CAUTION:** Before removing or installing components of a functioning router, attach an ESD strap to an ESD point and place the other end of the strap around your bare wrist. Failure to use an ESD strap could result in damage to the router.

The router must be connected to earth ground during normal operation. The protective earthing terminals on the rear of the chassis are provided to connect the router to ground (see Figure 14 on page 22). Additional grounding is provided to an AC-powered router when you plug its power supply into a grounded AC power receptacle.

For additional safety information, see "Safety and Regulatory Compliance Information" on page 197.

**Figure 13: Front of J4350 and J6350 Chassis**

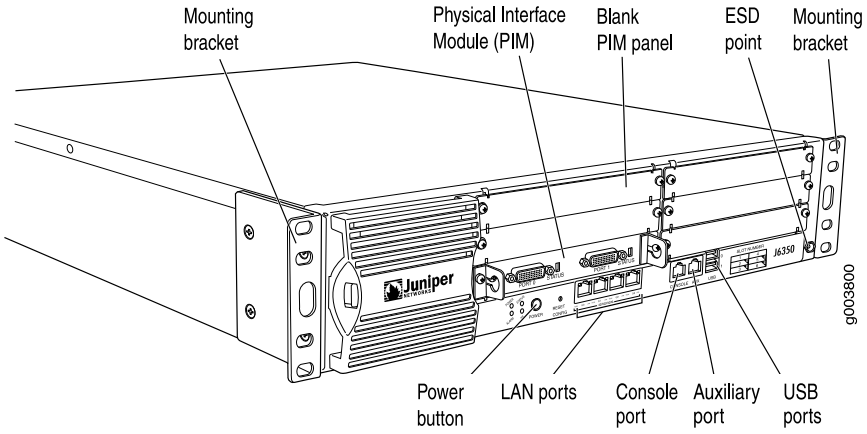
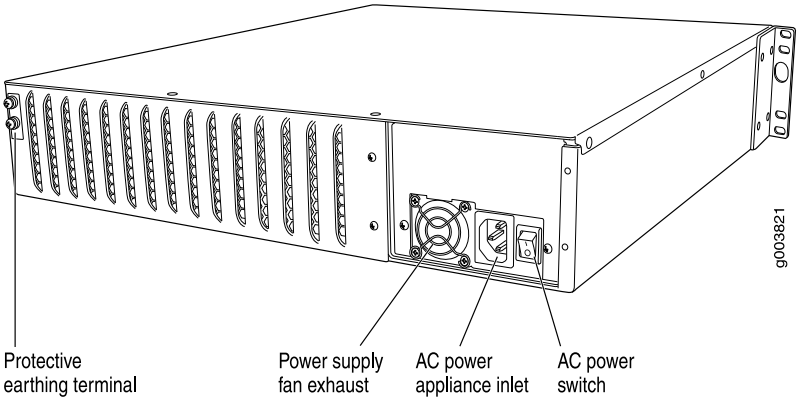



**Figure 14: Rear of J4350 AC-Powered Chassis**




**NOTE:** The J4350 AC-powered chassis has a power switch and does not include a power supply LED (unlike the J6350 AC-powered chassis).

**Figure 15: Rear of J6350 AC-Powered Chassis**

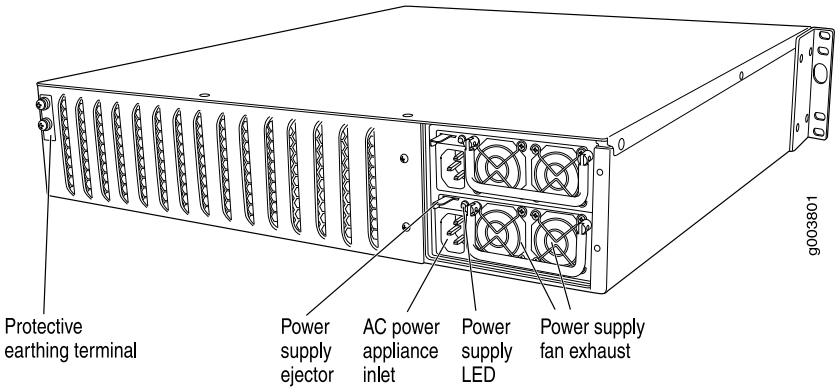


**Figure 16: Rear of J4350 DC-Powered Chassis**

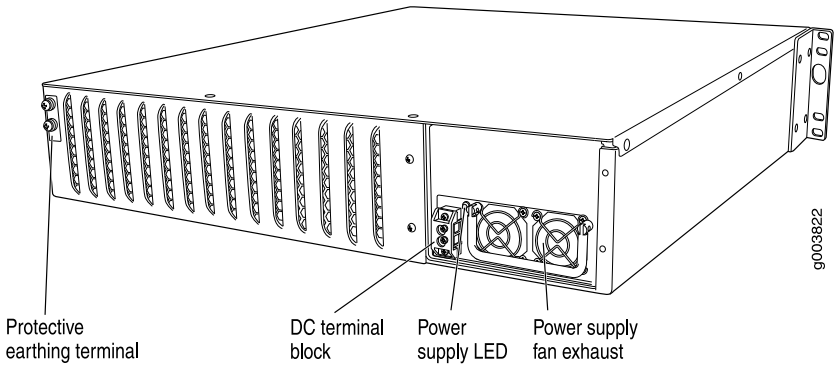



**Figure 17: Rear of DC-Powered J6350 Chassis**

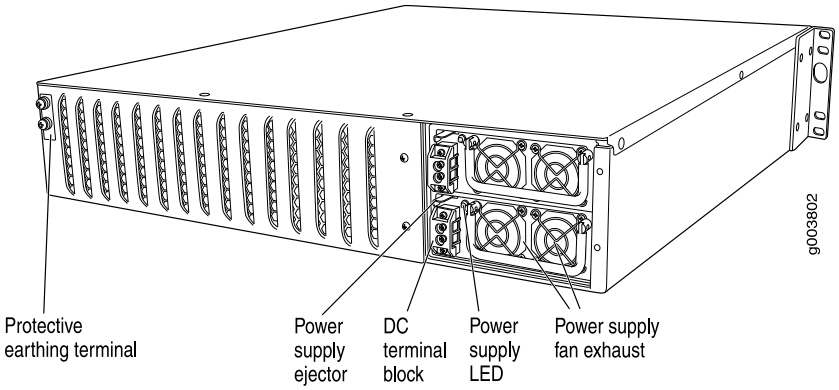


**Figure 18: J4350 and J6350 Hardware Components**

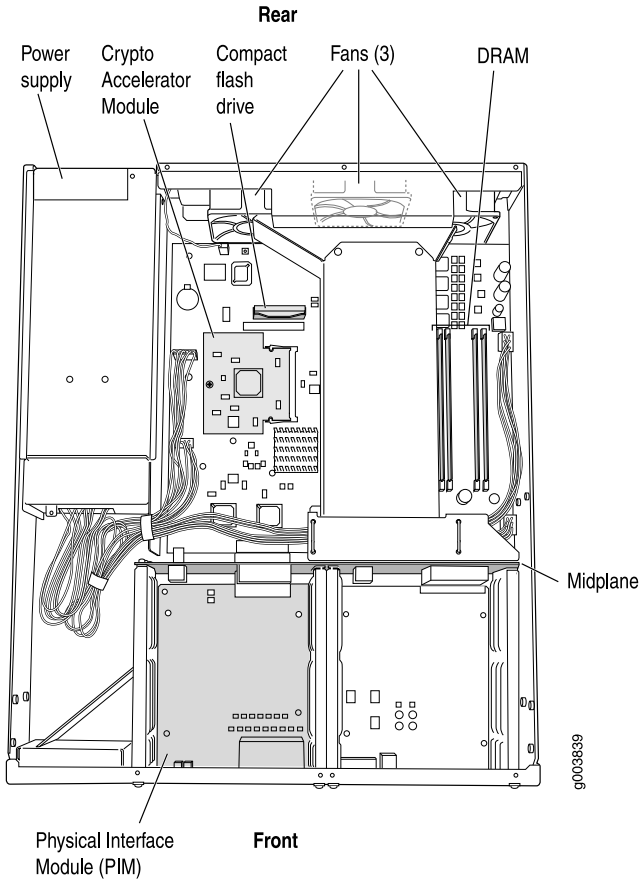



Table 11 on page 24 summarizes the physical specifications for the router chassis.

**Table 11: J4350 and J6350 Physical Specifications**

| Description | Value |
|---|---|
| Chassis dimensions | ■ 3.44 in. (8.74 cm) high<br>■ 17.44 in. (44.3 cm) wide—19.44 in. (48.38 cm) wide with mounting brackets attached<br>■ 21.13 in. (53.67 cm) deep—plus 0.5 in. (1.27 cm) of hardware that protrudes from the chassis front |
| Router weight | ■ J4350 Services Router:<br>■ Minimum (no PIMs): 23 lb (10.4 kg)<br>■ Maximum (six PIMs): 25.3 lb (11.5 kg)<br>■ J6350 Services Router<br>■ Minimum (no PIMs and one power supply): 25.5 lb (11.6 kg)<br>■ Maximum (six PIMs and two power supplies): 30.7 lb (13.9 kg) |

### J4350 and J6350 Midplane

The midplane is located in the center of the chassis and forms the rear of the PIM card cage (see Figure 18 on page 24). You install the PIMs into the midplane from the front of the chassis. Data packets are transferred across the midplane from the PIM to the Routing Engine, and from the Routing Engine across the midplane to the destination PIM.

### J4350 and J6350 Routing Engine Hardware

The Routing Engine consists of the following components.

- Processor—Creates the packet forwarding switch fabric for the router and runs JUNOS Internet software to maintain the router's routing tables and routing protocols.
- DRAM—Buffers incoming packets and provides storage for the routing and forwarding tables and for other Routing Engine processes.

  To view the amount of DRAM installed on your router, issue the show chassis routing-engine command.
- EPROM—Stores the serial number of the Routing Engine.

  To view the serial number of the Routing Engine, issue either the show chassis routing-engine command or the show chassis hardware command.
- Crypto Accelerator Module—Processor card that enhances performance of cryptographic algorithms used in IP security (IPSec) services. The cryptographic algorithms supported include Advanced Encryption Standard (AES), Data Encryption Standard (DES), triple DES (3DES), Hashed Message Authentication Code-Message Digest 5 (HMAC-MD5), and HMAC-Secure Hash Algorithm 1 (SHA-1).

  To determine whether there is a Crypto Accelerator Module installed on your router, issue the show chassis hardware command.
- Compact flash—Provides primary storage for software images, configuration files, and microcode. J4350 and J6350 routers have a slot on the motherboard for an internal compact flash. For information about replacing the compact flash, see “Replacing Internal Compact Flashes on J4350 and J6350 Routers” on page 129.

### J4350 and J6350 Boot Devices

The J4350 and J6350 Services Routers can boot from two devices:

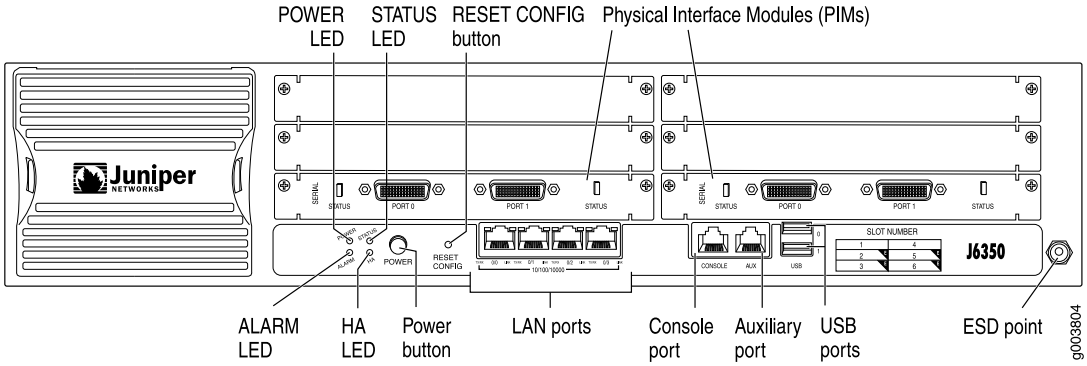
- Internal compact flash
- USB storage device

Normally, the J4350 or J6350 Services Router boots from the internal compact flash. If the compact flash fails, the router attempts to boot from the USB storage device.

## *J4350 and J6350 Front Panel*

The front panel of the Services Router (see Figure 19 on page 26) allows you to install or remove PIMs, view router status LEDs, access the console port, and perform simple control functions.

**Figure 19: Front of J4350 and J6350 Chassis**




The components of the front panel, from left to right, are described in the following sections:

- Physical Interface Modules (PIMs) on page 26
- Power Button and POWER LED on page 27
- STATUS LED on page 27
- ALARM LED on page 28
- HA LED on page 29
- RESET CONFIG Button on page 29
- Built-In Gigabit Ethernet Ports on page 29
- Console Port on page 30
- AUX Port on page 30
- USB Port on page 30

### Physical Interface Modules (PIMs)

Physical Interface Modules (PIMs) provide the physical connection to various network media types. For information about individual PIMs, see “Field-Replaceable PIMs” on page 38.

For pinouts of PIM cable connectors, see “Network Cable Specifications and Connector Pinouts” on page 179. For PIM replacement instructions, see “Replacing a PIM” on page 120.

Each J4350 and J6350 Services Router has six front panel slots for field-replaceable PIMs. These slots are numbered from top to bottom and from left to right as shown in the slot number diagram on the front panel, shown in Figure 20 on page 27.

**Figure 20: Slot Number Diagram on Front Panel**


Gigabit Ethernet and 4-port Fast Ethernet ePIMs can be installed in high-speed slots only. High-speed slots are indicated by a black triangle containing an **E** in the front panel slot number diagram. On J4350 Services Routers, the high-speed slots are slot 3 and slot 6. On J6350 Services Routers, the high-speed slots are slots 2, 3, 5, and 6.

Slot 0 is the fixed interface module that contains the built-in Ethernet ports.

## Power Button and POWER LED

The power button is located on the left side of the front panel (see Figure 19 on page 26). You can use the power button to power the Services Router on and off. When you power on the router, the Routing Engine boots as the power supply completes its startup sequence.

The POWER LED is located to the upper left of the LED dashboard. Table 12 on page 27 describes the POWER LED.

**Table 12: POWER LED**

| Color | State | Description |
|---|---|---|
| Green | On steadily | Power is functioning correctly. |
| | Blinking | Power button has been pressed and quickly released, and the router is gracefully shutting down. |
| Unlit | Off | Router is not receiving power. |

After the router is powered on, status indicators—such as LEDs on the front panel and show chassis command output—can take up to 60 seconds to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

If you need to power off the router after the Routing Engine finishes booting, use the J-Web interface or the CLI to halt the Services Router first. For instructions, see the *JUNOS Software Administration Guide*. Alternatively, you can press and release the power button to gracefully shut down the router. For more information, see “Powering a Services Router On and Off” on page 89.

## STATUS LED

When the system is powered on, the STATUS LED changes from off to blinking green. Startup takes approximately 90 seconds to complete. If you want to turn the system

off and on again, we recommend waiting a few seconds between shutting it down and powering it back up. Table 13 on page 28 describes the STATUS LED.

**Table 13: STATUS LED**

| Color | State | Description |
|---|---|---|
| Green | Blinking | Router is starting up or performing diagnostics. |
| | On steadily | Router is operating normally. |
| Red | Blinking | Error has been detected. |

## ALARM LED

The ALARM LED lights yellow to indicate a minor condition that requires monitoring or maintenance and lights red to indicate a major condition that can result in a system shutdown. When the condition is corrected, the light turns off. Table 14 on page 28 describes the ALARM LED.

**Table 14: ALARM LED**

| Color | State | Description |
|---|---|---|
| Red | On steadily | Major alarm indicates a critical situation on the router that has resulted from one of the following conditions. A red alarm condition requires immediate action:<br>■ One or more hardware components have failed.<br>■ One or more hardware components have exceeded temperature thresholds.<br>■ An alarm condition configured on an interface has triggered a critical warning. |
| Yellow | On steadily | Minor alarm condition requires monitoring or maintenance:<br>■ Indicates a noncritical condition on the router that, if left unchecked, might cause an interruption in service or degradation in performance.<br>■ A missing rescue configuration or software license generates a yellow system alarm. |
| Unlit | Off | No alarms. |

For information about alarm conditions and corrective actions, see “Monitoring and Correcting Chassis Alarm Conditions” on page 157. For additional information, see the *JUNOS Software Administration Guide*.

### HA LED

The HA (high availability) LED is located in the front panel near the power status LED of the LED dashboard. The LED lights when the router starts, but otherwise remains unlit.Table 15 on page 29 describes the HA LED.

**Table 15: HA LED**

| Color | State | Description |
|---|---|---|
| Green | On steadily | All cluster members and monitored links are available. |
| Red | On steadily | A cluster member is missing or unreachable, or the other node is no longer part of a cluster because it has been disabled by the dual membership and detection recovery process in reaction to a control link or fabric link failure. |
| Amber | On steadily | All cluster members are present, but one or more monitored links are down. |
| Unlit | Off | The node is not configured for clustering or it has been disabled by the dual membership and detection recovery process in reaction to a control link or fabric link failure. |

### RESET CONFIG Button

Use the RESET CONFIG button to return the router to a previous valid configuration or to the factory default configuration, or a rescue configuration. The button is recessed to prevent it from being pressed accidentally. For details about the RESET CONFIG button, see “Resetting the Configuration File When the Router Is Inaccessible” on page 160.

### Built-In Gigabit Ethernet Ports

Four built-in Gigabit Ethernet ports provide LAN connections over copper interfaces to hubs, switches, local servers, and workstations. You can also designate an Ethernet port for management traffic. When configuring one of these ports, you use the interface name that corresponds to the port’s location. From left to right on the front panel, the interface names for the ports are ge-0/0/0, ge-0/0/1, ge-0/0/2, and ge-0/0/3.

For Gigabit Ethernet port pinout information, see “Gigabit Ethernet ePIM RJ-45 Connector Pinout” on page 190.

Each port has two LEDs, a TX/RX LED on the left side and a LINK LED on the right side. Table 16 on page 29 describes the built-in Ethernet port LEDs.

**Table 16: Gigabit Ethernet Port LEDs**

| Function | Color | State | Description |
|---|---|---|---|
| LINK | Green | On steadily | Port is online. |
| | Unlit | Off | Port is offline. |

**Table 16: Gigabit Ethernet Port LEDs** *(continued)*

| Function | Color | State | Description |
|---|---|---|---|
| TX/RX | Green | Blinking | Port is transmitting or receiving data. |
| | Unlit | Off | Port might be online, but it is not receiving data. |

### Console Port

You can use the console port on the chassis front panel to connect to the Routing Engine through an RJ-45 serial cable. From the chassis console port, you can use the CLI to configure the router. The console port is configured as data terminal equipment (DTE) and supports the RS-232 (EIA-232) standard.

For information about securing the chassis console port, see the *J-series Services Router Administration Guide*.

For pinout information, see "Chassis Console Port Pinouts" on page 190.

### AUX Port

The port labeled AUX on the front panel of the J4350 or J6350 Services Router is for future use and is not activated.

### USB Port

The USB ports on the front panel of the router (see Figure 19 on page 26) accept a USB storage device or USB storage device adapter with a compact flash installed, as defined in the *CompactFlash Specification* published by the CompactFlash Association. When a USB storage device is installed and configured, it automatically acts as a secondary boot device if the internal compact flash fails on startup. Depending on the size of the USB storage device, you can also configure it to receive any core files generated during a failure. For information about configuring a USB storage device, see the *JUNOS Software Administration Guide*.

**NOTE:** For a list of supported USB storage devices, see the *JUNOS Software with Enhanced Services Release Notes* at http://www.juniper.net.

## *J4350 Power System*

The J4350 Services Router uses either AC or DC power. The autosensing power supply (see Figure 14 on page 22 or Figure 16 on page 23) distributes the different output voltages to the router components according to their voltage requirements. The power supply is fixed in the chassis and is not field-replaceable.

The AC power supply has a single AC appliance inlet that requires a dedicated AC power feed. The DC power supply has a terminal block that provides a single DC input (–48 VDC and return) and requires a dedicated 15 A (–48 VDC) circuit breaker.

The J4350 AC-powered chassis has a power switch and does not include a power LED.

The J4350 DC-powered chassis includes a power supply LED located to the upper right of the power supply connector. Table 17 on page 31 describes the power supply LED.

**Table 17: Power Supply LED**

| State | Description |
|---|---|
| Off | No power is flowing to the power supply. |
| Green | Power supply is connected and power is flowing. |
| Yellow | Power supply is connected, but the router is not powered on. |

For information about site power preparations, see "Power Guidelines, Requirements, and Specifications" on page 67. For information about connecting the router to power and ground, see "Connecting Power" on page 84.

**NOTE:** You cannot mix DC and AC power supplies in the same chassis.

**WARNING:** DC-powered Services Routers are intended for installation only in a restricted access location.

## *J6350 Power System*

The J6350 Services Router uses either AC or DC power. You can install one or two autosensing, load-sharing power supplies on the system board at the bottom of the chassis, as shown in Figure 15 on page 22 or Figure 17 on page 23. The power supplies distribute the different output voltages to the router components, depending on their voltage requirements. When two power supplies are installed and operational, they automatically share the electrical load.

For full redundancy, two power supplies are required. If a power supply stops functioning for any reason, the second power supply instantly begins providing all the power the router needs for normal functioning. It can provide full power indefinitely.

Each power supply has an LED located to the upper right of the power supply connector. Table 17 on page 31 describes the power supply LED.

For information about site power preparations, see "Power Guidelines, Requirements, and Specifications" on page 67. For information about connecting the router to power and ground, see "Connecting Power" on page 84.

Power supplies on J6350 Services Routers are hot-removable and hot-insertable. You can remove and replace a redundant power supply without powering down the router or disrupting the routing functions. To avoid electrical injury, carefully follow the instructions in “Replacing Power System Components” on page 139.

**NOTE:** You cannot mix DC and AC power supplies in the same chassis.

**WARNING:** DC-powered Services Routers are intended for installation only in a restricted access location.

## *J4350 and J6350 Cooling System*

The cooling system includes three fans at the rear of the chassis. The airflow produced by these fans keeps router components within the acceptable temperature range (see Figure 21 on page 33). The speed of the fans is adjusted automatically according to the current temperature.

An air filter protects the air intake opening at the front of the chassis and must be replaced periodically. For instructions, see “Replacing Air Filters on J4350 and J6350 Routers” on page 154.

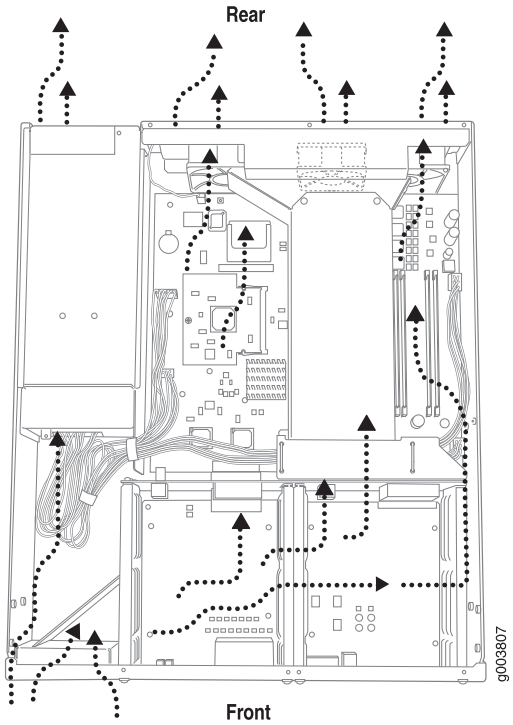
The Routing Engine monitors the temperature of the router components. If the maximum temperature specification, as measured at the CPU junction, is exceeded and the router cannot be adequately cooled, the Routing Engine shuts down the hardware components.

When the CPU temperature reaches 80°C (176°F), a yellow alarm is triggered. When the CPU temperature reaches 105°C (221°F), the system shuts down. There is no red alarm for temperature. You can view the CPU junction temperature using the show chassis routing-engine command. The CPU temperature runs a few degrees higher than the routing engine temperature displayed on the Monitor > Chassis page of the J-Web interface.

**NOTE:** On J4350 and J6350 routers that are not designed to comply with Network Equipment Building System (NEBS) criteria, the temperature at which the system shuts down is 90°C (194°F) rather than 105°C (221°F). To verify that the system is a NEBS-compliant system, run the show chassis hardware command. A NEBS-compliant system displays the term *NEBS* in the output.

An additional fan is part of each power supply. This fan is not regulated by the operating system.

**Figure 21: Airflow Through the J4350 and J6350 Chassis**



Chapter 3

# PIM Overview

J-series Services Routers accept Physical Interface Modules (PIMs) in the slots on the front of the chassis.

**CAUTION:** PIMs are not hot-swappable. You must power off the Services Router before removing or inserting a PIM module. Ensure that the PIMs are installed in the router chassis before booting up the system.

A Physical Interface Module (PIM) is a network interface card that is installed on a J-series Services Router to provide physical connections to a LAN or a WAN. The PIM receives incoming packets from the network and transmits outgoing packets to the network. Each PIM is equipped with a dedicated network processor that forwards incoming data packets to the Routing Engine and receives outgoing data packets from the Routing Engine. During this process, the PIM performs framing and line-speed signaling for its medium type.

For a complete list of supported PIMs, see "Field-Replaceable PIMs" on page 38.

A single WXC Integrated Services Module (also called an ISM 200) can be installed like a PIM in J2350, J4350, and J6350 routers to provide WAN acceleration. For more information, see the *WXC Integrated Services Module Installation and Configuration Guide*.

For J-series Services Router PIM compatibility matrix and datasheets, go to http://www.juniper.net/products/jseries/.

For information about network interfaces, and for configuration instructions, see the *JUNOS Software Interfaces and Routing Configuration Guide*.

This chapter contains the following topics:



## PIM Terms

To understand PIM, become familiar with the terms defined in Table 18 on page 36.

**Table 18: PIM Terms**

| Term | Definition |
|---|---|
| **ADSL 2/2 + Annex A** | ITU-T Standard G.992.1 that defines how ADSL works over plain old telephone service (POTS) lines. |
| **ADSL 2/2 + Annex B** | ITU-T Standard G.992.1 that defines how ADSL works over Integrated Services Digital Network (ISDN) lines. |
| **bandwidth on demand** | ISDN cost-control feature defining the bandwidth threshold that must be reached on all links before a Services Router initiates additional ISDN data connections to provide more bandwidth. |
| **Basic Rate Interface (BRI)** | ISDN interface intended for home and small enterprise applications. BRI consists of two 64-Kbps B-channels and one 16-Kbps D-channel. |
| **callback** | Alternative feature to dial-in that enables a J-series Services Router to call back the caller from the remote end of a backup ISDN connection. Instead of accepting a call from the remote end of the connection, the router rejects the call, waits a configured period of time, and calls a number configured on the router's dialer interface. See also *dial-in*. |
| **caller ID** | Telephone number of the caller on the remote end of a backup ISDN connection, used to dial in and also to identify the caller. Multiple caller IDs can be configured on an ISDN dialer interface. During dial-in, the router matches the incoming call's caller ID against the caller IDs configured on its dialer interfaces. Each dialer interface accepts calls from only callers whose caller IDs are configured on it. |
| **channel service unit (CSU)** | Unit that connects a digital telephone line to a multiplexer or other signal service. |
| **data service unit (DSU)** | Unit that connects a data terminal equipment (DTE) device—in this case, a Services Router—to a digital telephone line. |
| **data terminal equipment–to–data communication equipment (DTE–DCE) interface** | Interface that a Services Router (the DTE) uses to exchange information with a serial device such as a modem (the DCE).<br><br>A DTE cable uses a male 9-pin or 25-pin connector, and a DCE cable uses a female 9-pin or 25-pin connector. |
| **demand circuit** | Interface configured for dial-on-demand routing backup. In OSPF, the demand circuit reduces the amount of OSPF traffic by removing all OSPF protocols when the routing domain is in a steady state. |
| **dial backup** | Feature that reestablishes network connectivity through one or more backup ISDN dialer interfaces after a primary interface fails. When the primary interface is reestablished, the ISDN interface is disconnected. |
| **dial-in** | Feature that enables J-series Services Routers to receive calls from the remote end of a backup ISDN connection. The remote end of the ISDN call might be a service provider, a corporate central location, or a customer premises equipment (CPE) branch office. All incoming calls can be verified against caller IDs configured on the router's dialer interface. See also *callback*. |

**Table 18: PIM Terms** *(continued)*

| Term | Definition |
|---|---|
| **dialer filter** | Stateless firewall filter that enables dial-on-demand routing backup when applied to a physical ISDN interface and its dialer interface configured as a passive static route. The passive static route has a lower priority than dynamic routes. If all dynamic routes to an address are lost from the routing table and the router receives a packet for that address, the dialer interface initiates an ISDN backup connection and sends the packet over it. See also *dial-on-demand routing backup; floating static route*. |
| **dial-on-demand-routing (DDR) backup** | Feature that provides a J-series Services Router with full-time connectivity across an ISDN line. When routes on a primary serial T1, E1, T3, E3, Fast Ethernet, or PPPoE interface are lost, an ISDN dialer interface establishes a backup connection. To save connection time costs, the Services Router drops the ISDN connection after a configured period of inactivity. Services Router with ISDN interfaces support two types of dial-on-demand routing backup: on-demand routing with a dialer filter and dialer watch. See also *dialer filter; dialer watch*. |
| **dialer watch** | Dial-on-demand routing (DDR) backup feature that provides reliable connectivity without relying on a dialer filter to activate the ISDN interface. The ISDN dialer interface monitors the existence of each route on a watch list. If all routes on the watch list are lost from the routing table, dialer watch initiates the ISDN interface for failover connectivity. See also *dial-on-demand routing backup*. |
| **"dying gasp" notification** | Ability of a Services Router with a digital subscriber line (DSL) connection that has lost power to send a message informing the attached DSL access multiplexer (DSLAM) that it is about to go offline. |
| **ePIM** | Enhanced PIM. A particular type of high-speed PIM, such as the Gigabit Ethernet ePIM or 4-port Fast Ethernet ePIM, which can be inserted only in high-speed slots (slots 3 and 6 on a J4350 Services Router, or slots 2, 3, 5, and 6 on a J6350 Services Router). |
| **floating static route** | Route with an administrative distance greater than the administrative distance of the dynamically learned versions of the same route. The static route is used only when the dynamic routes are no longer available. When a floating static route is configured on an interface with a dialer filter, the interface can be used for backup. |
| **ISDN S/T interface** | Interface between an ISDN network and a network termination device consisting of two twisted pairs, one each for transmitting and receiving. The S/T interface usually resides in the customer premises and operates at 192 Kbps, of which ISDN traffic accounts for 144 Kbps. |
| **ISDN U interface** | Single twisted–pair interface line connecting the customer premises unit in an ISDN network to the central office. A U interface runs at 144 Kbps (128 Kbps for two B channels and 16 Kbps for the D channel). |
| **plain old telephone service (POTS)** | Standard telephone service that allows limited speed and bandwidth of 52 Kbps, which is also know as public switched telephone network (PSTN). |
| **Primary Rate Interface (PRI)** | ISDN service intended for higher-bandwidth applications than ISDN BRI. ISDN PRI consists of a single D-channel for control and signaling, plus a number of 64-Kbps B-channels—either 23 B-channels on a T1 line or 30 B-channels on an E1 line—to carry network traffic. |
| **uPIM** | Universal switching PIM. A particular type of PIM, such as the Gigabit Ethernet uPIM, which can be universally inserted in any slot on a J2320, J2350, J4350, or J6350 Services Router. |

## Field-Replaceable PIMs

PIMs are removable and insertable only when the Services Router is powered off. You install PIMs into slots in the router chassis. If a slot is not occupied by a PIM, a PIM blank panel must be installed to shield the empty slot and to allow cooling air to circulate properly through the router.

This section contains the following topics:



### *J2320 and J2350 Field-Replaceable PIM and Module Summary*

Table 19 on page 39 provides software release information, port numbers, and sample interface names for the field-replaceable PIMs and modules supported on J2320 and J2350 Services Routers. For interface naming conventions, see the *JUNOS Software Interfaces and Routing Configuration Guide*. The supported PIMs can be installed in any slot available on the J2320 and J2350 routers. The WXC Integrated Services Module supported on the J2350 model occupies two slots. You can install only one of these modules in a router chassis.

**CAUTION:** Do not install a combination of modules in a single chassis that exceeds the maximum power and heat capacity of the chassis. If J-series power management is enabled, PIMs and modules (PIMs or PIMs plus a WXC Integrated Services Module) that exceed the maximum power and heat capacity remain offline when the chassis is powered on.

To verify that the combination of modules to be installed in a chassis does not exceed the power and heat capacities for the router, see “Planning for Power Management” on page 72.

**Table 19: J2320 and J2350 Field-Replaceable PIM and Module Summary**

| PIM | Supported Software Releases for This PIM | Port Numbering | Sample Interface Name (type-pim/0/port) |
|---|---|---|---|
| 1-Port SFP, 6-Port SFP, 8-Port, and 16-Port Gigabit Ethernet uPIMs | Release 8.5 and later of JUNOS software with enhanced services | Ports:<br>■ 0<br>■ 0 through 5<br>■ 0 through 7<br>■ 0 through 15 | ge-2/0/0 |
| Dual-Port Serial PIM | Release 8.5 and later of JUNOS software with enhanced services | Ports—0 and 1 | se-3/0/1 |
| Dual-Port T1 or E1 PIM | Release 8.5 and later of JUNOS software with enhanced services | Ports—0 and 1 | t1-0/0/1<br>or<br>e1-0/0/1 |
| Dual-Port Channelized T1/E1/ISDN PRI PIM | Release 8.5 and later of JUNOS software with enhanced services | Ports—0 and 1 | ct1-0/0/0<br>ce1-0/0/0 |
| 4-Port ISDN BRI PIM | Release 8.5 and later of JUNOS software with enhanced services | Ports—0, 1, 2, and 3 | br-1/0/2 |
| ADSL PIM | Release 8.5 and later of JUNOS software with enhanced services | Port—0 | at-2/0/0 |
| G.SHDSL PIM | Release 8.5 and later of JUNOS software with enhanced services | Ports—0 and 1 | at-1/0/0 |
| WXC Integrated Services Module (ISM 200)<br>**NOTE:** This module is not supported on J2320 routers. | Release 8.5 and later of JUNOS software with enhanced services | Ports—0 | wx-1/0/0 |

## *J4350 and J6350 Field-Replaceable PIM Summary*

Table 20 on page 40 provides software release information, slot and port numbers, and sample interface names for the field-replaceable PIMs supported on J4350 and J6350 Services Routers.

**CAUTION:** Do not install a combination of modules in a single chassis that exceeds the maximum power and heat capacity of the chassis. If J-series power management is enabled, PIMs and modules (PIMs or PIMs plus a WXC Integrated Services Module) that exceed the maximum power and heat capacity remain offline when the chassis is powered on.

To verify that the combination of PIMs to be installed in a chassis does not exceed the power and heat capacities for the J4350 or J6350 router, see "Planning for Power Management" on page 72.

**Table 20: J4350 and J6350 Field-Replaceable PIM and Module Summary**

| PIM | Supported Software Releases for This PIM | Slot and Port Numbering | Sample Interface Name (type-pim/0/port) |
|---|---|---|---|
| 1-Port SFP Gigabit Ethernet uPIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Port—0 | ge-2/0/0 |
| 6-Port SFP Gigabit Ethernet uPIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 through 5 | ge-2/0/5 |
| 8-Port Gigabit Ethernet uPIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 through 7 | ge-2/0/7 |
| 16-Port Gigabit Ethernet uPIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 through 15 | ge-2/0/15 |
| 1-Port SFP Gigabit Ethernet ePIM | Release 8.5 and later of JUNOS software with enhanced services | Can be installed in any high-speed slot, as follows:<br>■ J4350: Slots 3 and 6<br>Port—0<br>■ J6350: Slots 2, 3, 5, and 6<br>Port—0 | ge-3/0/0 |
| Dual-Port Serial PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 and 1 | se-3/0/1 |
| Dual-Port T1 or E1 PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 and 1 | t1-0/0/1<br>or<br>e1-0/0/1 |
| Dual-Port Channelized T1/E1/ISDN PRI PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Port—0 and 1 | ct1-0/0/0<br>ce1-0/0/0 |

**Table 20: J4350 and J6350 Field-Replaceable PIM and Module Summary** *(continued)*

| PIM | Supported Software Releases for This PIM | Slot and Port Numbering | Sample Interface Name (type-pim/0/port) |
|---|---|---|---|
| T3 or E3 PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Port—0 | t3-0/0/0<br>or<br>e3-2/0/0 |
| Dual-Port Fast Ethernet PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 and 1 | fe-1/0/0 |
| 4-port Fast Ethernet ePIM PIM | Release 8.5 and later of JUNOS software with enhanced services | Can be installed in any high-speed slot, as follows:<br>■ J4350: Slots 3 and 6<br>Ports—0 through 3<br>■ J6350: Slots 2, 3, 5, and 6<br>Ports—0 through 3 | fe-3/0/0 |
| 4-Port ISDN BRI PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0, 1, 2, and 3 | br-1/0/2 |
| ADSL PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Port—0 | at-2/0/0 |
| G.SHDSL PIM | Release 8.5 and later of JUNOS software with enhanced services | Slots—1 through 6<br>Ports—0 and 1 | at-1/0/0 |
| WXC Integrated Services Module (ISM 200) | Release 8.5 and later of JUNOS software with enhanced services | Ports—0 | wx-1/0/0 |

## *1-Port, 6-Port, 8-Port, and 16-Port Gigabit Ethernet uPIMs*

Gigabit Ethernet uPIMs are supported on J2320, J2350, J4350, and J6350 Services Routers. Gigabit Ethernet uPIMs are available in four versions.

The 1-port and 6-port SFP Gigabit Ethernet uPIM, shown in Figure 22 on page 42 and Figure 23 on page 42, have small form-factor pluggable (SFP) transceivers to allow you to use different connectors. The optical SFP transceivers supported by these uPIMs are described in Table 22 on page 44.

**Figure 22: 1-Port Gigabit Ethernet uPIM**

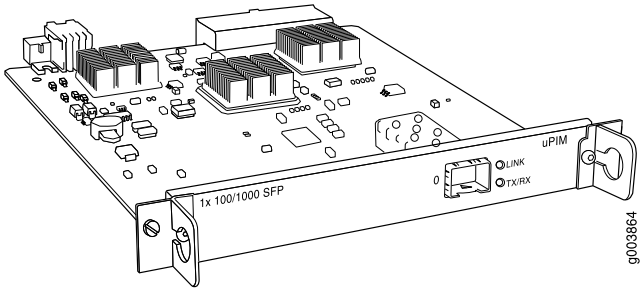
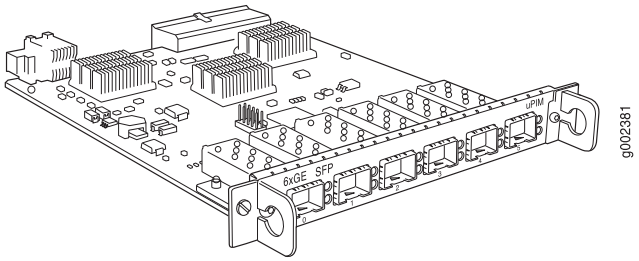



**Figure 23: 6-Port Gigabit Ethernet uPIM**




The 8-port and 16-port Gigabit Ethernet uPIMs, shown in Figure 24 on page 42 and Figure 25 on page 42, have RJ-45 connectors.

**Figure 24: 8-Port Gigabit Ethernet uPIM**

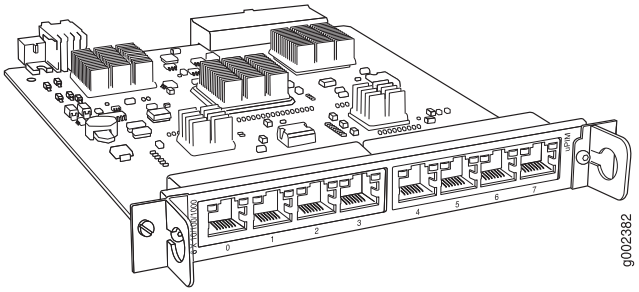
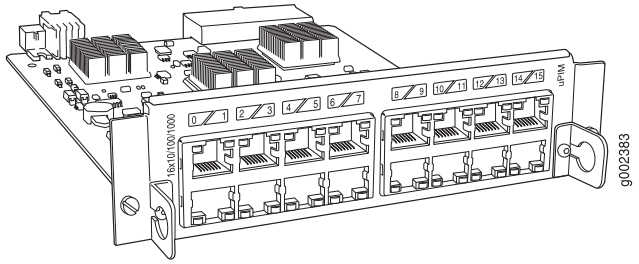



**Figure 25: 16-Port Gigabit Ethernet uPIM**



**Features.** Gigabit Ethernet uPIMs provide the following key features:

- The multiport uPIMs can be used as switches in the access layer (for connections to workstations and desktops). For more information, see the *JUNOS Software Interfaces and Routing Configuration Guide*.
- Link speed for 8-port and 16-port Gigabit Ethernet uPIMs is configurable to 10, 100, or 1000 Mbps, and transmission mode is configurable to half or full duplex. The 1-port and 6-port SFP Gigabit Ethernet uPIMs cannot be manually configured—they are set at 1000 Mbps and full duplex.
- Autonegotiation.
- 1-port and 6-port Gigabit Ethernet uPIMs use SFP transceivers to allow different connectors to be used on uPIM ports. These SFP Gigabit Ethernet uPIMs support 1000Base-SX, 1000Base-LX, and 1000Base-T SFPs. They do not support 1000Base-LH SFPs.

  1000Base-SX and 1000Base-LX SFP transceivers have the following characteristics:

  - Duplex LC/PC connector (Rx and Tx).
  - Optical interface support—See the *JUNOS Software Administration Guide*.
- 8-port and 16-port Gigabit Ethernet uPIMs—and SFPs on the 1-port and 6-port uPIMs—support 1000Base-T RJ-45 connectors.

  For pinouts of cable connectors for Gigabit Ethernet uPIMs, see "Gigabit Ethernet uPIM RJ-45 Connector Pinout" on page 189.

**Limitations.** Gigabit Ethernet uPIMs have the following limitations:

- Gigabit Ethernet uPIMs do not support SNMP.
- Gigabit Ethernet uPIM interfaces can be configured up to a maximum MTU size of 9014 bytes.

**Installation.** Gigabit Ethernet uPIMs can be inserted in any slot on J2320, J2350, J4350, or J6350 Services Routers.

Throughput for a uPIM is higher when it is inserted in a high-speed slot. High-speed slots are slots 3 and 6 on the J4350 router, and slots 2, 3, 5, and 6 on the J6350 router.

16-port Gigabit Ethernet uPIMs are two slots high. Because the connector on the PIM is on the lower half, the PIM occupies the slot that it is plugged into and the slot above it. Thus you cannot install a 16-port uPIM in the top slots of a router. For example, on a J4350 router you cannot install a 16-port uPIM in slots 1 and 4. If you install the PIM in slot 2, it occupies both slots 2 and 1.

To install or remove a PIM, see "Replacing a PIM" on page 120.

**Interface LEDs.** For 8-port and 16-port Gigabit Ethernet uPIMs, the activity LED is located on the left side of each port, and the link LED is located on the right side of each port. For the 6-port Gigabit Ethernet uPIM, the LEDs are located to the right of each port, with the link LED above the activity LED. LEDs on the 1-port uPIM are clearly labeled.Table 21 on page 44 describes the meaning of the LEDs.

**Table 21: Gigabit Ethernet Port LEDs**

| Function | Color | State | Description |
|---|---|---|---|
| Link | Green | On steadily | Port is online. |
| | Unlit | Off | Port is offline. |
| Activity (TX/RX) | Green | Blinking | Port is transmitting or receiving traffic. |
| | Unlit | Off | Port might be online, but it is not receiving traffic. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

**Optical Interface Support.** Table 22 on page 44 describes the optical interface support on the 1-port and 6-port Gigabit Ethernet uPIMs over single-mode fiber-optic (SMF) and multimode fiber-optic (MMF) cables.

**Table 22: Optical Interface Support for SFP Gigabit Ethernet uPIMs**

| Parameter | 1000Base-SX Transceiver | 1000Base-LX Transceiver |
|---|---|---|
| Model number | JX-SFP-1GE-SX | JX-SFP-1GE-LX |
| Maximum distance | 500 m (1640 ft) on 50/125-µm MMF cable<br><br>200 m (656 ft) on 62.5/125-µm MMF cable | 10 km (6.2 mi) on 9/125-µm SMF cable<br><br>550 m (1894 ft) on MMF cable |
| Transmitter wavelength | 830 nm through 860 nm | 1270 nm through 1355 nm |
| Average launch power | –9.5 dBm through –4 dBm | For SMF cable: –9.5 dBm through –3 dBm<br><br>For MMF cable: –11.5 dBm through –3 dBm |
| Receiver sensitivity | –21 dBm through –18 dBm | –25 dBm through –20.5 dBm |

**Copper Interface Support.** The 1-port and 6-port Gigabit Ethernet uPIMs also support 1000Base-T SFPs (model number JX-SFP-1GE-T).

## *1-Port Gigabit Ethernet ePIMs*

The 1-port Gigabit Ethernet ePIM is supported on J4350 and J6350 Services Routers and is available in two versions, one with copper connector (see Figure 26 on page 45), the other with small form-factor pluggable (SFP) transceivers (see Figure 27 on page 45).

**Figure 26: Copper Gigabit Ethernet ePIM**

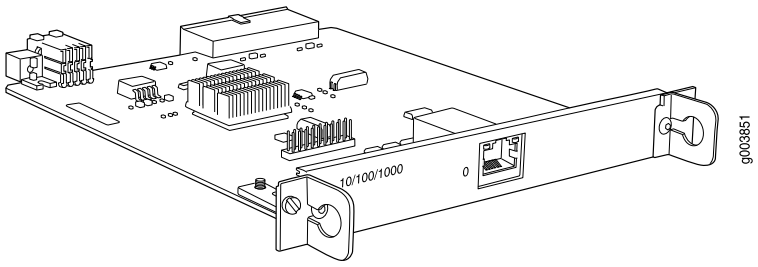
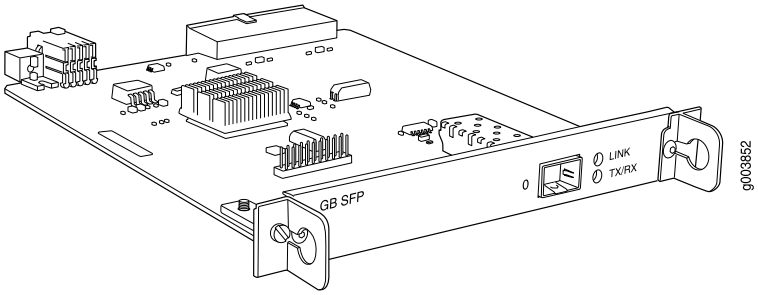



**Figure 27: SFP Gigabit Ethernet ePIM**




**Features.** The Gigabit Ethernet ePIM provides the following key features:

- Autonegotiation through medium-dependent interface (MDI) and MDI crossover (MDI-X) support.
- Link speeds for the Copper Gigabit Ethernet ePIM are configurable to 10, 100, or 1000 Mbps, and transmission mode is configurable to half or full duplex. The SFP Gigabit Ethernet ePIM cannot be manually configured—it is set at 1000 Mbps and full duplex.
- The SFP Gigabit Ethernet ePIM uses SFPs to allow different connectors to be used on the ePIM ports. The ePIM supports 1000Base-SX, 1000Base-LX, and 1000Base-T copper SFPs. It does not support 1000Base-LH SFPs.

  1000Base-SX and 1000Base-LX SFP transceivers have the following characteristics:

  - Duplex LC/PC connector (Rx and Tx).
  - Optical interface support—See Table 24 on page 46.

- Copper Gigabit Ethernet ePIM and 1000Base-T SFP transceivers have the following characteristics:

  - Connector: Four-pair, category 5 unshielded twisted-pair cable through an RJ-45 connector
  - Pinout: MDI crossover
  - Maximum distance: 100 m (328 ft)

For pinouts of cable connectors for Copper Gigabit Ethernet ePIMs, see “Gigabit Ethernet ePIM RJ-45 Connector Pinout” on page 190.

**Limitations.** The Gigabit Ethernet ePIM has the following limitations:

- Gigabit Ethernet ePIMs do not support SNMP.
- Configure Gigabit Ethernet ePIM interfaces up to a maximum MTU size of 9018 bytes.

**Installation.** You can install Gigabit Ethernet ePIMs in any high-speed slot as follows:

- J4350—Install up to two Gigabit Ethernet ePIMs in slots 3 and 6.
- J6350—Install up to four Gigabit Ethernet ePIMs in slots 2, 3, 5, and 6.

**NOTE:** High-speed slots are labeled with an **E** on the front-panel slot number diagram.

To install or remove a PIM, see "Replacing a PIM" on page 120.

**Interface LEDs.** The LINK and TX/RX LEDs indicate link status and activity. Table 23 on page 46 describes the meaning of the LEDs.

**Table 23: Gigabit Ethernet Port LEDs**

| Function | Color | State | Description |
|---|---|---|---|
| LINK | Green | On steadily | Port is online. |
| | Unlit | Off | Port is offline. |
| TX/RX | Green | Blinking | Port is transmitting or receiving traffic. |
| | Unlit | Off | Port might be online, but it is not receiving traffic. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

**Optical Interface Support.** Table 24 on page 46 describes the optical interface support on the SFP Gigabit Ethernet ePIM over single-mode fiber-optic (SMF) and multimode fiber-optic (MMF) cables.

**Table 24: Optical Interface Support for SFP Gigabit Ethernet ePIM**

| Parameter | 1000Base-SX Transceiver | 1000Base-LX Transceiver |
|---|---|---|
| Maximum distance | 500 m (1640 ft) on 50/125-µm MMF cable | 10 km (6.2 mi) on 9/125-µm SMF cable |
| | 200 m (656 ft) on 62.5/125-µm MMF cable | 550 m (1894 ft) on MMF cable |
| Transmitter wavelength | 830 nm through 860 nm | 1270 nm through 1355 nm |

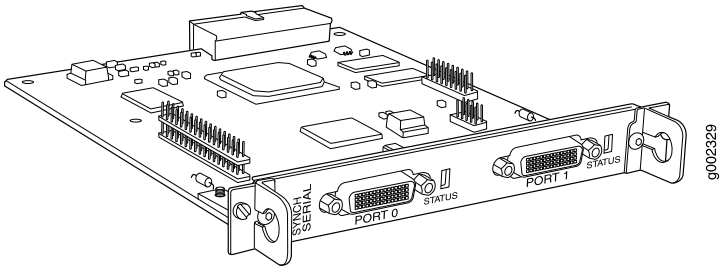
**Table 24: Optical Interface Support for SFP Gigabit Ethernet ePIM** *(continued)*

| Parameter | 1000Base-SX Transceiver | 1000Base-LX Transceiver |
|---|---|---|
| Average launch power | –9.5 dBm through –4 dBm | For SMF cable: –9.5 dBm through –3 dBm<br><br>For MMF cable: –11.5 dBm through –3 dBm |
| Receiver saturation | –3 dBm | –3 dBm |
| Receiver sensitivity | –18 dBm | –20.5 dBm |

## *Dual-Port Serial PIM*

The Dual-Port Serial PIM (Figure 28 on page 47) provides a physical connection to serial network media types through two serial interface ports.

**Figure 28: Dual-Port Serial PIM**




The Dual-Port Serial PIM provides the following key features:

- Onboard network processor
- Autoselection of operation modes based on data terminal equipment (DTE) or data communication equipment (DCE) cables
- Local and remote loopback diagnostics
- Configurable clock rate for the transmit (Tx) clock and receive (Rx) clock

For pinouts of cable connectors for serial PIMs, see “Serial PIM Cable Specifications” on page 179.

To install or remove a PIM, see “Replacing a PIM” on page 120.

Status LEDs indicate port status. Table 25 on page 48 describes the meaning of the LED states.

**Table 25: Status LEDs for Serial Ports**

| Color | State | Description |
|---|---|---|
| Green | On steadily | Online with no alarms or failures. |
| Red | On steadily | Active with a local alarm. The router has detected a failure. |
| Unlit | Off | Offline. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## *Dual-Port T1 or E1 PIM*

The Dual-Port T1 PIM (Figure 29 on page 48) and Dual-Port E1 PIM (Figure 30 on page 48) provide a physical connection to T1 or E1 network media types. Each PIM has two physical T1 or E1 ports with an integrated channel service unit (CSU) or data service unit (DSU).

**Figure 29: Dual-Port T1 PIM**

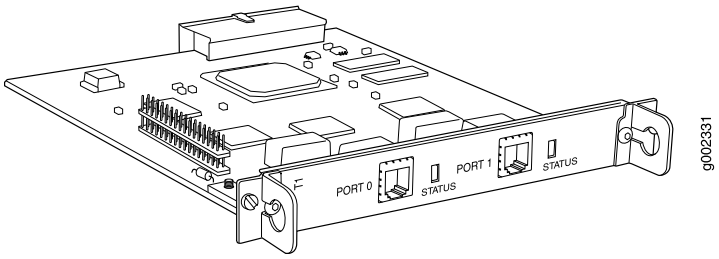
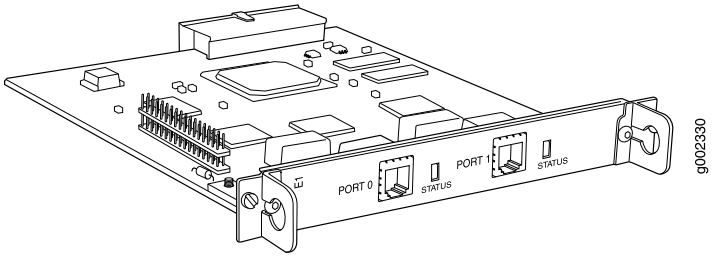



**Figure 30: Dual-Port E1 PIM**




The Dual-Port T1 and E1 PIMs provides the following key features:

- Onboard network processor
- Integrated CSU/DSU—Eliminates the need for a separate external device
- 56-Kbps and 64-Kbps modes
- ANSI T1.102, T1.107, and T1.403 standards compliance

- G.703, G.704, and G.706 E1 standards compliance
- Independent internal and external clocking system
- Loopback, bit error rate test (BERT), T1 facilities data link (FDL), and long buildout diagnostics

For pinouts of cable connectors for T1 and E1 PIMs, see "E1 and T1 RJ-48 Cable Pinouts" on page 191.

To install or remove a PIM, see "Replacing a PIM" on page 120.

Status LEDs indicate port status. Table 26 on page 49 describes the meaning of the LED states.

**Table 26: Status LEDs for T1 and E1 Ports**

| Color | State | Description |
|---|---|---|
| Green | On steadily | Online with no alarms or failures. |
| Red | On steadily | Active with a local alarm. The router has detected a failure. |
| Unlit | Off | Offline. |

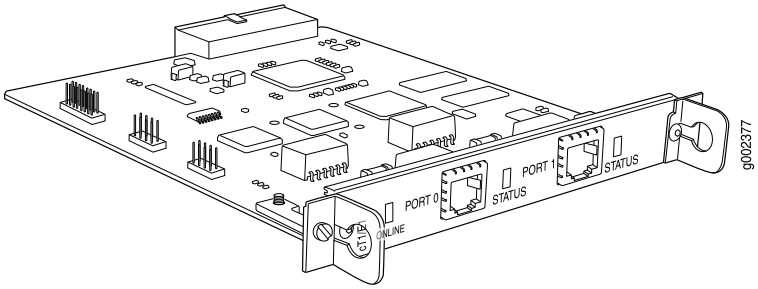
For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## *Dual-Port Channelized T1/E1/ISDN PRI PIM*

The Dual-Port Channelized T1/E1/ISDN PRI PIM (Figure 31 on page 50) is a multiflex interface card that allows you to configure a single interface as a channelized T1 interface or a channelized E1 interface. You can also configure ISDN PRI services on a channelized T1 or E1 interface. The channelized T1/E1/ISDN PRI interface supports up to 24 DS0 channels on a T1 interface and up to 31 DS0 channels on an E1 interface, in addition to supporting the features of regular (unchannelized) T1 and E1 PIMs. Each interface can be configured as a single clear-channel, fractionalized, or channelized interface.

**NOTE:** You cannot configure a channelized T1/E1/ISDN PRI interface through a J-Web Quick Configuration page.

**Figure 31: Channelized T1/E1/ISDN PRI PIM**




The Dual-Port Channelized T1/E1/ISDN PRI PIM provides the following key features:

- Onboard network processor
- Two-port channelization
- Interfaces that are software configurable as T1 or E1 channels or ISDN PRI B-channels
- Clear-channel, fractional, and channelized operation
- Lower latency due to the addition of a Freescale processor
- Maximum MTU value of 4500 bytes (for channelized T1 or E1 interface) and 4098 bytes (for ISDN PRI services)

**NOTE:** For a clear-channel T1 or E1 interface, the maximum MTU is 9150 bytes.

- 56-Kbps and 64-Kbps modes
- ANSI T1.102, T1.107, and T1.403 standards compliance
- G.703, G.704, and G.706 E1 standards compliance
- Independent internal and external clocking system
- Loopback, bit error rate test (BERT), T1 facilities data link (FDL), and long buildout diagnostics

For pinouts of cable connectors for channelized T1/E1/ISDN PRI PIMs, see “ISDN RJ-45 Connector Pinout” on page 195.

To install or remove a PIM, see “Replacing a PIM” on page 120.

Channelized T1/E1/ISDN PRI LEDs indicate PIM and port status. Table 27 on page 51 describes the meaning of the LED states.

**NOTE:** The STATUS LED displays channelized T1 or E1 port activity and alarms only. It does not display ISDN PRI B-channel or D-channel status.

**Table 27: LEDs for Channelized T1/E1/ISDN PRI PIMs**

| Label | Color | State | Description |
|---|---|---|---|
| ONLINE | Green | On steadily | PIM is online and operational. |
| | Unlit | Off | PIM is not online. |
| STATUS | Green | On steadily | Port is online with no alarms or failures, and the physical layer is active. |
| | Red | Online | Port is active with a local alarm. The router has detected a failure and the physical layer is inactive. |
| | Yellow | Online | Port is online with alarms for remote failures. |
| | Unlit | Offline | Port is disabled. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## *T3 or E3 PIM*

The T3 (also known as DS3) PIM (Figure 32 on page 51) and E3 PIM (Figure 33 on page 52) provide a physical connection to T3 or E3 network media types. The T3 and E3 PIMs include one physical T3 or E3 port with an integrated data service unit (DSU).

**Figure 32: T3 PIM**

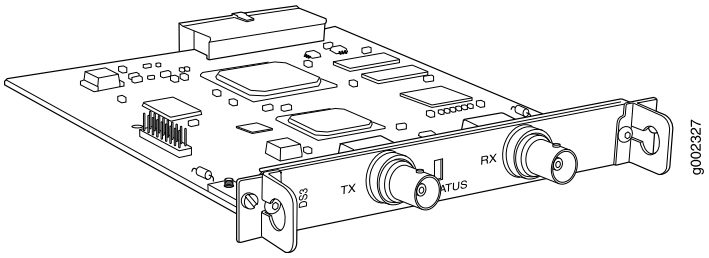
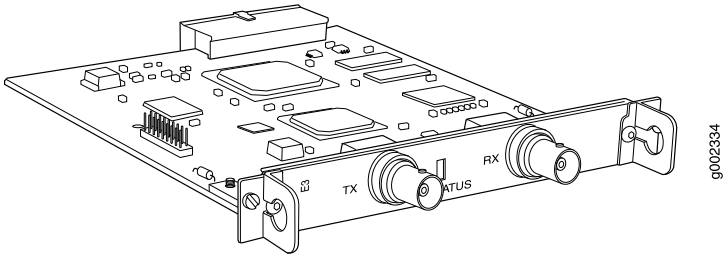


**Figure 33: E3 PIM**




The T3 and E3 PIMs provide the following key features:

- Onboard network processor
- Integrated DSU—Eliminates the need for a separate external device
- Subrate and scrambling options with support for major DSU vendors
- Independent internal and external clocking system
- Loopback (payload–supported only on T3 PIM, local, and remote), bit error rate test (BERT), and T3 far-end alarm and control (FEAC) diagnostics

For pinouts of cable connectors for T3 and E3 PIMs, see "E3 and T3 BNC Connector Pinout" on page 194.

To install or remove a PIM, see "Replacing a PIM" on page 120.

Status LEDs indicate port status. Table 28 on page 52 describes the meaning of the LED states.

**Table 28: Status LEDs for T3 and E3 Ports**

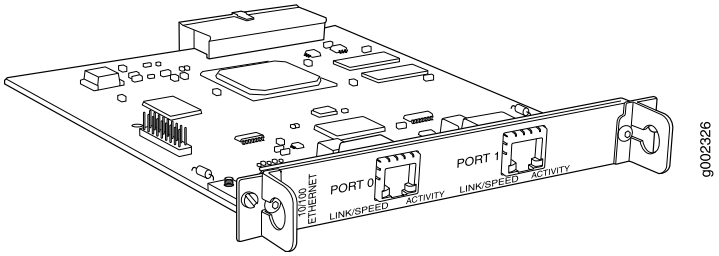
| Color | State | Description |
|---|---|---|
| Green | On steadily | Online with no alarms or failures. |
| Red | On steadily | Active with a local alarm. The router has detected a failure. |
| Yellow | On steadily | ■ Loopback mode.<br>■ T3 (DS3)—Remote endpoint is in red alarm failure.<br>■ E3—Remote defect indication (RDI). |
| Unlit | Off | Offline. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## *Dual-Port Fast Ethernet PIM*

The Dual-Port 10/100-Mbps Fast Ethernet PIM (Figure 34 on page 53) has two physical Fast Ethernet ports.

**Figure 34: Fast Ethernet PIM**




The Dual-Port Fast Ethernet PIM provides the following key features:

- Onboard network processor
- Full-duplex and half-duplex modes
- Media access control (MAC) address filtering
- Autonegotiation through medium-dependent interface (MDI) and MDI crossover (MDI–X) support

For pinouts of cable connectors for Fast Ethernet PIMs, see "Fast Ethernet RJ-45 Connector Pinout" on page 189.

To install or remove a PIM, see "Replacing a PIM" on page 120.

Fast Ethernet LEDs indicate link status, port speed, and activity. Table 29 on page 53 describes the meaning of the LEDs.

**Table 29: LEDs for Dual-Port Fast Ethernet PIM**

| Label | Color | State | Description |
|---|---|---|---|
| LINK/SPEED | Green (100 Mbps)<br>Yellow (10 Mbps) | On steadily | Online and link is active. |
| | Red | Disconnected | Link is unavailable. |
| ACTIVITY | Green | Blinking | Online with network traffic. |
| | Green | On steadily | Online without traffic. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

### *4-Port Fast Ethernet ePIM*

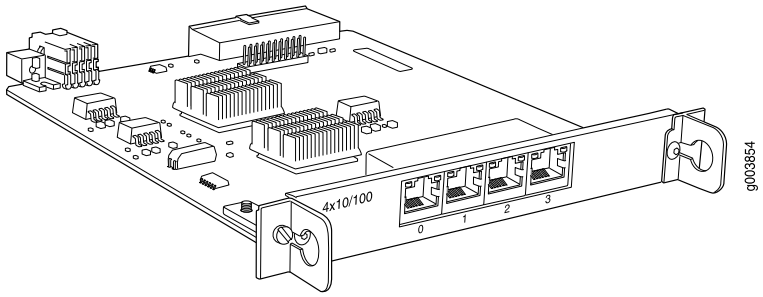
You can install 4-Port Fast Ethernet ePIMs in any of the high-speed slots, as follows:

- J4350—Install up to two 4-Port Fast Ethernet ePIMs in slots 3 and 6.
- J6350—Install up to four 4-Port Fast Ethernet ePIMs in slots 2, 3, 5, and 6.

**NOTE:** For 4-port Fast Ethernet ePIMs, if you apply a CoS scheduler map on outgoing (egress) traffic, the router does not divide the bandwidth appropriately among the CoS queues. As a workaround, configure enforced CoS shaping on the ports.

The 4-Port 10/100-Mbps Fast Ethernet ePIM, shown in Figure 35 on page 54, has four physical Fast Ethernet ports.

**Figure 35: 4-Port Fast Ethernet ePIM**




The 4-Port Fast Ethernet ePIM provides the following key features:

- Full-duplex and half-duplex modes.
- Autonegotiation through medium-dependent interface (MDI) and MDI crossover (MDI–X) support.

For pinouts of cable connectors for Fast Ethernet ePIMs, see “Fast Ethernet RJ-45 Connector Pinout” on page 189.

**NOTE:** 4-port Fast Ethernet ePIMs support a maximum frame size of 1514 bytes. Jumbo frames are not supported.

For information about installing and removing a PIM, see “Replacing a PIM” on page 120.

Fast Ethernet LEDs indicate link status and activity. Table 30 on page 55 describes the meaning of the LEDs.

**Table 30: LEDs for 4-Port Fast Ethernet ePIM**

| Label | Color | State | Description |
|---|---|---|---|
| Link status (upper left) | Green | On steadily | Port is online. |
| | Unlit | Off | Port is offline. |
| Link activity (upper right) | Green | Blinking | Port is transmitting or receiving data. |
| | Unlit | Off | Port might be online, but it is not transmitting or receiving data. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## *4-Port ISDN BRI PIMs*

The 4-port ISDN BRI PIMs have four physical ports that support the ISDN BRI S/T (Figure 36 on page 55) or ISDN BRI U (Figure 37 on page 55) interface type.

**Figure 36: ISDN BRI S/T PIM**

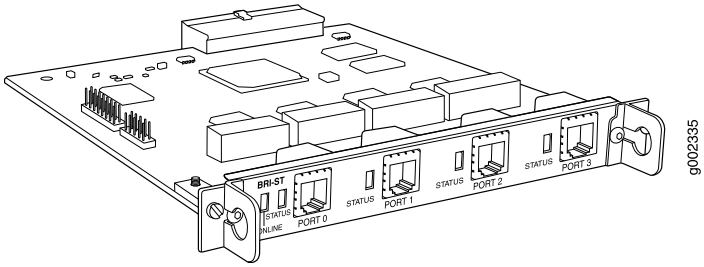
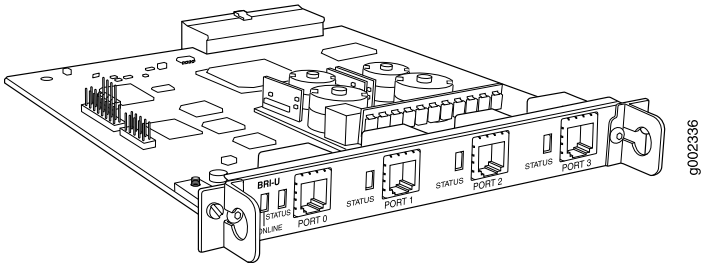



**Figure 37: ISDN BRI U PIM**




ISDN BRI PIMs provide the following key features:

- Onboard network processor
- Bandwidth on demand

- Dial backup
- Dial-on-demand routing backup (floating static and dialer watch)

For pinouts of cable connectors for ISDN PIMs, see "ISDN RJ-45 Connector Pinout" on page 195.

To install or remove a PIM, see "Replacing a PIM" on page 120.

ISDN LEDs indicate PIM and port status. Table 31 on page 56 describes the meaning of the LED states.

**Table 31: LEDs for ISDN BRI S/T and U PIMs**

| Label | Color | State | Description |
|---|---|---|---|
| ONLINE | Green | Blinking | Call setup is successful on either the B1 or B2 channel. |
| | Green | On steadily | ISDN Layer 2 is active. |
| | Amber | On steadily | ■ ISDN Layer 1 is active.<br>■ ISDN Layer 2 is unavailable. |
| | Red | Disconnected | ■ BRI interface port is not connected.<br>■ ISDN Layer 1 is unavailable. |
| | Unlit | Off | BRI interface is offline. |
| STATUS | Green | On steadily | PIM is online and operational. |
| | Red | Disconnected | PIM is not operational and needs replacement. |
| | Unlit | Off | PIM is offline. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## *ADSL PIM*

The ADSL PIM provides a single physical interface to asymmetric digital subscriber line (ADSL) network media types. The ADSL PIM, one supporting Annex A (Figure 38 on page 57) over plain old telephone service (POTS) and the other Annex B (Figure 39 on page 57) over ISDN, includes one physical ADSL port for an ATM-over-ADSL connection.

**Figure 38: ADSL 2/2+ Annex A PIM**

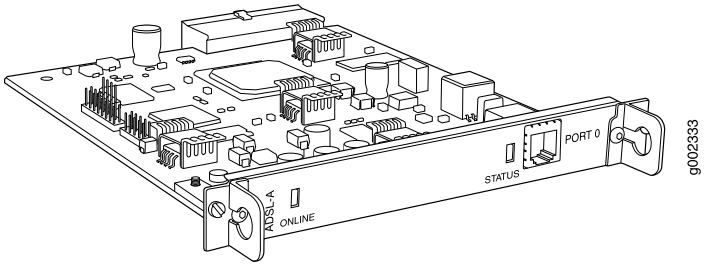
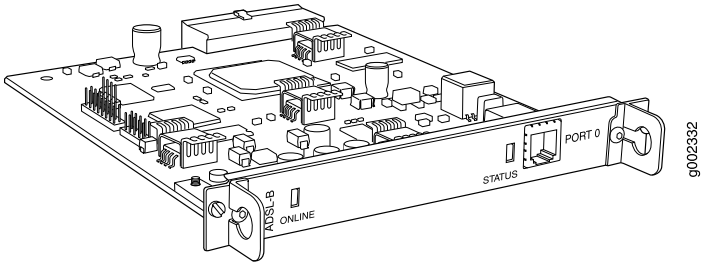



**Figure 39: ADSL 2/2+ Annex B PIM**




The ADSL PIM provides the following key features:

- Onboard network processor
- ADSL, ADSL2, and ADSL2 + protocols on the same PIM
- "Dying gasp" notification
- Asynchronous Transfer Mode (ATM) Adaptation Layer 5 (AAL5) encapsulation

For pinouts of cable connectors for ADSL PIMs, see "ADSL and G.SHDSL RJ-11 Connector Pinout" on page 194.

To install or remove a PIM, see "Replacing a PIM" on page 120.

The ADSL PIMs have two LEDs to indicate the status of the PIM and its port. Table 32 on page 57 describes the meaning of the LED states.

**Table 32: LEDs for ADSL PIMs**

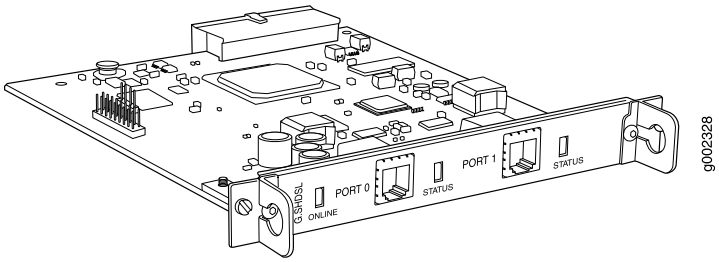
| Label | Color | State | Description |
|---|---|---|---|
| ONLINE | Green | On steadily | PIM passed the self-test and is online and operational. |
| | Unlit | Off | PIM is offline. |
| STATUS | Green | On steadily | Online with no alarms or failures. |
| | Red | On steadily | Active with local or remote alarms. The router has detected a failure. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

## G.SHDSL PIM

The G.SHDSL PIM (Figure 40 on page 58) provides symmetric high-speed digital subscriber line (SHDSL) physical interfaces to ATM network media types. The G.SHDSL PIM has two ports for ATM-over-SHDSL connections.

**Figure 40: G.SHDSL PIM**




The G.SHDSL PIM supports the following key features:

- Onboard network processor
- 2-port two-wire mode and 1-port four-wire mode
- Programmable line rates in both modes:
  - 2-port two-wire mode supports autodetection of line rate and fixed line rates from 192 Kbps to 2.304 Mbps in 64-Kbps increments.
  - 1-port four-wire mode supports fixed line rates from 384 Kbps to 4.608 Mbps in 128-Kbps increments.
- 32 virtual channels per PIM
- ATM-over-G.SHDSL framing
- "Dying gasp" notification
- Local and remote loopback diagnostics
- ITU-T G.991.2, ITU-T G.994.1, and ITU-T G.997.1 standards compliance

**NOTE:** Payload loopback functionality is not supported on ATM-over-SHDSL interfaces.

For pinouts of cable connectors for G.SHDSL PIMs, see "ADSL and G.SHDSL RJ-11 Connector Pinout" on page 194.

To install or remove a PIM, see "Replacing a PIM" on page 120.

The G.SHDSL PIM has two LEDs to indicate the status of the PIM and its ports. Table 33 on page 59 describes the meaning of the LED states.

**Table 33: LEDs for G.SHDSL PIMs**

| Label | Color | State | Description |
|---|---|---|---|
| ONLINE | Green | On steadily | Online with no alarms or failures. |
| | Red | Disconnected | Initialization of the PIM has failed. |
| | Unlit | Off | PIM is booting. |
| STATUS | Green | On steadily | Online with no alarms or failures. |
| | Red | On steadily | Active with a local alarm. The router has detected a failure. |

For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

# Part 2
# Installing a Services Router

Chapter 4

# Preparing for Router Installation

Before installing a J-series Services Router, make sure that your site has the proper operating environment and equipment. Use the checklist at the end of the chapter to help you prepare your site.

This chapter discusses the following topics:



## General Site Guidelines

The following precautions help you plan an acceptable operating environment for your Services Router and avoid environmentally caused equipment failures:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. Ensure that there is adequate circulation in the installation location. In J2320 and J2350 routers, allow at least 6 in. (15.2 cm) of clearance between the left and right sides of the chassis and adjacent equipment. In J4350 and J6350 routers, allow at least 6 in. (15.2 cm) of clearance between the front and back of the chassis and adjacent equipment.
- Follow ESD procedures described in “Preventing Electrostatic Discharge Damage” on page 201, to avoid damaging equipment. Static discharge can cause components to fail completely or intermittently over time.
- Install blank PIM panels in empty slots, to prevent any interruption or reduction in the flow of air across internal components.

## Rack Requirements

J-series Services Routers must be installed in a rack. Many types of racks are acceptable, including front-mount racks, four-post (telco) racks, and center-mount racks.

The following sections describe rack requirements:



### *Rack Size and Strength for J2320 and J2350 Routers*

The J2320 and J2350 Services Routers are designed for installation in a rack that complies with either of the following standards:

- A 19-in. rack as defined in Cabinets, Racks, Panels, and Associated Equipment (document number EIA-310-D) published by the Electronics Industry Association (http://www.eia.org)
- A 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (http://www.etsi.org)

  The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the router's mounting ears, which measure 19 in. (48.2 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required.

The rack rails must be spaced widely enough to accommodate the router chassis's external dimensions:

- J2320 chassis—1.75 in. (4.45 cm) high, 17.51 in. (44.48 cm) wide, and 15.1 in. (38.35 cm) deep.
- J2350 chassis—2.61 in. (6.63 cm) high, 17.51 in. (44.48 cm) wide, and 15.1 in. (38.35 cm) deep.

The outer edges of the mounting ears extend the width of either chassis to 19 in. (48.2 cm), and the front of the chassis extends approximately 0.78 in. (1.98 cm) beyond the mounting ears. The spacing of rails and adjacent racks must also allow for the clearances around the router and rack. (See “General Site Guidelines” on page 63.)

**CAUTION:** If you are mounting the router in a cabinet, be sure that ventilation is sufficient to prevent overheating.

If a front-mount rack is used, we recommend supporting the back of the router with a shelf or other structure.

The J2320 chassis height of 1.75 in. (4.45 cm) equals 1 U. The J2350 chassis height of 2.61 in. (6.63 cm) equals 1.5 U. Each *U* is a standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association.

### Rack Size and Strength for J4350 and J6350 Routers

The Services Router is designed for installation in a rack that complies with either of the following standards:

- A 19-in. rack as defined in Cabinets, Racks, Panels, and Associated Equipment (document number EIA-310-D) published by the Electronics Industry Association (http://www.eia.org)
- A 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (http://www.etsi.org)

  The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the router's mounting ears, which measure 19 in. (48.2 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required.

The rack rails must be spaced widely enough to accommodate the router chassis's external dimensions: 3.44 in. (8.74 cm) high, 17.44 in. (44.3 cm) wide, and 21.13 in. (53.67 cm) deep.

The outer edges of the mounting ears extend the width of either chassis to 19.44 in. (48.38 cm), and the front of the chassis extends approximately 0.5 in. (1.27 cm) beyond the mounting ears. The spacing of rails and adjacent racks must also allow for the clearances around the router and rack. (See "General Site Guidelines" on page 63.)

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**CAUTION:** If you are mounting the router in a cabinet, be sure that ventilation is sufficient to prevent overheating.

If a front-mount rack is used, we recommend supporting the back of the router with a shelf or other structure.

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The J4350 and J6350 chassis height of 3.44 in. (8.74 cm) equals 2 U. Each *U* is a standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association.

### Connection to Building Structure

Always secure the rack to the structure of the building. If your geographical area is subject to earthquakes, bolt the rack to the floor. For maximum stability, also secure the rack to ceiling brackets. For more information, see "Rack-Mounting Requirements and Warnings" on page 217.

## Router Environmental Tolerances

Table 34 on page 66 specifies the environmental conditions required for normal Services Router operation. In addition, the site must be as dust-free as possible. Dust can clog air intake vents, reducing cooling system efficiency. Check vents frequently, cleaning them as necessary.

**Table 34: Router Environmental Tolerances**

| Description | Value |
|---|---|
| Altitude | No performance degradation to 10,000 ft (3048 m) |
| Relative humidity | Normal operation ensured in relative humidity range of 5% to 90%, noncondensing |
| Temperature | Normal operation ensured in temperature range of 0°C (32°F) to 40°C (104°F)<br><br>Non-operating storage temperature in shipping carton: –40°C (–40°F) to 70°C (158°F) |
| Seismic | Designed to meet Telcordia Technologies Zone 4 earthquake requirements |
| Maximum thermal output | ■ J2320 chassis: 1091 BTU/hour (320 W)<br>■ J2350 chassis: 1195 BTU/hour (350 W)<br>■ J4350 chassis: 1092 BTU/hour (320 W)<br>■ J6350 chassis: 1126 BTU/hour (330 W) |

## Fire Safety Requirements

In the event of a fire emergency involving Services Routers and other network equipment, the safety of people is the primary concern. Establish procedures for protecting people in the event of a fire emergency, provide safety training, and properly provision fire-control equipment and fire extinguishers.

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

### *Fire Suppression*

In the event of an electrical hazard or an electrical fire, first unplug the power cord. (For shutdown instructions, see “Powering a Services Router On and Off” on page 89.)

Then, use a Type C fire extinguisher, which uses noncorrosive fire retardants, to extinguish the fire. For more information about fire extinguishers, see “Fire Suppression Equipment” on page 67.

### *Fire Suppression Equipment*

Type C fire extinguishers, which use noncorrosive fire retardants such as carbon dioxide ($CO_2$) and Halotron, are most effective for suppressing electrical fires. Type C fire extinguishers displace the oxygen from the point of combustion to eliminate the fire. For extinguishing fire on or around equipment that draws air from the environment for cooling, use this type of inert oxygen displacement extinguisher instead of an extinguisher that leave residues on equipment.

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

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

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

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

## Power Guidelines, Requirements, and Specifications

All Services Routers are available with AC power. J2350, J4350, and J6350 routers are also available with DC power. For information about each router's power system, see “J4350 Power System” on page 30 and “J6350 Power System” on page 31.

For site wiring and power system guidelines, requirements, and specifications, see the following sections:

- Site Electrical Wiring Guidelines on page 68
- Router Power Requirements on page 69
- AC Power, Connection, and Power Cord Specifications on page 69
- DC Power, Connection, and Power Cable Specifications on page 71
- Planning for Power Management on page 72

## *Site Electrical Wiring Guidelines*

**WARNING:** Certain ports on the router are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS requirements and protect against lightening surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the router are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

**WARNING:** DC-powered J2350, J4350 and J6350 Services Routers are intended for installation only in a restricted access location.

When planning the electrical wiring at your site, consider the factors discussed in the following sections.

### Signaling Limitations

Improperly installed wires can emit radio interference. In addition, the potential for damage from lightning strikes increases if wires exceed recommended distances, or if wires pass between buildings. The electromagnetic pulse (EMP) caused by lightning can damage unshielded conductors and destroy electronic devices. If your site has previously experienced such problems, you might want to consult experts in electrical surge suppression and shielding.

### Radio Frequency Interference

You can reduce or eliminate the emission of radio frequency interference (RFI) from your site wiring by using twisted-pair cable with a good distribution of grounding conductors. If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

### Electromagnetic Compatibility

If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, you might want to seek expert advice. Strong sources of electromagnetic interference (EMI) can destroy the signal drivers and receivers in the router and conduct power surges over the lines into the equipment, resulting in an electrical hazard. It is particularly important to provide a properly grounded and shielded environment and to use electrical surge-suppression devices.

**CAUTION:** To comply with intrabuilding lightning/surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.

## Router Power Requirements

Table 35 on page 69 and Table 36 on page 69 list the AC and DC power system electrical specifications for Services Routers.

**Table 35: AC and DC Power System Electrical Specifications for J2320 and J2350 Routers**

| Item | Specification |
|---|---|
| AC input voltage | 100 to 240 VAC nominal |
| AC input line frequency | 50 to 60 Hz |
| AC system current rating | J2320 Services Routers: 3.2 A to 1.3 A<br>J2350 Services Routers: 3.5 A to 1.5 A |
| DC input voltage | –48 to –60 VDC operating range |
| DC system current rating | 7.2 A |

**Table 36: AC and DC Power System Electrical Specifications for J4350 and J6350 Routers**

| Item | Specification |
|---|---|
| AC input voltage | 100 to 240 VAC nominal |
| AC input line frequency | 50 to 60 Hz |
| AC system current rating | J4350 Services Routers: 6 A<br>J6350 Services Routers: 8 A |
| DC input voltage | –48 to –60 VDC operating range |
| DC system current rating | 20 A |

## AC Power, Connection, and Power Cord Specifications

**NOTE:** The AC power cord for the Services Router is intended for use with the router only and not for any other use.

Detachable AC power cords, each 2.5 m (approximately 8 ft) long, are supplied with the Services Router. The appliance coupler at the female end of the cord inserts into the appliance inlet on the faceplate of the AC power supply. The coupler is type C19 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source receptacle that is standard for your geographical location.

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

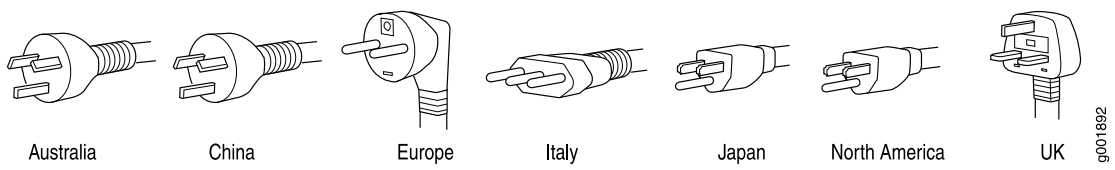
Table 37 on page 70 lists AC power cord specifications provided for each country or region.

**Table 37: AC Power Cord Specifications**

| Country | Electrical Specifications | Plug Standards |
|---|---|---|
| Australia | 250 VAC, 10 A, 50 Hz | AS/NZ 3112–1993 |
| China | 250 VAC, 10 A, 50 Hz | GB2099.1 1996 and GB1002 1996 (CH1-10P) |
| Europe (except Italy and United Kingdom) | 250 VAC, 10 A, 50 Hz | CEE (7) VII |
| Italy | 250 VAC, 10 A, 50 Hz | CEI 23–16/VII |
| Japan | 125 VAC, 12 A, 50 Hz or 60 Hz | JIS 8303 |
| North America | 125 VAC, 10 A, 60 Hz | NEMA 5-15 |
| United Kingdom | 250 VAC, 10 A, 50 Hz | BS 1363A |

Figure 41 on page 70 illustrates the plug on the power cord for each country or region listed in Table 37 on page 70.

**Figure 41: AC Plug Types**




**NOTE:** Power cords and cables must not block access to router components or drape where people might trip on them.

For information about the AC power supply, see “J2320 Power System” on page 18, “J2350 Power System” on page 18, “J4350 Power System” on page 30 or “J6350 Power System” on page 31.

To connect the power cord during initial installation, see “Connecting Power” on page 84.

To replace the AC power cord, see “Replacing AC Power Supply Cords” on page 139.

### *DC Power, Connection, and Power Cable Specifications*

Each DC power supply has a single DC input (–48 VDC and return) that requires a dedicated circuit breaker:

- J2350 routers—minimum 15 A (–48 VDC)
- J4350 and J6350 routers—minimum 25 A (–48 VDC)

If the J6350 router contains redundant DC power supplies, one power supply must be powered by a dedicated power feed derived from feed A, and the other power supply must be powered by a dedicated power feed derived from feed B. This configuration provides the commonly deployed A/B feed redundancy for the system.

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

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

**WARNING:** Power plant ground and chassis ground must be connected to the same building ground.

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

Each DC power cable (–48 VDC and return) must be 14 AWG single-strand wire cable, or as permitted by the local code. Each lug attached to the power cables must be a ring-type, vinyl-insulated TV14-6R lug, or equivalent.

**NOTE:** Power cords and cables must not block access to router components or drape where people might trip on them.

For information about the DC power supply, see "J2350 Power System" on page 18, "J4350 Power System" on page 30 or "J6350 Power System" on page 31.

To connect the DC power cable during initial installation, see "Connecting DC Power" on page 86.

To replace a DC power cable, see "Replacing DC Power Supply Cables" on page 142.

## *Planning for Power Management*

Before you install a chassis or add a new PIM to an existing chassis, verify that the combination of PIMs and modules (PIMs or PIMs plus a WXC Integrated Services Module) to be installed does not exceed the power and heat capacities for that model. Add the low-power tokens, high-power tokens, and heat tokens required by each PIM, and compare them to the capacity of the chassis.

**NOTE:** The low power and high power correspond to a specific voltage for that PIM.

**CAUTION:** Do not install a combination of modules in a single chassis that exceeds the maximum power and heat capacity of the chassis. If J-series power management is enabled, PIMs and modules (PIMs or PIMs plus a WXC Integrated Services Module) that exceed the maximum power and heat capacity remain offline when the chassis is powered on.

To verify that the combination of PIMs to be installed in a chassis does not exceed the power and heat capacities for that model:

1. Check Table 38 on page 73 to determine the token values for low-power, high-power, and heat for each PIM that you plan to install in the chassis.
2. For all PIMs to be installed in the chassis:
   a. Add the low-power tokens for all PIMs to be installed in the chassis.
   b. Add the high-power tokens for all PIMs to be installed in the chassis.
   c. Add the heat dissipation tokens for all PIMs to be installed in the chassis.
3. Verify that the total number of low-power tokens, total number of high-power tokens, and the total number of heat dissipation tokens do not exceed the maximums permitted for your J-series chassis as specified in Table 39 on page 74.

Table 38 on page 73 shows the low-power consumption, high-power consumption, and heat dissipation, represented in non-dimensional tokens, assigned to each J-series PIM.

**Table 38: J-series PIM Power Consumption and Heat Dissipation**

| Name | Model Number | PIM Abbreviation in JUNOS CLI | Tokens | | |
|---|---|---|---|---|---|
| | | | Low Power | High Power | Heat |
| 1-Port Gigabit Ethernet uPIM | JXU-SFP-S | 1xSFP uPIM | 8 | – | 8 |
| 6-Port Gigabit Ethernet uPIM | JXU-6GE-SFP-S | 6xSFP uPIM | 13 | – | 13 |
| 8-Port Gigabit Ethernet uPIM | JXU-8GE-TX-S | 8xGE uPIM | 21 | – | 27 |
| 16-Port Gigabit Ethernet uPIM | JXU-16GE-TX-S | 16xGE uPIM | 38 | – | 36 |
| 1-Port Copper Gigabit Ethernet ePIM | JXE-1GE-TX-S | 1xGE Copper | 6 | – | 7 |
| 1-Port SFP Gigabit Ethernet ePIM | JXE-1GE-SFP-S | 1xGE SFP | 4 | – | 4 |
| Dual-Port Serial PIM | JX-2Serial-S | 2xSerial | 5 | – | 6 |
| Dual-Port E1 PIM | JX-2E1-RJ48-S | 2xE1 | 6 | – | 6 |
| Dual-Port T1 PIM | JX-2T1-RJ48-S | 2xT1 | 6 | – | 5 |
| Dual-Port Channelized T1/E1/ISDN PRI PIM | JX-2CT1E1-RJ45-S | 2xCT1E1 / PRI | 5 | – | 5 |
| E3 PIM (1 port) | JX-1E3-S | 1xE3 | 7 | – | 7 |
| T3 PIM (also known as DS3) | JX-1DS3-S | 1xT3 | 7 | – | 7 |
| Dual-Port Fast Ethernet PIM | JX-2FE-TX-S | 2xFE | 6 | 1 | 6 |
| 4-Port Fast Ethernet ePIM | JXE-4FE-TX-S | 4xFE ePIM | 9 | – | 9 |
| 4-Port ISDN BRI S/T PIM | JX-4BRI-S-S | 4x BRI S/T | 4 | – | 4 |
| 4-Port ISDN BRI U PIM | JX-4BRI-U-S | 4x BRI U | 4 | – | 6 |
| ADSL 2/2 + Annex A PIM (1 port, for POTS) | JX-1ADSL-A-S | 1x ADSL Annex A | 16 | 2 | 16 |

**Table 38: J-series PIM Power Consumption and Heat Dissipation** *(continued)*

| Name | Model Number | PIM Abbreviation in JUNOS CLI | Tokens | | |
|---|---|---|---|---|---|
| | | | Low Power | High Power | Heat |
| ADSL 2/2 + Annex B PIM (1 port, for ISDN) | JX-1ADSL-B-S | 1x ADSL Annex B | 16 | 2 | 16 |
| G.SHDSL PIM (2-port two-wire mode or 1-port four-wire mode) | JX-2SHDSL-S | 2x SHDSL (ATM) | 9 | – | 10 |
| WXC Integrated Services Module | ISM-200–WXC | wan-acceleration | 7 | 37 | 49 |

Table 39 on page 74 lists the maximum power tokens and maximum heat tokens available for each model.

**Table 39: Maximum Power and Heat Capacities of J-series Models**

| Model | Low- Power Capacity (tokens) | High- Power Capacity (tokens) | Heat Capacity (tokens) |
|---|---|---|---|
| **J2320** | 50 | 50 | 68 |
| **J2350** | 84 | 84 | 84 |
| **J4350** | 100 | 100 | 100 |
| **J6350** | 100 | 100 | 100 |

## Network Cable Specifications

The Services Router supports interfaces that use various kinds of network cable. For information about the type of cable used by each interface, see “Network Cable Specifications and Connector Pinouts” on page 179.

## ISDN Provisioning

You might need a network termination type 1 (NT1) device to connect your ISDN interface to the ISDN service. Contact your service provider for details on the following information:

- External NT1 device and ISDN cable
- If the two items are required, where to obtain the items
- List of NT1 vendors

## Site Preparation Checklist

The checklist in Table 40 on page 75 summarizes the tasks you need to perform when preparing a site for Services Router installation.

**Table 40: Site Preparation Checklist**

| Item or Task | Performed By | Date | Notes |
|---|---|---|---|
| Verify that environmental factors such as temperature and humidity do not exceed router tolerances. | | | |
| Measure the distances between external power sources and the router installation site. | | | |
| Select the type of rack. | | | |
| Plan the rack location, including required space clearances. | | | |
| Secure the rack to the floor and the building structure. | | | |
| Acquire appropriate cables and connectors. | | | |

Chapter 5

# Installing and Connecting a Services Router

Make the appropriate preparations and verify the J-series equipment before installing a J-series Services Router and connecting it to a power source and the network.

**CAUTION:** Do not install a combination of modules in a single chassis that exceeds the maximum power and heat capacity of the chassis. If J-series power management is enabled, PIMs and modules (PIMs or PIMs plus a WXC Integrated Services Module) that exceed the maximum power and heat capacity remain offline when the chassis is powered on.

This chapter contains the following topics:



## Before You Begin

Before you begin installation, complete the following tasks:

- Read the information in "Maintenance and Operational Safety Guidelines and Warnings" on page 225, with particular attention to "Chassis Lifting Guidelines" on page 216.
- Determine where to install the Services Router, and verify that the rack or installation site meets the requirements described in "Preparing for Router Installation" on page 63.
- For installation, gather the following equipment and tools:

  - For J2320 and J2350 Services Routers—Number 2 Phillips screwdriver, and mounting screws appropriate for your rack.
  - For J4350 and J6350 Services Routers—Mounting brackets and screws (provided), number 2 Phillips screwdriver, and mounting screws appropriate for your rack.
- To connect the router to power and ground, have ready a grounding cable and lug, as specified in "Chassis Grounding" on page 83, and the power cords or cords shipped with the router. (You must supply your own power cables if you have a DC-powered router. See "DC Power, Connection, and Power Cable Specifications" on page 71.)

**NOTE:** The AC power cord for the Services Router is intended for use with the router only and not for any other use.

- To connect network interfaces, have ready a length of cable used by the interface, as specified in "Network Cable Specifications and Connector Pinouts" on page 179.
- If your router has ISDN ports, you might need an NT1 device to connect to the ISDN service. For details, see "ISDN Provisioning" on page 74.

## Unpacking a J-series Services Router

The Services Router is shipped in a cardboard carton and secured with foam packing material. The carton also contains an accessory box and quick start instructions.

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

To unpack the router:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the router.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box, and verify the contents against the parts inventory on the label attached to the carton.
5. Pull out the packing material holding the router in place.
6. Verify the contents of the carton against the packing list included with the router.
7. Save the shipping carton and packing materials in case you later need to move or ship the router.

## Installing J2320 and J2350 Routers

**WARNING:** DC-powered Services Routers are intended for installation only in a restricted access location.

You can center-mount or front-mount the J2320 and J2350 Services Routers in a rack. In general, a center-mount rack is preferable to a front-mount rack because the more even distribution of weight in the center-mount rack provides greater stability.

Many types of racks are acceptable, including four-post (telco) racks, enclosed cabinets, and open-frame racks. For more information about the type of rack or cabinet the J-series router can be installed into, see "Rack Requirements" on page 64.

**WARNING:** If you are installing multiple routers in one rack, install the lowest one first and proceed upward in the rack. Install heavier routers in the lower part of the rack. The router must be mounted at the bottom of the rack if it is the only unit in the rack.

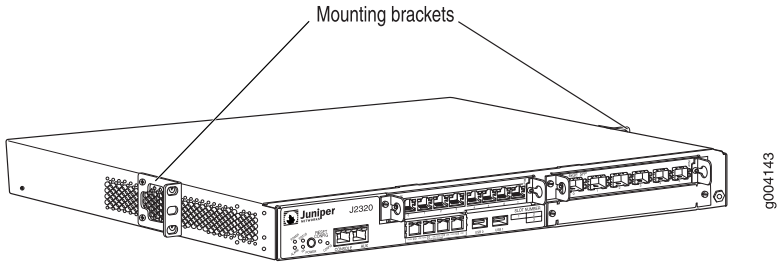
**WARNING:** The J2320 or J2350 chassis weighs between 14.8 lb (6.7 kg) and 18.2 lb (8.3 kg). Read and follow the lifting guidelines in "Chassis Lifting Guidelines" on page 216.

To install the J2320 or J2350 router into a rack:

1. If necessary, reposition the mounting brackets. You can position the brackets in either the center or the front. Positioning the brackets in the center offers greater stability.

   J2320 and J2350 Services Routers come with mounting brackets installed on them (see Figure 42 on page 79).

**Figure 42: Mounting Brackets on J2320 and J2350 Routers**




2. Have one person grasp the sides of the router, lift the router, and position it in the rack.

3. Align the top hole in each mounting bracket with a hole in each rack rail as shown in Figure 43 on page 80 and Figure 44 on page 80, making sure the chassis is level.

**Figure 43: Hanging a J2320 Router in a Rack**

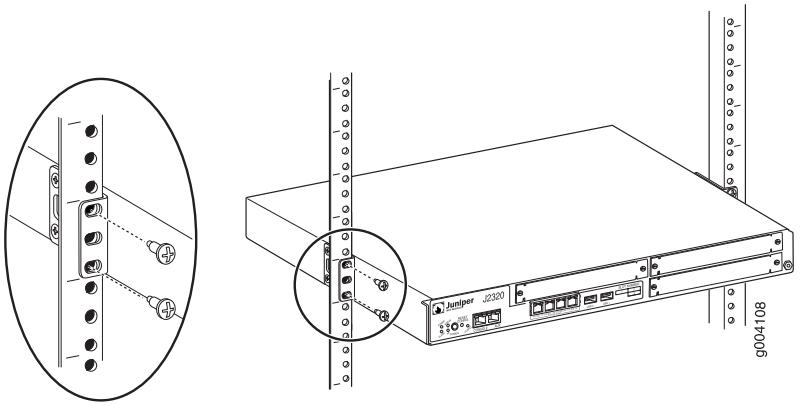
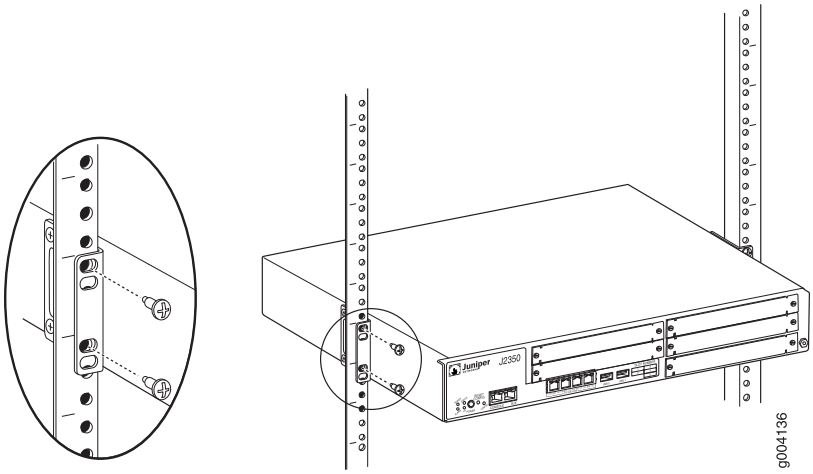



**Figure 44: Hanging a J2350 Router in a Rack**




4. Have a second person install a mounting screw into each of the two aligned holes. With a number 2 Phillips screwdriver, tighten the screws.
5. Verify that the mounting screw on one side of the rack is aligned with the mounting screw on the opposite side and that the router is level.
6. Install the second screw in each mounting bracket.

## Installing J4350 and J6350 Routers

**WARNING:** DC-powered Services Routers are intended for installation only in a restricted access location.

You can center-mount or front-mount the J4350 and J6350 Services Routers in a rack. In general, a center-mount rack is preferable to a front-mount rack because the more even distribution of weight in the center-mount rack provides greater stability.

Many types of racks are acceptable, including four-post (telco) racks, enclosed cabinets, and open-frame racks. For more information about the type of rack or cabinet the J-series router can be installed into, see "Rack Requirements" on page 64.

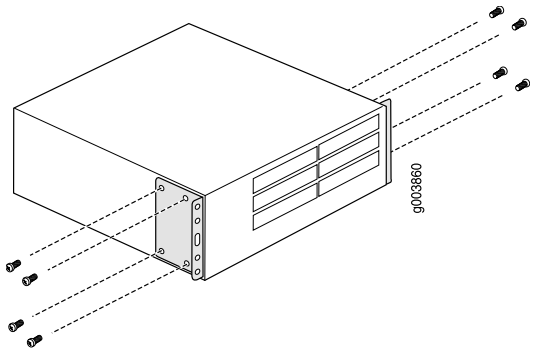
**WARNING:** If you are installing multiple routers in one rack, install the lowest one first and proceed upward in the rack. Install heavier routers in the lower part of the rack. The router must be mounted at the bottom of the rack if it is the only unit in the rack.

**WARNING:** The chassis weighs between 23 lb (10.4 kg) and 30.7 lb (13.9 kg). Read and follow the lifting guidelines in "Chassis Lifting Guidelines" on page 216.

To install the J4350 or J6350 into a rack:

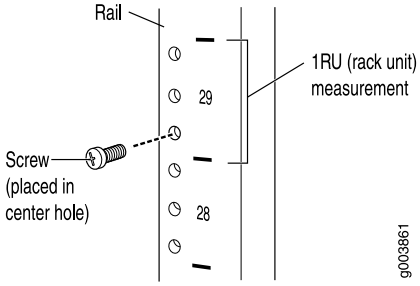
1. Attach the mounting brackets to the sides of the chassis (see Figure 45 on page 81). You can position the brackets either in the center or the front. Positioning the brackets in the center offers greater stability.

**Figure 45: Installing the Mounting Brackets**



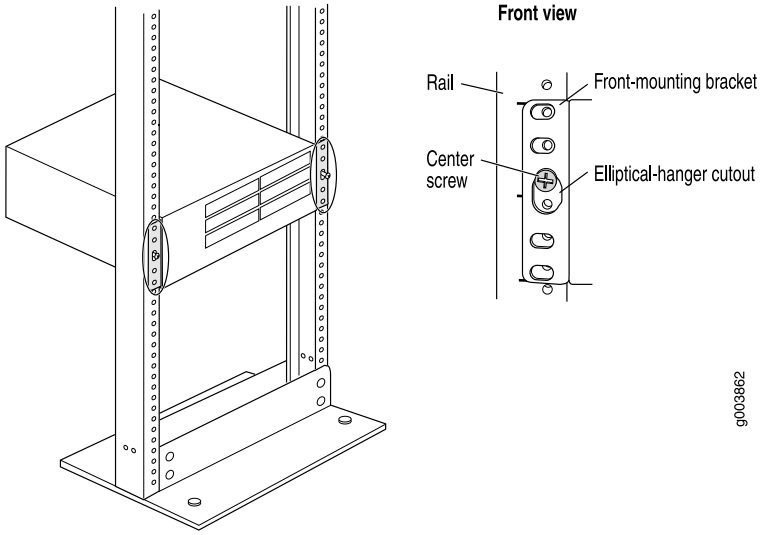

2. Attach a screw to each rack rail in the third hole down from where you want the top of the router to be positioned. Screw only part way in, leaving about ¼ in. (6 mm) distance between the screw head and the rail (see Figure 46 on page 82).

**Figure 46: Attaching the Center Screw to the Rack**




3. Lift the router and insert the larger elliptical openings in the mounting brackets onto the partially inserted screws so that the router is hanging from the two screws (see Figure 47 on page 82).

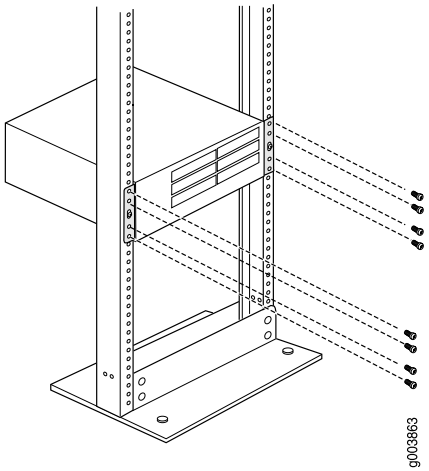
**Figure 47: Hanging the Router in the Rack**




4. Verify that the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side and that the router is level.

5. Install at least two mounting screws into each mounting bracket, in addition to the center screws from which the router hangs (see Figure 48 on page 83). Use a number 2 Phillips screwdriver to tighten the screws.

**Figure 48: Completing the Installation**




## Connecting Interface Cables to Services Routers

You connect the interfaces installed in the Services Router to various network media. For more information about the network interfaces supported on the router, see the *JUNOS Software Interfaces and Routing Configuration Guide*.

1. Have ready a length of the type of cable used by the interface, as specified in "Network Cable Specifications and Connector Pinouts" on page 179.
2. Insert the cable connector into the cable connector port on the interface faceplate.
3. Arrange the cable as follows to prevent it from dislodging or developing stress points:
   a. Secure the cable so that it is not supporting its own weight as it hangs to the floor.
   b. Place excess cable out of the way in a neatly coiled loop.
   c. Place fasteners on the loop to help maintain its shape.

## Chassis Grounding

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the Services Router must be adequately grounded before power is connected. In addition to the grounding pin on the AC power plug cord, a threaded insert (PEM nut), screw, and washer are provided on the rear of the chassis to connect the router to earth ground.

**CAUTION:** Before router installation begins, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the router (for example, by causing a short circuit).

- For J2320 and J2350 Services Routers—The grounding cables must be, at minimum, 14 AWG single-strand wire cable. The grounding lug must be a ring-type, vinyl-insulated TV14-8R lug as shown in Figure 49 on page 85 and Figure 50 on page 86.
- For J4350 and J6350 Services Routers—The grounding cables must be, at minimum, 12 AWG single-strand wire cable. The grounding lug must be a two-hole lug as shown in Figure 51 on page 86.

To ground the router before connecting power, you connect the grounding cable to earth ground and then attach the lug on the cable to the chassis grounding point, with the screw. (See "Connecting Power" on page 84.)

## Connecting Power

J2320, J2350 and J4350 Services Routers have a single fixed power supply. J6350 Services Routers have one or two field-replaceable power supplies. For more information about the J-series power specifications, see "Power Guidelines, Requirements, and Specifications" on page 67.

**WARNING:** DC-powered Services Routers are intended for installation only in a restricted access location.

### *Connecting AC Power*

The router must be connected to earth ground during normal operation. The protective earthing terminal on the rear of the chassis is provided to connect the router to ground. Additional grounding is provided to an AC-powered router when you plug its power supply into a grounded AC power receptacle.

The AC power cord shipped with the router connects the router to earth ground when plugged into an AC grounding-type power outlet. The router must be connected to earth ground during normal operation.

For power cord requirements, see "AC Power, Connection, and Power Cord Specifications" on page 69.

To connect AC power to the router:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
2. Use a grounding cable to connect the router to earth ground: (For cable requirements, see "Chassis Grounding" on page 83.)
   a. Verify that a licensed electrician has attached an appropriate grounding cable lug to the grounding cable.
   b. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the router is installed.

c. With a Phillips screwdriver, remove the screw and washer from the PEM nuts at the grounding point on the rear of the chassis.

d. Place the grounding lug at the other end of the cable over the grounding point, as shown in Figure 49 on page 85 through Figure 51 on page 86.

e. Secure the cable lug to the grounding point, first with the washer, then with the screw. On J2320 and J2350 routers, use the screw containing a captive washer to secure the cable lug to the grounding point.

3. Locate the power cord or cords shipped with the router, which has a plug appropriate for your geographical location. For power cord specifications, see "Power Guidelines, Requirements, and Specifications" on page 67.

4. For the power supply:

   a. Insert the appliance coupler end of a power cord into the appliance inlet on the power supply faceplate, as shown in Figure 49 on page 85 through Figure 51 on page 86.

   b. Insert the plug into an AC power source receptacle.

5. Verify that the power cord does not block access to router components or drape where people can trip on it.

6. On J2320 and J2350 routers, use the power cable tie as follows to relieve strain on the cable (see Figure 49 on page 85 and Figure 50 on page 86):

   a. Wrap the loose end of the tie around the cable, and insert it into the opening on the tie.

   b. Pull the end to tighten the tie.

   To release the tie from the cable, press down the tab on the tie and loosen it.

**Figure 49: Connecting AC Power to the J2320 Services Router**

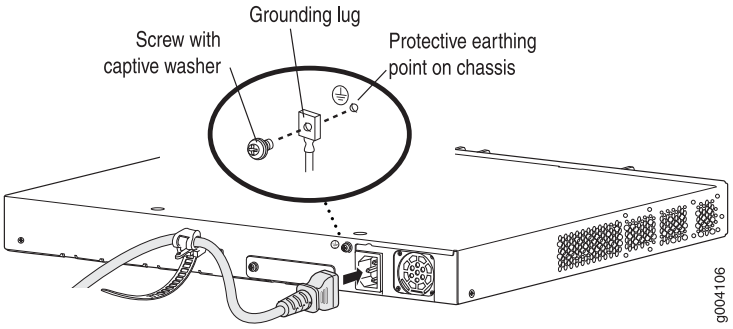


**Figure 50: Connecting AC Power to the J2350 Services Router**

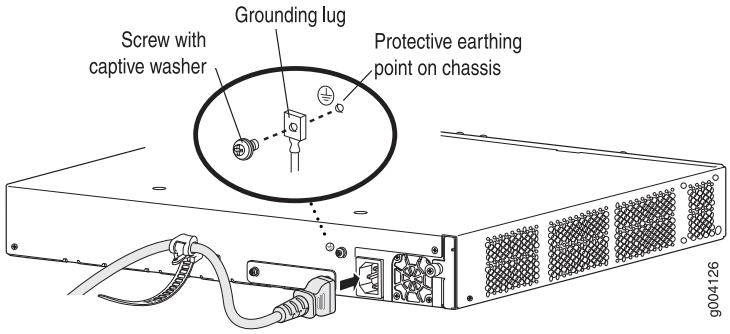
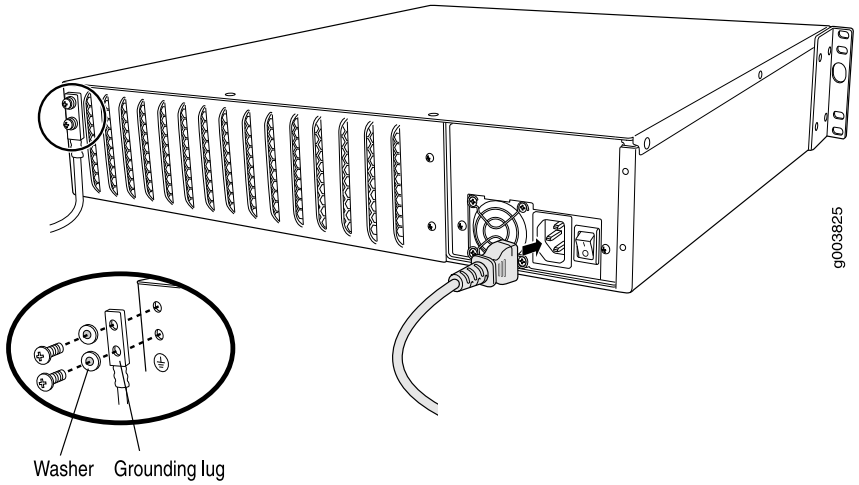



**Figure 51: Connecting AC Power to the J4350 or J6350 Services Router**




## *Connecting DC Power*

**CAUTION:** If your J6350 Services Router includes an optional redundant DC power supply, connect each of the two power supplies to different input power sources. Failure to do so makes the router susceptible to total power failure if one of the power supplies fails.

The router must be connected to earth ground during normal operation. The protective earthing terminal on the rear of the chassis is provided to connect the router to ground.

For DC cable requirements, see “DC Power, Connection, and Power Cable Specifications” on page 71.

To connect DC power to the router:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
2. Use a grounding cable to connect the router to earth ground: (For cable requirements, see "Chassis Grounding" on page 83.)
   a. Verify that a licensed electrician has attached an appropriate grounding cable lug to the grounding cable.
   b. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the router is installed.
   c. With a Phillips screwdriver, remove the screw and washer from the PEM nut at the grounding point on the rear of the chassis.
   d. Place the grounding lug at the other end of the cable over the grounding point, as shown in Figure 52 on page 88 and Figure 53 on page 89.
   e. Secure the cable lug to the grounding point, first with the washer, then with the screw. On J2320 and J2350 routers, use the screw containing a captive washer to secure the cable lug to the grounding point.

**NOTE:** A DC power supply in a Services Router becomes grounded when you connect a grounding cable between the router and earth ground.

3. For each power supply:
   a. Ensure that the voltage across the DC power source cable leads is 0 V and that the cable leads cannot become active in any way during installation.

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

   b. Verify that a licensed electrician has attached the appropriate power cable lugs to the negative and positive DC source power cables.
   c. Use a Phillips screwdriver to remove the clear plastic cover protecting the terminal block.
   d. Within the terminal block, remove the two center screws next to the labels –48 VDC and RTN.

      Each screw contains a captive washer to secure a DC source power cable lug to the terminal block.
   e. Using one of the removed screws, secure the positive (+) DC source power cable lug to the RTN terminal. Tighten the screw until snug. Do not

overtighten. Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to the screw.

f. Using the other removed screw, secure the negative (–) DC source power cable lug to the –48 VDC terminal. Tighten the screw until snug. Do not overtighten. Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to the screw.

g. Dress the power cables appropriately.

h. Replace the clear plastic cover over the terminal block.

4. Verify that the power cables do not block access to router components or drape where people can trip on them.

5. On J2320 and J2350 routers, use the power cable tie as follows to relieve strain on the cable (see Figure 52 on page 88 ):

   a. Wrap the loose end of the tie around the cable, and insert it into the opening on the tie.

   b. Pull the end to tighten the tie.

   To release the tie from the cable, press down the tab on the tie and loosen it.

**Figure 52: Connecting DC Power to the J2350 Services Router**

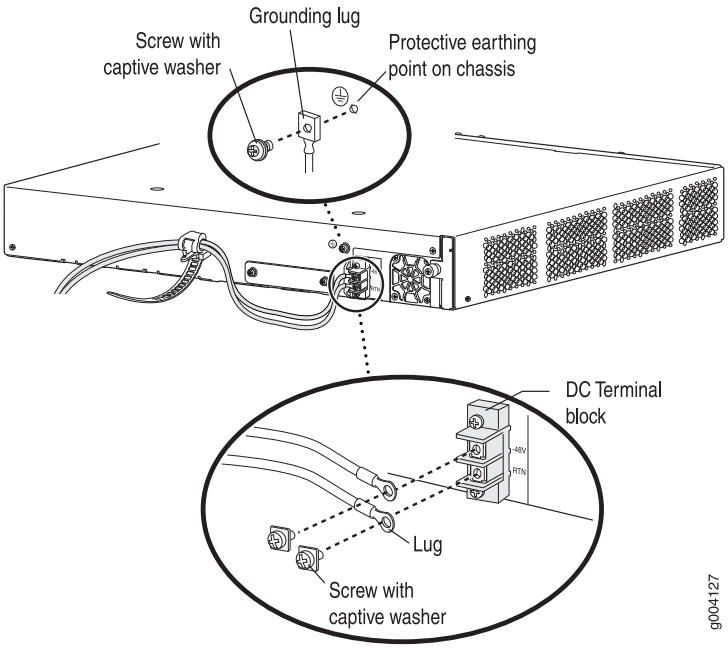
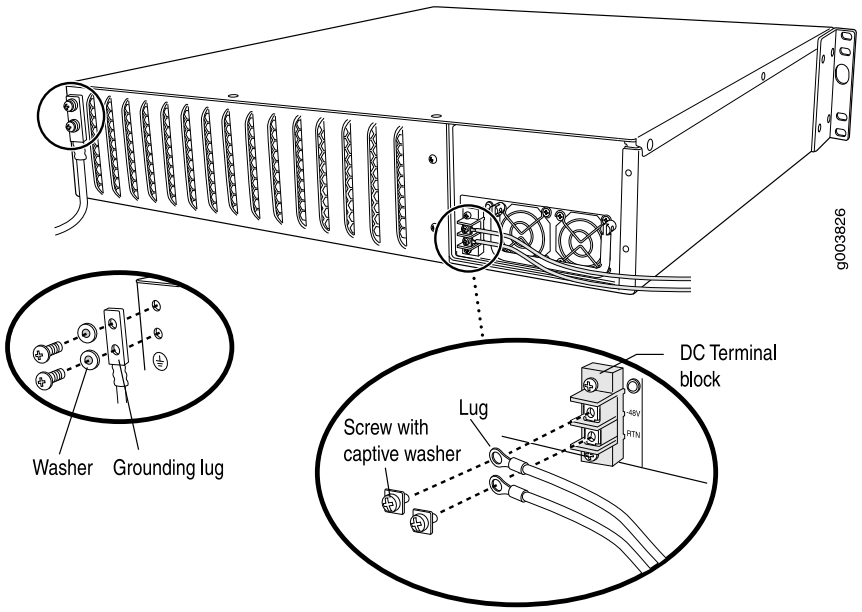


**Figure 53: Connecting DC Power to the J4350 or J6350 Services Router**




## Powering a Services Router On and Off

To power on a Services Router, press the power button. The Routing Engine boots as the power supply completes its startup sequence. The POWER LED lights during startup and remains on steadily when the router is operating normally.

To power off a Services Router, you can shut it down in one of the following ways:

- Graceful shutdown—Press and release the power button. The router begins gracefully shutting down the operating system and then powers itself off.
- Immediate shutdown—Press the power button and hold it for more than 5 seconds. The router immediately powers itself off without shutting down the operating system.

To remove power completely from the router, unplug the AC power cord or switch off the DC power source. The power button on the Services Router is a standby power switch. If the router is connected to a power source when you press the power button to power the router off, the router remains in standby mode and a small amount (5 V and 3.3 V) of standby voltage is still available in the chassis.

Chapter 6

# Establishing Basic Connectivity

The JUNOS software is preinstalled on the Services Router. When the router is powered on, it is ready to be configured. If the router does not have a configuration from the factory or your service provider, you must configure the software to establish basic connectivity.

If you are setting up a Services Router for the first time, you can use either J-Web Quick Configuration or a configuration editor to configure basic connectivity. If you are setting up many Services Routers, autoinstallation can help automate the configuration process. For more information, see the *JUNOS Software Administration Guide*.

This chapter contains the following topics. For more information about basic connectivity, see the *JUNOS System Basics Configuration Guide*.



## Basic Connectivity Terms

Before configuring basic connectivity, become familiar with the terms defined in Table 41 on page 91.

**Table 41: Basic Connectivity Terms**

| Term | Definition |
|---|---|
| domain name | Name that identifies the network or subnetwork of a router. |
| Dynamic Host Configuration Protocol (DHCP) | Protocol for assigning dynamic IP addresses to devices on a network. |
| gateway | Packets destined for IP addresses not identified in the routing table are sent to the default gateway. |

**Table 41: Basic Connectivity Terms** *(continued)*

| Term | Definition |
|---|---|
| **hostname** | Unique name that identifies a router on the network. |
| **loopback address** | IP address of a Services Router on logical interface lo0.0 that is always active and available to external hosts and as the source address for outgoing packets. |
| **Network Time Protocol (NTP)** | Protocol that provides a reliable way of synchronizing the system time of a router. |
| **root user** | A superuser or system administrator who can perform any task in the file system. |
| **secure shell (SSH)** | Protocol that provides a secured method of logging in to a remote network system. |
| **Telnet** | Software that allows a computer to act as a remote terminal on a network system. |

## Basic Connectivity Overview

To connect your Services Router to the network and establish basic connectivity, you enter information about your network. This overview contains the following topics:



### *Router Identification*

The domain name defines the network or subnetwork that the Services Router belongs to. The hostname refers to the specific machine, while the domain name is shared among all the devices in a given network. Together the hostname and domain name identify the router in the network.

### *Root Password*

The root user has complete privileges to configure the Services Router, and manage files in the router's file system. Initially, the root password is not defined on the

router. To ensure basic security, you must define the root password during initial configuration. If a root password is not defined, you cannot commit configuration settings to take effect on the router.

If you use a plain-text password, the router displays the password as an encrypted string so that users viewing the configuration cannot easily see the password.

The root password must meet the following conditions:

- The password must be at least 6 characters long.
- You can include most character classes in a password (alphabetic, numeric, and special characters), except control characters.
- Valid passwords must contain at least one change of case or character class.

### *Time Zone and System Time*

You define the time zone for the location where you plan to operate the Services Router by using a designation that consists of the following information for the location:

- Name of the continent or ocean—For example, America or Atlantic
- Name of the major city or other geographic feature in the time zone—For example, Detroit or Azores

A Network Time Protocol (NTP) server provides accurate time across a network. The router synchronizes the system time with the NTP server, and periodically accesses the NTP server to maintain the correct time.

The time zone and system time must be accurate so that the router schedules events and operations as expected.

### *Network Settings*

A Domain Name System (DNS) server on the network maintains a database for resolving hostnames and IP addresses. Network devices can query the DNS server by hostnames rather than IP addresses. The router accesses the DNS servers that are added to the configuration to resolve hostnames in the order in which you list them.

If you plan to include your router in several domains, you can add these domains to the configuration so that they are included in a DNS search. When DNS searches are requested, the domain suffixes are appended to the hostnames.

### *Default Gateway*

A default gateway is a static route that is used to direct packets addressed to networks not explicitly listed in the routing table. If a packet arrives at the Services Router with an address that the router does not have routing information for, the router sends the packet to the default gateway. The default gateway entry is always present in the routing and forwarding tables.

### *Backup Router*

You can specify a backup router to take over when the routing protocol process of the Services Router is not running, usually when the Services Router is booting, or if its routing protocol process has failed. Packets arriving at a Services Router in this situation are routed to the backup router. When the routing protocol process starts up again, the address of the backup router is removed from the routing and forwarding tables of the Services Router. The backup router must be located on the same subnet.

**NOTE:** To configure a backup router, you must use the CLI or J-Web configuration editor. You cannot configure a backup router with J-Web Quick Configuration.

### *Loopback Address*

The loopback address is the IP address of the Services Router. The loopback address ensures that the router provides an IP address to management applications. Because it must always be available to hosts attempting to route packets to the router, the loopback address resides on an interface that is always active, known as the loopback interface (lo0.0). Setting a loopback address ensures that the router can receive packets addressed to the loopback address as long as the router is reachable though any entry (ingress) interface. In addition, applications such as NTP, RADIUS, and TACACS+ can use the loopback address as the source address for outgoing packets.

If you use the J-Web Set Up Quick Configuration page, you can either set a loopback address of your choice or have the loopback address automatically set to 127.0.0.1 when you click **Apply** or **OK** to commit the configuration.

### *Built-In Ethernet Interface Address*

The built-in Gigabit Ethernet interfaces, ge-0/0/0 through ge-0/0/3, on the front panel of the Services Router, are the interfaces through which you perform initial router setup. The examples in this guide use the ge-0/0/0 interface as the management interface, but you can use any built-in Ethernet port for management. After the initial configuration is complete, you can attach the built-in Ethernet port that you are using for management purposes to the management network.

Before initial configuration, when the factory default configuration is active, the router attempts to perform autoinstallation by obtaining a router configuration through all its connected interfaces, including ge-0/0/0. The Services Router acts as a DHCP client out the built-in Ethernet interfaces.

If the Services Router does not find a DHCP server within a few seconds, it sets the address of ge-0/0/0 to 192.168.1.1/24 and becomes a DHCP server out the ge-0/0/0 interface.

**NOTE:** If the ge-0/0/1 interface is being used, it is set to 192.168.2.1/24.

With the router temporarily acting as a DHCP server, you can manually configure it with the J-Web interface. Any DHCP client host, for example, a PC or laptop computer, directly connected to ge-0/0/0 receives an address on the 192.168.1.1/24 network.

**NOTE:** The DHCP functionality for initial setup is different from the configurable DHCP server functionality of the Services Router during operation. To configure the Services Router as a DHCP server, see the *JUNOS Software Administration Guide*.

Once you connect your laptop or PC to ge-0/0/0, you can use a Web browser to visit the address 192.168.1.1/24, access the J-Web Set Up Quick Configuration page, and complete the initial configuration of the router.

After you perform the initial configuration and commit it by clicking **Apply** or **OK** on the Set Up page, the configured router can no longer act as a DHCP server. Therefore, to continue using ge-0/0/0 as a management interface you must configure the IP address of the interface as part of the initial configuration.

### *Management Access*

Telnet allows you to connect to the Services Router and access the CLI to execute commands from a remote system. Telnet connections are not encrypted and therefore can be intercepted.

Telnet access to the root user is prohibited. You must use more secure methods, such as SSH, to log in as root.

If you are using a JUNOScript server to configure and monitor routers, you can activate clear-text access on the router to allow unencrypted text to be sent directly over a TCP connection without using any additional protocol (such as SSH, SSL, or Telnet). Information sent in clear text is not encrypted and therefore can be intercepted. For more information about the JUNOScript application programming interface (API), see the *JUNOScript API Guide*.

SSH also allows you to connect to the router and access the CLI to execute commands from a remote system. However, unlike Telnet, SSH encrypts traffic so that it cannot be intercepted.

SSH can be configured so that connections are authenticated by a digital certificate. SSH uses public-private key technology for both connection and authentication. The SSH client software must be installed on the machine where the client application runs. If the SSH private key is encrypted (for greater security), the SSH client must be able to access the passphrase used to decrypt the key.

For information about obtaining SSH software, see http://www.ssh.com and http://www.openssh.com.

## Before You Begin

Before you begin initial configuration, complete the following tasks:

- Install the Services Router in its permanent location, as described in “Installing and Connecting a Services Router” on page 77.
- Gather the following information:
  - Hostname for the router on the network
  - Domain that the router belongs to on the network
  - Password for the root user
  - Time zone where the router is located
  - IP address of an NTP server (if NTP is used to set the time on the router)
  - IP address of a DNS server
  - List of domains that can be appended to hostnames for DNS resolution
  - IP address of the default gateway
  - IP address to be used for the loopback interface
  - IP address of the built-in Ethernet interface that you will use for management purposes. The examples in this guide use the **ge-0/0/0** interface.
- If you are performing the initial configuration with the J-Web interface, collect the following equipment:
  - A management device, such as a laptop, with an Ethernet port
  - An Ethernet cable (provided)
- If you are performing the initial configuration with the CLI, collect the following equipment:
  - A management device, such as a PC or laptop, with a serial port and an asynchronous terminal application (such as Microsoft Windows Hyperterminal)
  - An RJ-45 to DB-9 serial port adapter (provided)
  - An Ethernet cable (provided)
  - For a remote connection, two dial-up modems
  - For a remote modem connection, a DB-9 female to DB-25 male adapter, or other adapter appropriate for your modem (not provided)

## Connecting to a Services Router

You can connect to the Services Router using the J-Web or CLI interface. You can connect to the CLI from a remote location through two dial-up modems. For details see, “Connecting to the CLI Remotely” on page 100.

This section contains the following topics:



## *Connecting to the J-Web Interface*

If you plan to use the J-Web interface to configure the Services Router, you must connect through one of the built-in Ethernet management ports, as shown in Figure 54 on page 98 and Figure 55 on page 98.

When the Services Router is powered on for the first time, the system looks for a DHCP server, and if it does not find one, it assigns an IP address within the 192.168.1.0/24 subnetwork to any devices connected to it.

To connect to the J-Web interface through port 0 on the router (see Figure 54 on page 98 and Figure 55 on page 98):

1. On the management device, such as a PC or laptop, you use to access the J-Web interface, verify that the address of the port that you connect to the router is set to one of the following:
   - An Ethernet address on the 192.168.1/24 subnetwork other than 192.168.1.1
   - An Ethernet address from a DHCP server
2. Turn off the power to the management device.
3. Plug one end of the Ethernet cable into the Ethernet port on the management device.
4. Connect the other end of the Ethernet cable to the built-in Ethernet port on the router.
5. Power on the router by pressing the power button on the front panel.
6. Wait until the STATUS LED on the front panel turns solid green.
7. Turn on the power to the management device. The router assigns an IP address to the management device within the 192.168.1.0/24 subnetwork if the device is configured to use DHCP.
8. From the management device, open a Web browser and enter the IP address 192.168.1.1 in the address field. The Set Up Quick Configuration page appears.
9. Configure basic settings for your router as described in "Configuring Basic Settings with J-Web Quick Configuration" on page 103.

**NOTE:** You must manually configure the IP address for the management port you are using before you save your initial configuration. When you save the configuration for the first time, you will lose the connection to the router if you have not manually configured the IP address. If you lose connection through the management interface, you must connect through the console port.

**Figure 54: Connecting to the Gigabit Ethernet Port on J2320 and J2350 Routers**

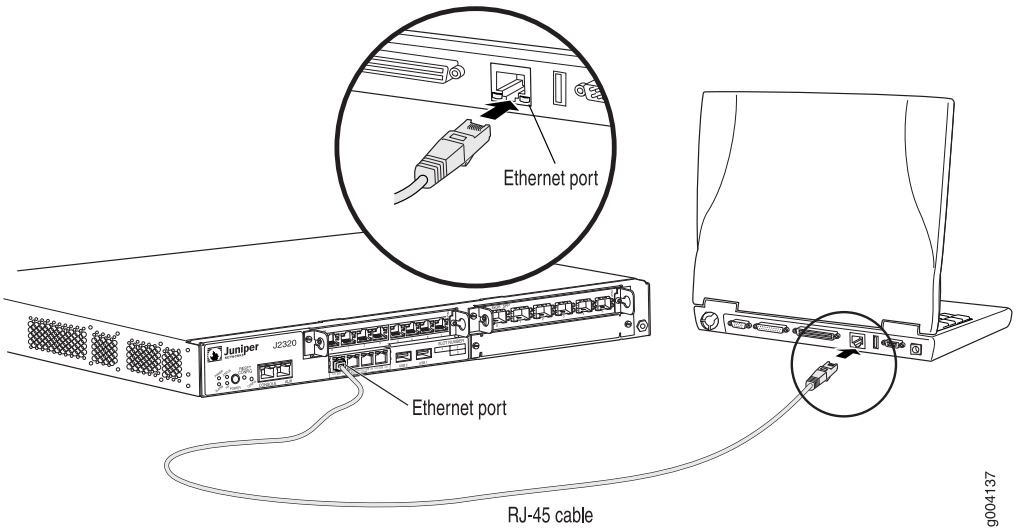
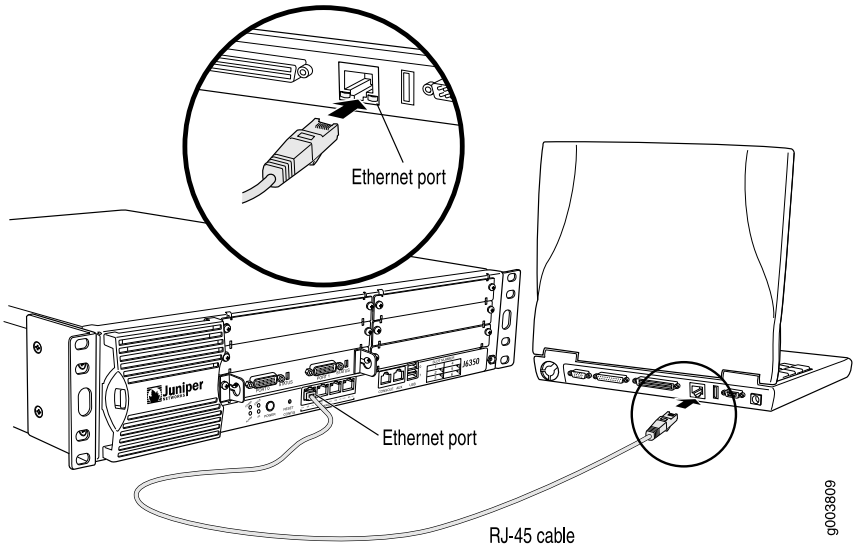



**Figure 55: Connecting to the Gigabit Ethernet Port on J4350 and J6350 Routers**




## *Connecting to the CLI Locally*

If you plan to use the CLI to configure the router, you must connect through the console port, as shown in Figure 56 on page 100 and Figure 57 on page 100.

**NOTE:** Figure 56 on page 100 and Figure 57 on page 100 show a connection to a local management device. A remote connection to the router through a modem requires the cable and connector shown (provided in the router's accessory box), plus a DB-9 female to DB-25 male (or similar) adapter for your modem, which you must purchase separately.

To connect to the CLI using a local management device through the console port on the router:

1. Turn off power to the router.
2. Turn off the power to the management device, such as a PC or laptop computer, that you are using to access the CLI.
3. Plug one end of the Ethernet cable supplied with your router into the RJ-45 to DB-9 serial port adapter supplied with your router (see Figure 57 on page 100).
4. Plug the RJ-45 to DB-9 serial port adapter into the serial port on the management device (see Figure 57 on page 100).
5. Connect the other end of the Ethernet cable to the console port on the router (Figure 57 on page 100).
6. Turn on the power to the management device.
7. Start your asynchronous terminal emulation application (such as Microsoft Windows Hyperterminal) and select the appropriate COM port to use (for example, COM1).
8. Configure the port settings as follows:
   - Bits per second: 9600
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None
9. Power on the router by pressing the power button on the front panel. Verify that the POWER LED on the front panel turns green.

   The terminal emulation screen on your management device displays the boot sequence. When the router has finished booting, a login prompt appears.
10. Log in as the user root. No password is required at initial connection, but you must assign a root password before committing any configuration settings.

**Figure 56: Connecting to the Console Port on J2320 and J2350 Routers**

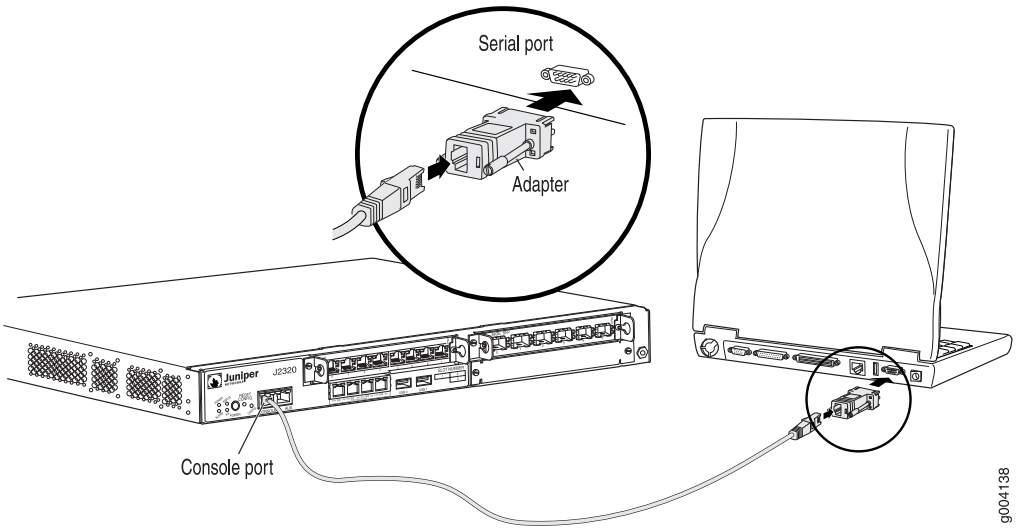
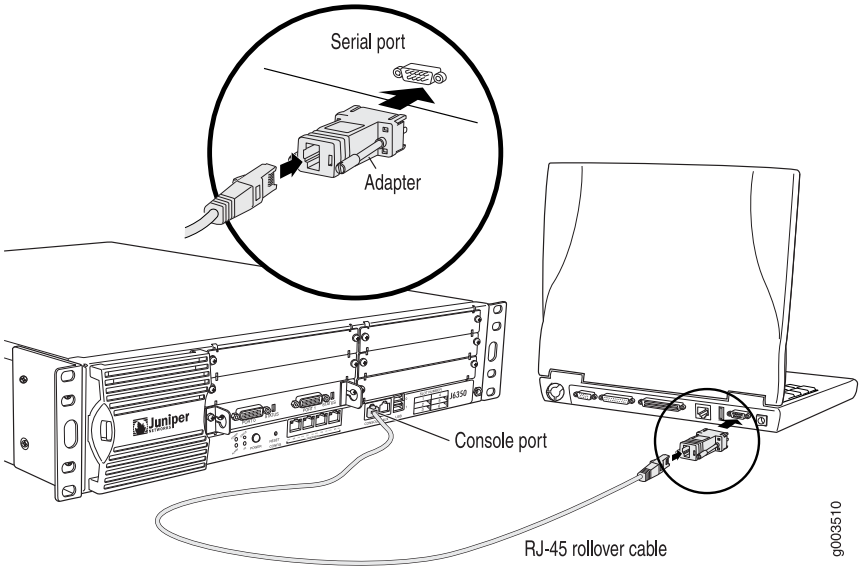



**Figure 57: Connecting to the Console Port on the J4350 and J6350 Routers**




## *Connecting to the CLI Remotely*

You can connect to the CLI from a remote location through two dial-up modems: a modem that is connected to the console port on the Services Router and a second modem connected to a remote management device. The modem connection allows you to remotely perform the same console operations you can perform locally.

This section contains the following topics:



### Configuring the Modem at the Router End

**NOTE:** These instructions use Hayes-compatible modem commands to configure the modem. If your modem is not Hayes-compatible, refer to the documentation for your modem and enter equivalent modem commands.

Before you can connect a dial-up modem to the console port on the Services Router, you must configure the modem to accept a call on the first ring and accept Data Terminal Ready (DTR) signals. You must also disable flow control on the modem.

To configure the modem on the router end:

1. Connect the modem to a PC or laptop computer.
2. Power on the modem.
3. From the PC or laptop computer, start your asynchronous terminal emulation application (such as Microsoft Windows Hyperterminal) and select the COM port to which the modem is connected (for example, COM1).
4. Configure the port settings as follows:
   - Bits per second: 9600
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None
5. In the HyperTerminal window, enter AT.

   An OK response verifies that the modem communicates successfully with the COM port on the PC or laptop.
6. To configure the modem to answer a call on the first ring, enter ATS0=1.
7. To configure the modem to accept modem control Data Terminal Ready (DTR) signals, enter AT&D1.
8. To disable flow control, enter AT&K0.
9. To save modem settings, enter AT&W.

### Connecting the Modem to the Console Port

**NOTE:** Most modems have an RS-232 DB-25 connector. You must separately purchase an adapter to connect your modem to the RJ-45 to DB-9 adapter and Ethernet cable supplied with the router.

To connect the dial-up modem to the console port on the router:

1. Turn off power to the router.
2. Turn off the power to the modem.
3. Plug one end of the Ethernet cable supplied with your router into the console port on the router.
4. Plug the other end of the Ethernet cable into the RJ-45 to DB-9 serial port adapter supplied with your router.
5. Connect the serial port adapter to a separately purchased DB-9 female to DB-25 male adapter, or other adapter appropriate for your modem.
6. Plug the modem adapter into the DB-25 connector on the modem.
7. Connect the modem to your telephone network.
8. Turn on the power to the modem.
9. Power on the router by pressing the power button on the front panel. Verify that the POWER LED on the front panel turns green.

### Connecting to the CLI at the User End

To remotely connect to the CLI through a dial-up modem connected to the console port on the router:

1. At your remote location, connect a modem to a management device such as a PC or laptop computer.
2. On the PC or laptop computer, start your asynchronous terminal emulation application (such as Microsoft Windows Hyperterminal).
3. Select the COM port to which the modem is connected (for example, COM1).
4. Configure the port settings as follows:
   - Bits per second: 9600
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None
5. In the HyperTerminal window, enter AT.

An OK response verifies that the modem communicates successfully with the COM port on the PC or laptop.

6. To dial the modem that is connected to the console port on the router, enter ATDT *remote-modem-number*. For example, if the number of the modem connected to the console port on the router is 0013033033030, enter ATDT 0013033033030.

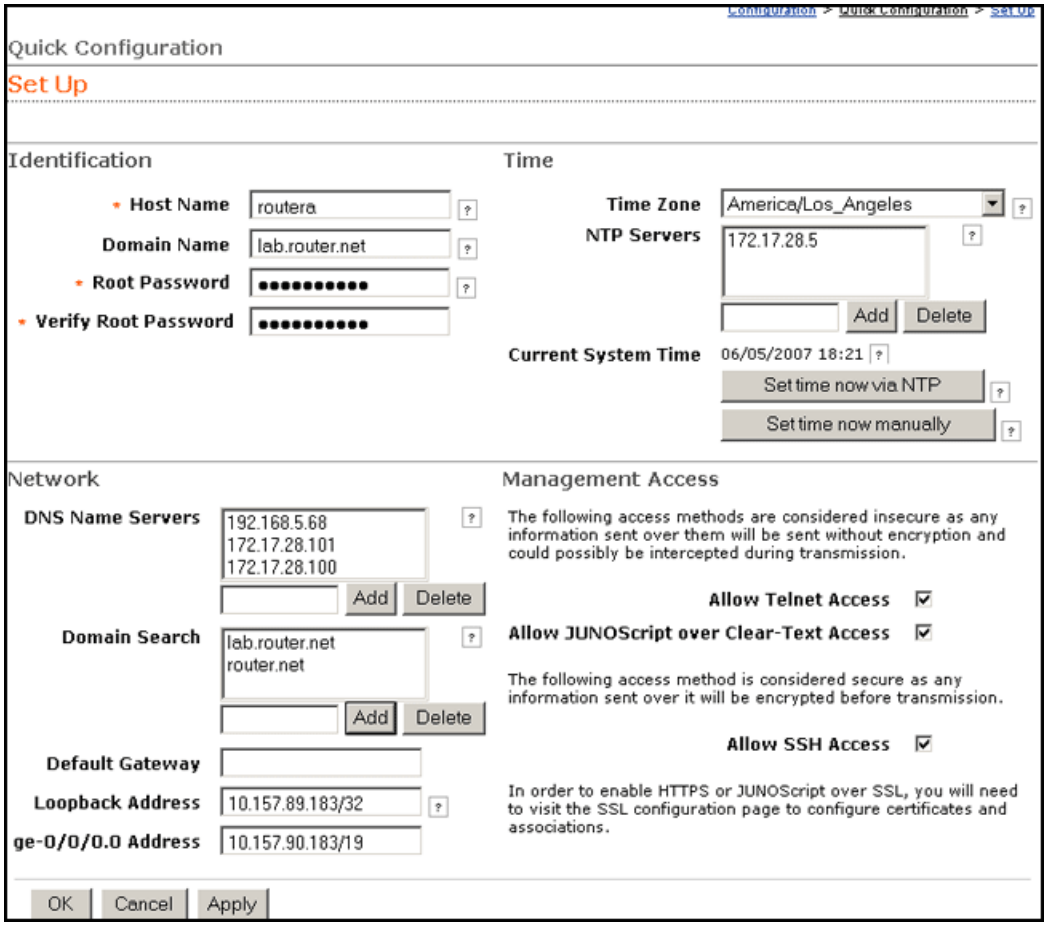
   The router login prompt appears.

7. Log in as the user root. No password is required at initial connection, but you must assign a root password before committing any configuration settings.

## Configuring Basic Settings with J-Web Quick Configuration

J-Web Quick Configuration allows you to configure basic settings. Figure 58 on page 103 shows the Quick Configuration page for basic setup.

**Figure 58: Set Up Quick Configuration Page**




Before you configure the router, gather the information described in “Before You Begin” on page 95.

To configure basic settings with J-Web Quick Configuration:

1. If you have not already done so, connect a management device to the ge-0/0/0 interface on port 0/0. For instructions, see "Connecting to the J-Web Interface" on page 97.
2. If the Set Up Quick Configuration page is not displayed, select **Configuration > Quick Configuration > Set Up**.
3. Enter information into the Set Up Quick Configuration page, as described in Table 42 on page 104.
4. Click one of the following buttons:
   - To apply the configuration and stay in the Set Up Quick Configuration page, click **Apply**.
   - To apply the configuration and return to the Quick Configuration page, click **OK**.
   - To cancel your entries and return to the Quick Configuration page, click **Cancel**.

**NOTE:** After initial configuration is complete, the Services Router stops functioning as a DHCP server. If you change the IP address of ge-0/0/0 and have the management device configured to use DHCP, you lose your DHCP lease and your connection to the router through the J-Web interface. To reestablish a connection, either set the IP address on the management device manually, or connect ge-0/0/0 to the management network and access the router another way—for example, through the console port.

5. To check the configuration, see "Verifying Basic Connectivity and the Configuration" on page 113.

**Table 42: Set Up Quick Configuration Summary**

| Field | Function | Your Action |
|---|---|---|
| **Identification** | | |
| Host Name (required) | Defines the hostname of the router. | Type the hostname. |
| Domain Name | Defines the network or subnetwork that the machine belongs to. | Type the domain name. |
| Root Password (required) | Sets the root password that user "root" can use to log in to the router. | Type a plain-text password that the system encrypts.<br>**NOTE:** After a root password has been defined, it is required when you log in to the J-Web user interface or the CLI. |
| Verify Root Password (required) | Verifies the root password has been typed correctly. | Retype the password. |

**Table 42: Set Up Quick Configuration Summary** *(continued)*

| Field | Function | Your Action |
|---|---|---|
| **Time** | | |
| Time Zone | Identifies the time zone that the router is located in. | From the list, select the appropriate time zone. |
| NTP Servers | Specify an NTP server that the router can reach to synchronize the system time. | To add an IP address, type it in the box to the left of the Add button, then click **Add**.<br><br>To delete an IP address, click on it in the box above the Add button, then click **Delete**. |
| Current System Time | Synchronizes the system time with the NTP server, or manually set the system time and date. | ■ To immediately set the time using the NTP server, click **Set Time via NTP**. The router sends a request to the NTP server and synchronizes the system time.<br><br>**NOTE:** If you are configuring other settings on this page, the router also synchronizes the system time using the NTP server when you click **Apply** or **OK**.<br><br>■ To set the time manually, click **Set Time Manually**. A pop-up window allows you to select the current date and time from lists. |
| **Network** | | |
| DNS Name Servers | Specify a DNS server that the router can use to resolve hostnames into addresses. | To add an IP address, type it in the box to the left of the Add button, then click **Add**.<br><br>To delete an IP address, click on it in the box above the Add button, then click **Delete**. |
| Domain Search | Adds each domain name that the router is included in to the configuration so that they are included in a DNS search. | To add a domain name, type it in the box to the left of the Add button, then click **Add**.<br><br>To delete a domain name, click on it in the box above the Add button, then click **Delete**. |
| Default Gateway | Defines a default gateway through which to direct packets addressed to networks not explicitly listed in the routing table. | Type a 32-bit IP address, in dotted decimal notation. |
| Loopback Address | Defines a reserved IP address that is always available on the router. If no address is entered, this address is set to 127.0.0.1/32. | Type a 32-bit IP address and prefix length, in dotted decimal notation. |
| ge-0/0/0 Address | Defines the IP address and prefix length of ge-0/0/0. The interface ge-0/0/0 is typically used as the management interface for accessing the router. The DHCP client sets this address to 192.168.1.1/24 if no DHCP server is found. | Type a 32-bit IP address and prefix length, in dotted decimal notation.<br><br>**NOTE:** You must enter the ge-0/0/0 address on the Quick Configuration Set Up page before you click **Apply** or **OK**. If you do not manually configure this address, you will lose your connection to the J-Web interface when you click **Apply** or **OK**. |
| **Management Access** | | |

**Table 42: Set Up Quick Configuration Summary** *(continued)*

| Field | Function | Your Action |
|---|---|---|
| Allow Telnet Access | Allows remote access to the router using Telnet. | To enable Telnet access, select the check box. |
| Allow JUNOScript over Clear-Text Access | Allows JUNOScript to access the router using a protocol for sending unencrypted text over a TCP connection. | To enable JUNOScript access over clear text, select the check box. |
| Allow SSH Access | Allows remote access to the router using SSH. | To enable SSH access, select the check box. |

## Configuring Basic Settings Using the CLI Configuration Wizard

To establish basic connectivity on a Services Router, you must identify the router, connect the router to the network, and specify basic network settings. This section explains how to use the command line interface (CLI) configuration wizard for JUNOS software with enhanced services to configure basic settings so that you can connect the router to a network and further configure it using the J-Web interface or the CLI.

**NOTE:** To use the CLI configuration wizard, you must have JUNOS software with enhanced services installed on your Services Router. If JUNOS software with enhanced services is not installed on your Services Router, following the instructions in"Configuring Basic Settings with J-Web Quick Configuration" on page 103 to use the J-Web Quick Configuration pages to configure basic settings or use the CLI, as described in "Configuring Basic Settings with a Configuration Editor" on page 110.

### *About the CLI Configuration Wizard*

The JUNOS software with enhanced services configuration wizard is a command line interface application that allows you to configure basic settings for a Services Router that is already configured with the factory default settings. For details on factory default settings, see the *JUNOS Software Administration Guide*.

Understand these configuration wizard characteristics before using the wizard:

- Because the configuration wizard overrides any existing configuration, it is meant to be used on a router configured with the factory defaults only.
- The configuration wizard shows default values in parenthesis ( ).
- At any time during the configuration you can type a question mark (?) to obtain Help.
- To terminate the configuration at any time without completing it, press Ctrl + c.
- After you complete the configuration, the wizard allows you to review it before committing it on the router.

### *Using the JUNOS Software with Enhanced Services Configuration Wizard*

Before you use the CLI configuration wizard, log in to the Services Router console as described in "Connecting to the CLI Locally" on page 98 or "Connecting to the CLI Remotely" on page 100

To invoke the configuration wizard, enter config-wizard at the console prompt. After you invoke the wizard, it presents the following series of prompts. Follow the prompts as described in Table 43 on page 107.

**Table 43: Basic Configuration Wizard Summary**

| Prompt | Function | Your Action |
|---|---|---|
| **Identification** | | |
| Enter host name: | Defines the hostname of the router. | Type the hostname. Alphanumeric, hyphen, and underline characters are allowed. |
| Please enter root password: | Sets the root password that user "root" can use to log into the router. | Type a plain-text password that the system encrypts.<br><br>**NOTE:** After a root password has been defined, it is required when you log into the J-Web user interface or the CLI. |
| Retype root password: | Verifies that the root password has been typed correctly. | Retype the password. |
| Would you like to configure a domain name? [yes, no] (no):<br><br>If you enter y(es), the configuration wizard presents the following prompt.<br><br>Enter domain name: | Defines the network or subnetwork that the machine belongs to. | Type the domain name. Alphanumeric, hyphen, period, and underline characters are allowed. |

**Table 43: Basic Configuration Wizard Summary** *(continued)*

| Prompt | Function | Your Action |
|---|---|---|
| Would you like to configure name server? [yes, no] (no):<br><br>If you enter y(es), the configuration wizard presents the following prompt:<br><br>Enter IP address for the name server:<br><br>After you specify one name server, the configuration wizard presents the following prompt:<br><br>Would you like to configure alternative name server? [yes, no] (no):<br><br>If you enter y(es), the configuration wizard presents the following prompt:<br><br>Enter IP address for the name server: | Defines the name server | Type the IP address of the name server. |
| **Management Interfaces** | | |

**Table 43: Basic Configuration Wizard Summary** *(continued)*

| Prompt | Function | Your Action |
|---|---|---|
| To allow you to configure the management interfaces, the configuration wizard presents the following information. To configure a specific management interface, enter the number associated with it at the prompt.<br><br>Configure the following network interfaces<br><br>Identifier...Interface<br><br>....1.....ge-0/0/0<br><br>....2.....ge-0/0/1<br><br>....3.....ge-0/0/2<br><br>....4.....ge-0/0/3<br><br>Would you like to configure any of the above interfaces [yes, no] (yes):<br><br>Please enter one or more identifiers of the interfaces separated by comma.<br><br>For example, 1, 2<br><br>Please select interface identifiers:<br><br>For example, if you enter 1, the following text and prompt is displayed:<br><br>Configure IP on interface ge-0/0/0<br><br>IP address for this interface:<br><br>After you enter the IP address, the configuration wizard presents the following prompt:<br><br>Subnet mask bit length for this interface [1–32] (32):<br><br>After you enter the subnet mask for the interface, the configuration wizard presents the following prompt:<br><br>Enter a security zone name to associate this interface to: | | |
| **Default Gateway** | | |
| Would you like to configure default gateway? [yes, no] (no):<br><br>If you enter y(es), the configuration wizard presents the following prompt:<br><br>Enter IP address for the default gateway: | Defines a default gateway through which to direct packets addressed to networks not explicitly listed in the routing table. | Type a 32-bit IP address, in dotted decimal notation. |
| **New User Account** | | |

**Table 43: Basic Configuration Wizard Summary** *(continued)*

| Prompt | Function | Your Action |
|---|---|---|
| Would you like to create a new user account? [yes, no] (no):<br><br>If you enter y(es), the configuration wizard displays the following prompt:<br><br>Enter a new user name:<br><br>After you enter a username, the configuration wizard prompts you for an associated password.<br><br>Enter user password<br><br>After you enter the password, the configuration wizard requests that you verify it.<br><br>Retype the password: | Defines a new (non-root) user account. | Type a username composed of only alphanumeric characters, the hyphen character, and the underscore character.<br><br>For the password, you must enter a value that is no less than 6 and no more than 128 characters long. It must contain at least 1 uppercase character and 1 lowercase character. It can include numbers and special characters. |
| **SNMP** | | |
| Would you like to configure SNMP Network Management? [yes,no] (no):<br><br>If you enter y(es), the configuration wizard presents the following prompt:<br><br>Enter community string [public]: | Configures the Simple Network Management Protocol parameters. The SNMP community string defines the relationship between an SNMP server system and the client systems. The string serves as a password to control the client's access to the server. | Type the SNMP community string. |

## Configuring Basic Settings with a Configuration Editor

To establish basic connectivity on a Services Router, you identify the router, connect the router to the network, and specify basic network settings.

In a typical network, the Services Router has the basic settings listed in Table 44 on page 110. Determine the values to set on the Services Router in your network.

**Table 44: Sample Settings on a Services Router**

| Services Router Property | Sample Value |
|---|---|
| Services Router hostname | routera |
| Access for user “root” | SSH RSA public key |
| IP address of the NTP server used to synchronize system time on the Services Router | 10.148.2.21 |
| Services Router location | Sunnyvale, California, USA, which is in the America/Los_Angeles time zone |

**Table 44: Sample Settings on a Services Router** *(continued)*

| Services Router Property | Sample Value |
|---|---|
| IP address of the DNS server to which DNS requests are sent | 10.148.2.32 |
| Domains to which the Services Router belongs | lab.router.net and router.net |
| IP address of a backup router to use while the Services Router is booting or if the routing protocol processes fail to start | 192.168.2.12/24 |
| Loopback IP address and prefix length for the Services Router lo0 interface | 172.16.1.24/32 |
| IP address and prefix length for the Services Router ge-0/0/0 interface | 192.168.1.1/24 |

You can configure basic settings in the J-Web interface from a device attached to the ge-0/0/0 interface on port 0. For instructions, see "Connecting to the J-Web Interface" on page 97. You can also connect to the CLI to configure basic settings. For instructions, see "Connecting to the CLI Locally" on page 98 and "Connecting to the CLI Remotely" on page 100.

To use a configuration editor to configure basic settings:

1. Navigate to the top of the configuration hierarchy in either the J-Web or CLI configuration editor.
2. To configure basic settings, perform the configuration tasks described in Table 45 on page 111.
3. If you are using the J-Web interface, click **Commit** to view a summary of your changes, then click **OK** to commit the configuration. If you are using the CLI, commit the configuration by entering the commit command.
4. To check the configuration, see Displaying Basic Connectivity Configurations on page 114.

**Table 45: Configuring Basic Settings**

| Task | J-Web Configuration Editor | CLI Configuration Editor |
|---|---|---|
| Navigate to the **System** level in the configuration hierarchy. | 1. In the J-Web interface, select **Configuration > View and Edit > Edit Configuration**.<br>2. Next to System, click **Configure** or **Edit**. | From the [edit] hierarchy level, enter<br>edit system |
| Define the hostname of the router. | In the Host name box, type the hostname of the router—for example, routera. | Set the hostname. For example:<br>set host-name routera |
| Name the domain in which the router is located. | In the Domain name box, type the domain name of the router—for example, lab.router.net. | Set the domain name. For example:<br>set domain-name lab.router.net |

**Table 45: Configuring Basic Settings** *(continued)*

| Task | J-Web Configuration Editor | CLI Configuration Editor |
|---|---|---|
| Allow SSH remote access. | 1. In the Nested configuration section, next to Services, click **Configure** or **Edit**.<br>2. Next to Ssh, click **Configure** or **Edit**.<br>3. Click **OK**.<br>4. Click **OK** a second time to return to the System level in the configuration editor hierarchy. | Set remote access for SSH:<br><br>set services ssh |
| Define root authentication for access to the router.<br><br>**NOTE:** For readability, the entire key is not shown. | 1. In the Nested configuration section, next to Root authentication, click **Configure** or **Edit**.<br>2. Next to Ssh rsa, click **Add New Entry**.<br>3. In the Authorized key box, type the RSA password—for example, ssh-rsa AAAAB3Nza...D9Y2gXF9ac== root@routera.lab.router.net<br>4. Click **OK**.<br>5. Click **OK** a second time to return to the System level in the configuration editor hierarchy. | Set the root password. For example:<br><br>set root-authentication ssh-rsa "ssh-rsa AAAAB3Nza...D9Y2gXF9ac== root@routera.lab.router.net" |
| Define the time zone the router is located in. | In the Time zone list, select the time zone for your router—for example, **America/Los_Angeles**. | Set the time zone. For example:<br><br>set time-zone America/Los_Angeles |
| Define the NTP server that NTP requests can be sent to. | 1. In the Nested configuration section, next to Ntp, click **Configure** or **Edit**.<br>2. Next to Server, click **Add New Entry**.<br>3. In the Address box, type the NTP server's IP address—for example, 10.148.2.21<br>4. Click **OK**.<br>5. Click **OK** a second time to return to the System level in the configuration editor hierarchy. | Set the address of the NTP server. For example:<br><br>set ntp server 10.148.2.21 |
| Define the DNS server that receives DNS requests. | 1. Next to Name server, click **Add New Entry**.<br>2. In the Address box, type the address of the DNS server—for example, 10.148.2.32.<br>3. Click **OK**. | Set the address of the DNS server. For example:<br><br>set name-server 10.148.2.32 |
| Add each domain that the router belongs to. | 1. Next to Domain search, click **Add New Entry**.<br>2. In the Value box, type the name of the domain in which the router is located—for example, lab.router.net.<br>3. Click **OK**.<br>4. Next to Domain search, click **Add New Entry**.<br>5. In the Value box, type the name of another domain that the router belongs to—for example, router.net.<br>6. Click **OK**. | Set the domains to be searched. For example:<br><br>set domain-search lab.router.net<br><br>set domain-search router.net |

**Table 45: Configuring Basic Settings** *(continued)*

| Task | J-Web Configuration Editor | CLI Configuration Editor |
|---|---|---|
| Define the backup router to be used when the router is booting or the routing protocol processes are not running. | In the Backup router section, next to Address, type the IP address of the backup router—for example, 192.168.2.44. | Set the address for the backup router. For example:<br><br>set backup router 192.168.2.44 |
| Define the IP address for lo0.0. | 1. In the configuration editor hierarchy, next to Interfaces, click **Configure** or **Edit**.<br>2. In the Interface table, locate the lo0 row and click **Unit**.<br>3. In the Unit table, click **0**, and in the Family section next to Inet, click **Configure** or **Edit**.<br>4. To delete the existing IP address, click the **Discard** button. Select the **Delete Configuration Below This Point** option button from the next display.<br>5. Next to Address, click **Add new entry**.<br>6. In the Source box, type the address and prefix length for the loopback interface—for example, 172.16.1.24/32.<br>7. Click **OK**. | 1. From the [edit] hierarchy level, enter<br><br>edit interfaces<br>2. Delete the existing IP address:<br><br>delete lo0 unit 0 family inet address<br>3. Set the IP address and prefix length of lo0.0. For example:<br><br>set lo0 unit 0 family inet address 172.16.1.24/32 |
| Define the IP address for ge-0/0/0. | 1. In the configuration editor hierarchy, next to Interfaces, click **Configure** or **Edit**.<br>2. In the Interface table, locate the ge-0/0/0 row and click **Unit**.<br>3. In the Unit table, click **0**, and in the Family section next to Inet, click **Configure** or **Edit**.<br>4. To delete the existing IP address, click the **Discard** button. Select the **Delete Configuration Below This Point** option button from the next display.<br>5. Next to Address, click **Add new entry**.<br>6. In the Source box, type the address and prefix length for the management interface—for example, 192.168.1.1/24.<br>7. Click **OK**. | 1. Delete the existing IP address:<br><br>delete ge-0/0/0 unit 0 family inet address.<br>2. Set the IP address and prefix length of ge-0/0/0. For example:<br><br>set ge-0/0/0 unit 0 family inet address 192.168.1.1/24 |

## Verifying Basic Connectivity and the Configuration

To verify that the Services Router has the settings you configured, perform the following task:

- Displaying Basic Connectivity Configurations on page 114

### *Displaying Basic Connectivity Configurations*

**Purpose** Verify the configuration of basic connectivity. Because the basic connectivity settings appear in different places in the configuration hierarchy, displaying the entire configuration at once makes viewing the settings easier.

**Action** From the J-Web interface, select **Configuration > View and Edit > View Configuration Text**. Alternatively, from configuration mode in the CLI, enter the **show** command. The following sample output displays the sample values configured in Table 45 on page 111. Your output displays the values you set.

```
[edit]
user@host# show
system {
    host-name routera;
    domain-name lab.router.net;
    domain-search [ lab.router.net router.net ];
    backup-router 192.168.2.44;
    time-zone America/Los_Angeles;
    root-authentication {
        ssh-rsa "ssh-rsa AAAAB3Nza...D9Y2gXF9ac==root@routera.lab.router.net";
    }
    name-server {
        10.148.2.32;
    }
    services {
        ssh
    }
    ntp {
        server 10.148.2.21;
    }
}
interfaces {
    ge-0/0/0 {
        unit 0 {
            family inet {
                address 192.168.1.1/24;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 172.16.1.24/32;
            }
        }
    }
}
```

**Meaning** The output shows the configuration of basic connectivity. Verify that the values displayed are correct for your Services Router.

**Related Topics** For more information about the format of a configuration file, see the *JUNOS CLI User Guide*.

Chapter 7

# Installing JUNOS Software with Enhanced Services

For information explaining how to install JUNOS software with enhanced services if your Services Router is running JUNOS software, see the *JUNOS Software with Enhanced Services Migration Guide*. For information explaining how to upgrade the software if you have already installed JUNOS software with enhanced services, see the *JUNOS Software Administration Guide*.

# Part 3
# Maintaining Services Router Hardware

Chapter 8

# Replacing Hardware Components

Because many of the Services Router's hardware components are field-replaceable units (FRUs), you can remove and replace them yourself. When you need to replace a router component, contact your customer support or sales representative to order the field-replaceable unit (FRU) that contains the component. For instructions, see "Contacting Customer Support and Returning Hardware" on page 169.

This chapter contains the following topics:



## Tools and Parts Required

To replace hardware components, you need the tools and parts listed in Table 46 on page 120.

**Table 46: Tools and Parts Required**

| Tool or Part | Components |
|---|---|
| Electrostatic bag or antistatic mat | All |
| Electrostatic discharge (ESD) grounding wrist strap | All |
| Flat-blade screw-blade screwdriver, approximately 1/4 in. (6 mm) | PIM |
| Phillips (+) screwdriver, number 1 and number 2 | ■ Chassis cover<br>■ Compact flash<br>■ Crypto Accelerator Module<br>■ DRAM modules<br>■ PIM<br>■ Power system components |

## Replacing the Console Port Cable

The RJ-45 port labeled CONSOLE on the Services Router's front panel allows you to connect the router to an external management device, such as a laptop or a terminal server. For cable specifications, see “Chassis Console Port Pinouts” on page 190.

To replace the console port cable:

1. Locate an appropriate replacement cable and connector.
2. Plug the Ethernet connector at either end of the cable into the console port on the front panel (see Figure 57 on page 100).
3. Plug the connector at the other end of the cable into the external management device. If you are connecting to a DB-9 serial port, use the provided RJ-45 to DB-9 serial port adapter.

## Replacing a PIM

To remove or install field-replaceable Physical Interface Modules (PIMs) in a Services Router, you must first power off the router. This section contains the following topics:

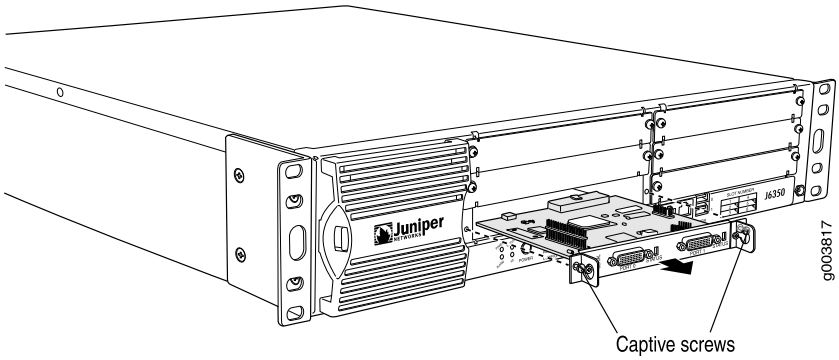


### *Removing a PIM*

The PIMs are installed in the front of the Services Router. A PIM weighs less than 1 lb (0.5 kg).

**CAUTION:** Do not hot-swap WXC Integrated Services Modules. Failure to power off the router before removing or installing a WXC Integrated Services Module might result in damage to the hardware.

**Figure 59: Removing a PIM**



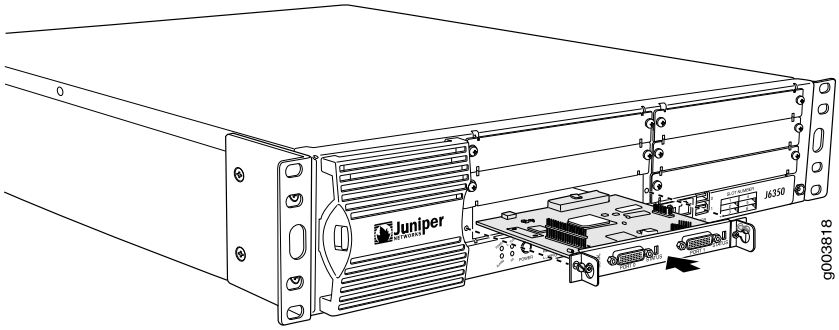

To remove a PIM (see Figure 59 on page 121):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the PIM.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the Services Router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Press and release the power button to power off the router. Verify that the POWER LED blinks and then turns off.
4. Label the cables connected to the PIM so that you can later reconnect each cable to the correct PIM.
5. Disconnect the cables from the PIM.
6. If necessary, arrange the cables to prevent them from dislodging or developing stress points:
   - Secure each cable so that it is not supporting its own weight as it hangs to the floor.
   - Place excess cable out of the way in a neatly coiled loop.
   - Use fasteners to maintain the shape of cable loops.
7. Loosen the captive screws on each side of the PIM faceplate.
8. Grasp the handles on each side of the PIM faceplate, and slide the PIM out of the router. Place it in the electrostatic bag or on the antistatic mat.
9. If you are not reinstalling a PIM into the emptied slot, install a blank PIM panel over the slot to maintain proper airflow.

## *Installing a PIM*

**CAUTION:** Do not hot-swap WXC Integrated Services Modules. Failure to power off the router before removing or installing a WXC Integrated Services Module might result in damage to the hardware.

**Figure 60: Installing a PIM**




**CAUTION:** Do not install a combination of modules in a single chassis that exceeds the maximum power and heat capacity of the chassis. If J-series power management is enabled, PIMs and modules (PIMs or PIMs plus a WXC Integrated Services Module) that exceed the maximum power and heat capacity remain offline when the chassis is powered on.

To verify that the combination of PIMs to be installed in a chassis do not exceed the power and heat capacities for the J4350 or J6350 router, see "Planning for Power Management" on page 72.

To install a PIM (see Figure 60 on page 122):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the Services Router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
2. Press and release the power button to power off the router. Verify that the POWER LED blinks and then turns off.
3. Align the notches in the connector at the rear of the PIM with the notches in the PIM slot in the Services Router, and slide the PIM in until it lodges firmly in the router.

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

4. Tighten the captive screws on each side of the PIM faceplate.

5. Insert the appropriate cables into the cable connectors on the PIM.
6. If necessary, arrange the cables to prevent them from dislodging or developing stress points:
   - Secure each cable so that it is not supporting its own weight as it hangs to the floor.
   - Place excess cable out of the way in a neatly coiled loop.
   - Use fasteners to maintain the shape of cable loops.
7. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

## Replacing PIM Cables

Removing and installing PIM cables does not affect Services Router function, except that a PIM does not receive or transmit data while its cable is disconnected. To replace a PIM cable, perform the following procedures:


- Removing PIM Cables on page 123
- Installing PIM Cables on page 123


### *Removing PIM Cables*

To remove a PIM cable:

1. If you are removing all cables connected to the PIM, issue the following CLI command to take the PIM offline:

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

   For example, to take the PIM in slot 4 offline, enter the following command:

   ```
   user@host> request chassis fpc slot 4 offline
   ```

   For more information about the command, see the *JUNOS System Basics and Services Command Reference*.
2. Unplug the cable from the cable connector port.
3. Detach the cable from the destination port.

### *Installing PIM Cables*

To install a PIM cable:

1. Have ready a length of the type of cable used by the PIM. For cable specifications, see “Network Cable Specifications and Connector Pinouts” on page 179.
2. Insert the cable connector into the cable connector port on the PIM faceplate.

3. Arrange the cable as necessary to prevent it from dislodging or developing stress points:
   - Secure the cable so that it is not supporting its own weight as it hangs to the floor.
   - Place excess cable out of the way in a neatly coiled loop.
   - Use fasteners to maintain the shape of cable loops.
4. Insert the other end of the cable into the destination port.
5. Repeat the previous steps for any additional cables.
6. If the PIM is offline (its status LED is steadily red), issue the following CLI command to bring the PIM online:

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

   For example, to bring the PIM in slot 4 online, enter the following command:

   ```
   user@host> request chassis fpc slot 4 online
   ```

   For more information about the command, see the *JUNOS System Basics and Services Command Reference*.
7. Verify that the PIM status LED shines steadily green to confirm that the PIM is online.

   You can also verify correct PIM functioning by issuing the show chassis fpc pic-status command described in the *JUNOS Software Interfaces and Routing Configuration Guide*.

**NOTE:** In the show chassis fpc pic-status command, the PIM slot number is reported as an FPC number and the PIM number (always 0) is reported as a PIC number. For more information about interface naming, see the *JUNOS Software Interfaces and Routing Configuration Guide*.

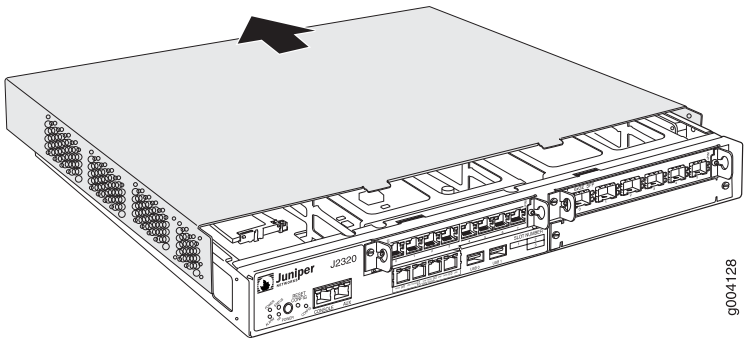
## Removing and Replacing the Chassis Cover on J2320 and J2350 Routers

On J2320 and J2350 routers, the chassis cover fits tightly on the chassis. To remove the cover from the chassis:

1. Press and release the power button to power off the router. Wait for the POWER LED to turn off.
2. Remove the power cable from the power source receptacle.
3. With a Phillips screwdriver remove the grounding screw.
4. Remove the router from the rack.

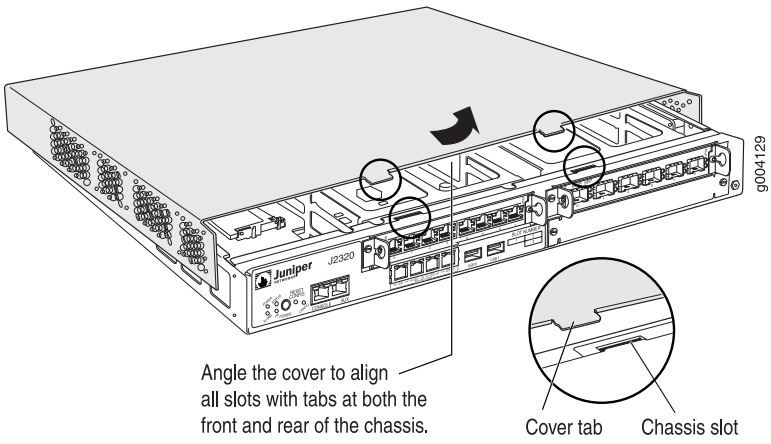
5. With a Phillips screwdriver remove the flat head screws from the rear and sides of the chassis.
6. Position the router so that you face the front panel.
7. Place your hands on the cover and press down while pushing the cover back until the two front tabs disengage from the chassis base (see Figure 61 on page 125).

**Figure 61: Sliding the Chassis Cover**




8. Lift the cover upward and pull it away from the tabs on the rear of the chassis (see Figure 62 on page 125).

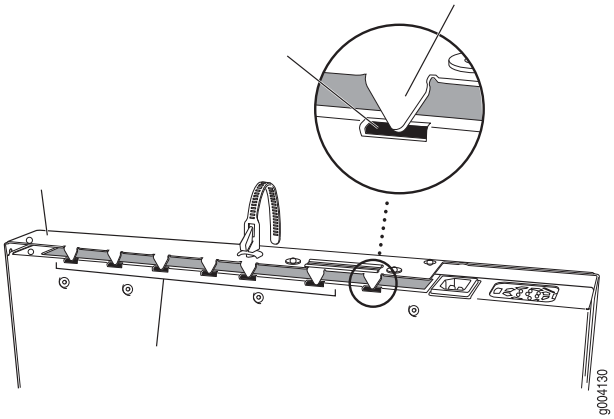
**Figure 62: Removing and Replacing the Chassis Cover**




To replace the cover on the J2320 and J2350 chassis:

1. Lower the cover onto the chassis so that the front edge of the cover is a few inches away from the front edge of the chassis base (see Figure 62 on page 125).
2. Tilt the cover and align the rear tabs with the slots at the bottom of the chassis (see Figure 63 on page 126).

**Figure 63: Matching the Chassis Slots and Tabs**



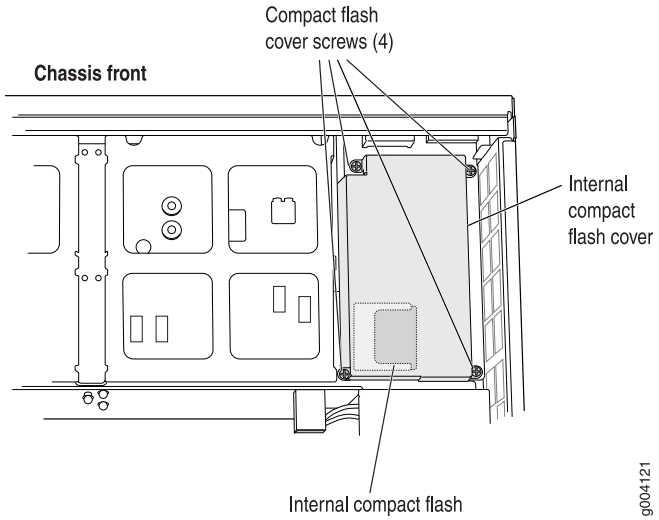

3. Lower the cover fully onto the base, and slide it so that the front tabs match the front slots and the chassis cover and base edges align completely.
4. Insert and tighten the flat head screws with a Phillips screwdriver.
5. Return the router to its installation site, and attach the grounding cable and the power cables. (See “Connecting Power” on page 84.)
6. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

## Replacing Internal Compact Flashes on J2320 and J2350 Routers

The internal compact flash provides primary storage for the router and is installed in a slot on the bottom of the J2320 or J2350 chassis (see Figure 64 on page 127). It can accommodate software images, configuration files, and microcode. For information about configuring the internal compact flash, see the *JUNOS Software Administration Guide*.

**NOTE:** Use only compact flash cards purchased from Juniper Networks for your J-series platform and model.

**Figure 64: Location of J2320 and J2350 Internal Compact Flash**




To replace the internal compact flash:

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Press and release the power button to power off the router. Wait for the POWER LED to turn off.
4. Remove the power cable from the power source receptacle.
5. Remove chassis cover. (See "Removing and Replacing the Chassis Cover on J2320 and J2350 Routers" on page 124.)

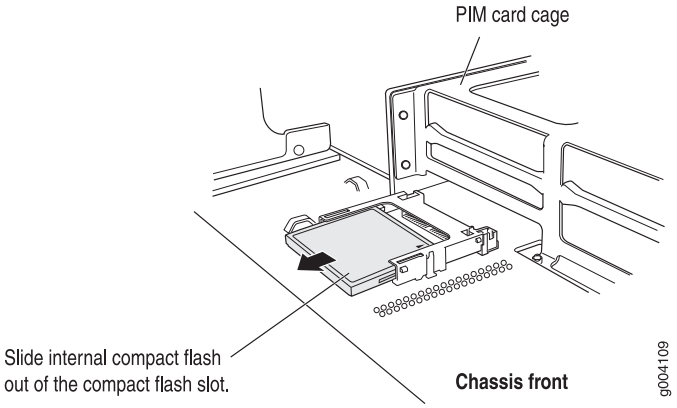
---

**WARNING:** If the fans are still rotating, wait until they stop before proceeding with the next step.

---

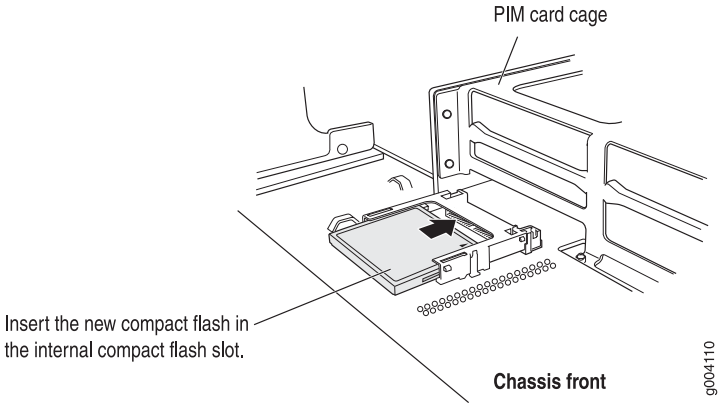
6. With a Phillips screwdriver, loosen the pan head screws that secure the internal compact flash slot cover.
7. Remove the compact flash slot cover.
8. Gently grasp the compact flash, and slide it out of the compact flash slot (see Figure 65 on page 128).

**Figure 65: Removing the J2320 or J2350 Internal Compact Flash**




9. Place the compact flash on the antistatic mat or in the electrostatic bag.
10. With the vendor name and memory size facing up and the arrow pointing towards the router, insert the new compact flash into the compact flash slot (see Figure 66 on page 128).

**Figure 66: Inserting the J2320 or J2350 Internal Compact Flash**



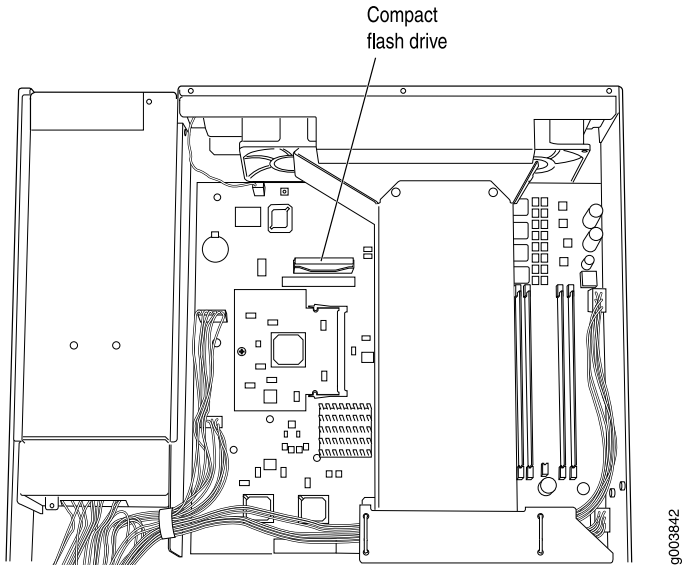

11. Replace the compact flash slot cover.
12. Tighten the pan head screws that secure the compact flash slot cover.
13. Slide the chassis cover onto the chassis.
14. Replace the chassis cover. (See “Removing and Replacing the Chassis Cover on J2320 and J2350 Routers” on page 124.)
15. Replace the power cable.
16. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

## Replacing Internal Compact Flashes on J4350 and J6350 Routers

The internal compact flash is installed in a slot on the bottom of the J4350 or J6350 chassis (see Figure 67 on page 129).

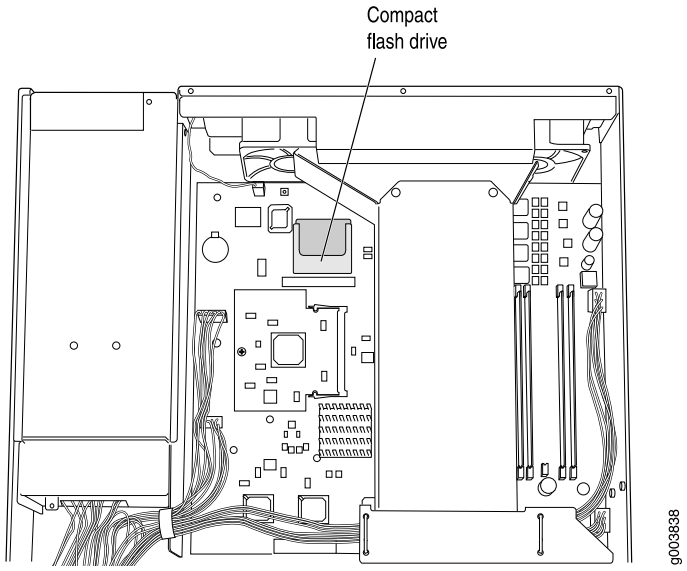
**NOTE:** Use only compact flash cards purchased from Juniper Networks for your J-series platform and model.

**Figure 67: Location of J4350 and J6350 Compact Flash**




On some J4350 and J6350 Services Routers, the compact flash is in a horizontal position, while on others it is in a vertical position. Figure 68 on page 130 shows the alternative horizontal orientation of the compact flash.

**Figure 68: Alternative Horizontal Orientation of J4350 and J6350 Compact Flash**



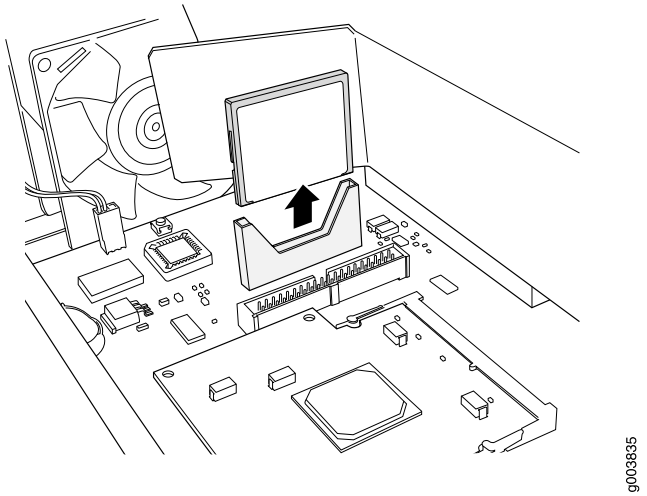

To replace the compact flash:

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Press and release the power button to power off the router. Wait for the POWER LED to turn off.
4. Remove the power cord or cable from the power source receptacle.
5. Remove the screws from the sides and top of the chassis that secure the cover to the chassis.
6. Slide the cover off the chassis.

**WARNING:** If the fans are still rotating, wait until they stop before proceeding with the next step, especially if your compact flash is in the horizontal position (flat against the system board).

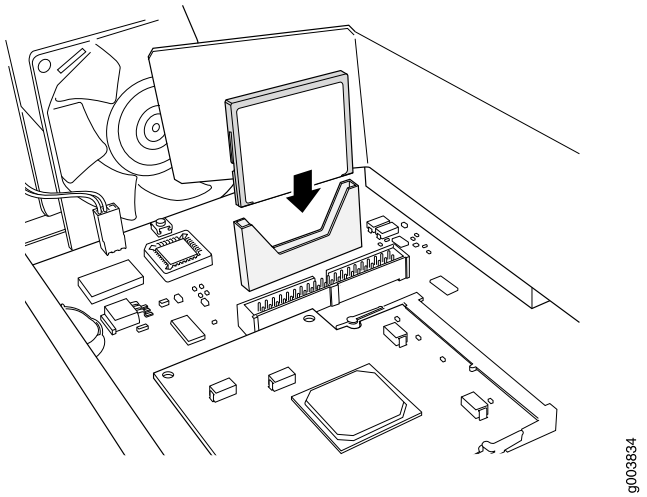
7. Slide the compact flash out of its slot, as shown in Figure 69 on page 131.

**Figure 69: Removing the J4350 or J6350 Compact Flash**




8. Place the compact flash on the antistatic mat or in the electrostatic bag.
9. Slide the new compact flash into the slot and press down, as shown in Figure 70 on page 131.

**Figure 70: Inserting the J4350 or J6350 Compact Flash**




**NOTE:** On some Services Routers the compact flash is in a horizontal position. If the compact flash connection is horizontal, lay the compact flash behind the slot and slide it forward until it clicks into place.

10. Slide the cover onto the chassis.
11. Replace and tighten the screws on the sides and top of the chassis that secure the cover to the chassis.

12. Replace the power cord or cable.
13. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

## Replacing External Compact Flashes

The external compact flash is an optional component on J2320 and J2350 Services Routers. It provides secondary storage for the router and can accommodate software images, configuration files, and microcode. If the internal compact flash fails on startup, the router boots from the external compact flash.

For information about configuring the external compact flash, see the *JUNOS Software Administration Guide*.

**NOTE:** Depending on your configuration, the Services Router might not have an external compact flash. If no external compact flash is installed, proceed directly to Step 10 to install the compact flash.

The external compact flash is installed in a slot on the rear of the J2320 or J2350 chassis.

To replace the external compact flash:

1. Verify the device that the router used to boot by running the show system storage command from the CLI. For example:

```
user@host> show system storage

Filesystem        512-blocks       Used      Avail Capacity Mounted on
/dev/ad0s1a           218254     175546      40526     81%  /
...
```

   The boot device is mounted on /. The internal compact flash is located at ad0. The external compact flash is located at ad2. The USB storage device is located at da0. This example shows that the router booted from the internal compact flash.

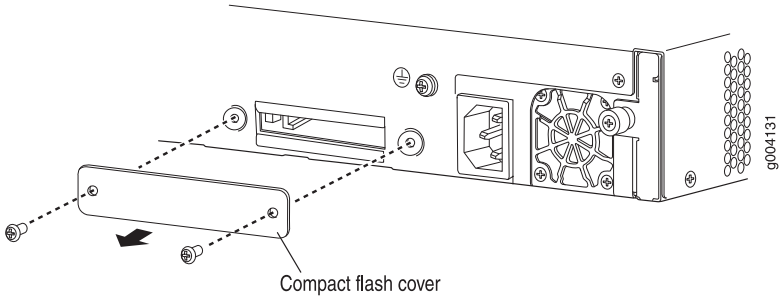
   If the show system storage output indicates that the router booted from the external compact flash, you need to power off the router before replacing the compact flash.

2. Place an electrostatic bag or antistatic mat on a flat, stable surface.
3. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.
4. Press and release the power button to power off the router. Wait for the POWER LED to turn off before you remove the compact flash.

Skip this step, if the router did not boot from the external compact flash (see step 1).

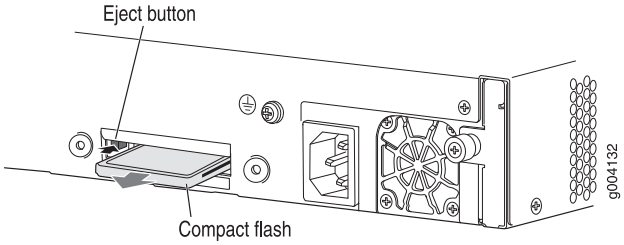
5. With a Phillips screwdriver, loosen the pan head screws that secure the external compact flash cover to the rear of the chassis (see Figure 71 on page 133).

**Figure 71: Removing the External Compact Flash Cover**



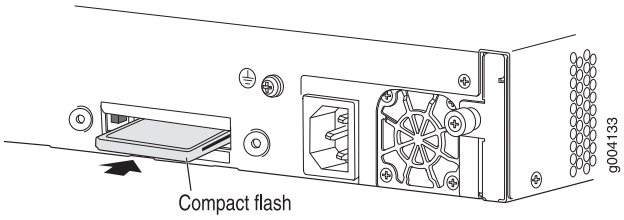

6. Remove the compact flash cover.
7. Eject the external compact flash by pressing the ejector button to the left of the compact flash slot once to unlock the button, and again to eject the compact flash (see Figure 72 on page 133).

**Figure 72: Removing the External Compact Flash**




8. Gently grasp the compact flash, and slide it out of the slot.
9. Place the compact flash on the antistatic mat or in the electrostatic bag.
10. With the vendor name and memory size facing up and the arrow pointing towards the router, insert the new compact flash in the external compact flash slot (see Figure 73 on page 133).

**Figure 73: Inserting the External Compact Flash**




11. Replace the compact flash slot cover.

12. Tighten the pan head screws that secures the compact flash slot cover to the rear of the chassis.
13. Plug the power cord into the power supply.
14. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

## Replacing USB Storage Devices

USB storage devices are optional components on J-series Services Routers. If installed, a USB storage device provides secondary storage for the router. It can accommodate software images, configuration files, and microcode. If the internal compact flash fails on startup, and the external compact flash is not installed or fails, the router boots from the USB storage device.

For information about configuring the USB storage device, see the *JUNOS Software Interfaces and Routing Configuration Guide*.

**NOTE:** For a list of supported USB storage devices, see the *JUNOS Software with Enhanced Services Release Notes* at http://www.juniper.net.

To remove and install a USB storage device, perform the following procedures:

- Removing the USB Storage Device on page 134
- Installing the USB Storage Device on page 135

### *Removing the USB Storage Device*

**NOTE:** Depending on your configuration, the Services Router might not have a USB storage device. If no USB storage device is installed, proceed directly to "Installing the USB Storage Device" on page 135.

The USB storage device is installed into the USB port on the front panel of the Services Router. To remove the USB storage device:

1. Verify the device that the router used to boot, by running the show system storage command from the CLI. For example:

```
user@host> show system storage

Filesystem        512-blocks       Used      Avail Capacity Mounted on
/dev/ad0s1a           218254     175546      40526     81%  /
...
```

   The boot device is mounted on /. The internal compact flash is located at ad0. The external compact flash is located at ad2. The USB storage device is located at da0. This example shows that the router booted from the internal compact flash.

   If the show system storage output indicates that the router booted from the external compact flash, you need to power off the router before replacing the compact flash.

2. Place an electrostatic bag or antistatic mat on a flat, stable surface.
3. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.
4. Press and release the power button to power off the router. Wait for the POWER LED to turn off before you remove the compact flash.

   Skip this step, if the router did not boot from the external compact flash (see Step 1).

5. Gently grasp the USB storage device and slide it out of the USB port.
6. Place the USB storage device on the antistatic mat or in the electrostatic bag.

### *Installing the USB Storage Device*

To install the USB storage device:

**NOTE:** For a list of supported USB storage devices, see the *JUNOS Software with Enhanced Services Release Notes* at http://www.juniper.net.

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.
2. Orient the USB storage device with the USB port on the front panel of the router.

3. Insert the USB storage device into the USB port. If the USB storage device does not easily slide into the port, it might not be oriented correctly. Turn the USB storage device upside-down and try again.
4. To configure the USB storage device with the request system snapshot command, see the *JUNOS Software Administration Guide*.

## Replacing DRAM Modules

The DRAM installed on the Routing Engine provides storage for the routing and forwarding tables and for other Routing Engine processes. The design of the Routing Engine allows you to modify the DRAM configuration by adding DRAM modules to the system board, or removing DRAM modules from the board.

The DRAM modules are located on the top of the system board, as shown in Figure 74 on page 136 and Figure 75 on page 137. Two pairs of slots are available for installing DRAM modules. Installing DRAM modules in slots away from each other provides better performance than installing them in two adjacent slots.

**NOTE:** Use only DRAM modules purchased through Juniper Networks specifically for your model.

**Figure 74: J2320 and J2350 DRAM Location**

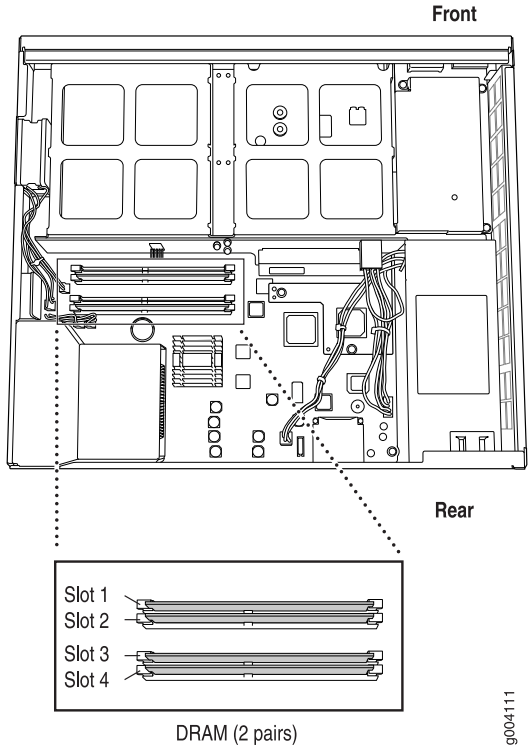
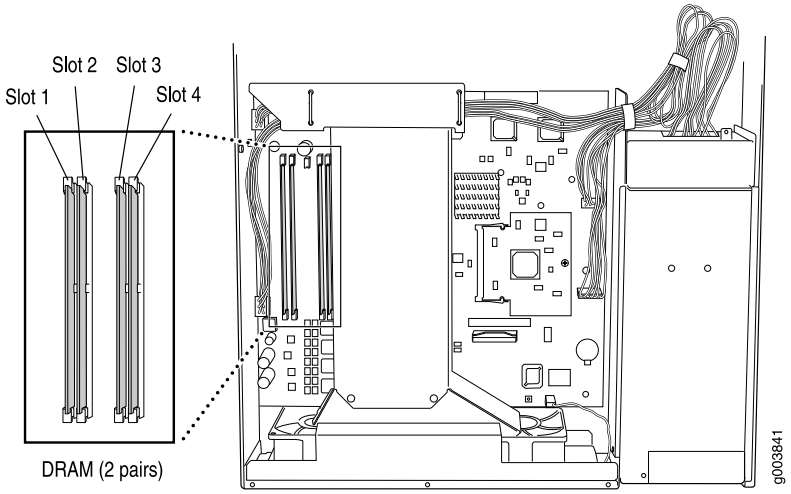


**Figure 75: J4350 and J6350 DRAM Location**




To modify the DRAM configuration, use the following procedures:

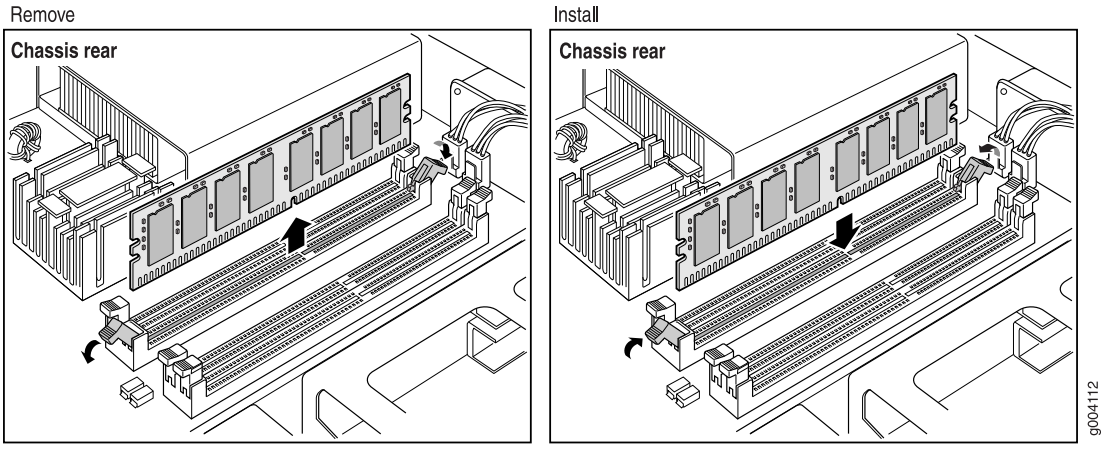
- Removing a DRAM Module on page 137
- Installing a DRAM Module on page 138

## *Removing a DRAM Module*

To remove a DRAM module:

1. Place an electrostatic bag or antistatic mat on a flat, stable surface.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see the Getting Started Guide for your router.
3. Press and release the power button to power off the router. Wait for the POWER LED to turn off.
4. Unplug the power cord or cable from the power source receptacle.
5. Remove the screws from the sides and top of the chassis that secure the cover to the chassis.
6. Slide the cover off the chassis. (For J2320 and J2350 routers, see “Removing and Replacing the Chassis Cover on J2320 and J2350 Routers” on page 124.)
7. To release the DRAM module, press the plastic ejectors on both sides of the module (see Figure 76 on page 138).
8. Grasp the DRAM module, being careful not to touch any electrical components on the module, and firmly pull it out of the slot on the system board.
9. Place the DRAM module on the antistatic mat or in the electrostatic bag.

**Figure 76: Installing or Replacing DRAM Modules**




## *Installing a DRAM Module*

J2320, J2350, J4350 and J6350 Services Routers support 256-MB and 512-MB DRAM modules. Use only DRAM modules purchased from Juniper Networks specifically for your model.

**NOTE:** If you are installing a second DRAM module, do not install it in a slot adjacent to the first module. For example, if the first DRAM module is installed in slot 1, install the second module in slot 3 (see Figure 74 on page 136 and Figure 75 on page 137).

To install a DRAM module:

1. Take the following steps if you have not already done so:
   a. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see the Getting Started Guide for your router.
   b. Press and release the power button to power off the router. Wait for the POWER LED to turn off.
   c. Unplug the power cord or cable from the power source receptacle.
   d. Remove the screws from the sides and top of the chassis that secure the cover to the chassis.
   e. Slide the cover off the chassis. (For J2320 and J2350 routers, see "Removing and Replacing the Chassis Cover on J2320 and J2350 Routers" on page 124.)
2. Remove the DRAM module from its electrostatic bag.
3. Press the plastic ejectors on both sides of the DRAM slot to open it (see Figure 76 on page 138).
4. Grasp the DRAM module by the edges, being careful not to touch any electrical components.

5. Pressing firmly on both ends, push the module into the slot until the ejectors click into the closed position (see Figure 76 on page 138).
6. Slide the cover onto the chassis.
7. Replace and tighten the screws on the sides and top of the chassis that secure the cover to the chassis.
8. Replace the power cord or cable.
9. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.
10. To view the DRAM configuration and verify that it was installed correctly, issue the show chassis routing-engine command, described in the *JUNOS System Basics and Services Command Reference*. This command shows the total memory installed.

## Replacing Power System Components

The power cords on all Services Routers are replaceable.

You can add a second power supply to the J6350 Services Router that is of the same type as the first (either AC or DC). The power supplies are located at the right rear of the chassis (see Figure 15 on page 22 and Figure 17 on page 23). Each J6350 power supply provides power to all components in the router. The J6350 power supplies are fully redundant. If one power supply fails or is removed, the remaining power supply instantly assumes the entire electrical load. One power supply can provide full power for as long as the router is operational.

Each J6350 power supply is hot-insertable and hot-removable.

**CAUTION:** Do not leave a power supply slot empty for more than a short time while the Services Router is operational. The power supply or a blank power supply panel must remain in the chassis for proper airflow.

To replace power system components, use the following procedures:

- Replacing AC Power Supply Cords on page 139
- Removing an AC Power Supply from J6350 Routers on page 140
- Installing an AC Power Supply in J6350 Routers on page 141
- Replacing DC Power Supply Cables on page 142
- Removing a DC Power Supply on page 143
- Installing a DC Power Supply on page 144

### *Replacing AC Power Supply Cords*

To replace the AC power cord for a redundant power supply:

1. Locate a replacement power cord with the type of plug appropriate for your geographical location (see “AC Power, Connection, and Power Cord Specifications” on page 69).
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.
3. Press and release the power button to power off the router. Wait for the POWER LED to turn off.

**NOTE:** If the power supply is a redundant power supply in a J6350 Services Router, you can leave the router powered on and power flowing in the other power supply.

4. Unplug the power cord from the power source receptacle.
5. Unplug the power cord from the appliance inlet on the power supply faceplate.
6. Insert the appliance coupler end of the replacement power cord into the appliance inlet on the power supply faceplate.
7. Insert the power cord plug into an AC power source receptacle.

**NOTE:** Each power supply must be connected to a dedicated AC power feed. For information about connecting to AC power sources, see “Connecting Power” on page 84.

8. Verify that the power cord does not block access to Services Router components or drape where people might trip on it.
9. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

## *Removing an AC Power Supply from J6350 Routers*

The power supplies are located at the right rear of the chassis. A power supply weighs 2.4 lb (1.1 kg).

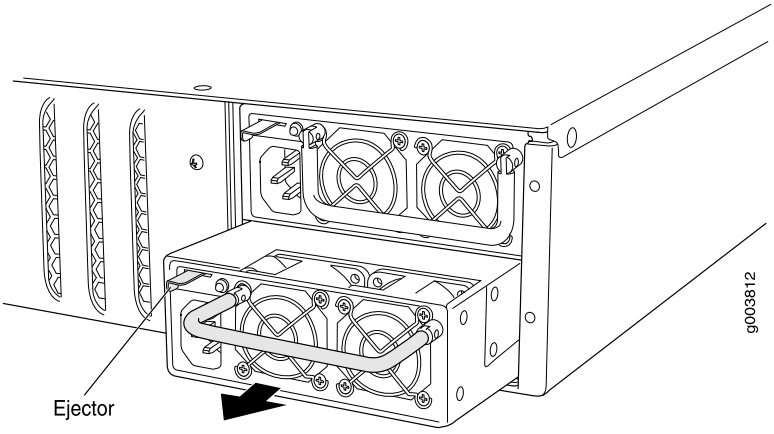
To remove an AC power supply from a J6350 Services Router (see Figure 77 on page 141):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.
2. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.

**NOTE:** If the power supply is a redundant power supply in a J6350 Service Router, you can leave the router powered on and power flowing in the other power supply.

3. Unplug the power cord from the power source receptacle.
4. Unplug the power cord from the appliance inlet on the power supply faceplate.
5. Slide the ejector tab on the power supply faceplate to the right and hold it in place to unlock the power supply.
6. Grasp the handle on the power supply faceplate, and pull firmly to start removing the power supply. Slide it halfway out of the chassis (see Figure 77 on page 141).
7. Place one hand underneath the power supply to support it and slide it completely out of the chassis.
8. If you are not reinstalling a power supply into the emptied slot, install a blank power supply panel over the slot.

**Figure 77: Removing an AC Power Supply**




## *Installing an AC Power Supply in J6350 Routers*

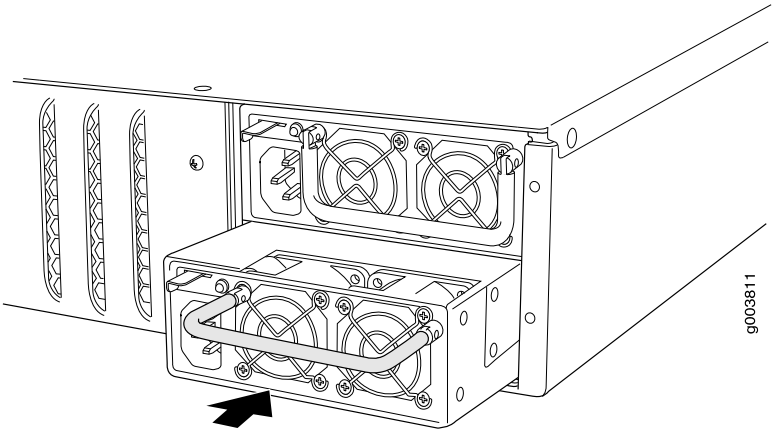
To install an AC power supply in a J6350 Services Router (see Figure 78 on page 142):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.
2. Using both hands, slide the power supply into the chassis until you feel resistance.
3. Firmly push the power supply into the chassis until it comes to a stop. Make sure that the power supply faceplate is flush with any adjacent power supply faceplate.
4. Insert the appliance coupler end of a power cord into the appliance inlet on the power supply faceplate.
5. Insert the power cord plug into an AC power source receptacle.

**NOTE:** Each power supply must be connected to a dedicated AC power feed. For information about connecting to AC power sources, see "Connecting Power" on page 84.

6. Verify that the power cord does not block access to router components or drape where people might trip on it.
7. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

**Figure 78: Installing an AC Power Supply**




## *Replacing DC Power Supply Cables*

To replace a power cable for a DC power supply:

1. Locate a replacement power cable and a lug that meet the specifications defined in "Chassis Grounding" on page 83 and "DC Power, Connection, and Power Cable Specifications" on page 71.

**CAUTION:** A licensed electrician must attach a cable lug to the power cable that you supply. A cable with an incorrectly attached lug can damage the router (for example, by causing a short circuit).

2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.
4. Ensure that the voltage across the DC power source cable leads is 0 V and that the cable leads cannot become active during installation.

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

5. Remove the power cable from the DC power source.
6. Use a Phillips screwdriver to remove the clear plastic cover protecting the terminal block.
7. Within the terminal block, remove the screw that fastens the power cable lug to the terminal block.
8. Carefully move the power cable out of the way.
9. Using the removed screw, secure the replacement power cable (see 1) to the appropriate terminal. Tighten the screw until snug. Do not overtighten.

   The screw contains a captive washer used to secure the power cable lug to the terminal block.

**NOTE:** Each power supply must be connected to a dedicated DC power feed. For information about connecting to DC power sources, see "Connecting Power" on page 84.

10. Dress the power cable appropriately.
11. Replace the clear plastic cover over the terminal block.
12. Verify that the power cable does not block access to router components or drape where people might trip on it.
13. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

### *Removing a DC Power Supply*

The power supplies are located at the right rear of the chassis. A power supply weighs 2.4 lb (1.1 kg).

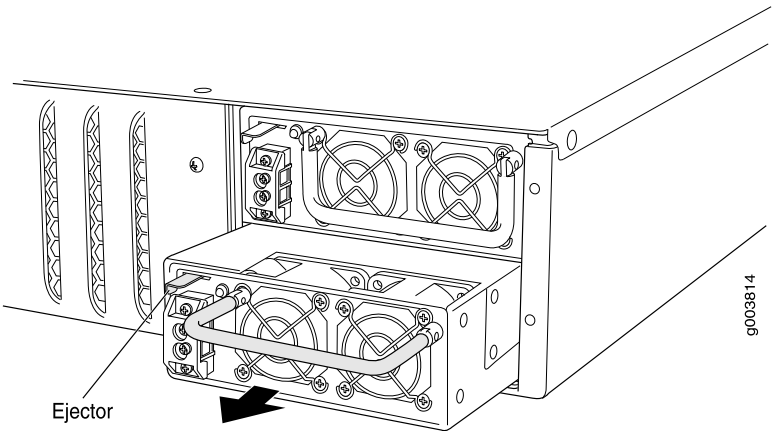
To remove a DC power supply (see Figure 79 on page 144):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
2. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.
3. Ensure that the voltage across the DC power source cable leads is 0 V and that the cable leads cannot become active during installation.

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

4. Remove the power cables from the DC power source.
5. Use a Phillips screwdriver to remove the clear plastic cover protecting the terminal block.
6. Within the terminal block, remove the screws that fasten the power cable lugs to the terminal block.
7. Carefully move the power cables out of the way.
8. Slide the ejector tab on the power supply faceplate to the right, and hold it in place to unlock the power supply.
9. Grasp the handle on the power supply faceplate, and pull firmly to start removing the power supply. Slide it halfway out of the chassis (see Figure 79 on page 144).
10. Place one hand underneath the power supply to support it, and slide it completely out of the chassis.
11. If you are not reinstalling a power supply into the emptied slot, install a blank power supply panel over the slot.

**Figure 79: Removing a DC Power Supply**




## *Installing a DC Power Supply*

Each power supply in a DC-powered router must be connected to earth ground. A ground terminal is provided on each DC power supply for this purpose.

To install a DC power supply (see Figure 80 on page 146):

1. Ensure that the voltage across the DC power source cable leads is 0 V and that the cable leads cannot become active during installation.

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

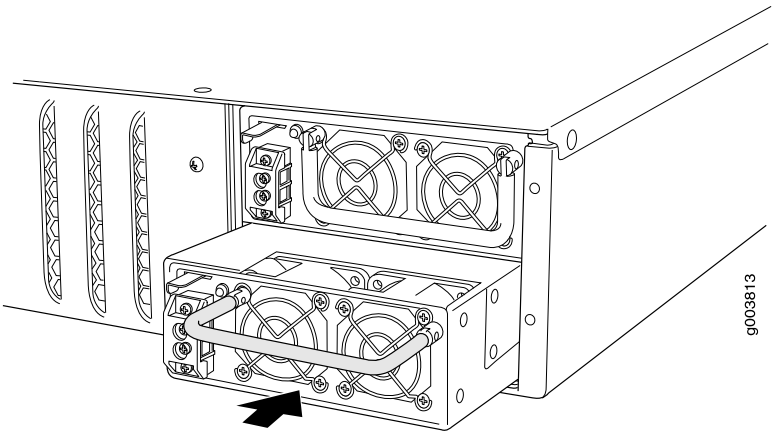
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Using both hands, slide the power supply into the chassis until you feel resistance.
4. Firmly push the power supply into the chassis until it comes to a stop. Make sure that the power supply faceplate is flush with any adjacent power supply faceplate.
5. Use a Phillips screwdriver to remove the clear plastic cover protecting the terminal block.
6. Within the terminal block, remove the two center screws next to the labels –48 VDC and RTN.

   Each screw contains a captive washer to secure a power cable lug to the terminal block.
7. Using one of the removed screws, secure the positive ( + ) DC source power cable lug to the RTN terminal. Tighten the screw until snug. Do not overtighten. Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to the screw.
8. Using the other removed screw, secure the negative (–) DC source power cable lug to the –48 VDC terminal. Tighten the screw until snug. Do not overtighten. Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to the screw.

**NOTE:** Each power supply must be connected to a dedicated DC power feed. For information about connecting to DC power sources, see "Connecting Power" on page 84.

9. Dress the power cables appropriately.
10. Replace the clear plastic cover over the terminal block.
11. Verify that the power cord does not block access to router components or drape where people might trip on it.
12. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

**Figure 80: Installing a DC Power Supply**

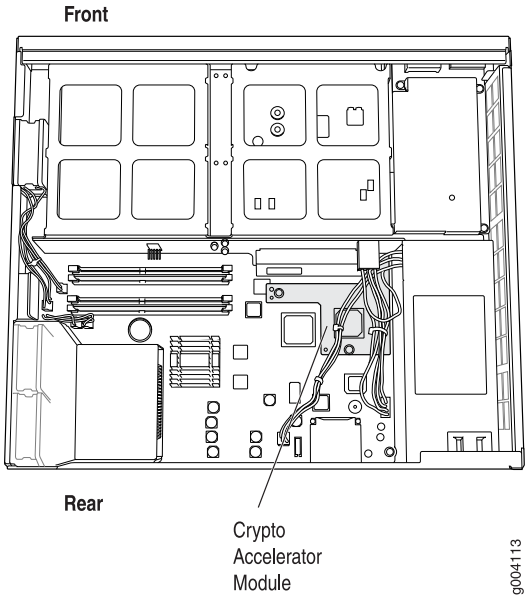



## Replacing Crypto Accelerator Modules on J2320 and J2350 Routers

The Crypto Accelerator Module is a processor card that enhances performance of cryptographic algorithms used in IP security (IPSec) services. The Crypto Module is an optional feature on J2320 and J2350 Services Routers.

Figure 81 on page 146 shows the location of the Crypto Accelerator Module on J2320 and J2350 routers.

**Figure 81: Crypto Accelerator Module Location on J2320 and J2350 Routers**




To remove or install a Crypto Accelerator Module, use the following procedures:

- Removing a J2320 or J2350 Crypto Accelerator Module on page 147
- Installing a J2320 or J2350 Crypto Accelerator Module on page 148

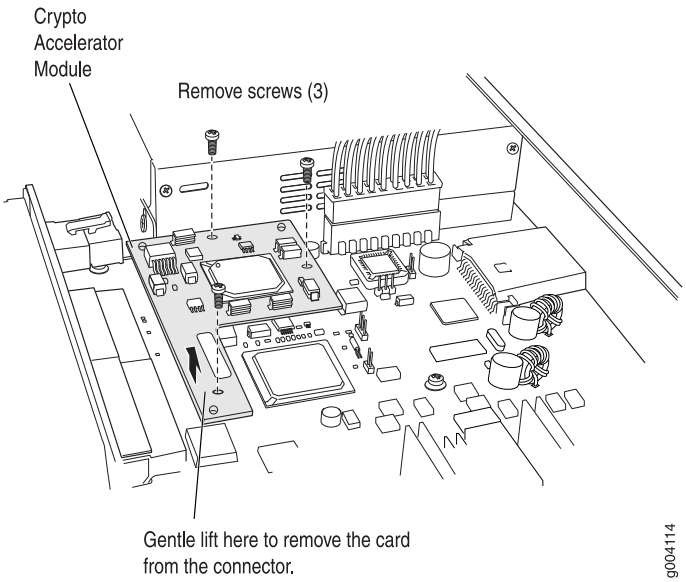
### *Removing a J2320 or J2350 Crypto Accelerator Module*

**NOTE:** If you are installing a Crypto Accelerator Module into a J2320 or J2350 Services Router for the first time, proceed directly to "Installing a J2320 or J2350 Crypto Accelerator Module" on page 148.

To remove the Crypto Accelerator Module:

1. Place an electrostatic bag or antistatic mat on a flat stable surface to receive the Crypto Module.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.
4. Unplug the power cord or cable from the power source receptacle.
5. Remove the chassis cover. (See "Removing and Replacing the Chassis Cover on J2320 and J2350 Routers" on page 124.)
6. Locate the Crypto Module on the system board (see Figure 81 on page 146).
7. Using a Phillips screwdriver, remove the three screws from top of the Crypto Accerator Module, as shown in Figure 82 on page 147.

**Figure 82: Removing a J2320 or J2350 Crypto Module**



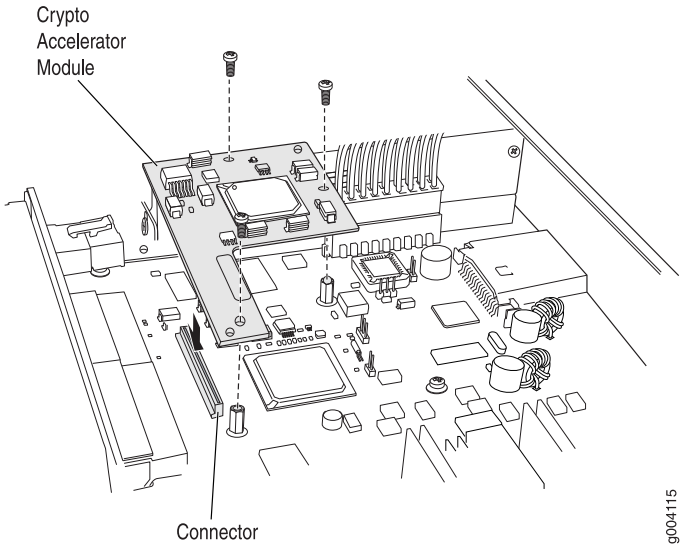

8. Gently lift the Crypto Module to disengage it from the connector on the system board, as shown in Figure 82 on page 147.
9. Place the Crypto Module on the antistatic mat or in the electrostatic bag.

## *Installing a J2320 or J2350 Crypto Accelerator Module*

To install a Crypto Accelerator Module:

1. Take the following steps if you have not already done so:
   a. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
   b. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.
   c. Unplug the power cord or cable from the power source receptacle.
   d. Remove the chassis cover. (See "Removing and Replacing the Chassis Cover on J2320 and J2350 Routers" on page 124.)
2. Locate the Crypto Module connector on the system board (see Figure 83 on page 148).
3. Remove the Crypto Module from its electrostatic bag.
4. Align the notches in the Crypto Module with the notches in the connector on the system board and push the Crypto Module down flat, as shown in Figure 83 on page 148.

**Figure 83: Installing a J2320 or J2350 Crypto Accelerator Module**




5. Insert the three screws and tighten them until snug. Do not overtighten.
6. Replace the chassis cover. (See "Removing and Replacing the Chassis Cover on J2320 and J2350 Routers" on page 124.)
7. Replace the power cord or cable.

8. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.

9. Verify that the Crypto Module is correctly installed by issuing the show chassis hardware command, as shown in the following example:

```
user@host> show chassis hardware

user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1086AA8ADA      J4350
Midplane         REV 00   710-012339   NE0664
System IO        REV 00   710-012315   NE3564            JX350 System IO
Crypto Module                                           Crypto
Acceleration
Routing Engine   REV 00   710-012149                  RE-J4350-2540
FPC 0                                                   FPC
  PIC 0                                                 4x GE Base PIC
Power Supply 0
```

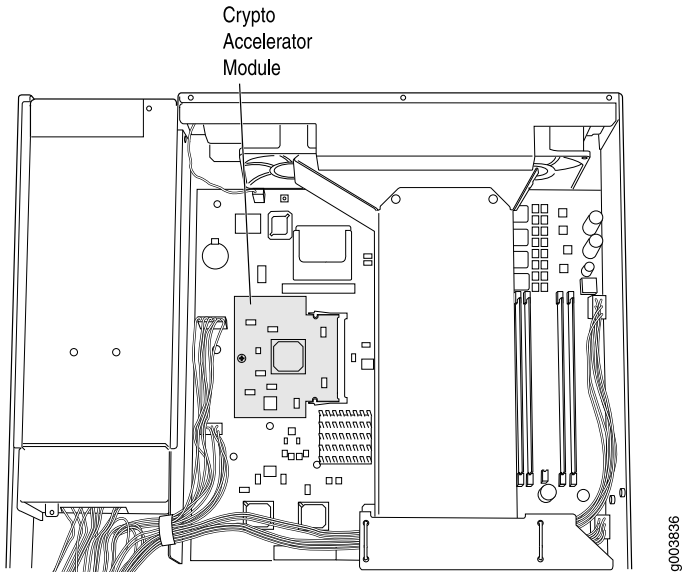
If Crypto Module appears in the output, the Crypto Accelerator Module is installed correctly.

## Replacing Crypto Accelerator Modules on J4350 and J6350 Routers

The Crypto Accelerator Module is a processor card that enhances performance of cryptographic algorithms used in IP security (IPSec) services. The Crypto Module is a standard feature on J6350 Services Routers and an optional feature on the J4350 Services Routers.

Figure 84 on page 150 shows the location of the Crypto Accelerator Module.

**Figure 84: Crypto Accelerator Module Location on J4350 and J6350 Routers**




To modify a Crypto Accelerator Module configuration, use the following procedures:

- Removing a J4350 or J6350 Crypto Accelerator Module on page 150
- Installing a J4350 or J6350 Crypto Accelerator Module on page 152

## *Removing a J4350 or J6350 Crypto Accelerator Module*

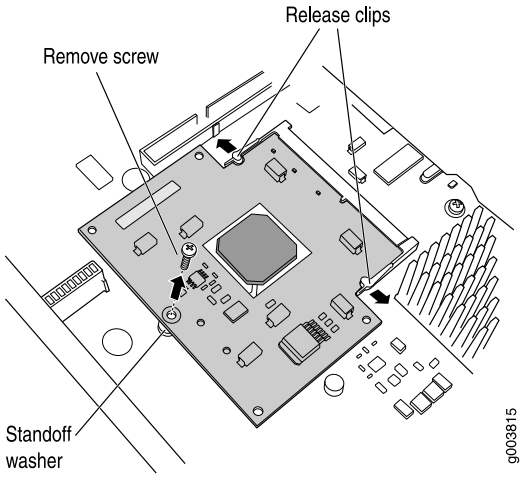
**NOTE:** If you are installing a Crypto Accelerator Module into a J4350 Services Router for the first time, proceed directly to "Installing a J4350 or J6350 Crypto Accelerator Module" on page 152.

To remove the Crypto Accelerator Module:

1. Place an electrostatic bag or antistatic mat on a flat stable surface to receive the Crypto Module.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.
4. Unplug the power cord or cable from the power source receptacle.
5. Remove the screws from the sides and the top of the chassis, and slide the cover off the chassis.

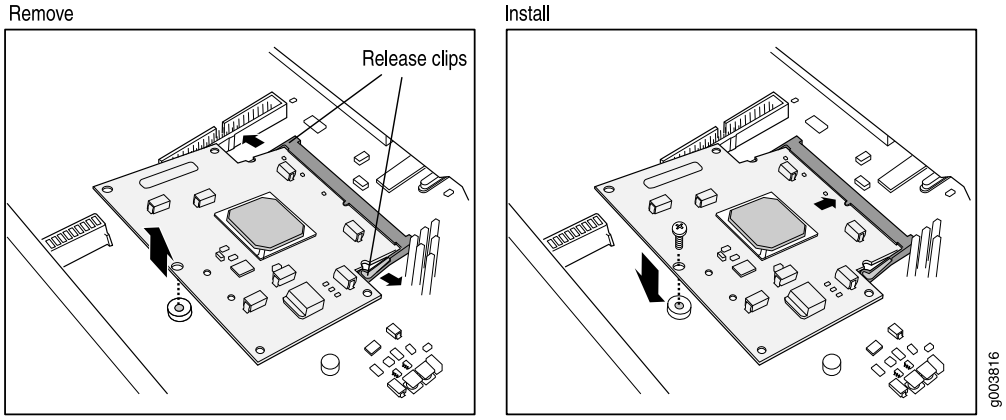
6. Locate the Crypto Module on the system board (see Figure 84 on page 150).
7. Using a Phillips screwdriver remove the screw, as shown in Figure 85 on page 151.

**Figure 85: Removing a J4350 or J6350 Crypto Module Screw**




8. Pull the white release clips on either side of the Crypto Module out to either side, as shown in Figure 86 on page 151, to tilt the Crypto Module upward.

**Figure 86: Removing and Installing a J4350 or J6350 Crypto Accelerator Module**




9. Slide the Crypto Module out of its socket.
10. Remove the standoff washer that was under the Crypto Module.
11. Place the Crypto Module on the antistatic mat or in the electrostatic bag.

### *Installing a J4350 or J6350 Crypto Accelerator Module*

To install a Crypto Accelerator Module:

1. Take the following steps if you have not already done so:
   a. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
   b. Press and release the power button to power off the Services Router. Wait for the POWER LED to turn off.
   c. Unplug the power cord or cable from the power source receptacle.
   d. Remove the screws from the sides and the top of the chassis, and slide the cover off the chassis.
2. Locate the Crypto Module socket on the system board (see Figure 84 on page 150). The socket is tipped up at an angle when empty.
3. If a screw and standoff washer are already in place (see Figure 85 on page 151), remove them.
4. Remove the Crypto Module from its electrostatic bag and insert it into the socket.
5. Push the Crypto Module down flat against the main board until the release clips click into place, as shown in Figure 86 on page 151.
6. Insert the standoff washer under the Crypto Module.
7. Insert the screw and tighten it until snug. Do not overtighten.
8. Slide the cover onto the router, and replace and tighten the cover screws.
9. Replace the power cord or cable.
10. Press and release the power button to power on the router. Verify that the POWER LED lights steadily.
11. Verify that the Crypto Module is correctly installed by issuing the show chassis hardware command, as shown in the following example:

```
user@host> show chassis hardware

Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1086A34ADA      J4350
Midplane         REV 00   710-014594
System IO        REV 00   710-012315                     JX350 System IO
Routing Engine   REV 00   710-012149                     RE-J4350-2540
Crypto Module                                            Crypto
acceleration
FPC 0                                                    FPC
  PIC 0                                                  4x GE Base PIC
```

If Crypto Module appears in the output, the Crypto Accelerator Module is installed correctly.

## Replacing Air Filters on J2350 Routers

The cooling fans on J2350 routers draw air through vents along the left side of the chassis and exhaust it through vents on the right side of the chassis. For more information, see “J2320 and J2350 Cooling System” on page 19.

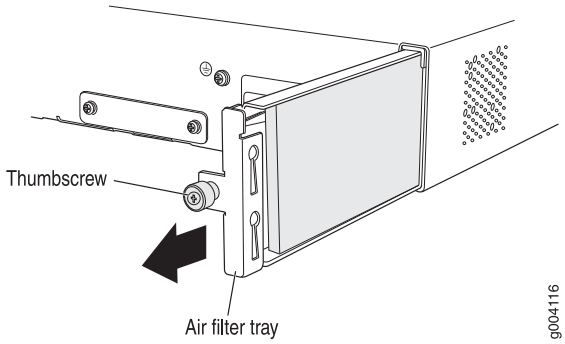
On J2350 routers that comply with Network Equipment Building System (NEBS) criteria, the air intake grid contains a filter. To verify that the system is a NEBS-compliant system, run the show chassis hardware command. A NEBS-compliant system displays the term *NEBS* in the output.

We recommend changing the filter every 6 months. However, the optimal filter replacement interval can vary depending on the environment where the router is located. If temperature alarms appear, inspect the air filter.

To replace the air filter:

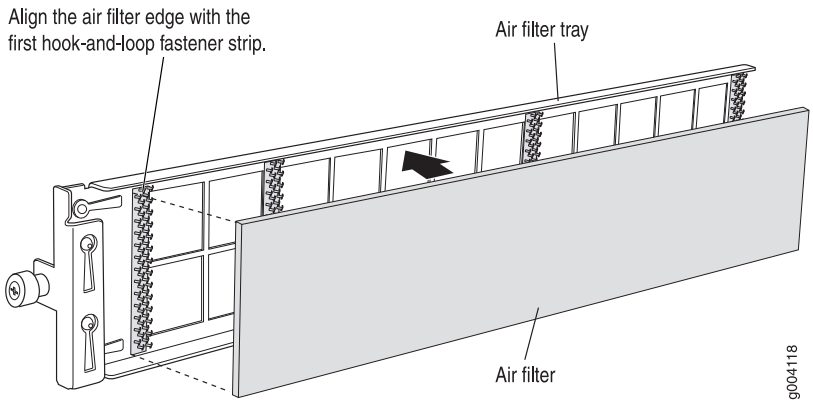
1. Loosen the filter tray thumbscrew at the rear of the J2350 chassis.
2. Hold the screw firmly and pull it away from the chassis until you have pulled the attached filter tray out of the chassis (see Figure 87 on page 153).

**Figure 87: Removing the Air Filter Tray**



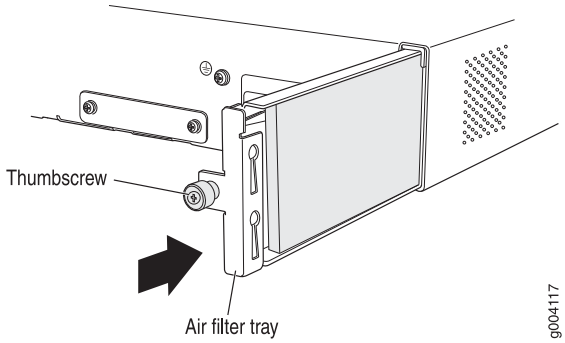

3. Hook-and-loop fasteners on the base of the filter tray hold the air filter inside the tray. Grasp the air filter with your fingers and gently pull it away from the filter tray.
4. Set the old air filter aside.
5. Place the new filter so that its edge aligns with the first hook-and-loop fastener as shown Figure 88 on page 154.

**Figure 88: Placing the Air Filter on the Air Filter Tray**




6. Press down on the filter until it is firmly seated against the bottom of the tray.
7. Hold the filter tray with the thumbscrew so that its sheet metal side faces the power supply fan exhaust. The air filter tray is designed to prevent it from being inserted incorrectly (see Figure 89 on page 154).

**Figure 89: Inserting the Air Filter Tray on J2350 Routers**

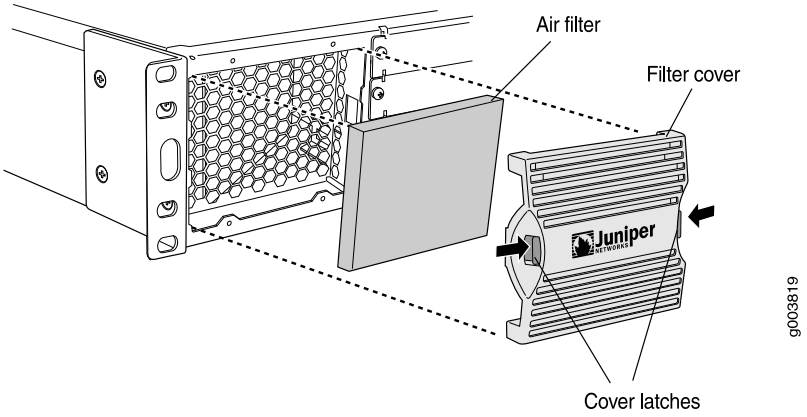



8. Slide the tray fully into the air filter opening.
9. Tighten the thumbscrew to the chassis.

## Replacing Air Filters on J4350 and J6350 Routers

The front panel of J4350 and J6350 Services Routers contains an air intake grid with a protective cover and a filter, as shown in Figure 90 on page 155.

**Figure 90: Attaching Air Filter and Filter Cover**




We recommend changing the filter every 6 months. However, the optimal filter replacement interval can vary depending on the environment where the router is located. If temperature alarms appear, inspect the air filter.

To replace the air filter:

1. Remove the filter cover by squeezing the plastic tabs on either side of the filter cover.
2. Pull the filter cover away from the chassis.
3. Remove the old filter.
4. Place the new filter in the opening.
5. Replace the filter cover by pressing it until it clicks into place.

Chapter 9

# Troubleshooting a Services Router

This chapter contains the following topics:



## Troubleshooting Hardware Components

This section contains the following topics:



### *Monitoring and Correcting Chassis Alarm Conditions*

You can monitor alarms to troubleshoot hardware problems on a Services Router. Alarms alert you to conditions on the router chassis, or in the system software that might prevent the router from operating normally. You can monitor active alarms from the J-Web interface or the CLI.

Services Router alarms warn you about conditions that can prevent the router from operating normally. Chassis and system alarm conditions are preset. When the Routing Engine detects an alarm condition, it lights the ALARM LED on the front panel. When the condition is corrected, the light turns off.

To view a more detailed description of the alarm cause, issue the show chassis alarms CLI command:

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

Table 47 on page 158 describes alarms that can occur for a chassis component such as the Routing Engine or a Physical Interface Module (PIM).

**Table 47: Chassis Alarm Conditions and Corrective Actions**

| Component | Alarm Conditions | Corrective Action | Alarm Severity |
|---|---|---|---|
| Alternative boot media | The Services Router boots from an alternative boot device. | Typically, the router boots from the internal compact flash. If you configured your router to boot from an alternative boot device, ignore this alarm condition.<br><br>If you did not configure the router to boot from an alternative boot device, contact JTAC. (See "Requesting Technical Support" on page xxii.) | Yellow (minor) |
| PIM | A PIM has failed.<br><br>When a PIM fails, it attempts to reboot. If the Routing Engine detects that a PIM is rebooting too often, it shuts down the PIM. | Replace the failed PIM. (See "Replacing a PIM" on page 120) | Red (major) |
| Routing Engine | An error occurred during the process of reading or writing compact flash. | Reformat the compact flash and install a bootable image. (See the *JUNOS Software Administration Guide*.)<br><br>If this remedy fails, you must replace the failed Routing Engine. To contact JTAC, see "Requesting Technical Support" on page xxii. | Yellow (minor) |
| | Routing Engine temperature is too warm. | ■ Check the room temperature. (See "Router Environmental Tolerances" on page 66.)<br>■ Check the air flow. (See "General Site Guidelines" on page 63.)<br>■ Check the fans. If you must replace a fan or the Routing Engine, contact JTAC. (See "Requesting Technical Support" on page xxii.)<br>■ If the router has an air filter, check the filter and replace it if it appears clogged. (See "Replacing Air Filters on J2350 Routers" on page 153or "Replacing Air Filters on J4350 and J6350 Routers" on page 154.) | Yellow (minor) |
| | Routing Engine fan has failed. | Replace the failed fan. To contact JTAC, see "Requesting Technical Support" on page xxii. | Red (major) |

### *Troubleshooting Power Management*

If one or more PIMs remain offline when you power on the chassis, the combination of PIMs installed might exceed the power and heat capacity of the chassis. For information about the maximum power and heat tokens permitted for each chassis, see "Planning for Power Management" on page 72.

To bring the PIM online:

1. Check if the PIM exceeds the power and heat tokens permitted by issuing the show chassis fpc and show chassis power-ratings CLI commands:

```
user@host> show chassis fpc

Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State           (C)  Total  Interrupt      DRAM (MB) Heap     Buffer

  0  Online        -------------------- CPU less FPC --------------------

  1  Online        -------------------- CPU less FPC --------------------

  2  Online        -------------------- CPU less FPC --------------------

  3  Empty
  4  Empty
  5  Offline       ------ Hardware exceeds High Power token limits ------
```

   In this example, J-series power management has placed the PIM in slot 5 in an offline state to prevent damage. If brought online, the PIM would cause the combination of PIMs to exceed the maximum limit of 83 high-power tokens for the J2350 router.

```
user@host> show chassis power-ratings

Device     Low     High     Heat   Ratings
                  Power   Power
Total Tokens    83      83       83     -
FPC 1           6       27       21     OK
FPC 2           3       27       18     OK
FPC 3           3       27       18     OK
FPC 4           0       0        0      OK
FPC 5           2       27       2      Exceeded
Tokens Used     14      108      59     -
```

**NOTE:** In the show chassis power-ratings command output, the PIM slot number is reported as an FPC number.

   The offline PIM is not powered off and continues to draw minimal power.

2. To bring the PIM online, you have the following options:

- Remove one or more PIMs from the chassis. This option requires that you power off the router. For more information about removing PIMs, see “Removing a PIM” on page 120
- Bring the PIM online without powering off the router. To do so, use the set chassis fpc offline command to set another PIM slot in the chassis to the offline state. For example:

```
user@host# set chassis fpc 2 offline
```

  If the power and heat tokens no longer exceed the maximum, the PIMs that were placed offline by J-series power management are brought online automatically.

- Use the set chassis disable-power-management command to disable J-series power management:

```
user@host# set chassis disable-power-management
```

**CAUTION:** Use extreme caution when disabling J-series power management. To prevent equipment damage, do not install a combination of PIMs that exceeds the power or heat capacity of your router when J-series power management is disabled.

  The set chassis disable-power-management command brings the offline PIMs online automatically.

To reenable J-series power management, remove the set chassis disable-power-management command from the configuration. For detailed information about the set chassis fpc offline and set chassis disable-power-management commands, see the *JUNOS System Basics Configuration Guide*.

## Resetting the Configuration File When the Router Is Inaccessible

You can use the router's RESET CONFIG button to restore the router's configuration file when the current one is faulty or fails. You can also change the default behavior of the RESET CONFIG button.

### *Using the RESET CONFIG Button*

If a configuration fails or denies management access to the router, you can use the RESET CONFIG button to restore the router to the factory default configuration or a rescue configuration. For example, if someone inadvertently commits a configuration that denies management access to a router, you can delete the invalid configuration and replace it with a rescue configuration by pressing the RESET CONFIG button. The button is recessed to prevent it from being pressed accidentally.

The rescue configuration is a previously committed, valid configuration. You must have previously set the rescue configuration through the J-Web interface or the CLI.

To press the RESET CONFIG button, insert a small probe (such as a straightened paper clip) into the pinhole on the front panel (see Figure 8 on page 13 and Figure 9 on page 13):

- By default, pressing and quickly releasing the RESET CONFIG button loads and commits the rescue configuration through the J-Web interface or the CLI. (For details, see the *J-Web Interface User Guide* and the *JUNOS CLI User Guide*.)
- By default, pressing and holding the RESET CONFIG button for 15 seconds or more—until the STATUS LED blinks red—deletes *all* configurations on the router, including the backup configurations and rescue configuration, and loads and commits the factory configuration. (For details about the factory default settings, see the *JUNOS Software Administration Guide*.)

### *Changing the RESET CONFIG Button Behavior*

You can change the default operation of the the RESET CONFIG button by limiting how the button resets the router:

- To prevent the RESET CONFIG button from setting the router to the factory default configuration and deleting all other configurations, enter the following command. You can still press and quickly release the button to reset it to the rescue configuration.

  ```
  user@host# set chassis config-button no-clear
  ```

- To prevent the RESET CONFIG button from setting the router to the rescue configuration, enter the following command. You can still press and hold button for 15 seconds or more to reset the router to the factory defaults.

  ```
  user@host# set chassis config-button no-rescue
  ```

- To disable the button and prevent the router from resetting to either configuration, use the following command:

  ```
  user@host# set chassis config-button no-clear no-rescue
  ```

The no-rescue option prevents the RESET CONFIG button from loading the rescue configuration. The no-clear option prevents the RESET CONFIG button from deleting all configurations on the router.

To return the function of the RESET CONFIG to its default behavior, remove the config-button statement from the router configuration.

## Recovering the Root Password

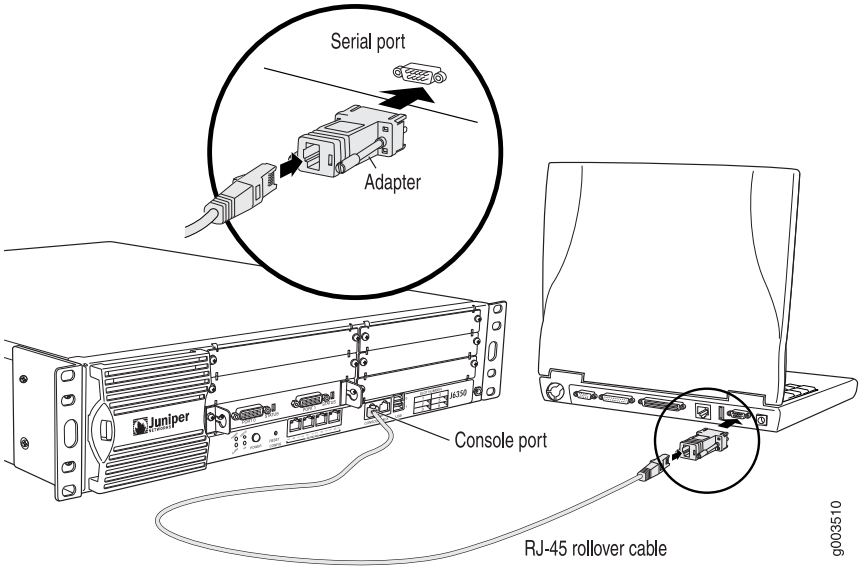
If you forget the root password for the router, you can use the password recovery procedure to reset the root password.

**NOTE:** You need console access to recover the root password.

To recover the root password:

1. Power off the router by pressing the power button on the front panel.
2. Turn off the power to the management device, such as a PC or laptop computer, that you want to use to access the CLI.
3. Plug one end of the Ethernet rollover cable supplied with the router into the RJ-45 to DB-9 serial port adapter supplied with the router (see Figure 91 on page 162).
4. Plug the RJ-45 to DB-9 serial port adapter into the serial port on the management device (see Figure 91 on page 162).
5. Connect the other end of the Ethernet rollover cable to the console port on the router (see Figure 91 on page 162).

**Figure 91: Connecting to the Console Port on the J4350 or J6350 Services Router**




6. Turn on the power to the management device.
7. On the management device, start your asynchronous terminal emulation application (such as Microsoft Windows Hyperterminal) and select the appropriate COM port to use (for example, COM1).
8. Configure the port settings as follows:
   - Bits per second: 9600
   - Data bits: 8
   - Parity: None

- Stop bits: 1
- Flow control: None

9. Power on the router by pressing the power button on the front panel. Verify that the POWER LED on the front panel turns green.

   The terminal emulation screen on your management device displays the router's boot sequence.

10. When the following prompt appears, press the Spacebar to access the router's bootstrap loader command prompt:

```
Hit [Enter] to boot immediately, or space bar for command prompt.
Booting [kernel] in 9 seconds...
```

11. At the following prompt, enter boot -s to start up the system in single-user mode.

```
ok boot -s
```

12. At the following prompt, enter recovery to start the root password recovery procedure.

```
Enter full pathname of shell or 'recovery' for root password recovery or
RETURN for /bin/sh: recovery
```

13. Enter configuration mode in the CLI.
14. Set the root password. For example:

```
user@host# set system root-authentication plain-text-password
```

    For more information about configuring the root password, see the *JUNOS System Basics Configuration Guide*.

15. At the following prompt, enter the new root password. For example:

```
New password: juniper1


Retype new password:
```

16. At the second prompt, reenter the new root password.
17. If you are finished configuring the network, commit the configuration.

```
root@host# commit

commit complete
```

18. Exit configuration mode in the CLI.
19. Exit operational mode in the CLI.
20. At the prompt, enter y to reboot the router.

```
Reboot the system? [y/n] y
```

## Recovering Primary Boot Devices

All Services Routers use a compact flash to store JUNOS Enhanced Services, router configuration files, and log files. The internal compact flash is not hot-swappable and is accessible only after you remove the cover on the back panel of the router chassis. In addition to the internal compact flash, J2320 and J2350 Services Routers have a slot in the front of the chassis for external flash media. All Services Routers also support externally pluggable USB storage devices. If the primary storage medium becomes corrupted and no secondary medium is in place, you can reload the JUNOS recovery software package onto the corrupted compact flash card with a desktop or laptop computer running either a UNIX, Microsoft Windows 2000, or Windows XP operating system.

This section contains the following topics:



### *Why Compact Flash Recovery Might Be Necessary*

For media redundancy, we recommend that you keep a secondary storage medium attached and updated at all times. Use the request system snapshot command to perform the update. (For instructions, see the *JUNOS Software Administration Guide*.)

If the internal compact flash fails at startup, the Services Router automatically boots itself from the external compact flash or USB storage device. When a redundant storage medium is not available, the router is unable to boot and does not come back online. This situation can occur if the power fails during a JUNOS Enhanced Services upgrade and the physical or logical storage media on the router are corrupted.

If the primary storage medium becomes corrupted and no secondary medium is in place, you can reload the JUNOS Enhanced Services image onto the corrupted compact flash with a desktop or laptop computer running either a UNIX, Microsoft Windows 2000, or Windows XP operating system.

**CAUTION:** This procedure does not recover any router configuration files. After you reinstall JUNOS Enhanced Services, all the information on the original internal compact flash is lost.

### *Recommended Recovery Hardware and Software*

Before configuring compact flash recovery, assemble the equipment and software listed in Table 48 on page 165.

**Table 48: Recommended Recovery Hardware and Software**

| Recommended Hardware and Software | Examples |
|---|---|
| **Recovery Hardware** | |
| Host system | Desktop or laptop PC equipped with a PCMCIA controller or USB port |
| Adapter appropriate for your system | ■ For systems with PCMCIA controllers, a compact-flash-to-PCMCIA adapter—for example, a Macally PCM-CF compact flash PCMCIA adapter.<br>■ For systems with a USB port, a USB-to-compact-flash adapter. For example:<br>■ SIIG USB 2.0 Card Reader, model US2274, part number JU-CF0122<br>■ MediaGear USB 2.0 Combo 9-in-4, model MGTR100<br>■ AVP USB 8-in-1 Card Reader, model UC-28<br>■ Inland Multi-Plus Card Reader, part number 08310<br>■ HummingBird Multi Card Reader, HCR 81 |
| **Recovery Software** | |
| Software appropriate for your system | ■ UNIX with PCMCIA drivers<br>■ Windows 2000, or Windows XP |
| Systems running Windows require additional software. | ■ WinZip, gzip, or a similar compression utility<br>■ A utility such as the following that allows you to write files to unformatted devices:<br>■ Norton Ghost<br>■ dd utility from the Cygwin package<br>■ physdiskwrite utility |

## *Configuring Internal Compact Flash Recovery*

To recover an internal compact flash with a corrupt or missing operating system, you must remove the corrupt internal compact from the J-series Services Router, plug it into a PC with a PCMIA adapter or USB card reader, copy the JUNOS recovery software package onto it, and reinstall on the router.

Recovery software packages are available from the same location as J-series upgrade software packages. (See the *JUNOS Software Administration Guide*.)

To recover an internal compact flash:

1. Plug the compact flash into a PCMCIA adapter or USB card reader.
2. Plug the PCMCIA adapter or USB card reader into the host PC and verify that the compact flash is recognized by the operating system.
3. Select the appropriate recovery software package according to the size of your compact flash. The uncompressed package must have the same size as the target compact flash capacity: 128 MB, 256 MB, 512 MB or 1024 MB. The recovery software package name indicates the size of the package. For information about recovery software package names, see the *JUNOS Software Administration Guide*.

4. Copy the software package to a temporary directory on the host PC and uncompress it with a compression utility, such as WinZip.
5. Copy the uncompressed software package from the temporary directory to the compact flash with one of the following commands:

**CAUTION:** You must use the correct target device name. Failure to do so might damage other storage devices connected to the host PC.

- On a UNIX PC, use the command dd if=*filename* of=/dev/*device_name*. Replace *filename* with the name of the uncompressed image, and *device_name* with the name of the unformatted PCMCIA card device. For example:

```
root# dd if=junos-jseries-7.0-20041028.0-export-cf128 of=/dev/hde

250368+0 records in250368+0 records out
```

- On a Windows 2000 or Windows XP PC, use the Norton Ghost, dd, or physdiskwrite utility. The following example shows the use of physdiskwrite:

```
C:\> physdiskwrite –u junos-jseries-7.0-20041028.0-export-cf512

physdiskwrite v0.5 by Manuel Kasper
      Searching for physical drives...
      Information for \\.\PhysicalDrive0:
      Windows: cyl: 2432
      tpc: 255
      spt: 63
      C/H/S: 16383/16/63
      Model: HITACHI_DK23DA-20
      Serial number: 123ABC
      Firmware rev.: 00J2A0G0
      Information for \\.\PhysicalDrive1:
      Windows: cyl: 125
      tpc: 255
      spt: 63
      Which disk do you want to write? (0..1) 1
      WARNING: that disk is larger than 800 MB! Make sure you're
      not accidentally overwriting your primary hard disk!
      Proceeding on your own risk...
      About to overwrite the contents of disk 1 with new data.
      Proceed? (y/n) y
      511451136/511451136 bytes written in total
```

**NOTE:** The copy process can take several minutes.

After copying the software package to the compact flash, you can use it as the internal compact flash in any J-series Services Router.

## Contacting the Juniper Networks Technical Assistance Center

If you need assistance while troubleshooting a Services Router, open a support case using the Case Manager link at http://www.juniper.net/support/, or call 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States). For more information, see "Contacting Customer Support and Returning Hardware" on page 169.

Chapter 10

# Contacting Customer Support and Returning Hardware

This chapter describes how to return the Services Router or individual components to Juniper Networks for repair or replacement. It contains the following topics:



## Locating Component Serial Numbers

Before contacting Juniper Networks to request a Return Materials Authorization (RMA), you must find the serial number on the router or component. To list the router components and their serial numbers, enter the following command-line interface (CLI) command:

```
user@host> show chassis hardware
  Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                015810200500      J6350
Midplane         REV 00   710-012339
System IO        REV 00   710-012315                     JX350 System IO
Routing Engine   REV 00   710-012151      RE-J6350-3400
HW crypto                                                 Crypto accelerator
FPC 0                                                     FPC
  PIC 0                                                   4x GE Base
PIC
```

**NOTE:** In the show chassis hardware command, the PIM slot number is reported as an FPC number and the PIM number (always 0) is reported as the PIC number.

Most components also have a serial number ID label attached to the component body.

The following sections describe the label location on each type of component:



## *J2320 and J2350 Chassis Serial Number and Agency Labels*

J2320 and J2350 Services Routers have serial number ID labels located on the back of the chassis, as shown in Figure 92 on page 170, and an agency label on the bottom of the chassis, as shown in Figure 93 on page 170.

**Figure 92: Location of the Serial Number ID Labels**

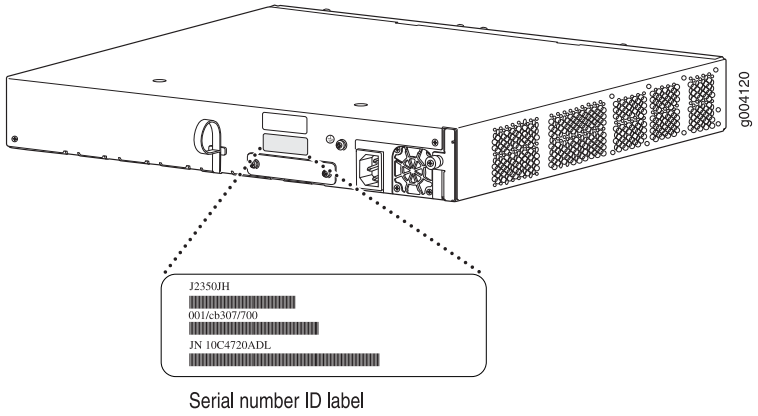
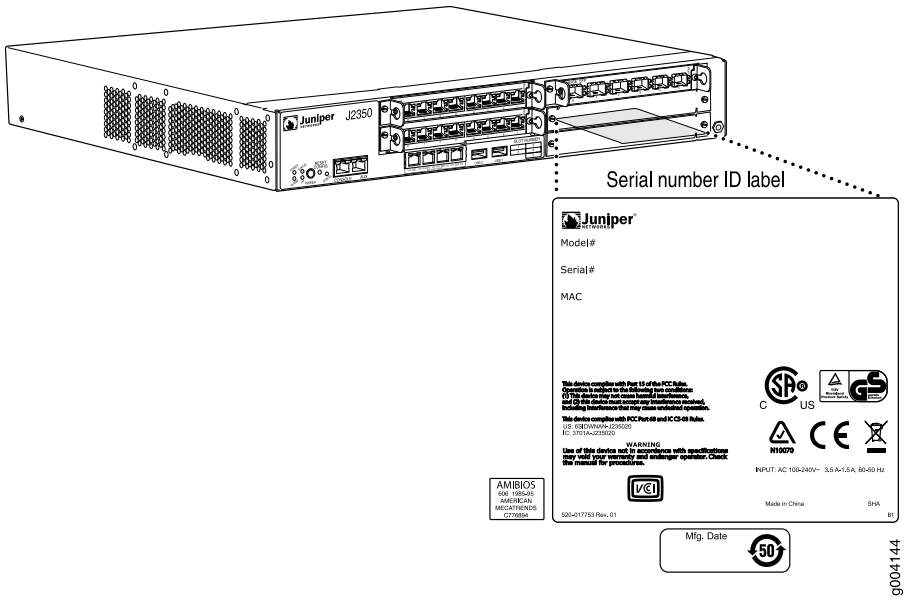



**Figure 93: Location of the Agency Labels**



## *J4350 and J6350 Chassis Serial Number and Agency Labels*

J4350 and J6350 Services Routers have serial number ID labels on the back of the chassis, as shown in Figure 94 on page 171, and an agency label on the bottom front corner, as shown in Figure 95 on page 171.

**Figure 94: Location of Serial Number ID Labels**

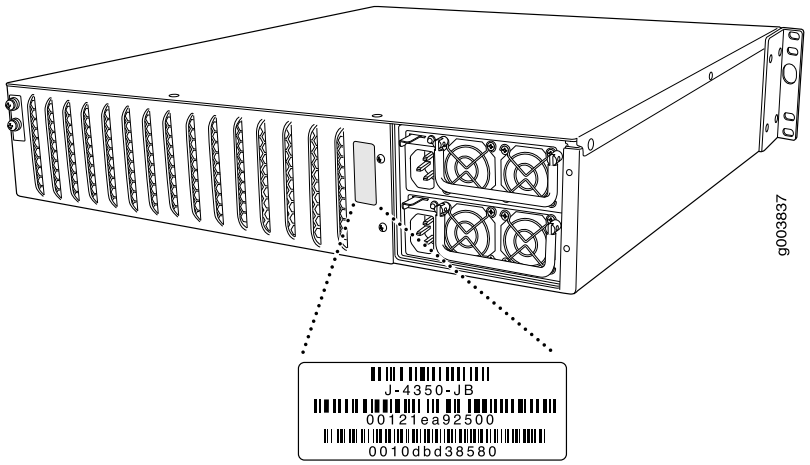
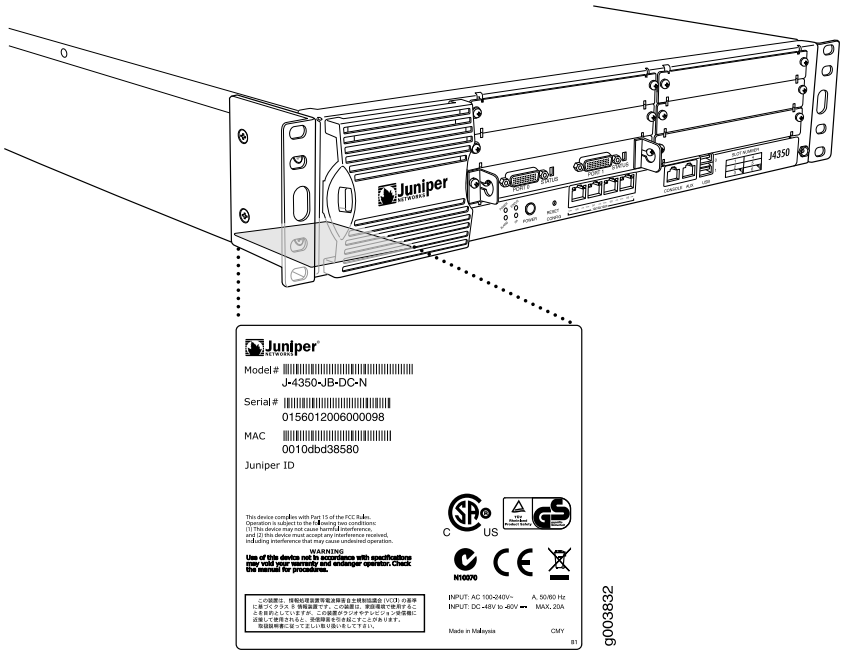



**Figure 95: Location of the Agency Labels**




Serial ID label

### PIM Serial Number Label

PIMs are field-replaceable. Each PIM has a unique serial number. The serial number label is located on the right side of the PIM, when the PIM is horizontally oriented (as it would be installed in the router). The exact location might be slightly different on different PIMs, depending on the placement of components on the PIM board.

### Power Supply Serial Number Labels

The power supplies installed in the J6350 Services Router are field-replaceable. Each power supply has a unique serial number. The serial number label is located on the top of the power supply.

## Contacting Customer Support

After you have located the serial numbers of the components you need to return, contact Juniper Networks Technical Assistance Center (JTAC) in one of the following ways.

You can contact JTAC 24 hours a day, seven days a week.

- On the Web, using the Case Manager link at http://www.juniper.net/support/
- By telephone:

  From the US and Canada: 1-888-314-JTAC

  From all other locations: 1-408-745-9500

If contacting JTAC by telephone, enter your 11-digit case number followed by the pound (#) key if this is an existing case, or press the star (*) key to be routed to the next available support engineer.

### Information You Might Need to Supply to JTAC

When requesting support from JTAC by telephone, be prepared to provide the following information:

- Your existing case number, if you have one
- Details of the failure or problem
- Type of activity being performed on the router when the problem occurred
- Configuration data displayed by one or more show commands

## Return Procedure

If the problem cannot be resolved by the JTAC technician a Return Materials Authorization (RMA) number is issued. This number is used to track the returned material at the factory and to return repaired or new components to the customer as needed.

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

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

For product problems or technical support issues, open a support case using the Case Manager link at http://www.juniper.net/support/, or call 1-888-314-JTAC (within the United States) or 1-408-745-9500 (outside the United States).

When you need to return a component:

1. Determine the part number and serial number of the component. For instructions, see "Locating Component Serial Numbers" on page 169.
2. Obtain an RMA number from JTAC.
3. Provide the following information:
   - Part number and serial number of component
   - Your name, organization name, telephone number, fax number, and shipping address
   - Description of the failure

   The support representative validates your request and issues an RMA number for return of the component.
4. Pack the router or component for shipment, as described in "Packing a Router or Component for Shipment" on page 173.

## Packing a Router or Component for Shipment

This section contains the following topics:



### *Tools and Parts Required*

To remove components from the router or the router from a rack, you need the following tools and parts:

- Blank panels to cover empty slots
- Electrostatic bag or antistatic mat, for each component
- Electrostatic discharge (ESD) grounding wrist strap

- Flat-blade screwdriver, approximately 1/4 in. (6 mm)
- Phillips (+) screwdrivers, numbers 1 and 2

## Packing the Services Router for Shipment

To pack the router for shipment, follow this procedure:

1. Retrieve the shipping carton and packing materials in which the router was originally shipped. If you do not have these materials, contact your Juniper Networks representative about approved packaging materials.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see "Preventing Electrostatic Discharge Damage" on page 201.
3. On the console or other management device connected to the master Routing Engine, enter CLI operational mode and issue the following command to shut down the router software.

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

   Wait until a message appears on the console confirming that the operating system has halted. For more information about the command, see the *JUNOS Software Interfaces and Routing Configuration Guide*.
4. Shut down power to the router by pressing the power button on the front panel of the router.
5. Disconnect power from the router. For instructions, see "Replacing AC Power Supply Cords" on page 139.
6. Remove the cables that connect to all external devices. For instructions, see "Removing PIM Cables" on page 123.
7. Remove all field-replaceable units (FRUs) from the router.
8. If the router is installed on a wall or rack, have one person support the weight of the router, while another person unscrews and removes the mounting screws.
9. Place the router in the shipping carton.
10. Cover the router with an ESD bag, and place the packing foam on top of and around the router.
11. Replace the accessory box on top of the packing foam.
12. Securely tape the box closed.
13. Write the RMA number on the exterior of the box to ensure proper tracking.

## Packing Components for Shipment

To pack and ship individual components, follow these guidelines:

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

**CAUTION:** Do not stack any of the router components.

# Part 4
# J-series Requirements and Specifications

Chapter 11

# Network Cable Specifications and Connector Pinouts

The network interfaces supported on the router accept different kinds of network cable.



## Serial PIM Cable Specifications

The 2-port serial PIM uses the cables and connectors summarized in Table 49 on page 179. Pinouts are detailed in Table 50 on page 180 through Table 59 on page 188.

**Table 49: 2-Port Serial PIM Cables and Connectors**

| Name | Connector | Connector Hardware | End-to-End Conductors | Pinouts |
|---|---|---|---|---|
| RS-232 DTE | DB-25 male | 4-40 threaded jackscrews | 13 | Table 50 on page 180 |
| RS-232 DCE | DB-25 female | 4-40 threaded jacknuts | 13 | Table 51 on page 181 |
| RS-422/449 (EIA-449) DTE | DC-37 (DB-37) male | 4-40 threaded jackscrews | 25 | Table 52 on page 181 |
| RS-422/449 (EIA-449) DCE | DC-37 (DB-37) female | 4-40 threaded jacknuts | 25 | Table 53 on page 183 |

**Table 49: 2-Port Serial PIM Cables and Connectors** *(continued)*

| Name | Connector | Connector Hardware | End-to-End Conductors | Pinouts |
|---|---|---|---|---|
| EIA-530A DTE | DB-25 male | 4-40 threaded jackscrews | 23 | Table 54 on page 184 |
| EIA-530A DCE | DB-25 female | 4-40 threaded jacknuts | 22 | Table 55 on page 185 |
| V.35 DTE | M/34 male | Standard (Normally included with M/34 connector shell) | 18 | Table 56 on page 186 |
| V.35 DCE | M/34 female | Standard (Normally included with M/34 connector shell) | 18 | Table 57 on page 187 |
| X.21 DTE | DB-15 male | M3 threaded jackscrews | 13 | Table 58 on page 187 |
| X.21 DCE | DB-15 female | M3 threaded jacknuts | 13 | Table 59 on page 188 |

## *RS-232 DTE Cable Pinout*

**Table 50: RS-232 DTE Cable Pinout**

| LFH-60 Pin | DB-25 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Frame Ground |
| 60 | 2 | – | Transmit Data |
| 1 | 3 | – | Receive Data |
| 48 | 4 | – | Request to Send |
| 37 | 5 | – | Clear to Send |
| 9 | 6 | – | Data Set Ready |
| 57 | 7 | – | Signal Ground |
| 13 | 8 | – | Data Carrier Detect |
| 56 | 15 | – | Transmit Clock |
| 5 | 17 | – | Receive Clock |
| 41 | 18 | – | Local Loopback |
| 33 | 20 | – | Data Terminal Ready |
| 52 | 24 | – | Terminal Clock |
| 22 to 21 | – | – | – |

**Table 50: RS-232 DTE Cable Pinout** *(continued)*

| LFH-60 Pin | DB-25 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 18 to 17 | – | – | – |

## *RS-232 DCE Cable Pinout*

**Table 51: RS-232 DCE Cable Pinout**

| LFH-60 Pin | DB-25 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Frame Ground |
| 1 | 2 | – | Transmit Data |
| 60 | 3 | – | Receive Data |
| 37 | 4 | – | Request to Send |
| 48 | 5 | – | Clear to Send |
| 33 | 6 | – | Data Set Ready |
| 57 | 7 | – | Signal Ground |
| 13 | 8 | – | Data Carrier Detect |
| 56 | 15 | – | Transmit Clock |
| 52 | 17 | – | Receive Clock |
| 45 | 18 | – | Local Loopback |
| 9 | 20 | – | Data Terminal Ready |
| 5 | 24 | – | Terminal Clock |
| 22 to 21 | – | – | – |

## *RS-422/449 (EIA-449) DTE Cable Pinout*

**Table 52: RS-422/449 (EIA-449) DTE Cable Pinout**

| LFH-60 Pin | DC-37 (DB-37) Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Shield Ground |
| 60 | 4 | 59 | Send Data (A) |
| 56 | 5 | 55 | Send Timing (A) |

**Table 52: RS-422/449 (EIA-449) DTE Cable Pinout** *(continued)*

| LFH-60 Pin | DC-37 (DB-37) Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 1 | 6 | 2 | Receive Data (A) |
| 48 | 7 | 47 | Request to Send (A) |
| 5 | 8 | 6 | Receive Timing (A) |
| 37 | 9 | 38 | Clear to Send (A) |
| 41 | 10 | – | Local Loopback |
| 9 | 11 | 10 | Data Mode (A) |
| 33 | 12 | 34 | Terminal Ready (A) |
| 13 | 13 | 14 | Receive Ready (A) |
| 52 | 17 | 51 | Terminal Timing (A) |
| 36 | 19 | – | Signal Ground |
| 4 | 20 | – | Receive Common |
| 59 | 22 | 60 | Send Data (B) |
| 55 | 23 | 56 | Send Timing (B) |
| 2 | 24 | 1 | Receive Data (B) |
| 47 | 25 | 48 | Request to Send (B) |
| 6 | 26 | 5 | Receive Timing (B) |
| 38 | 27 | 37 | Clear to Send (B) |
| 10 | 29 | 9 | Data Mode (B) |
| 34 | 30 | 33 | Terminal Ready (B) |
| 14 | 31 | 13 | Receiver Ready (B) |
| 51 | 35 | 52 | Terminal Timing (B) |
| 57 | 37 | – | Send Common |
| 26 to 25 | – | – | – |
| 18 to 17 | – | – | – |

## *RS-422/449 (EIA-449) DCE Cable Pinout*

**Table 53: RS-422/449 (EIA-449) DCE Cable Pinout**

| LFH-60 Pin | DC-37 (DB-37) Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Shield Ground |
| 1 | 4 | 2 | Send Data (A) |
| 56 | 5 | 55 | Send Timing (A) |
| 60 | 6 | 59 | Receive Data (A) |
| 37 | 7 | 38 | Request to Send (A) |
| 52 | 8 | 51 | Receive Timing (A) |
| 48 | 9 | 47 | Clear to Send (A) |
| 45 | 10 | – | Local Loopback |
| 33 | 11 | 34 | Data Mode (A) |
| 9 | 12 | 10 | Terminal Ready (A) |
| 13 | 13 | 14 | Receive Ready (A) |
| 5 | 17 | 6 | Terminal Timing (A) |
| 36 | 19 | – | Signal Ground |
| 4 | 20 | – | Receive Common |
| 2 | 22 | 1 | Send Data (B) |
| 55 | 23 | 56 | Send Timing (B) |
| 59 | 24 | 60 | Receive Data (B) |
| 38 | 25 | 37 | Request to Send (B) |
| 51 | 26 | 52 | Receive Timing (B) |
| 47 | 27 | 48 | Clear to Send (B) |
| 34 | 29 | 33 | Data Mode (B) |
| 10 | 30 | 9 | Terminal Ready (B) |
| 14 | 31 | 13 | Receiver Ready (B) |
| 6 | 35 | 5 | Terminal Timing (B) |
| 57 | 37 | – | Send Common |
| 26 to 25 | – | – | – |

## *EIA-530A DTE Cable Pinout*

**Table 54: EIA-530A DTE Cable Pinout**

| LFH-60 Pin | DB-25 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Shield Ground |
| 60 | 2 | 59 | Transmit Data (A) |
| 1 | 3 | 2 | Receive Data (A) |
| 48 | 4 | 47 | Request to Send (A) |
| 37 | 5 | 38 | Clear to Send (A) |
| 9 | 6 | – | Data Set Ready (A) |
| 57 | 7 | – | Signal Ground |
| 13 | 8 | 14 | Received Line Signal Detector (A) |
| 6 | 9 | 5 | Receive Clock (B) |
| 14 | 10 | 13 | Received Line Signal Detector (B) |
| 51 | 11 | 52 | Terminal Timing (B) |
| 55 | 12 | 56 | Transmit Clock (B) |
| 38 | 13 | 37 | Clear to Send (B) |
| 59 | 14 | 60 | Transmit Data (B) |
| 56 | 15 | 55 | Transmit Clock (A) |
| 2 | 16 | 1 | Receive Data (B) |
| 5 | 17 | 6 | Receive Clock (A) |
| 41 | 18 | – | Local Loopback |
| 47 | 19 | 48 | Request to Send (B) |
| 33 | 20 | – | Data Terminal Ready (A) |
| 4 | 23 | – | Signal Ground |
| 52 | 24 | 51 | Terminal Timing (A) |
| 26 to 25 | – | – | – |
| 30 to 29 | – | – | – |
| 18 to 17 | – | – | – |

## *EIA-530A DCE Cable Pinout*

**Table 55: EIA-530A DCE Cable Pinout**

| LFH-60 Pin | DB-25 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Shield Ground |
| 1 | 2 | 2 | Transmit Data (A) |
| 60 | 3 | 59 | Receive Data (A) |
| 37 | 4 | 38 | Request to Send (A) |
| 48 | 5 | 47 | Clear to Send (A) |
| 33 | 6 | – | Data Set Ready (A) |
| 57 | 7 | – | Signal Ground |
| 13 | 8 | 14 | Received Line Signal Detector (A) |
| 51 | 9 | 52 | Receive Clock (B) |
| 14 | 10 | 13 | Received Line Signal Detector (B) |
| 6 | 11 | 5 | Terminal Timing (B) |
| 55 | 12 | 56 | Transmit Clock (B) |
| 47 | 13 | 48 | Clear to Send (B) |
| 2 | 14 | 1 | Transmit Data (B) |
| 56 | 15 | 55 | Transmit Clock (A) |
| 59 | 16 | 60 | Receive Data (B) |
| 52 | 17 | 51 | Receive Clock (A) |
| 45 | 18 | – | Local Loopback |
| 38 | 19 | 37 | Request to Send (B) |
| 9 | 20 | – | Data Terminal Ready (A) |
| 4 | 23 | – | Signal Ground |
| 5 | 24 | 6 | Terminal Timing (A) |
| 26 to 25 | – | – | – |
| 30 to 29 | – | – | – |

## *V.35 DTE Cable Pinout*

**Table 56: V.35 DTE Cable Pinout**

| LFH-60 Pin | M/34 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | A | – | Frame Ground |
| 57 | B | – | Signal Ground |
| 48 | C | – | Request to Send |
| 37 | D | – | Clear to Send |
| 9 | E | – | Data Set Ready |
| 13 | F | – | Received Line Signal Detector |
| 33 | H | – | Data Terminal Ready |
| 41 | K | – | Test Mode |
| 60 | P | 59 | Transmit Data (A) |
| 1 | R | 2 | Receive Data (A) |
| 59 | S | 60 | Transmit Data (B) |
| 2 | T | 1 | Receive Data (B) |
| 52 | U | 51 | Terminal Timing (A) |
| 5 | V | 6 | Receive Timing (A) |
| 51 | W | 52 | Terminal Timing (B) |
| 6 | X | 5 | Receive Timing (B) |
| 56 | Y | 55 | Transmit Timing (A) |
| 55 | AA | 56 | Transmit Timing (B) |
| 22 to 21 | – | – | – |
| 26 to 25 | – | – | – |
| 18 to 17 | – | – | – |

## V.35 DCE Cable Pinout

**Table 57: V.35 DCE Cable Pinout**

| LFH-60 Pin | M/34 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | A | – | Frame Ground |
| 57 | B | – | Signal Ground |
| 37 | C | – | Request to Send |
| 48 | D | – | Clear to Send |
| 33 | E | – | Data Set Ready |
| 13 | F | – | Received Line Signal Detector |
| 9 | H | – | Data Terminal Ready |
| 45 | K | – | Test Mode |
| 1 | P | 2 | Transmit Data (A) |
| 60 | R | 59 | Receive Data (A) |
| 2 | S | 1 | Transmit Data (B) |
| 59 | T | 60 | Receive Data (B) |
| 5 | U | 6 | Terminal Timing (A) |
| 52 | V | 51 | Receive Timing (A) |
| 6 | W | 5 | Terminal Timing (B) |
| 51 | X | 52 | Receive Timing (B) |
| 56 | Y | 55 | Transmit Timing (A) |
| 55 | AA | 56 | Transmit Timing (B) |
| 22 to 21 | – | – | – |
| 26 to 25 | – | – | – |

## X.21 DTE Cable Pinout

**Table 58: X.21 DTE Cable Pinout**

| LFH-60 Pin | DB-15 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Shield Ground |

**Table 58: X.21 DTE Cable Pinout** *(continued)*

| LFH-60 Pin | DB-15 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 60 | 2 | 59 | Transmit Data (A) |
| 48 | 3 | 47 | Control (A) |
| 1 | 4 | 2 | Receive (A) |
| 37 | 5 | 38 | Indicate (A) |
| 5 | 6 | 6 | Signal Element Timing (A) |
| 57 | 8 | – | Signal Ground |
| 59 | 9 | 60 | Transmit Data (B) |
| 47 | 10 | 48 | Control (B) |
| 2 | 11 | 1 | Receive (B) |
| 38 | 12 | 37 | Indicate (B) |
| 6 | 13 | 5 | Signal Element Timing (B) |
| 30 to 29 | – | – | – |
| 18 to 17 | – | – | – |

## *X.21 DCE Cable Pinout*

**Table 59: X.21 DCE Cable Pinout**

| LFH-60 Pin | DB-15 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 15 | 1 | – | Shield Ground |
| 1 | 2 | 2 | Transmit Data (A) |
| 37 | 3 | 38 | Control (A) |
| 60 | 4 | 59 | Receive (A) |
| 48 | 5 | 47 | Indicate (A) |
| 52 | 6 | 51 | Signal Element Timing (A) |
| 57 | 8 | – | Signal Ground |
| 2 | 9 | 1 | Transmit Data (B) |
| 38 | 10 | 37 | Control (B) |
| 59 | 11 | 60 | Receive (B) |

**Table 59: X.21 DCE Cable Pinout** *(continued)*

| LFH-60 Pin | DB-15 Pin | LFH-60 Pairing | Description |
|---|---|---|---|
| 47 | 12 | 48 | Indicate (B) |
| 51 | 13 | 52 | Signal Element Timing (B) |
| 30 to 29 | – | – | – |

## Fast Ethernet RJ-45 Connector Pinout

Table 60 on page 189 describes the Fast Ethernet RJ-45 connector pinout information.

**NOTE:** Either a straight-through or cross-over cable can be used to connect to the interface.

**Table 60: Fast Ethernet RJ-45 Connector Pinout**

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

## Gigabit Ethernet uPIM RJ-45 Connector Pinout

Table 61 on page 189 describes connector pinout information for 8-port and 16-port Gigabit Ethernet uPIM ports.

**Table 61: Gigabit Ethernet uPIM RJ-45 Connector Pinout**

| Pin | Signal Name | Function |
|---|---|---|
| 1 | BI_DA + | Bidirectional pair + A |
| 2 | BI_DA- | Bidirectional pair -A |

**Table 61: Gigabit Ethernet uPIM RJ-45 Connector Pinout** *(continued)*

| Pin | Signal Name | Function |
|---|---|---|
| 3 | BI_DB + | Bidirectional pair + B |
| 4 | BI_DC + | Bidirectional pair + C |
| 5 | BI_DC- | Bidirectional pair -C |
| 6 | BI_DB- | Bidirectional pair -B |
| 7 | BI_DD + | Bidirectional pair + D |
| 8 | BI_DD- | Bidirectional pair -D |

## Gigabit Ethernet ePIM RJ-45 Connector Pinout

Table 62 on page 190 describes connector pinout information for 1-port Gigabit Ethernet ePIM ports.

**Table 62: Gigabit Ethernet ePIM RJ-45 Connector Pinouts**

| Pin | Signal |
|---|---|
| 1 | MDI0 + |
| 2 | MDI0- |
| 3 | MDI1 + |
| 4 | MDI2 + |
| 5 | MDI2- |
| 6 | MDI1- |
| 7 | MDI3 + |
| 8 | MDI3- |

## Chassis Console Port Pinouts

The console port on a J-series Services Router chassis has an RJ-45 connector. Table 63 on page 191 provides RJ-45 chassis console connector pinout information. An RJ-45 cable is supplied with the router.

To connect the console port to an external management device, you need an RJ-45 to DB-9 serial port adapter, which is also supplied with the router.

**Table 63: RJ-45 Chassis Console Connector Pinout**

| Pin | Signal | Description |
|---|---|---|
| 1 | RTS Output | Request to Send |
| 2 | DTR Output | Data Terminal Ready |
| 3 | TxD Output | Transmit Data |
| 4 | GND | Chassis Ground |
| 5 | GND | Chassis Ground |
| 6 | RxD Input | Receive Data |
| 7 | DSR Input | Data Set Ready |
| 8 | CTS Input | Clear to Send |

Table 64 on page 191 describes the DB-9 connector pinouts.

**Table 64: DB-9 Console Connector Pinout**

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

## E1 and T1 RJ-48 Cable Pinouts

The E1 and T1 PIMs use an RJ-48 cable, which is not supplied with the PIM.

**CAUTION:** To maintain agency approvals, use only a properly constructed, shielded cable.

Table 65 on page 192 through Table 68 on page 193 describe the RJ-48 connector pinouts.

**Table 65: RJ-48 Connector to RJ-48 Connector (Straight) Pinout**

| RJ-48 Pin (on T1/E1 PIM) (Data Numbering Form) | RJ-48 Pin (Data Numbering Form) | Signal |
|---|---|---|
| 1 | 1 | RX, Ring, – |
| 2 | 2 | RX, Tip, + |
| 4 | 4 | TX, Ring, – |
| 5 | 5 | TX, Tip, + |
| 3 | 3 | Shield/Return/Ground |
| 6 | 6 | Shield/Return/Ground |
| 7 | No connect | No connect |
| 8 | No connect | No connect |

**Table 66: RJ-48 Connector to RJ-48 Connector (Crossover) Pinout**

| RJ-48 Pin (on T1/E1 PIM) (Data Numbering Form) | RJ-48 Pin (Data Numbering Form) | Signal |
|---|---|---|
| 1 | 4 | RX/Ring/– <––> TX/Ring/– |
| 2 | 5 | RX/Tip/+ <––> TX/Tip/+ |
| 4 | 1 | TX/Ring/– <––> RX/Ring/– |
| 5 | 2 | TX/Tip/+ <––> RX/Tip/+ |
| 3 | 3 | Shield/Return/Ground |
| 6 | 6 | Shield/Return/Ground |
| 7 | No connect | No connect |
| 8 | No connect | No connect |

**Table 67: RJ-48 Connector to DB-15 Connector (Straight) Pinout**

| RJ-48 Pin (on T1/E1 PIM) (Data Numbering Form) | DB-15 Pin (Data Numbering Form) | Signal |
|---|---|---|
| 1 | 11 | RX/Ring/– <––> RX/Ring/– |
| 2 | 3 | RX/Tip/+ <––> RX/Tip/+ |
| 4 | 9 | TX/Ring/– <––> TX/Ring/– |
| 5 | 1 | TX/Tip/+ <––> TX/Tip/+ |
| 3 | 4 | Shield/Return/Ground |
| 6 | 2 | Shield/Return/Ground |
| 7 | No connect | No connect |
| 8 | No connect | No connect |
| 9 | No connect | No connect |
| 10 | No connect | No connect |
| 11 | No connect | No connect |
| 12 | No connect | No connect |
| 13 | No connect | No connect |
| 14 | No connect | No connect |
| 15 | No connect | No connect |

**Table 68: RJ-48 Connector to DB-15 Connector (Crossover) Pinout**

| RJ-48 Pin (on T1/E1 PIM) (Data Numbering Form) | DB-15 Pin (Data Numbering Form) | Signal |
|---|---|---|
| 1 | 9 | RX/Ring/– <––> TX/Ring/– |
| 2 | 1 | RX/Tip/+ <––> TX/Tip/+ |
| 4 | 11 | TX/Ring/– <––> RX/Ring/– |
| 5 | 3 | TX/Tip/+ <––> RX/Tip/+ |
| 3 | 4 | Shield/Return/Ground |
| 6 | 2 | Shield/Return/Ground |

**Table 68: RJ-48 Connector to DB-15 Connector (Crossover) Pinout** *(continued)*

| RJ-48 Pin (on T1/E1 PIM) (Data Numbering Form) | DB-15 Pin (Data Numbering Form) | Signal |
|---|---|---|
| 7 | No connect | No connect |
| 8 | No connect | No connect |
| 9 | No connect | No connect |
| 10 | No connect | No connect |
| 11 | No connect | No connect |
| 12 | No connect | No connect |
| 13 | No connect | No connect |
| 14 | No connect | No connect |
| 15 | No connect | No connect |

## E3 and T3 BNC Connector Pinout

The E3 and T3 PIMs each use two BNC connectors—one for transmitting data (TX) and one for receiving data (RX).

## ADSL and G.SHDSL RJ-11 Connector Pinout

The 1-port ADSL 2/2 + Annex A and Annex B PIMs use an RJ-11 cable, which is not supplied with the PIMs. The 2-port G.SHDSL Annex A and Annex B PIM also uses an RJ-11 cable, which is not supplied with the PIM. Table 69 on page 194 describes the RJ-11 connector pinout.

**Table 69: ADSL and G.SHDSL RJ-11 Connector Pinout**

| Pin | Signal |
|---|---|
| 1 | No connect |
| 2 | No connect |
| 3 | RJ P –Tip |
| 4 | RJ N –Ring |
| 5 | No connect |
| 6 | No connect |

## ISDN RJ-45 Connector Pinout

The 1-port and 4-port ISDN PIMs use an RJ-45 cable, which is not supplied with the PIMs. Table 70 on page 195 describes the RJ-45 connector pinout.

**Table 70: ISDN RJ-45 Connector Pinout**

| Pin | Signal |
|---|---|
| 1 | No connect |
| 2 | No connect |
| 3 | RJ_SX_P |
| 4 | RJ_SR_P |
| 5 | RJ_SR_N |
| 6 | RJ_SX_N |
| 7 | No connect |
| 8 | No connect |
| 9 | Shielded |
| 10 | Shielded 2 |

Chapter 12

# Safety and Regulatory Compliance Information

To install and use the Services Router safely, follow proper safety procedures. This chapter discusses the following safety and regulatory compliance information:



## Definition of Safety Warning Levels

This manual uses the following three levels of safety warnings:

**NOTE:** You might find this information helpful in a particular situation, or might otherwise overlook it.

**CAUTION:** You need to observe the specified guidelines to avoid minor injury or discomfort to you, or severe damage to the Services Router.

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

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

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

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

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

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

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

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

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

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

## Safety Guidelines and Warnings

This section lists the following safety guidelines and warnings for installing, operating, and maintaining a Services Router:



### *General Safety Guidelines and Warnings*

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

- Perform only the procedures explicitly described in this manual. Make sure that only authorized service personnel perform other system services.
- Keep the area around the chassis clear and free from dust before, during, and after installation.
- Keep tools away from areas where people could trip over them while walking.
- Do not wear loose clothing or jewelry, such as rings, bracelets, or chains, which could become caught in the chassis.
- Wear safety glasses if you are working under any conditions that could be hazardous to your eyes.
- Do not perform any actions that create a potential hazard to people or make the equipment unsafe.
- Never attempt to lift an object that is too heavy for one person to handle.
- Never install or manipulate wiring during electrical storms.
- Never install electrical jacks in wet locations unless the jacks are specifically designed for wet environments.
- Operate the Services Router only when it is properly grounded.
- The separate protective earthing terminal provided on this product shall be permanently connected to earth.
- Replace fuses only with fuses of the same type and rating.

- Do not open or remove chassis covers or sheet metal parts unless instructions are provided in this manual. Such an action could cause severe electrical shock.
- Do not push or force any objects through any opening in the chassis frame. Such an action could result in electrical shock or fire.
- Avoid spilling liquid onto the Services Router chassis or onto any Services Router component. Such an action could cause electrical shock or damage the Services Router.
- Avoid touching uninsulated electrical wires or terminals that have not been disconnected from their power source. Such an action could cause electrical shock.

In addition, observe the warnings and guidelines in the following sections.

### Qualified Personnel Warning

**WARNING:** Only trained and qualified personnel should install or replace the Services Router.

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

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

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

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

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

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

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

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

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

### Preventing Electrostatic Discharge Damage

Many Services Router hardware components are sensitive to damage from static electricity. Some components can be impaired by voltages as low as 30 V. You can easily generate potentially damaging static voltages whenever you handle plastic or foam packing material or if you move components across plastic or carpets. Observe the following guidelines to minimize the potential for electrostatic discharge (ESD) damage, which can cause intermittent or complete component failures:

- Always use an ESD wrist strap or ankle strap, and make sure that it is in direct contact with your skin.

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**CAUTION:** For safety, periodically check the resistance value of the ESD strap. The measurement should be in the range of 1 to 10 Mohms.

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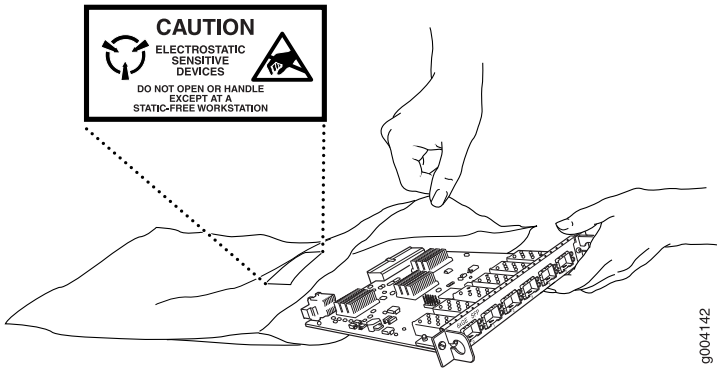
- When handling any component that is removed from the chassis, make sure the equipment end of your ESD strap is attached to one of the electrostatic discharge points on the chassis, which are shown in Figure 1 on page 8, Figure 2 on page 9 and Figure 13 on page 22.
- Avoid contact between the component and your clothing. ESD voltages emitted from clothing can still damage components.
- When removing or installing a component, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an electrostatic bag (see Figure 96 on page 201). If you are returning a component, place it in an electrostatic bag before packing it.

**Figure 96: Place a Component into an Electrostatic Bag**




## *Electrical Safety Guidelines and Warnings*

When working on equipment powered by electricity, follow the guidelines described in the following sections:

- General Electrical Safety Guidelines on page 202
- AC Power Electrical Safety Guidelines on page 203
- DC Power Electrical Safety Guidelines on page 204

### General Electrical Safety Guidelines

**WARNING:** Certain ports on the router are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS requirements and protect against lightening surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the router are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

**CAUTION:** To comply with intrabuilding lightning and surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.

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

- Install the Services Router in compliance with the following local, national, or international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Canada—Canadian Electrical Code, Part 1, CSA C22.1.

  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.
- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.
- Make sure that grounding surfaces are cleaned and brought to a bright finish before grounding connections can be made.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the Services Router within marked electrical ratings and product usage instructions.
- For the Services Router and peripheral equipment to function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

Many Services Router components can be removed and replaced without powering down or disconnecting power to the Services Router, as detailed in elsewhere in this manual. Never install equipment if it appears damaged.

### AC Power Electrical Safety Guidelines

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

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

- AC-powered routers are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding should comply with local and national electrical codes.
- You must provide an external Listed circuit breaker rated minimum 15 A in the building installation.
- The power cord serves as the main disconnecting device. The socket outlet must be near the router and be easily accessible.
- The cores in the mains lead are colored in accordance with the following code (within the United States):
  - Green and yellow—Earth
  - Blue—Neutral
  - Brown—Live

- When a router is equipped with two AC power supplies, both power cords (one for each power supply) must be unplugged to completely disconnect power to the router.
- Note the following warnings printed on the AC power supply faceplate:
  - To completely de-energize the system disconnect maximum of 2 power cordsets.
  - Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk. [Swedish]

***Power Cable Warning (Japanese)***

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

注意

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

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### DC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to a DC-powered router:

- A DC-powered router is equipped with a DC terminal block that is rated for the power requirements of a maximally configured router. To supply sufficient power, terminate the DC input wiring on a facility DC source capable of supplying at least 8 A @ –48 VDC. Incorporate an easily accessible disconnect device into the facility wiring. Be sure to connect the ground wire or conduit to a solid office (earth) ground. A closed loop ring is recommended for terminating the ground conductor at the ground stud.
- In the United States, a restricted access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

**NOTE:** Primary overcurrent protection is provided by the building circuit breaker. This breaker should protect against excess currents, short circuits, and earth faults in accordance with NEC ANSI/NFPA70.

- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.

- For personal safety, connect the green and yellow wire to safety (earth) ground at both the router and the supply side of the DC wiring.
- The marked input voltage of –48 VDC for a DC-powered router is the nominal voltage associated with the battery circuit, and any higher voltages are only to be associated with float voltages for the charging function.
- Because the router is a positive ground system, you must connect the positive lead to the terminal labeled RTN, the negative lead to the terminal labeled –48 VDC, and the earth ground to the chassis grounding points.

### Power Sources for Redundant Power Supplies

If your J6350 Services Router includes an optional redundant DC power supply, make sure that the two DC power supplies are powered by dedicated power feeds derived from feed A and feed B. This configuration provides the commonly deployed A/B feed redundancy for the system. Failure to do so makes the router susceptible to total power failure if one of the power supplies fails.

## 冗余电源

如果 Juniper Networks 设备包含一个可选的冗余电源　请将两个电源连接到不同的输入电源。不这样做的结果是 Juniper Networks 设备一路供电出问题时导致全部的电源故障

### DC Power Disconnection Warning

**WARNING:** Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.

**Waarschuwing** Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

**Varoitus** Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

**WARNING: Attention** Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu,

placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

**Warnung** Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

**Avvertenza** Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

---

**WARNING: Advarsel** Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

**Aviso** Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

**¡Atención!** Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF), y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

**Varning!** Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

---

### DC Power Grounding Requirements and Warning

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors, but is identifiable by green and yellow stripes, is installed as part of the branch circuit that supplies the unit. The grounding conductor must be permanently connected to earth.

For further information, see “Chassis Grounding” on page 83 and “DC Power, Connection, and Power Cable Specifications” on page 71.

**WARNING:** When installing the router, the ground connection must always be made first and disconnected last.

**Waarschuwing** Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

**Varoitus** Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

**Attention** Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

**Warnung** Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

**Avvertenza** In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

**Advarsel** Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

**Aviso** Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

**¡Atención!** Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

**Varning!** Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

### DC Power Wiring Sequence Warning

**WARNING:** Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, + RTN to + RTN, then -48 V to -48 V. When disconnecting power, the proper wiring sequence is -48 V to -48 V, + RTN to + RTN, then ground to ground. Note that the ground wire should always be connected first and disconnected last.

**WARNING: Waarschuwing** De juiste bedradingsvolgorde verbonden is aarde naar aarde, + RTN naar + RTN, en –48 V naar – 48 V. De juiste bedradingsvolgorde losgemaakt is en –48 V naar – 48 V, + RTN naar + RTN, aarde naar aarde.

**WARNING: Varoitus** Oikea yhdistettava kytkentajarjestys on maajohto maajohtoon, + RTN varten + RTN, –48 V varten – 48 V. Oikea irrotettava kytkentajarjestys on –48 V varten – 48 V, + RTN varten + RTN, maajohto maajohtoon.

**WARNING: Attention** Câblez l'approvisionnement d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, + RTN à + RTN, puis -48 V à -48 V. En débranchant la puissance, l'ordre approprié de câblage est -48 V à -48 V, + RTN à + RTN, a alors rectifié pour rectifier. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

**WARNING: Warnung** Verdrahten Sie die Gleichstrom-Versorgung mit den passenden Ansätzen am Verdrahtung Ende. Wenn man Energie anschließt, wird die korrekte Verdrahtung. Reihenfolge gerieben, um, + RTN zu + RTN, dann -48 V bis -48 V zu reiben. Wenn sie Energie trennt, ist die korrekte Verdrahtung Reihenfolge -48 V bis -48 V, + RTN zu + RTN, rieb dann, um zu reiben. Beachten Sie, daß der Erdungsdraht immer zuerst angeschlossen werden und zuletzt getrennt werden sollte.

**WARNING: Avvertenza** Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

**WARNING: Advarsel** Riktig tilkoples tilkoplingssekvens er jord til jord, + RTN til + RTN, –48 V til – 48 V. Riktig frakoples tilkoplingssekvens er –48 V til – 48 V, + RTN til + RTN, jord til jord.

**WARNING: Aviso** Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, + RTN a + RTN, entonces -48 V a -48 V. Al desconectar potencia, la secuencia apropiada del cableado es -48 V a -48 V, + RTN a + RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

**WARNING: ¡Atención!** Wire a fonte de alimentação de DC Usando os talões apropriados na extremidade da fiação. Ao conectar a potência, a seqüência apropriada da fiação é moída para moer, + RTN a + RTN, então -48 V a -48 V. Ao desconectar a potência, a seqüência apropriada da fiação é -48 V a -48 V, + RTN a + RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

**Varning!** Korrekt kopplingssekvens ar jord till jord, + RTN till + RTN, –48 V till – 48 V. Korrekt kopplas kopplingssekvens ar –48 V till – 48 V, + RTN till + RTN, jord till jord.

### DC Power Wiring Terminations Warning

**WARNING:** When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations should be the appropriate size for the wires and should clamp both the insulation and conductor.

**WARNING: Waarschuwing** Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

**WARNING: Varoitus** Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

**WARNING: Attention** Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

**WARNING: Warnung** Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

**WARNING: Avvertenza** Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

**WARNING: Advarsel** Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

**WARNING: Aviso** Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

**WARNING: ¡Atención!** Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

**WARNING: Varning!** När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

### Grounded Equipment Warning

**WARNING:** The router is intended to be grounded. Ensure that the router is connected to earth ground during normal use.

**Waarschuwing** Deze apparatuur hoort geaard te worden Zorg dat de host-computer tijdens normaal gebruik met aarde is verbonden.

**Varoitus** Tämä laitteisto on tarkoitettu maadoitettavaksi. Varmista, että isäntälaite on yhdistetty maahan normaalikäytön aikana.

**Attention** Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.

**Warnung** Dieses Gerät muß geerdet werden. Stellen Sie sicher, daß das Host-Gerät während des normalen Betriebs an Erde gelegt ist.

**WARNING: Avvertenza** Questa apparecchiatura deve essere collegata a massa. Accertarsi che il dispositivo host sia collegato alla massa di terra durante il normale utilizzo.

**Advarsel** Dette utstyret skal jordes. Forviss deg om vertsterminalen er jordet ved normalt bruk.

**Aviso** Este equipamento deverá estar ligado à terra. Certifique-se que o host se encontra ligado à terra durante a sua utilização normal.

**¡Atención!** Este equipo debe conectarse a tierra. Asegurarse de que el equipo principal esté conectado a tierra durante el uso normal.

**Varning!** Denna utrustning är avsedd att jordas. Se till att värdenheten är jordad vid normal användning.

### Warning Statement for Norway and Sweden

**WARNING:** The equipment must be connected to an earthed mains socket-outlet.

**Advarsel** Apparatet skal kobles til en jordet stikkontakt.

**Varning!** Apparaten skall anslutas till jordat nätuttag.

### In Case of Electrical Accident

If an electrical accident results in an injury, take the following actions in this order:

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.
2. Disconnect power from the Services Router.
3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, then call for help.

### Multiple Power Supplies Disconnection Warning

**WARNING:** The J6350 Services Router has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

**WARNING: Waarschuwing** Deze J6350 eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

**WARNING: Varoitus** Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

**WARNING: Attention** Cette J6350 unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

**WARNING: Warnung** Diese J6350 Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

**WARNING: Avvertenza** Questa J6350 unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

**WARNING: Advarsel** Denne J6350 enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

**WARNING: Aviso** Este J6350 dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

**WARNING: ¡Atención!** Esta J6350 unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

**WARNING: Varning!** Denna J6350 enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

### Power Disconnection Warning

**WARNING:** Before working on the router or near power supplies, unplug the power cord from an AC router.

**WARNING: Waarschuwing** Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen.

**WARNING: Varoitus** Kytke irti vaihtovirtalaitteiden virtajohto, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

**WARNING: Attention** Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.

**WARNING: Warnung** Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw.

**WARNING: Avvertenza** Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA.

**WARNING: Advarsel** Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut på vekselstrømsenheter.

**WARNING: Aviso** Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada.

**WARNING: ¡Atención!** Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA).

**WARNING: Varning!** Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden.

### TN Power Warning

**WARNING:** The router is designed to work with a TN power system.

**WARNING: Waarschuwing** Het apparaat is ontworpen om te functioneren met TN energiesystemen.

**WARNING: Varoitus** Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

**WARNING: Attention** Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

**WARNING: Warnung** Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

**WARNING: Avvertenza** Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

**WARNING: Advarsel** Utstyret er utfomet til bruk med TN-strømsystemer.

**WARNING: Aviso** O dispositivo foi criado para operar com sistemas de corrente TN.

**WARNING: ¡Atención!** El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.

**WARNING: Varning!** Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.

### Telecommunication Line Cord Warning

**WARNING:** To reduce the risk of fire, use only No. 26 AWG or larger UL-listed or CSA-certified telecommunication line cord.

**WARNING: Waarschuwing** Om brandgevaar te reduceren, dient slechts telecommunicatielijnsnoer nr. 26 AWG of groter gebruikt te worden.

**WARNING: Varoitus** Tulipalovaaran vähentämiseksi käytä ainoastaan nro 26 AWG- tai paksumpaa tietoliikennejohdinta.

**WARNING: Attention** Pour réduire les risques d'incendie, n'utiliser que des cordons de lignes de télécommunications de type AWG n° 26 ou plus larges.

**WARNING: Warnung** Zur Reduzierung der Feuergefahr eine Fernmeldeleitungsschnur der Größe 26 AWG oder größer verwenden.

**WARNING: Avvertenza** Per ridurre il rischio di incendio, usare solo un cavo per linea di telecomunicazioni di sezione 0,12 mm2 (26 AWG) o maggiore.

**WARNING: Advarsel** Bruk kun AWG nr. 26 eller telekommunikasjonsledninger med større dimensjon for å redusere faren for brann.

**WARNING: Aviso** Para reduzir o risco de incêndio, utilize apenas terminais de fio de telecomunicações Nº. 26 AWG ou superiores.

**WARNING: ¡Atención!** Para reducir el riesgo de incendios, usar sólo líneas de telecomunicaciones de calibre No. 26 AWG o más gruesas.

**WARNING: Varning!** För att minska brandrisken skall endast Nr. 26 AWG eller större telekommunikationsledning användas.

## *Installation Safety Guidelines and Warnings*

Observe the following guidelines and warnings before and during Services Router installation:


- Chassis Lifting Guidelines on page 216
- Installation Instructions Warning on page 216
- Rack-Mounting Requirements and Warnings on page 217
- Ramp Warning on page 221


### Chassis Lifting Guidelines

The weight of a fully populated chassis is approximately 25.3 lbs (11.5 kg) for a J4350 Services Router, and 30.7 lb (13.9 kg) for a J6350 Services Router. Observe the following guidelines for lifting and moving a Services Router:

- Before moving the Services Router, read the guidelines in "Preparing for Router Installation" on page 63 to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the Services Router, disconnect all external cables.
- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

### Installation Instructions Warning

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

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

**Varoitus** Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

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

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

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

**Advarsel** Les installasjonsinstruksjonene før systemet kobles til strømkilden.

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

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

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

### Rack-Mounting Requirements and Warnings

Ensure that the equipment rack into which the Services Router is installed is evenly and securely supported, to avoid the hazardous condition that could result from uneven mechanical loading.

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

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

**WARNING: Waarschuwing** Om lichamelijk letsel te voorkomen wanneer u dit toestel in een rek monteert of het daar een servicebeurt geeft, moet u speciale voorzorgsmaatregelen nemen om ervoor te zorgen dat het toestel stabiel blijft. De onderstaande richtlijnen worden verstrekt om uw veiligheid te verzekeren:

- De Juniper Networks router moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.

- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

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

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

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

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

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**WARNING: Warnung** Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen,

um sicherzustellen, daß das System stabil bleibt. Die folgenden Richtlinien sollen zur Gewährleistung Ihrer Sicherheit dienen:

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

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

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

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

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

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**WARNING: Aviso** Para se prevenir contra danos corporais ao montar ou reparar esta unidade numa estante, deverá tomar precauções especiais para se certificar de que o sistema possui um suporte estável. As seguintes directrizes ajudá-lo-ão a efectuar o seu trabalho com segurança:

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

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

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

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

- Juniper Networks router måste installeras i en ställning som är förankrad i byggnadens struktur.
- Om denna enhet är den enda enheten på ställningen skall den installeras längst ned på ställningen.

- Om denna enhet installeras på en delvis fylld ställning skall ställningen fyllas nedifrån och upp, med de tyngsta enheterna längst ned på ställningen.
- Om ställningen är försedd med stabiliseringsdon skall dessa monteras fast innan enheten installeras eller underhålls på ställningen.

### Ramp Warning

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

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

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

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

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

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

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

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

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

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

## *Laser and LED Safety Guidelines and Warnings*

Single-mode Physical Interface Modules (PIMs) are equipped with laser transmitters, which are considered a Class 1 Laser Product by the U.S. Food and Drug Administration, and are evaluated as a Class 1 Laser Product per EN 60825–1 requirements.

Observe the following guidelines and warnings:


- General Laser Safety Guidelines on page 222
- Class 1 Laser Product Warning on page 222
- Class 1 LED Product Warning on page 222
- Laser Beam Warning on page 223
- Radiation from Open Port Apertures Warning on page 224

### General Laser Safety Guidelines

When working around PIMs, observe the following safety guidelines to prevent eye injury:

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

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

### Class 1 Laser Product Warning

**WARNING:** Class 1 laser product.

**Waarschuwing** Klasse-1 laser produkt.

**Varoitus** Luokan 1 lasertuote.

**Attention** Produit laser de classe I.

**Warnung** Laserprodukt der Klasse 1.

**WARNING: Avvertenza** Prodotto laser di Classe 1.

**Advarsel** Laserprodukt av klasse 1.

**Aviso** Produto laser de classe 1.

**¡Atención!** Producto láser Clase I.

**Varning!** Laserprodukt av klass 1.

### Class 1 LED Product Warning

**WARNING:** Class 1 LED product.

**Waarschuwing** Klasse 1 LED-product.

**Varoitus** Luokan 1 valodiodituote.

**Attention** Alarme de produit LED Class I.

**Warnung** Class 1 LED-Produktwarnung.

**WARNING: Avvertenza** Avvertenza prodotto LED di Classe 1.

**Advarsel** LED-produkt i klasse 1.

**Aviso** Produto de classe 1 com LED.

**¡Atención!** Aviso sobre producto LED de Clase 1.

**Varning!** Lysdiodprodukt av klass 1.

### Laser Beam Warning

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

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

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

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

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

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

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

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

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

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

### Radiation from Open Port Apertures Warning

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

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

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

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

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

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

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

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

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

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

## *Maintenance and Operational Safety Guidelines and Warnings*

As you maintain the Services Router, observe the following guidelines and warnings:


- Battery Handling Warning on page 226
- Jewelry Removal Warning on page 227
- Lightning Activity Warning on page 228
- Operating Temperature Warning on page 229
- Product Disposal Warning on page 231

### Battery Handling Warning

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

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

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

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

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

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

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

**WARNING: Aviso** Existe perigo de explosão se a bateria for substituída incorrectamente. Substitua a bateria por uma bateria igual ou de um tipo equivalente recomendado pelo fabricante. Destrua as baterias usadas conforme as instruções do fabricante.

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

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

### Jewelry Removal Warning

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

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

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

**WARNING: Attention** Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.

**WARNING: Warnung** Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.

**WARNING: Avvertenza** Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

**WARNING: Advarsel** Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.

**WARNING: Aviso** Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.

**WARNING: ¡Atención!** Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.

**WARNING: Varning!** Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.

### Lightning Activity Warning

**WARNING:** Do not work on the system or connect or disconnect cables during periods of lightning activity.

**WARNING: Waarschuwing** Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.

**WARNING: Varoitus** Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.

**WARNING: Attention** Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.

**WARNING: Warnung** Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.

**WARNING: Avvertenza** Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.

**WARNING: Advarsel** Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.

**WARNING: Aviso** Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).

**WARNING: ¡Atención!** No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.

**WARNING: Varning!** Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.

### Operating Temperature Warning

**WARNING:** To prevent the router from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C). To prevent airflow restriction, allow at least 6 inches (15.2 cm) of clearance around the ventilation openings.

**WARNING: Waarschuwing** Om te voorkomen dat welke router van de Juniper Networks router dan ook oververhit raakt, dient u deze niet te bedienen op een plaats

waar de maximale aanbevolen omgevingstemperatuur van 40°C wordt overschreden. Om te voorkomen dat de luchtstroom wordt beperkt, dient er minstens 15,2 cm speling rond de ventilatie-openingen te zijn.

**WARNING: Varoitus** Ettei Juniper Networks router-sarjan reititin ylikuumentuisi, sitä ei saa käyttää tilassa, jonka lämpötila ylittää korkeimman suositellun ympäristölämpötilan 40°C. Ettei ilmanvaihto estyisi, tuuletusaukkojen ympärille on jätettävä ainakin 15,2 cm tilaa.

**WARNING: Attention** Pour éviter toute surchauffe des routeurs de la gamme Juniper Networks router, ne l'utilisez pas dans une zone où la température ambiante est supérieure à 40°C. Pour permettre un flot d'air constant, dégagez un espace d'au moins 15,2 cm autour des ouvertures de ventilations.

**WARNING: Warnung** Um einen Router der router vor Überhitzung zu schützen, darf dieser nicht in einer Gegend betrieben werden, in der die Umgebungstemperatur das empfohlene Maximum von 40°C überschreitet. Um Lüftungsverschluß zu verhindern, achten Sie darauf, daß mindestens 15,2 cm lichter Raum um die Lüftungsöffnungen herum frei bleibt.

**WARNING: Avvertenza** Per evitare il surriscaldamento dei router, non adoperateli in un locale che ecceda la temperatura ambientale massima di 40°C. Per evitare che la circolazione dell'aria sia impedita, lasciate uno spazio di almeno 15.2 cm di fronte alle aperture delle ventole.

**WARNING: Advarsel** Unngå overoppheting av eventuelle rutere i Juniper Networks router Disse skal ikke brukes på steder der den anbefalte maksimale omgivelsestemperaturen overstiger 40°C (104°F). Sørg for at klaringen rundt lufteåpningene er minst 15,2 cm (6 tommer) for å forhindre nedsatt luftsirkulasjon.

**WARNING: Aviso** Para evitar o sobreaquecimento do encaminhador Juniper Networks router, não utilize este equipamento numa área que exceda a temperatura máxima recomendada de 40°C. Para evitar a restrição à circulação de ar, deixe pelo menos um espaço de 15,2 cm à volta das aberturas de ventilação.

**WARNING: ¡Atención!** Para impedir que un encaminador de la serie Juniper Networks router se recaliente, no lo haga funcionar en un área en la que se supere la

temperatura ambiente máxima recomendada de 40°C. Para impedir la restricción de la entrada de aire, deje un espacio mínimo de 15,2 cm alrededor de las aperturas para ventilación.

**WARNING: Varning!** Förhindra att en Juniper Networks router överhettas genom att inte använda den i ett område där den maximalt rekommenderade omgivningstemperaturen på 40°C överskrids. Förhindra att luftcirkulationen inskränks genom att se till att det finns fritt utrymme på minst 15,2 cm omkring ventilationsöppningarna.

### Product Disposal Warning

**WARNING:** Disposal of this product must be handled according to all national laws and regulations.

**WARNING: Waarschuwing** Dit produkt dient volgens alle landelijke wetten en voorschriften te worden afgedankt.

**WARNING: Varoitus** Tämän tuotteen lopullisesta hävittämisestä tulee huolehtia kaikkia valtakunnallisia lakeja ja säännöksiä noudattaen.

**WARNING: Attention** La mise au rebut définitive de ce produit doit être effectuée conformément à toutes les lois et réglementations en vigueur.

**WARNING: Warnung** Dieses Produkt muß den geltenden Gesetzen und Vorschriften entsprechend entsorgt werden.

**WARNING: Avvertenza** L'eliminazione finale di questo prodotto deve essere eseguita osservando le normative italiane vigenti in materia

**WARNING: Advarsel** Endelig disponering av dette produktet må skje i henhold til nasjonale lover og forskrifter.

**WARNING: Aviso** A descartagem final deste produto deverá ser efectuada de acordo com os regulamentos e a legislação nacional.

**WARNING: ¡Atención!** El desecho final de este producto debe realizarse según todas las leyes y regulaciones nacionales

**WARNING: Varning!** Slutlig kassering av denna produkt bör skötas i enlighet med landets alla lagar och föreskrifter.

## Agency Approvals

The Services Router complies with the following standards:

- Safety
  - CAN/CSA-22.2 No. 60950–1–03–UL 60950–1 Safety of Information Technology Equipment
  - EN 60950–1 Safety of Information Technology Equipment
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC (J2320 and J2350)
  - AS/NZS 3548 Class A (Australia/New Zealand)
  - EN 55022 Class A Emissions (Europe)
  - FCC Part 15 Class A (USA)
  - VCCI Class A (Japan)
  - FCC Part 68
  - Industry Canada CS-03
- EMC (J4320 and J6350)
  - AS/NZS 3548 Class B (Australia/New Zealand)
  - EN 55022 Class B Emissions (Europe)
  - FCC Part 15 Class B (USA)
  - VCCI Class B (Japan)
  - FCC Part 68
  - Industry Canada CS-03
- Immunity

- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity
- EN 61000-4-11 Voltage Dips and Sags

- ETSI
  - ETSI EN-300386-2 Telecommunication Network Equipment. Electromagnetic Compatibility Requirements

## Compliance Statements for Environmental Requirements

### *Lithium Battery*

Batteries in this product are not based on mercury, lead, or cadmium substances. The batteries used in this product are in compliance with EU Directives 91/157/EEC, 93/86/EEC, and 98/101/EEC. The product documentation includes instructional information about the proper method of reclamation and recycling.

## Compliance Statements for EMC Requirements



### *Canada*

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the

inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

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**CAUTION:** Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

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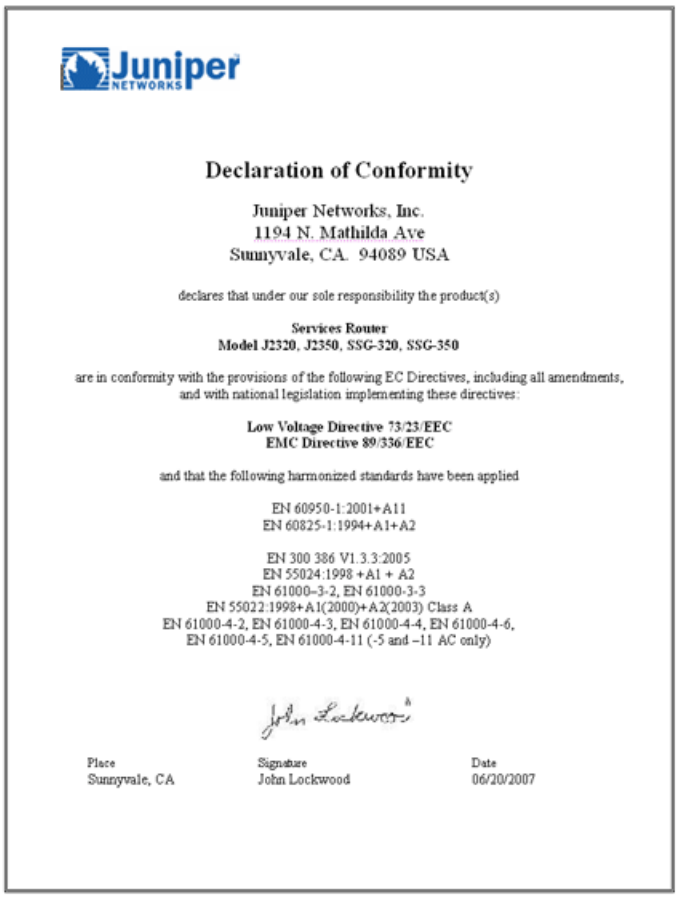
Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

### *European Community*



Juniper NETWORKS

**Declaration of Conformity**

Juniper Networks, Inc.
1194 N. Mathilda Ave
Sunnyvale, CA. 94089 USA

declares that under our sole responsibility the product(s)

**Services Router**
**Model J2320, J2350, SSG-320, SSG-350**

are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

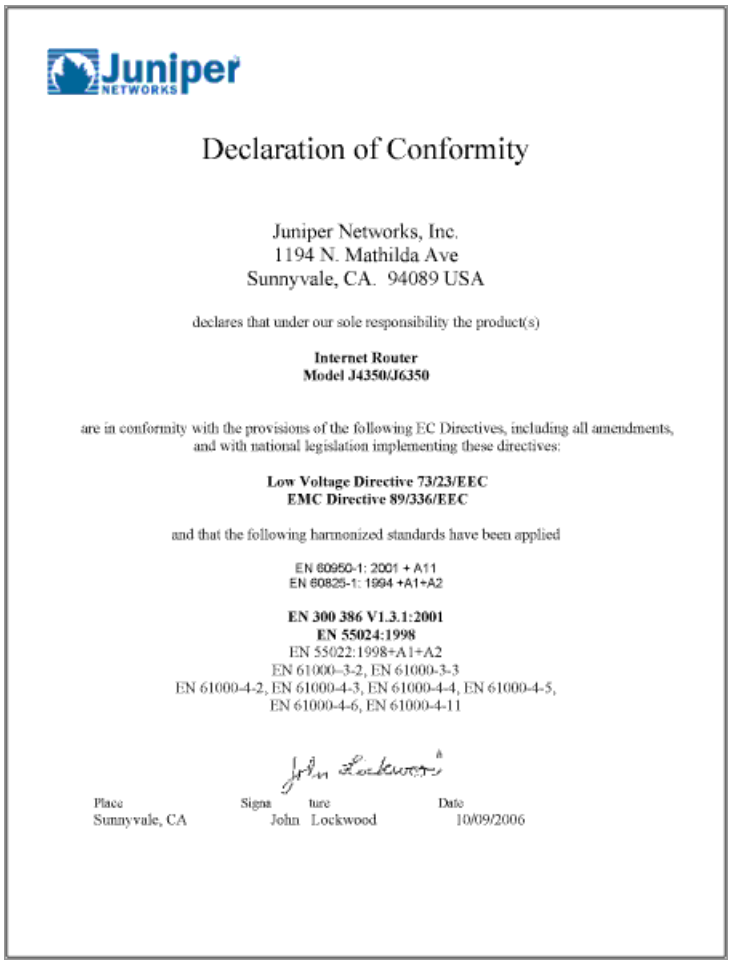
**Low Voltage Directive 73/23/EEC**
**EMC Directive 89/336/EEC**

and that the following harmonized standards have been applied

EN 60950-1:2001+A11
EN 60825-1:1994+A1+A2

EN 300 386 V1.3.3:2005
EN 55024:1998 +A1 + A2
EN 61000–3-2, EN 61000-3-3
EN 55022:1998+A1(2000)+A2(2003) Class A
EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-6,
EN 61000-4-5, EN 61000-4-11 (-5 and –11 AC only)

| Place | Signature | Date |
|---|---|---|
| Sunnyvale, CA | John Lockwood | 06/20/2007 |



Declaration of Conformity

Juniper Networks, Inc.
1194 N. Mathilda Ave
Sunnyvale, CA. 94089 USA

declares that under our sole responsibility the product(s)

**Internet Router**
**Model J4350/J6350**

are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

**Low Voltage Directive 73/23/EEC**
**EMC Directive 89/336/EEC**

and that the following harmonized standards have been applied

EN 60950-1: 2001 + A11
EN 60825-1: 1994 +A1+A2

**EN 300 386 V1.3.1:2001**
**EN 55024:1998**
EN 55022:1998+A1+A2
EN 61000–3-2, EN 61000-3-3
EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5,
EN 61000-4-6, EN 61000-4-11

| Place | Signature | Date |
|---|---|---|
| Sunnyvale, CA | John Lockwood | 10/09/2006 |

### *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Ｂ情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

The preceding translates as follows:

This is a Class B product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

## *United States*

The Services Router has been tested and found to comply with the limits for a Class B 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.

### FCC Part 15 Statement

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for help.

### FCC Part 68 Statement

This equipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the product is a label that contains the FCC registration number for this device. If requested, this information must be provided to the telephone company.

This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.

If this device causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. The telephone company may request that you disconnect the equipment until the problem is resolved. The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of this equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment or for repair or warranty information, please follow the applicable procedures explained in the “Technical Support” section of this manual.

- FCC Registration Number—See label on product.
- Required Connector (USOC)—RJ-48C
- Service Order Code (SOC)—6.ON

# Part 5
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