



JUNOS® Software with Enhanced Services

Hardware Guide for J-series Services Routers

Release 9.3

Juniper Networks, Inc.

1194 North Mathilda Avenue
Sunnyvale, California 94089
USA

408-745-2000

www.juniper.net

Part Number: 530-025836-01, Revision 1

This product includes the Envoy SNMP Engine, developed by Epilogue Technology, an Integrated Systems Company. Copyright © 1986-1997, Epilogue Technology Corporation. All rights reserved. This program and its documentation were developed at private expense, and no part of them is in the public domain.

This product includes memory allocation software developed by Mark Moraes, copyright © 1988, 1989, 1993, University of Toronto.

This product includes FreeBSD software developed by the University of California, Berkeley, and its contributors. All of the documentation and software included in the 4.4BSD and 4.4BSD-Lite Releases is copyrighted by the Regents of the University of California. Copyright © 1979, 1980, 1983, 1986, 1988, 1989, 1991, 1992, 1993, 1994. The Regents of the University of California. All rights reserved.

GateD software copyright © 1995, the Regents of the University. All rights reserved. Gate Daemon was originated and developed through release 3.0 by Cornell University and its collaborators. Gated is based on Kirton's EGP, UC Berkeley's routing daemon (routed), and DCN's HELLO routing protocol. Development of Gated has been supported in part by the National Science Foundation. Portions of the GateD software copyright © 1988, Regents of the University of California. All rights reserved. Portions of the GateD software copyright © 1991, D. L. S. Associates.

This product includes software developed by Maker Communications, Inc., copyright © 1996, 1997, Maker Communications, Inc.

Juniper Networks, the Juniper Networks logo, JUNOS, NetScreen, ScreenOS, and Steel-Belted Radius are registered trademarks of Juniper Networks, Inc. in the United States and other countries. JUNOSe is a trademark of Juniper Networks, Inc. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Products made or sold by Juniper Networks or components thereof might be covered by one or more of the following patents that are owned by or licensed to Juniper Networks: U.S. Patent Nos. 5,473,599, 5,905,725, 5,909,440, 6,192,051, 6,333,650, 6,359,479, 6,406,312, 6,429,706, 6,459,579, 6,493,347, 6,538,518, 6,538,899, 6,552,918, 6,567,902, 6,578,186, and 6,590,785.

JUNOS Software with Enhanced Services Hardware Guide
Release 9.3

Copyright © 2008, Juniper Networks, Inc.
All rights reserved. Printed in USA.

Revision History
October 2008—Revision 1

The information in this document is current as of the date listed in the revision history.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. The JUNOS software has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

SOFTWARE LICENSE

The terms and conditions for using this software are described in the software license contained in the acknowledgment to your purchase order or, to the extent applicable, to any reseller agreement or end-user purchase agreement executed between you and Juniper Networks. By using this software, you indicate that you understand and agree to be bound by those terms and conditions. Generally speaking, the software license restricts the manner in which you are permitted to use the software and may contain prohibitions against certain uses. The software license may state conditions under which the license is automatically terminated. You should consult the license for further details. For complete product documentation, please see the Juniper Networks Web site at www.juniper.net/techpubs.

END USER LICENSE AGREEMENT

READ THIS END USER LICENSE AGREEMENT ("AGREEMENT") BEFORE DOWNLOADING, INSTALLING, OR USING THE SOFTWARE. BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE OR OTHERWISE EXPRESSING YOUR AGREEMENT TO THE TERMS CONTAINED HEREIN, YOU (AS CUSTOMER OR IF YOU ARE NOT THE CUSTOMER, AS A REPRESENTATIVE/AGENT AUTHORIZED TO BIND THE CUSTOMER) CONSENT TO BE BOUND BY THIS AGREEMENT. IF YOU DO NOT OR CANNOT AGREE TO THE TERMS CONTAINED HEREIN, THEN (A) DO NOT DOWNLOAD, INSTALL, OR USE THE SOFTWARE, AND (B) YOU MAY CONTACT JUNIPER NETWORKS REGARDING LICENSE TERMS.

1. **The Parties.** The parties to this Agreement are (i) Juniper Networks, Inc. (if the Customer's principal office is located in the Americas) or Juniper Networks (Cayman) Limited (if the Customer's principal office is located outside the Americas) (such applicable entity being referred to herein as "Juniper"), and (ii) the person or organization that originally purchased from Juniper or an authorized Juniper reseller the applicable license(s) for use of the Software ("Customer") (collectively, the "Parties").

2. **The Software.** In this Agreement, "Software" means the program modules and features of the Juniper or Juniper-supplied software, for which Customer has paid the applicable license or support fees to Juniper or an authorized Juniper reseller, or which was embedded by Juniper in equipment which Customer purchased from Juniper or an authorized Juniper reseller. "Software" also includes updates, upgrades and new releases of such software. "Embedded Software" means Software which Juniper has embedded in or loaded onto the Juniper equipment and any updates, upgrades, additions or replacements which are subsequently embedded in or loaded onto the equipment.

3. **License Grant.** Subject to payment of the applicable fees and the limitations and restrictions set forth herein, Juniper grants to Customer a non-exclusive and non-transferable license, without right to sublicense, to use the Software, in executable form only, subject to the following use restrictions:

- a. Customer shall use Embedded Software solely as embedded in, and for execution on, Juniper equipment originally purchased by Customer from Juniper or an authorized Juniper reseller.
- b. Customer shall use the Software on a single hardware chassis having a single processing unit, or as many chassis or processing units for which Customer has paid the applicable license fees; provided, however, with respect to the Steel-Belted Radius or Odyssey Access Client software only, Customer shall use such Software on a single computer containing a single physical random access memory space and containing any number of processors. Use of the Steel-Belted Radius or IMS AAA software on multiple computers or virtual machines (e.g., Solaris zones) requires multiple licenses, regardless of whether such computers or virtualizations are physically contained on a single chassis.
- c. Product purchase documents, paper or electronic user documentation, and/or the particular licenses purchased by Customer may specify limits to Customer's use of the Software. Such limits may restrict use to a maximum number of seats, registered endpoints, concurrent users, sessions, calls, connections, subscribers, clusters, nodes, realms, devices, links, ports or transactions, or require the purchase of separate licenses to use particular features, functionalities, services, applications, operations, or capabilities, or provide throughput, performance, configuration, bandwidth, interface, processing, temporal, or geographical limits. In addition, such limits may restrict the use of the Software to managing certain kinds of networks or require the Software to be used only in conjunction with other specific Software. Customer's use of the Software shall be subject to all such limitations and purchase of all applicable licenses.
- d. For any trial copy of the Software, Customer's right to use the Software expires 30 days after download, installation or use of the Software. Customer may operate the Software after the 30-day trial period only if Customer pays for a license to do so. Customer may not extend or create an additional trial period by re-installing the Software after the 30-day trial period.
- e. The Global Enterprise Edition of the Steel-Belted Radius software may be used by Customer only to manage access to Customer's enterprise network. Specifically, service provider customers are expressly prohibited from using the Global Enterprise Edition of the Steel-Belted Radius software to support any commercial network access services.

The foregoing license is not transferable or assignable by Customer. No license is granted herein to any user who did not originally purchase the applicable license(s) for the Software from Juniper or an authorized Juniper reseller.

4. **Use Prohibitions.** Notwithstanding the foregoing, the license provided herein does not permit the Customer to, and Customer agrees not to and shall not: (a) modify, unbundle, reverse engineer, or create derivative works based on the Software; (b) make unauthorized copies of the Software (except as necessary for backup purposes); (c) rent, sell, transfer, or grant any rights in and to any copy of the Software, in any form, to any third party; (d) remove any proprietary notices, labels, or marks on or in any copy of the Software or any product in which the Software is embedded; (e) distribute any copy of the Software to any third party, including as may be embedded in Juniper equipment sold in the secondhand market; (f) use any 'locked' or key-restricted feature, function, service, application, operation, or capability without first purchasing the applicable license(s) and obtaining a valid key from Juniper, even if such feature, function, service, application, operation, or capability is enabled without a key; (g) distribute any key for the Software provided by Juniper to any third party; (h) use the Software in any manner that extends or is broader than the uses purchased by Customer from Juniper or an authorized Juniper reseller; (i) use Embedded Software on non-Juniper equipment; (j) use Embedded Software (or make it available for use) on Juniper equipment that the Customer did not originally purchase from Juniper or an authorized Juniper reseller; (k) disclose the results of testing or benchmarking of the Software to any third party without the prior written consent of Juniper; or (l) use the Software in any manner other than as expressly provided herein.

5. **Audit.** Customer shall maintain accurate records as necessary to verify compliance with this Agreement. Upon request by Juniper, Customer shall furnish such records to Juniper and certify its compliance with this Agreement.

6. **Confidentiality.** The Parties agree that aspects of the Software and associated documentation are the confidential property of Juniper. As such, Customer shall exercise all reasonable commercial efforts to maintain the Software and associated documentation in confidence, which at a minimum includes restricting access to the Software to Customer employees and contractors having a need to use the Software for Customer's internal business purposes.

7. **Ownership.** Juniper and Juniper's licensors, respectively, retain ownership of all right, title, and interest (including copyright) in and to the Software, associated documentation, and all copies of the Software. Nothing in this Agreement constitutes a transfer or conveyance of any right, title, or interest in the Software or associated documentation, or a sale of the Software, associated documentation, or copies of the Software.

8. **Warranty, Limitation of Liability, Disclaimer of Warranty.** The warranty applicable to the Software shall be as set forth in the warranty statement that accompanies the Software (the "Warranty Statement"). Nothing in this Agreement shall give rise to any obligation to support the Software. Support services may be purchased separately. Any such support shall be governed by a separate, written support services agreement. TO THE MAXIMUM EXTENT PERMITTED BY LAW, JUNIPER SHALL NOT BE LIABLE FOR ANY LOST PROFITS, LOSS OF DATA, OR COSTS OR PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, OR FOR ANY SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THIS AGREEMENT, THE SOFTWARE, OR ANY JUNIPER OR JUNIPER-SUPPLIED SOFTWARE. IN NO EVENT SHALL JUNIPER BE LIABLE FOR DAMAGES ARISING FROM UNAUTHORIZED OR IMPROPER USE OF ANY JUNIPER OR JUNIPER-SUPPLIED SOFTWARE, EXCEPT AS EXPRESSLY PROVIDED IN THE WARRANTY STATEMENT TO THE EXTENT PERMITTED BY LAW, JUNIPER DISCLAIMS ANY AND ALL WARRANTIES IN AND TO THE SOFTWARE (WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE), INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NONINFRINGEMENT. IN NO EVENT DOES JUNIPER WARRANT THAT THE SOFTWARE, OR ANY EQUIPMENT OR NETWORK RUNNING THE SOFTWARE, WILL OPERATE WITHOUT ERROR OR INTERRUPTION, OR WILL BE FREE OF VULNERABILITY TO INTRUSION OR ATTACK. In no event shall Juniper's or its suppliers' or licensors' liability to Customer, whether in contract, tort (including negligence), breach of warranty, or otherwise, exceed the price paid by Customer for the Software that gave rise to the claim, or if the Software is embedded in another Juniper product, the price paid by Customer for such other product. Customer acknowledges and agrees that Juniper has set its prices and entered into this Agreement in reliance upon the disclaimers of warranty and the limitations of liability set forth herein, that the same reflect an allocation of risk between the Parties (including the risk that a contract remedy may fail of its essential purpose and cause consequential loss), and that the same form an essential basis of the bargain between the Parties.

9. **Termination.** Any breach of this Agreement or failure by Customer to pay any applicable fees due shall result in automatic termination of the license granted herein. Upon such termination, Customer shall destroy or return to Juniper all copies of the Software and related documentation in Customer's possession or control.

10. **Taxes.** All license fees payable under this agreement are exclusive of tax. Customer shall be responsible for paying Taxes arising from the purchase of the license, or importation or use of the Software. If applicable, valid exemption documentation for each taxing jurisdiction shall be provided to Juniper prior to invoicing, and Customer shall promptly notify Juniper if their exemption is revoked or modified. All payments made by Customer shall be net of any applicable withholding tax. Customer will provide reasonable assistance to Juniper in connection with such withholding taxes by promptly: providing Juniper with valid tax receipts and other required documentation showing Customer's payment of any withholding taxes; completing appropriate applications that would reduce the amount of withholding tax to be paid; and notifying and assisting Juniper in any audit or tax proceeding related to transactions hereunder. Customer shall comply with all applicable tax laws and regulations, and Customer will promptly pay or reimburse Juniper for all costs and damages related to any liability incurred by Juniper as a result of Customer's non-compliance or delay with its responsibilities herein. Customer's obligations under this Section shall survive termination or expiration of this Agreement.

11. **Export.** Customer agrees to comply with all applicable export laws and restrictions and regulations of any United States and any applicable foreign agency or authority, and not to export or re-export the Software or any direct product thereof in violation of any such restrictions, laws or regulations, or without all necessary approvals. Customer shall be liable for any such violations. The version of the Software supplied to Customer may contain encryption or other capabilities restricting Customer's ability to export the Software without an export license.

12. **Commercial Computer Software.** The Software is "commercial computer software" and is provided with restricted rights. Use, duplication, or disclosure by the United States government is subject to restrictions set forth in this Agreement and as provided in DFARS 227.7201 through 227.7202-4, FAR 12.212, FAR 27.405(b)(2), FAR 52.227-19, or FAR 52.227-14(ALT III) as applicable.

13. **Interface Information.** To the extent required by applicable law, and at Customer's written request, Juniper shall provide Customer with the interface information needed to achieve interoperability between the Software and another independently created program, on payment of applicable fee, if any. Customer shall observe strict obligations of confidentiality with respect to such information and shall use such information in compliance with any applicable terms and conditions upon which Juniper makes such information available.

14. **Third Party Software.** Any licensor of Juniper whose software is embedded in the Software and any supplier of Juniper whose products or technology are embedded in (or services are accessed by) the Software shall be a third party beneficiary with respect to this Agreement, and such licensor or vendor shall have the right to enforce this Agreement in its own name as if it were Juniper. In addition, certain third party software may be provided with the Software and is subject to the accompanying license(s), if any, of its respective owner(s). To the extent portions of the Software are distributed under and subject to open source licenses obligating Juniper to make the source code for such portions publicly available (such as the GNU General Public License ("GPL") or the GNU Library General Public License ("LGPL")), Juniper will make such source code portions (including Juniper modifications, as appropriate) available upon request for a period of up to three years from the date of distribution. Such request can be made in writing to Juniper Networks, Inc., 1194 N. Mathilda Ave., Sunnyvale, CA 94089, ATTN: General Counsel. You may obtain a copy of the GPL at <http://www.gnu.org/licenses/gpl.html>, and a copy of the LGPL at <http://www.gnu.org/licenses/lgpl.html>.

15. **Miscellaneous.** This Agreement shall be governed by the laws of the State of California without reference to its conflicts of laws principles. The provisions of the U.N. Convention for the International Sale of Goods shall not apply to this Agreement. For any disputes arising under this Agreement, the Parties hereby consent to the personal and exclusive jurisdiction of, and venue in, the state and federal courts within Santa Clara County, California. This Agreement constitutes the entire and sole agreement between Juniper and the Customer with respect to the Software, and supersedes all prior and contemporaneous

agreements relating to the Software, whether oral or written (including any inconsistent terms contained in a purchase order), except that the terms of a separate written agreement executed by an authorized Juniper representative and Customer shall govern to the extent such terms are inconsistent or conflict with terms contained herein. No modification to this Agreement nor any waiver of any rights hereunder shall be effective unless expressly assented to in writing by the party to be charged. If any portion of this Agreement is held invalid, the Parties agree that such invalidity shall not affect the validity of the remainder of this Agreement. This Agreement and associated documentation has been written in the English language, and the Parties agree that the English version will govern. (For Canada: Les parties aux présentes confirment leur volonté que cette convention de même que tous les documents y compris tout avis qui s'y rattache, soient rédigés en langue anglaise. (Translation: The parties confirm that this Agreement and all related documentation is and will be in the English language)).

Abbreviated Table of Contents

	About This Guide	xvii
Part 1	Services Router Overview	
	Chapter 1 Overview of Services Routers	3
	Chapter 2 J-series Services Router Hardware Features	7
	Chapter 3 PIM Overview	35
Part 2	Installing a Services Router	
	Chapter 4 Preparing for Router Installation	63
	Chapter 5 Installing and Connecting a Services Router	77
	Chapter 6 Establishing Basic Connectivity	91
	Chapter 7 Installing JUNOS Software with Enhanced Services	115
Part 3	Maintaining Services Router Hardware	
	Chapter 8 Replacing Hardware Components	119
	Chapter 9 Troubleshooting a Services Router	157
	Chapter 10 Contacting Customer Support and Returning Hardware	169
Part 4	J-series Requirements and Specifications	
	Chapter 11 Network Cable Specifications and Connector Pinouts	179
	Chapter 12 Safety and Regulatory Compliance Information	197
Part 5	Index	
	Index	241

Table of Contents

	About This Guide	xvii
	Objectives	xvii
	Audience	xvii
	Supported Routing Platforms	xviii
	How to Use This Manual	xviii
	Document Conventions	xx
	List of Technical Publications	xxii
	Documentation Feedback	xxiii
	Requesting Technical Support	xxiii
Part 1	Services Router Overview	
Chapter 1	Overview of Services Routers	3
	J2320 Services Router Overview	3
	J2350 Services Router Overview	4
	J4350 Services Router Overview	5
	J6350 Services Router Overview	6
Chapter 2	J-series Services Router Hardware Features	7
	J2320 and J2350 Services Router Hardware Features	7
	J2320 and J2350 Chassis	8
	J2320 and J2350 Midplane	12
	J2320 and J2350 Routing Engine Hardware	12
	J2320 and J2350 Boot Devices	12
	J2320 and J2350 Front Panel	13
	Physical Interface Modules (PIMs)	14
	Power Button and POWER LED	14
	STATUS LED	15
	ALARM LED	15
	HA LED	16
	RESET CONFIG Button	16
	Built-In Gigabit Ethernet Ports	17
	Console Port	17
	AUX Port	17
	USB Port	17
	J2320 and J2350 External Compact Flashes	18

J2320 Power System	18
J2350 Power System	18
J2320 and J2350 Cooling System	19
J4350 and J6350 Services Router Hardware Features	20
J4350 and J6350 Chassis	21
J4350 and J6350 Midplane	25
J4350 and J6350 Routing Engine Hardware	25
J4350 and J6350 Boot Devices	25
J4350 and J6350 Front Panel	26
Physical Interface Modules (PIMs)	26
Power Button and POWER LED	27
STATUS LED	27
ALARM LED	28
HA LED	29
RESET CONFIG Button	29
Built-In Gigabit Ethernet Ports	29
Console Port	30
AUX Port	30
USB Port	30
J4350 Power System	30
J6350 Power System	31
J4350 and J6350 Cooling System	32

Chapter 3

PIM Overview

35

PIM Terms	35
Field-Replaceable PIMs	38
J2320 and J2350 Field-Replaceable PIM and Module Summary	38
J4350 and J6350 Field-Replaceable PIM Summary	39
1-Port, 6-Port, 8-Port, and 16-Port Gigabit Ethernet uPIMs	41
1-Port Gigabit Ethernet ePIMs	44
Dual-Port Serial PIM	47
Dual-Port T1 or E1 PIM	48
Dual-Port Channelized T1/E1/ISDN PRI PIM	49
T3 or E3 PIM	51
Dual-Port Fast Ethernet PIM	53
4-Port Fast Ethernet ePIM	54
4-Port ISDN BRI PIMs	55
ADSL PIM	56
G.SHDSL PIM	58

Part 2**Installing a Services Router**

Chapter 4**Preparing for Router Installation****63**

General Site Guidelines	63
Rack Requirements	64
Rack Size and Strength for J2320 and J2350 Routers	64
Rack Size and Strength for J4350 and J6350 Routers	65
Connection to Building Structure	65
Router Environmental Tolerances	66
Fire Safety Requirements	66
Fire Suppression	66
Fire Suppression Equipment	67
Power Guidelines, Requirements, and Specifications	67
Site Electrical Wiring Guidelines	68
Signaling Limitations	68
Radio Frequency Interference	68
Electromagnetic Compatibility	68
Router Power Requirements	69
AC Power, Connection, and Power Cord Specifications	69
DC Power, Connection, and Power Cable Specifications	71
Planning for Power Management	72
Network Cable Specifications	74
ISDN Provisioning	74
Site Preparation Checklist	75

Chapter 5**Installing and Connecting a Services Router****77**

Before You Begin	77
Unpacking a J-series Services Router	78
Installing J2320 and J2350 Routers	79
Installing J4350 and J6350 Routers	80
Connecting Interface Cables to Services Routers	83
Chassis Grounding	83
Connecting Power	84
Connecting AC Power	84
Connecting DC Power	86
Powering a Services Router On and Off	89

Chapter 6**Establishing Basic Connectivity****91**

Basic Connectivity Terms	91
Basic Connectivity Overview	92
Router Identification	92
Root Password	92
Time Zone and System Time	93
Network Settings	93
Default Gateway	93
Backup Router	94

Loopback Address	94
Built-In Ethernet Interface Address	94
Management Access	95
Before You Begin	95
Connecting to a Services Router	96
Connecting to the J-Web Interface	97
Connecting to the CLI Locally	98
Connecting to the CLI Remotely	100
Configuring the Modem at the Router End	101
Connecting the Modem to the Console Port	102
Connecting to the CLI at the User End	102
Configuring Basic Settings with J-Web Quick Configuration	103
Configuring Basic Settings Using the CLI Configuration Wizard	106
About the CLI Configuration Wizard	106
Using the JUNOS Software with Enhanced Services Configuration Wizard	107
Configuring Basic Settings with a Configuration Editor	110
Verifying Basic Connectivity and the Configuration	113
Displaying Basic Connectivity Configurations	114

Chapter 7	Installing JUNOS Software with Enhanced Services	115
------------------	---	------------

Part 3	Maintaining Services Router Hardware
---------------	---

Chapter 8	Replacing Hardware Components	119
------------------	--------------------------------------	------------

Tools and Parts Required	119
Replacing the Console Port Cable	120
Replacing a PIM	120
Removing a PIM	120
Installing a PIM	122
Replacing PIM Cables	123
Removing PIM Cables	123
Installing PIM Cables	123
Removing and Replacing the Chassis Cover on J2320 and J2350 Routers	124
Replacing Internal Compact Flashes on J2320 and J2350 Routers	126
Replacing Internal Compact Flashes on J4350 and J6350 Routers	129
Replacing External Compact Flashes	132
Replacing USB Storage Devices	134
Removing the USB Storage Device	134
Installing the USB Storage Device	135
Replacing DRAM Modules	136
Removing a DRAM Module	137
Installing a DRAM Module	138
Replacing Power System Components	139
Replacing AC Power Supply Cords	139
Removing an AC Power Supply from J6350 Routers	140
Installing an AC Power Supply in J6350 Routers	141

Replacing DC Power Supply Cables	142
Removing a DC Power Supply	143
Installing a DC Power Supply	144
Replacing Crypto Accelerator Modules on J2320 and J2350 Routers	146
Removing a J2320 or J2350 Crypto Accelerator Module	147
Installing a J2320 or J2350 Crypto Accelerator Module	148
Replacing Crypto Accelerator Modules on J4350 and J6350 Routers	149
Removing a J4350 or J6350 Crypto Accelerator Module	150
Installing a J4350 or J6350 Crypto Accelerator Module	152
Replacing Air Filters on J2350 Routers	153
Replacing Air Filters on J4350 and J6350 Routers	154

Chapter 9

Troubleshooting a Services Router 157

Troubleshooting Hardware Components	157
Monitoring and Correcting Chassis Alarm Conditions	157
Troubleshooting Power Management	159
Resetting the Configuration File When the Router Is Inaccessible	160
Using the RESET CONFIG Button	160
Changing the RESET CONFIG Button Behavior	161
Recovering the Root Password	161
Recovering Primary Boot Devices	164
Why Compact Flash Recovery Might Be Necessary	164
Recommended Recovery Hardware and Software	164
Configuring Internal Compact Flash Recovery	165
Contacting the Juniper Networks Technical Assistance Center	167

Chapter 10

Contacting Customer Support and Returning Hardware 169

Locating Component Serial Numbers	169
J2320 and J2350 Chassis Serial Number and Agency Labels	170
J4350 and J6350 Chassis Serial Number and Agency Labels	171
PIM Serial Number Label	172
Power Supply Serial Number Labels	172
Contacting Customer Support	172
Information You Might Need to Supply to JTAC	172
Return Procedure	172
Packing a Router or Component for Shipment	173
Tools and Parts Required	173
Packing the Services Router for Shipment	174
Packing Components for Shipment	174

Part 4**J-series Requirements and Specifications**

Chapter 11**Network Cable Specifications and Connector Pinouts****179**

Serial PIM Cable Specifications	179
RS-232 DTE Cable Pinout	180
RS-232 DCE Cable Pinout	181
RS-422/449 (EIA-449) DTE Cable Pinout	181
RS-422/449 (EIA-449) DCE Cable Pinout	183
EIA-530A DTE Cable Pinout	184
EIA-530A DCE Cable Pinout	185
V.35 DTE Cable Pinout	186
V.35 DCE Cable Pinout	187
X.21 DTE Cable Pinout	187
X.21 DCE Cable Pinout	188
Fast Ethernet RJ-45 Connector Pinout	189
Gigabit Ethernet uPIM RJ-45 Connector Pinout	189
Gigabit Ethernet ePIM RJ-45 Connector Pinout	190
Chassis Console Port Pinouts	190
E1 and T1 RJ-48 Cable Pinouts	191
E3 and T3 BNC Connector Pinout	194
ADSL and G.SHDSL RJ-11 Connector Pinout	194
ISDN RJ-45 Connector Pinout	195

Chapter 12**Safety and Regulatory Compliance Information****197**

Definition of Safety Warning Levels	197
Safety Guidelines and Warnings	199
General Safety Guidelines and Warnings	199
Qualified Personnel Warning	200
Preventing Electrostatic Discharge Damage	201
Electrical Safety Guidelines and Warnings	201
General Electrical Safety Guidelines	202
AC Power Electrical Safety Guidelines	203
DC Power Electrical Safety Guidelines	204
Power Sources for Redundant Power Supplies	205
DC Power Disconnection Warning	205
DC Power Grounding Requirements and Warning	206
DC Power Wiring Sequence Warning	207
DC Power Wiring Terminations Warning	209
Grounded Equipment Warning	210
Warning Statement for Norway and Sweden	211
In Case of Electrical Accident	211
Multiple Power Supplies Disconnection Warning	211
Power Disconnection Warning	213
TN Power Warning	214
Telecommunication Line Cord Warning	215

Installation Safety Guidelines and Warnings	216
Chassis Lifting Guidelines	216
Installation Instructions Warning	216
Rack-Mounting Requirements and Warnings	217
Ramp Warning	221
Laser and LED Safety Guidelines and Warnings	221
General Laser Safety Guidelines	222
Class 1 Laser Product Warning	222
Class 1 LED Product Warning	222
Laser Beam Warning	223
Radiation from Open Port Apertures Warning	224
Maintenance and Operational Safety Guidelines and Warnings	225
Battery Handling Warning	226
Jewelry Removal Warning	227
Lightning Activity Warning	228
Operating Temperature Warning	229
Product Disposal Warning	231
Agency Approvals	232
Compliance Statements for Environmental Requirements	233
Lithium Battery	233
Compliance Statements for EMC Requirements	233
Canada	233
European Community	235
Japan	236
United States	237
FCC Part 15 Statement	237
FCC Part 68 Statement	237

Part 5

Index

Index	241
-------------	-----

About This Guide

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

- Objectives on page xvii
- Audience on page xvii
- Supported Routing Platforms on page xviii
- How to Use This Manual on page xviii
- Document Conventions on page xx
- List of Technical Publications on page xxii
- Documentation Feedback on page xxiii
- Requesting Technical Support on page xxiii

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 9.3 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 xviii 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 xviii, see “List of Technical Publications” on page xxii. 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	J-series Services Routers:
■ Installing hardware and establishing basic connectivity	■ <i>JUNOS Software with Enhanced Services Quick Start</i>
■ Initially setting up a device	■ <i>JUNOS Software with Enhanced Services Hardware Guide</i>
	■ <i>JUNOS Software with Enhanced Services Release Notes</i>
	SRX-series services gateways: the appropriate <i>Services Gateway Getting Started Guide</i>
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	<i>JUNOS Software with Enhanced Services Migration Guide</i> (J-series Services Routers only)
■ Migrating from ScreenOS Release 5.4 or later JUNOS software with enhanced services	
Context—Changing to Secure Context or Router Context	
Changing the device from one context to another and understanding the factory default settings	<i>JUNOS Software Administration Guide</i>
Interface Configuration	

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

Task	Related Documentation
Configuring device interfaces	<ul style="list-style-type: none"> ■ <i>JUNOS Software Interfaces and Routing Configuration Guide</i> ■ <i>JUNOS Software CLI Reference</i>
Deployment Planning and Configuration	
<ul style="list-style-type: none"> ■ Understanding and gathering information required to design network firewalls and IPsec VPNs ■ Implementing a JUNOS software with enhanced services firewall from a sample scenario ■ Implementing a policy-based IPsec VPN from a sample scenario 	<i>JUNOS Software with Enhanced Services Design and Implementation Guide</i> (J-series Services Routers only)
Security Configuration	
Configuring and managing the following security services:	<ul style="list-style-type: none"> ■ <i>JUNOS Software Security Configuration Guide</i> ■ <i>JUNOS Software CLI Reference</i>
<ul style="list-style-type: none"> ■ Stateful firewall policies ■ Zones and their interfaces and address books ■ IPsec VPNs ■ Firewall screens ■ Interface modes: Network Address Translation (NAT) mode and Router mode ■ Public Key Cryptography (PKI) ■ Application Layer Gateways (ALGs) ■ Chassis clusters ■ Intrusion Detection and Prevention (IDP) 	
Routing Protocols and Services Configuration	
<ul style="list-style-type: none"> ■ Configuring routing protocols, including static routes and the dynamic routing protocols RIP, OSPF, BGP, and IS-IS ■ Configuring class-of-service (CoS) features, including traffic shaping and policing ■ Configuring packet-based stateless firewall filters (access control lists) to control access and limit traffic rates ■ Configuring MPLS to control network traffic patterns 	<ul style="list-style-type: none"> ■ <i>JUNOS Software Interfaces and Routing Configuration Guide</i> ■ <i>JUNOS Software CLI Reference</i>
WAN Acceleration Module Installation (Optional)	
Installing and initially configuring a WXC Integrated Services Module (ISM 200)	<i>WXC Integrated Services Module Installation and Configuration Guide</i> (J-series Services Routers only)
User and System Administration	

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

Task	Related Documentation
<ul style="list-style-type: none"> ■ Administering user authentication and access ■ Monitoring the device, routing protocols, and routing operations ■ Configuring and monitoring system alarms and events, real-time performance (RPM) probes, and performance ■ Monitoring the firewall and other security-related services ■ Managing system log files ■ Upgrading software ■ Diagnosing common problems 	<i>JUNOS Software Administration Guide</i>
User Interfaces	
<ul style="list-style-type: none"> ■ Understanding and using the J-Web interface ■ Understanding and using the CLI configuration editor 	<ul style="list-style-type: none"> ■ <i>JUNOS Software with Enhanced Services Quick Start</i> (J-series Services Routers only) ■ <i>JUNOS Software Administration Guide</i>

Document Conventions

Table 2 on page xx 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 xx 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: 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.	<code>user@host> show chassis alarms</code> <code>No alarms currently active</code>
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>JUNOS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Plain text like this	Represents names of configuration statements, commands, files, and directories; IP addresses; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
; (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.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. 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 .

List of Technical Publications

The following sections list hardware and software guides and release notes for J-series Services Routers running JUNOS software with enhanced services.

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

- | | |
|------------------------|--|
| Hardware Guides | <ul style="list-style-type: none"> ■ <i>JUNOS Software with Enhanced Services Quick Start</i>—Explains how to quickly set up a J-series Services Router. This document contains router declarations of conformity. ■ <i>JUNOS Software with Enhanced Services Hardware Guide</i>—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. |
| Software Guides | <ul style="list-style-type: none"> ■ <i>JUNOS Software Interfaces and Routing Configuration Guide</i>—Explains how to configure SRX-series and J-series interfaces for basic IP routing with standard routing protocols, ISDN service, firewall filters (access control lists), and class-of-service (CoS) traffic classification. ■ <i>JUNOS Software Security Configuration Guide</i>—Explains how to configure and manage SRX-series and J-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). ■ <i>JUNOS Software Administration Guide</i>—Shows how to monitor SRX-series and J-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. ■ <i>JUNOS Software CLI Reference</i>—Provides the complete configuration hierarchy available on SRX-series and J-series devices. This guide also describes the configuration statements and operational mode commands unique to these devices. ■ <i>JUNOS Network Management Configuration Guide</i>—Describes enterprise-specific MIBs for JUNOS software. The information in this guide is applicable to M-series, T-series, EX-series, SRX-series, and J-series devices. ■ <i>JUNOS System Log Messages Reference</i>—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, SRX-series, and J-series devices. |

- *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 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.
- Release Notes** ■ *JUNOS Software with Enhanced Services Release Notes*—Summarizes new features and known problems for J-series Services Routers and the JUNOS software running on those routers. The release notes also contain corrections and updates to the manuals and software upgrade and downgrade instructions.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

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

Requesting Technical Support

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

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the JTAC User Guide located at <http://www.juniper.net/customers/support/downloads/710059.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC Hours of Operation —The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

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

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base:
<http://kb.juniper.net/>
- Download the latest versions of software and review release notes:
<http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications:
<https://www.juniper.net/alerts/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool located at <https://tools.juniper.net/SerialNumberEntitlementSearch/>.

Opening a Case with JTAC

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

- Use the Case Management 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

- Overview of Services Routers on page 3
- J-series Services Router Hardware Features on page 7
- PIM Overview on page 35

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 on page 3
- J2350 Services Router Overview on page 4
- J4350 Services Router Overview on page 5
- J6350 Services Router Overview on page 6

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 on page 7
- J4350 and J6350 Services Router Hardware Features on page 20

J2320 and J2350 Services Router Hardware Features

This section contains the following topics:

- J2320 and J2350 Chassis on page 8
- J2320 and J2350 Midplane on page 12
- J2320 and J2350 Routing Engine Hardware on page 12
- J2320 and J2350 Boot Devices on page 12
- J2320 and J2350 Front Panel on page 13
- J2320 and J2350 External Compact Flashes on page 18
- J2320 Power System on page 18
- J2350 Power System on page 18
- J2320 and J2350 Cooling System on page 19

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.



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.

Figure 1: Front of J2320 Chassis

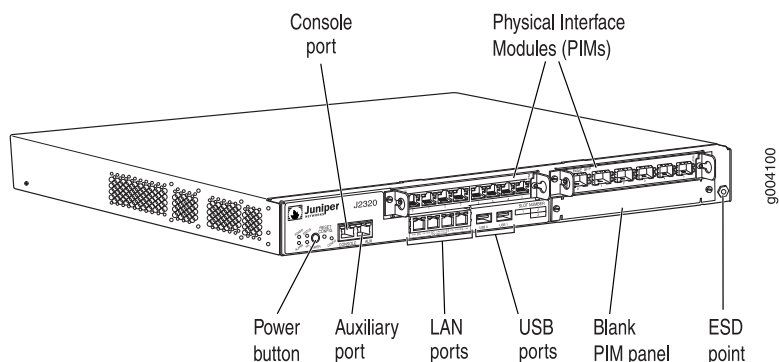


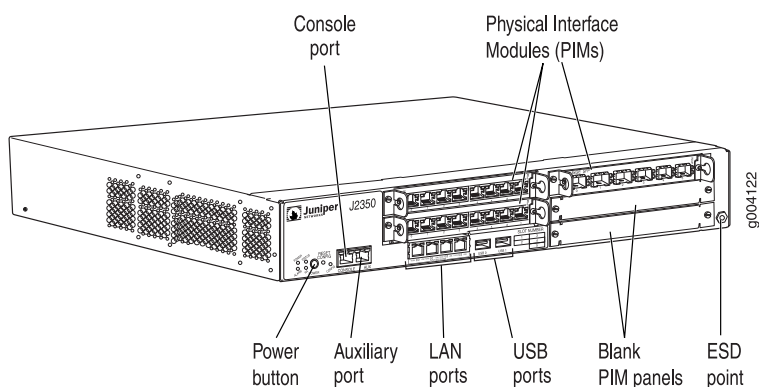
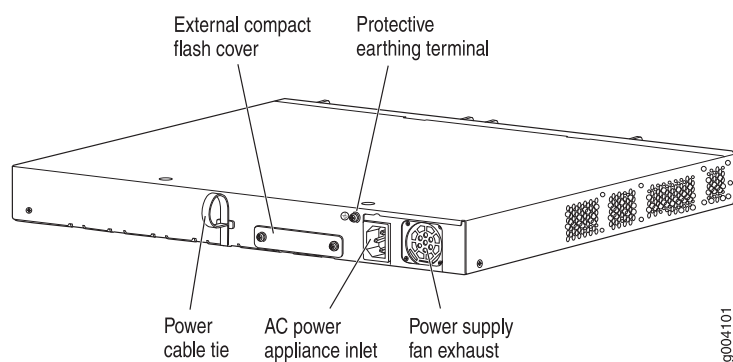
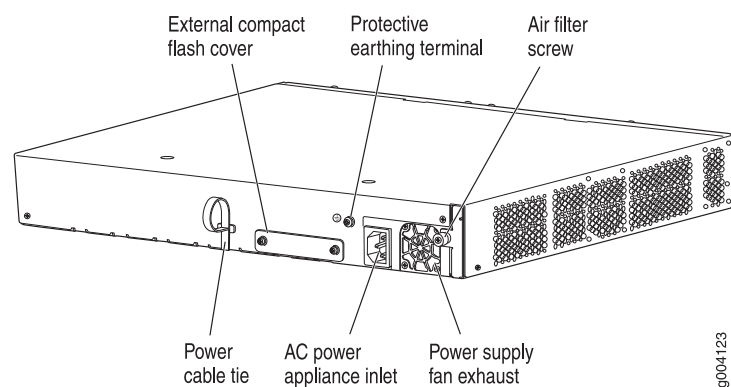
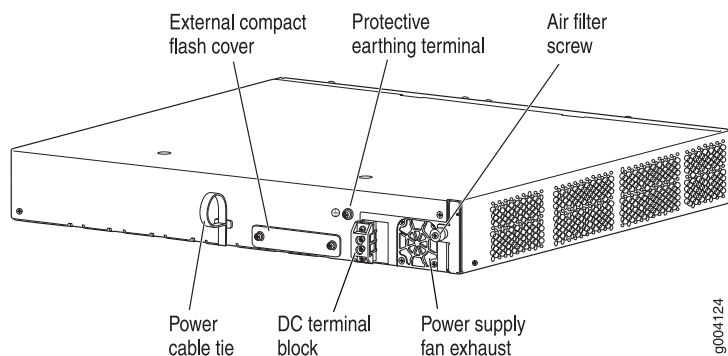
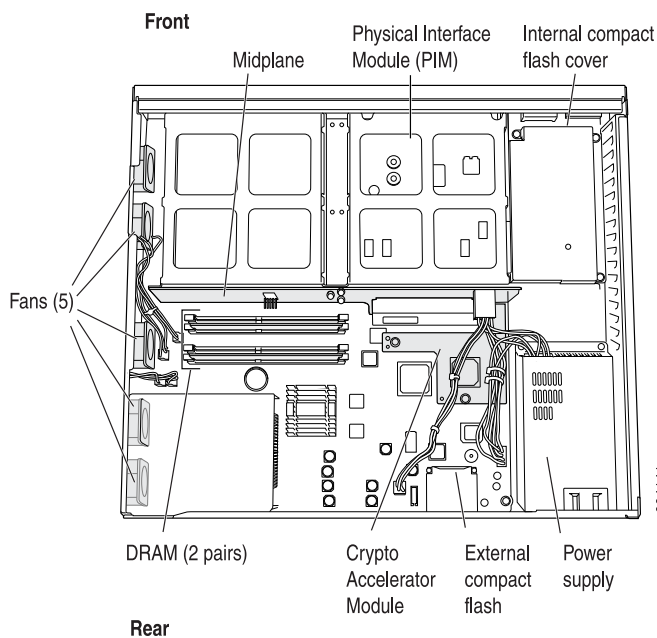
Figure 2: Front of J2350 Chassis**Figure 3: Rear of J2320 Chassis****Figure 4: Rear of J2350 AC-Powered Chassis**

Figure 5: Rear of J2350 DC-Powered Chassis



g004124

Figure 6: J2320 Hardware Components



g004141

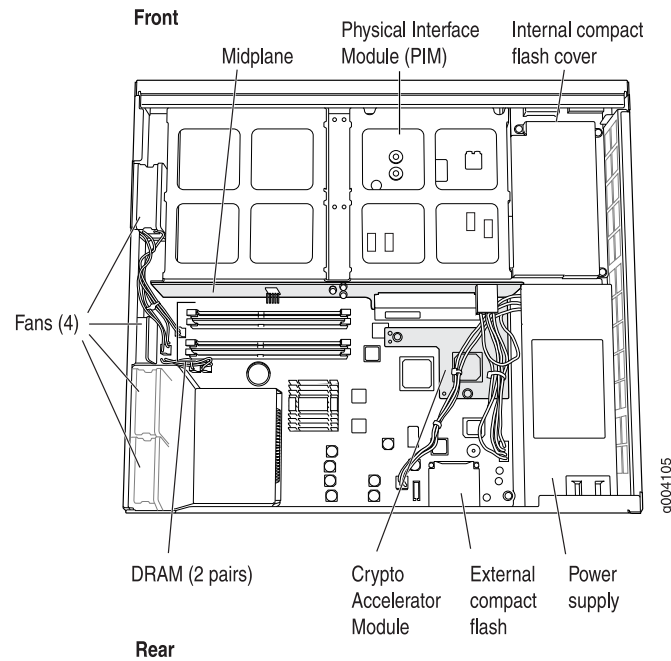
Figure 7: J2350 Hardware Components

Table 4 on page 11 summarizes the physical specifications for the router chassis.

Table 4: J2320 and J2350 Physical Specifications

Description	Value
Chassis dimensions	<ul style="list-style-type: none"> ■ J2320 Services Router <ul style="list-style-type: none"> ■ 1.75 in. (4.45 cm) high ■ 17.51 in. (44.48 cm) wide—18.9 in. (48.01 cm) wide with mounting brackets attached ■ 15.1 in. (38.35 cm) deep—plus 0.78 in. (1.98 cm) of hardware that protrudes from the chassis front ■ J2350 Services Router <ul style="list-style-type: none"> ■ 2.61 in. (6.63 cm) high ■ 17.51 in. (44.48 cm) wide—18.9 in. (48.01 cm) wide with mounting brackets attached ■ 15.1 in. (38.35 cm) deep—plus 0.78 in. (1.98 cm) of hardware that protrudes from the chassis front
Router weight	<ul style="list-style-type: none"> ■ J2320 Services Router <ul style="list-style-type: none"> ■ Minimum (no PIMs): 14.8 lbs (6.7 kg) ■ Maximum (three PIMs): 15.9 lbs (7.2 kg) ■ J2350 Services Router <ul style="list-style-type: none"> ■ Minimum (no PIMs): 16.3 lbs (7.4 kg) ■ 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

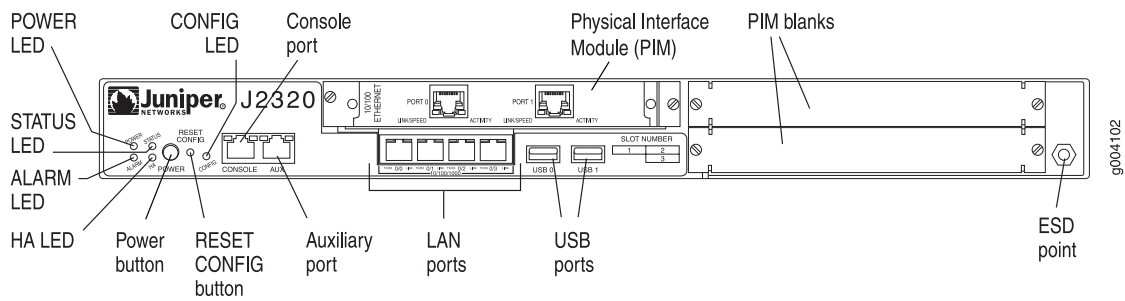
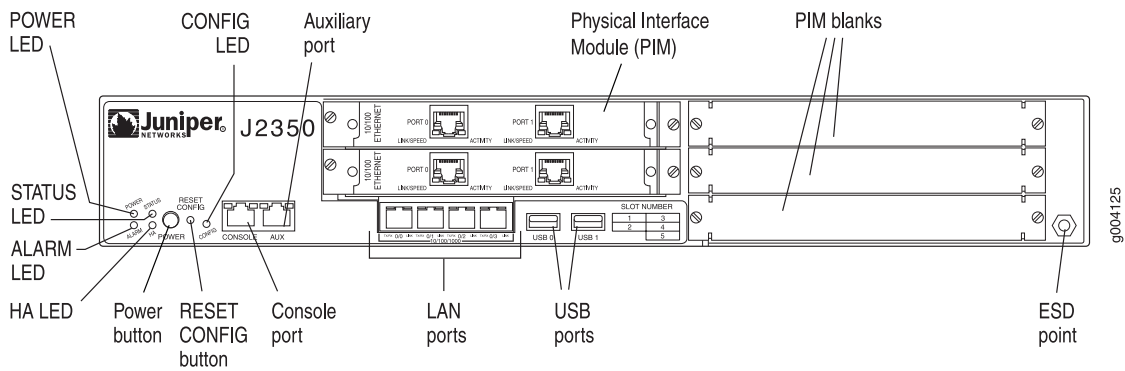


Figure 9: Front of J2350 Chassis



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)

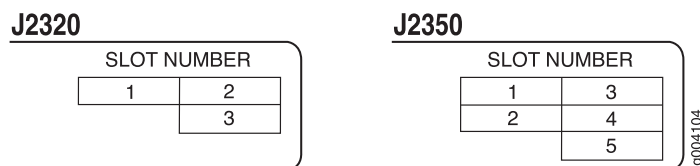
Physical Interface Modules (PIMs) provide the physical connection to various network media types. For information about individual PIMs, see “Field-Replaceable PIMs” on page 38.

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 5 on page 14 describes the POWER LED.

Table 5: 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 6 on page 15 describes the **STATUS** LED.

Table 6: 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 7 on page 15 describes the **ALARM** LED.

Table 7: J2320 and J2350 ALARM LED

Color	State	Description
Red	On steadily	<p>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:</p> <ul style="list-style-type: none"> ■ One or more hardware components have failed. ■ One or more hardware components have exceeded temperature thresholds. ■ An alarm condition configured on an interface has triggered a critical warning.

Table 7: J2320 and J2350 ALARM LED *(continued)*

Color	State	Description
Yellow	On steadily	Minor alarm condition requires monitoring or maintenance: <ul style="list-style-type: none"> ■ Indicates a noncritical condition on the router that, if left unchecked, might cause an interruption in service or degradation in performance. ■ 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 8 on page 16 describes the HA LED.

Table 8: 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 9 on page 17 describes the built-in Ethernet port LEDs.

Table 9: 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

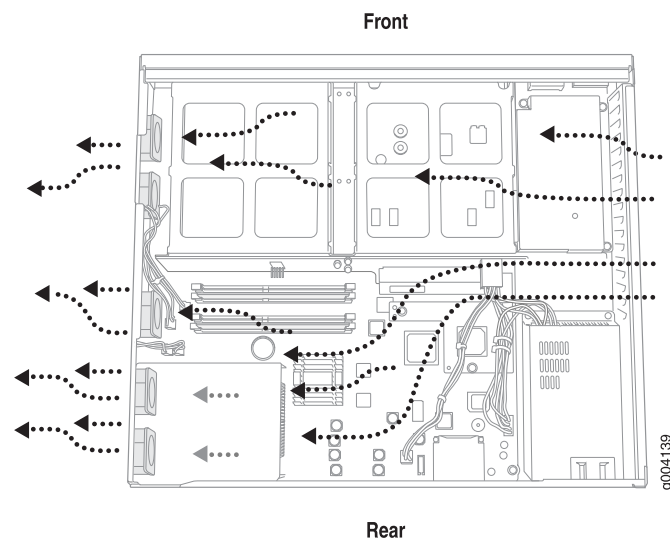
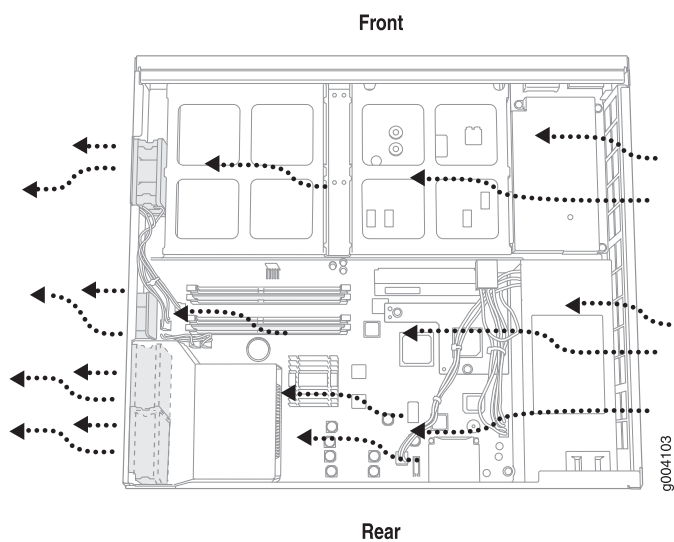
The cooling system in J2320 and J2350 routers is from side to side. The J2320 router has five cooling fans and the J2350 router has four cooling fans. The fans draw air through vents along the left side of the chassis and exhaust it through vents on the right side of the chassis. The airflow produced 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:

- J4350 and J6350 Chassis on page 21
- J4350 and J6350 Midplane on page 25
- J4350 and J6350 Routing Engine Hardware on page 25
- J4350 and J6350 Boot Devices on page 25
- J4350 and J6350 Front Panel on page 26
- J4350 Power System on page 30

- 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:

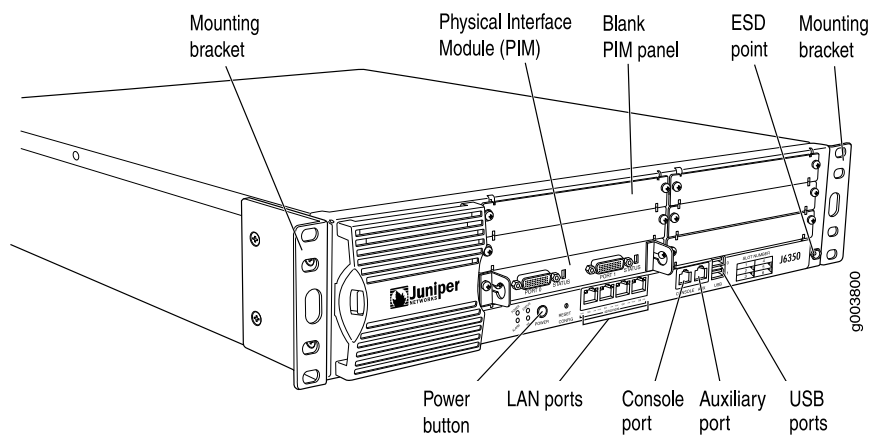
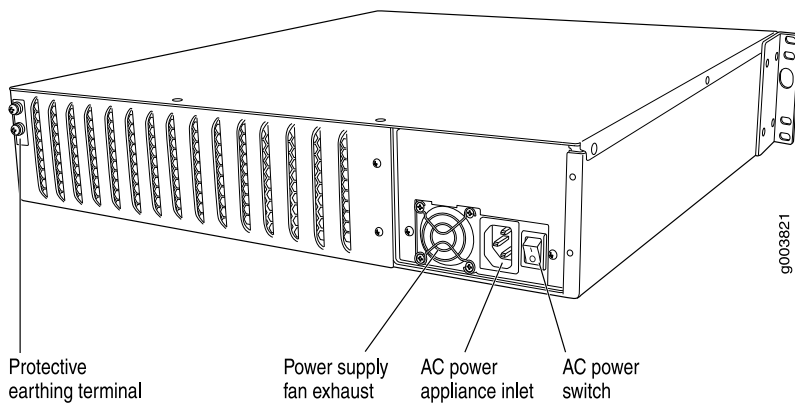
- Mounting brackets—One pair of metal brackets can be mounted at the front or center of the chassis. Use the brackets for mounting the chassis in a rack or cabinet.
- Earthing terminals—Two protective earthing terminals, PEM nuts at the rear of the chassis ensure safe dissipation of static electricity 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).

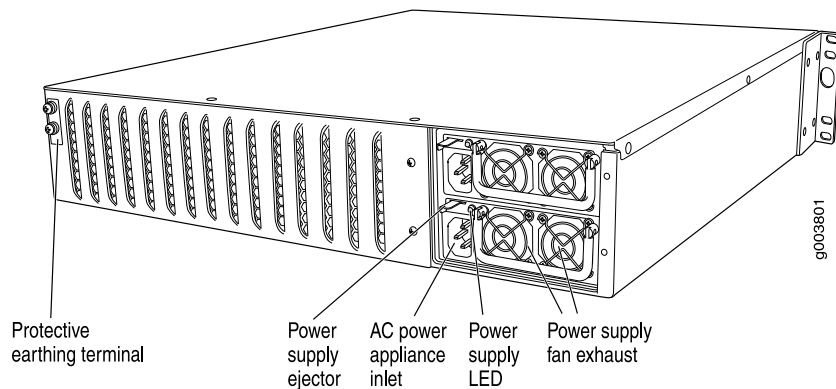
Figure 15: Rear of J6350 AC-Powered Chassis

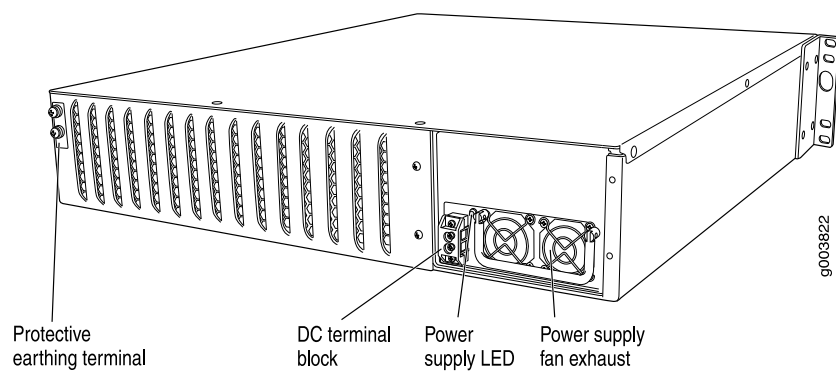
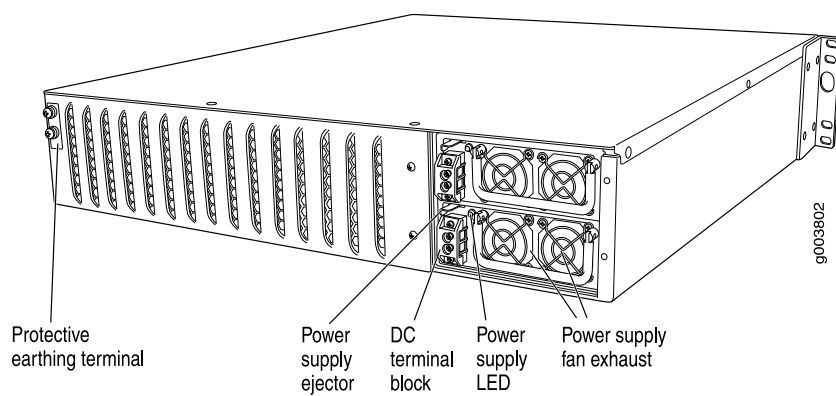
Figure 16: Rear of J4350 DC-Powered Chassis**Figure 17: Rear of DC-Powered J6350 Chassis**

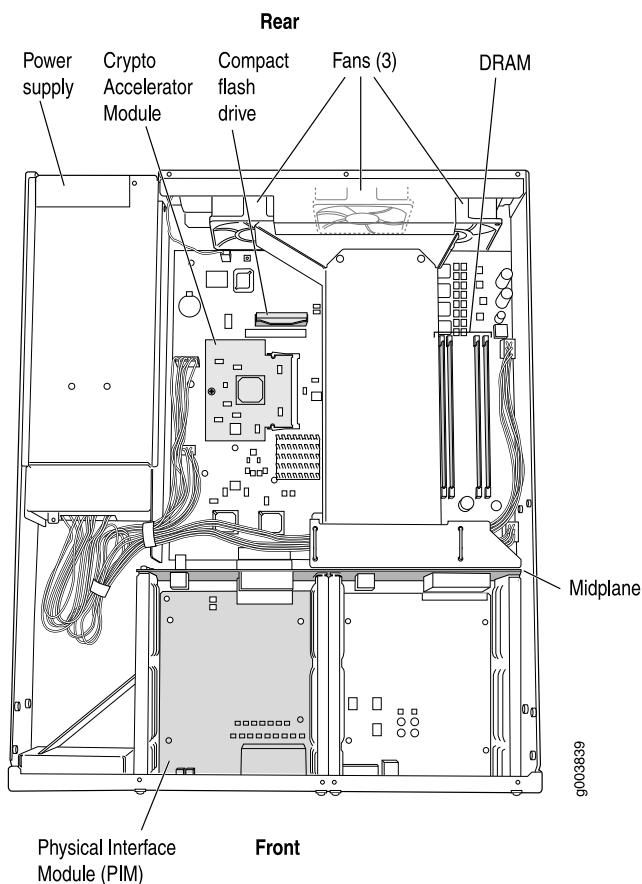
Figure 18: J4350 and J6350 Hardware Components

Table 10 on page 24 summarizes the physical specifications for the router chassis.

Table 10: J4350 and J6350 Physical Specifications

Description	Value
Chassis dimensions	<ul style="list-style-type: none"> ■ 3.44 in. (8.74 cm) high ■ 17.44 in. (44.3 cm) wide—19.44 in. (48.38 cm) wide with mounting brackets attached ■ 21.13 in. (53.67 cm) deep—plus 0.5 in. (1.27 cm) of hardware that protrudes from the chassis front
Router weight	<ul style="list-style-type: none"> ■ J4350 Services Router: <ul style="list-style-type: none"> ■ Minimum (no PIMs): 23 lb (10.4 kg) ■ Maximum (six PIMs): 25.3 lb (11.5 kg) ■ J6350 Services Router <ul style="list-style-type: none"> ■ Minimum (no PIMs and one power supply): 25.5 lb (11.6 kg) ■ 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:

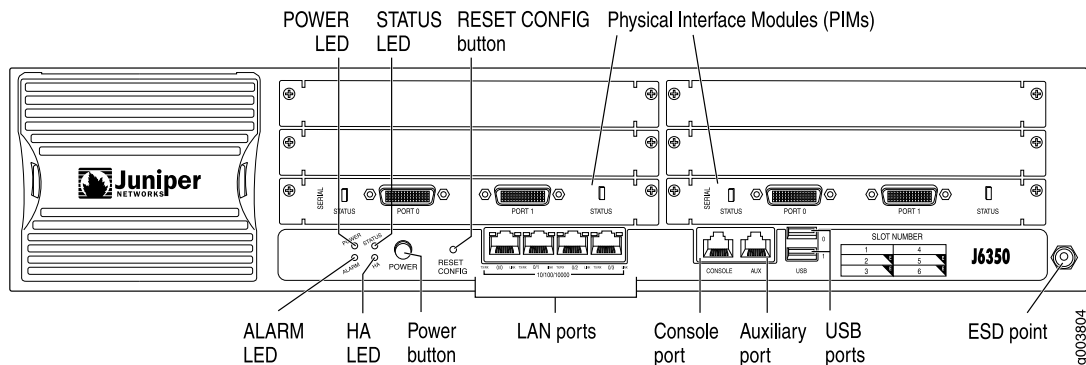
- Internal compact flash
- USB storage device

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:

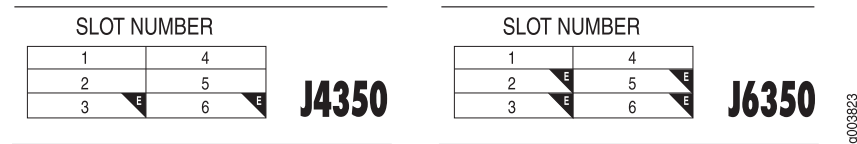
- Physical Interface Modules (PIMs) on page 26
- Power Button and POWER LED on page 27
- STATUS LED on page 27
- ALARM LED on page 28
- HA LED on page 29
- RESET CONFIG Button on page 29
- Built-In Gigabit Ethernet Ports on page 29
- Console Port on page 30
- AUX Port on page 30
- USB Port on page 30

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 11 on page 27 describes the **POWER** LED.

Table 11: 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 12 on page 28 describes the **STATUS LED**.

Table 12: 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 13 on page 28 describes the **ALARM LED**.

Table 13: 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: <ul style="list-style-type: none"> ■ One or more hardware components have failed. ■ One or more hardware components have exceeded temperature thresholds. ■ An alarm condition configured on an interface has triggered a critical warning.
Yellow	On steadily	Minor alarm condition requires monitoring or maintenance: <ul style="list-style-type: none"> ■ Indicates a noncritical condition on the router that, if left unchecked, might cause an interruption in service or degradation in performance. ■ 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 14 on page 29 describes the HA LED.

Table 14: 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 15 on page 29 describes the built-in Ethernet port LEDs.

Table 15: Gigabit Ethernet Port LEDs

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

Table 15: 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 16 on page 31 describes the power supply LED.

Table 16: 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 16 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.

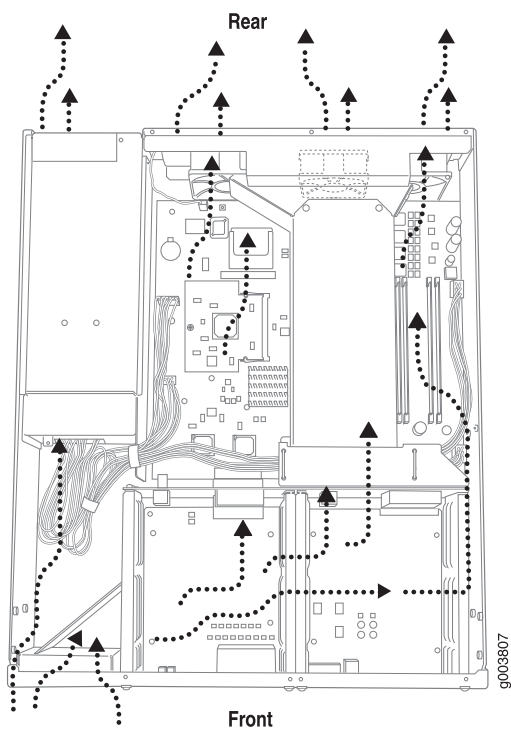
The Routing Engine monitors the temperature of the router components. If the maximum temperature specification, as measured at the CPU junction, is exceeded and the router cannot be adequately cooled, the Routing Engine shuts down the hardware components.

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/jservice/>.

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 on page 35
- Field-Replaceable PIMs on page 38

PIM Terms

To understand PIM, become familiar with the terms defined in Table 17 on page 36.

Table 17: 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 <i>dial-in</i> .
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). 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 <i>callback</i> .

Table 17: 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 <i>dial-on-demand routing backup</i> ; <i>floating static route</i> .
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 <i>dialer filter</i> ; <i>dialer watch</i> .
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 <i>dial-on-demand routing backup</i> .
“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 known 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 on page 38
- J4350 and J6350 Field-Replaceable PIM Summary on page 39
- 1-Port, 6-Port, 8-Port, and 16-Port Gigabit Ethernet uPIMs on page 41
- 1-Port Gigabit Ethernet ePIMs on page 44
- Dual-Port Serial PIM on page 47
- Dual-Port T1 or E1 PIM on page 48
- Dual-Port Channelized T1/E1/ISDN PRI PIM on page 49
- T3 or E3 PIM on page 51
- Dual-Port Fast Ethernet PIM on page 53
- 4-Port Fast Ethernet ePIM on page 54
- 4-Port ISDN BRI PIMs on page 55
- ADSL PIM on page 56
- G.SHDSL PIM on page 58

J2320 and J2350 Field-Replaceable PIM and Module Summary

Table 18 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 18: 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: <ul style="list-style-type: none"> ■ 0 ■ 0 through 5 ■ 0 through 7 ■ 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 or 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 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)	Release 8.5 and later of JUNOS software with enhanced services	Ports—0	wx-1/0/0
NOTE: This module is not supported on J2320 routers.			

J4350 and J6350 Field-Replaceable PIM Summary

Table 19 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 19: 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 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 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 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 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: <ul style="list-style-type: none"> ■ J4350: Slots 3 and 6 Port—0 ■ J6350: Slots 2, 3, 5, and 6 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 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 Ports—0 and 1	t1-0/0/1 or 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 Port—0 and 1	ct1-0/0/0 ce1-0/0/0

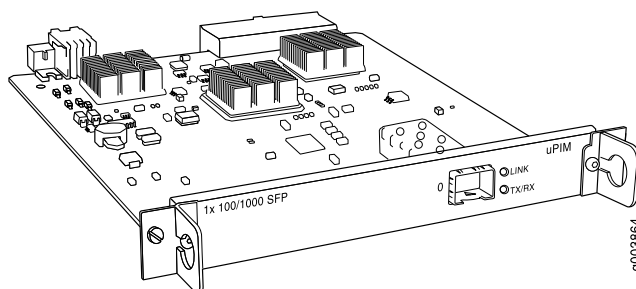
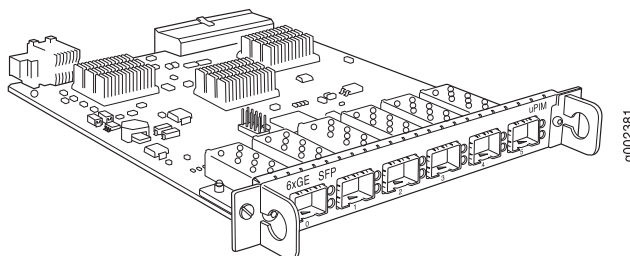
Table 19: J4350 and J6350 Field-Replaceable PIM and Module Summary (continued)

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 Port—0	t3-0/0/0 or e3-2/0/0
Dual-Port Fast Ethernet PIM	Release 8.5 and later of JUNOS software with enhanced services	Slots—1 through 6 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: <ul style="list-style-type: none"> ■ J4350: Slots 3 and 6 Ports—0 through 3 ■ J6350: Slots 2, 3, 5, and 6 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 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 Port—0	at-2/0/0
G.SHDSL PIM	Release 8.5 and later of JUNOS software with enhanced services	Slots—1 through 6 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

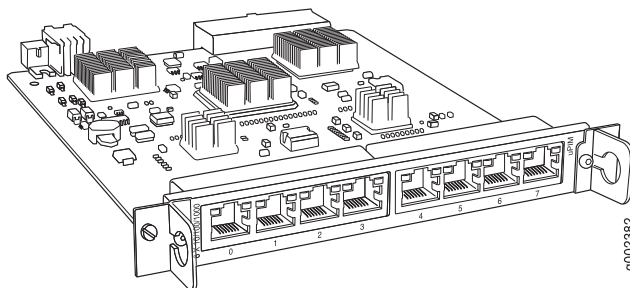
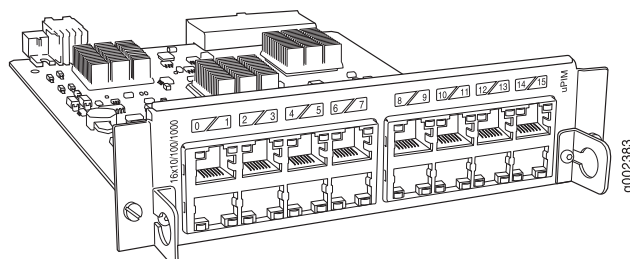
1-Port, 6-Port, 8-Port, and 16-Port Gigabit Ethernet uPIMs

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 21 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 20 on page 44 describes the meaning of the LEDs.

Table 20: 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 21 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.

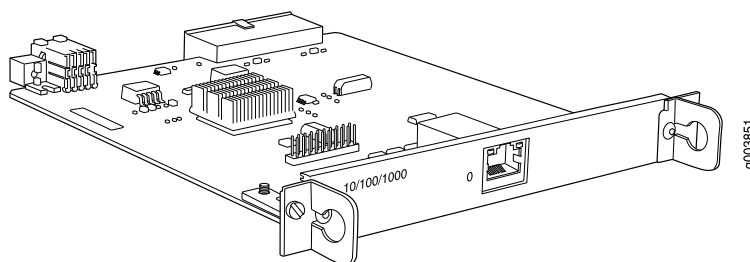
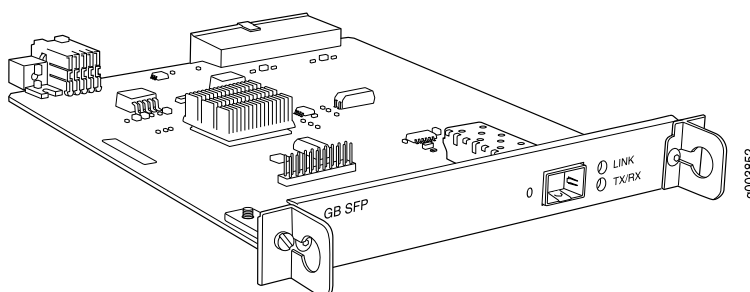
Table 21: Optical Interface Support for SFP Gigabit Ethernet uPIMs

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- μ m MMF cable	10 km (6.2 mi) on 9/125- μ m SMF cable
	200 m (656 ft) on 62.5/125- μ m MMF cable	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
		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 23 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 22 on page 46 describes the meaning of the LEDs.

Table 22: 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 23 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 23: Optical Interface Support for SFP Gigabit Ethernet ePIM

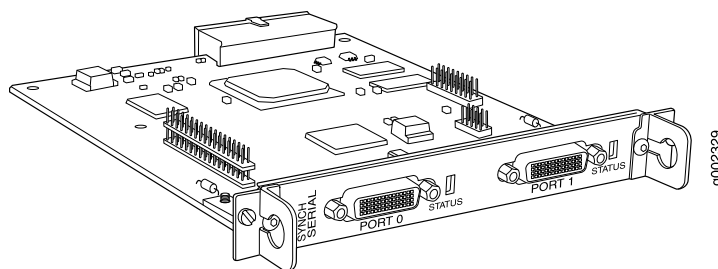
Parameter	1000Base-SX Transceiver	1000Base-LX Transceiver
Maximum distance	500 m (1640 ft) on 50/125-μm MMF cable	10 km (6.2 mi) on 9/125-μm SMF cable
	200 m (656 ft) on 62.5/125-μm MMF cable	550 m (1894 ft) on MMF cable
Transmitter wavelength	830 nm through 860 nm	1270 nm through 1355 nm

Table 23: 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 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 24 on page 48 describes the meaning of the LED states.

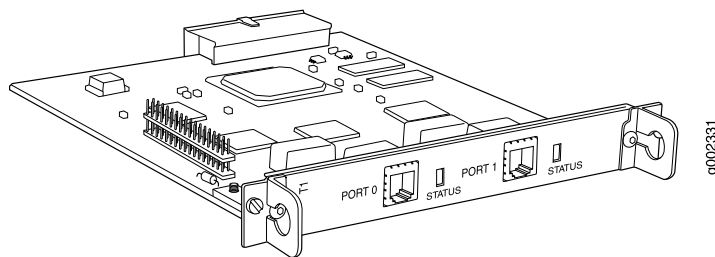
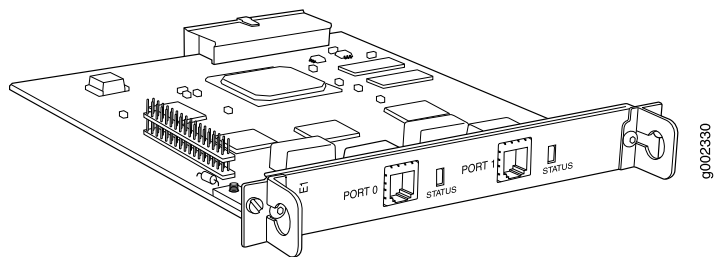
Table 24: Status LEDs for Serial Ports

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 25 on page 49 describes the meaning of the LED states.

Table 25: 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.

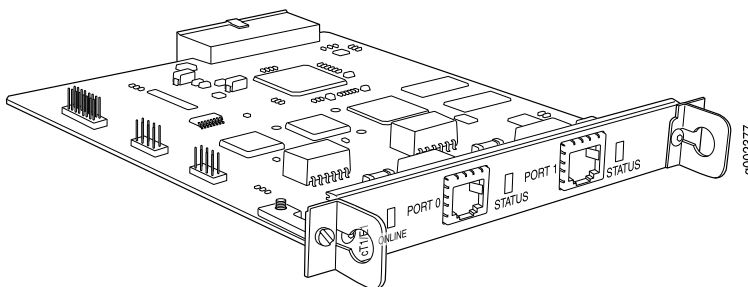
For alarms, see the configuring and monitoring alarms information in the *JUNOS Software Administration Guide*.

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 26 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 26: 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).

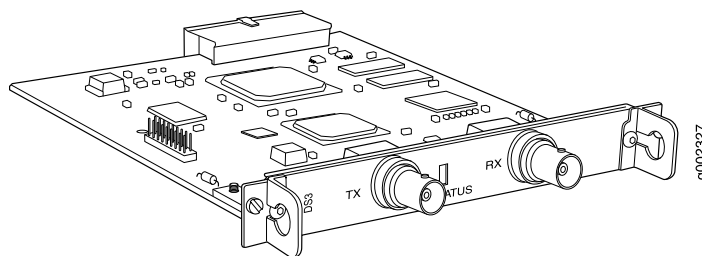
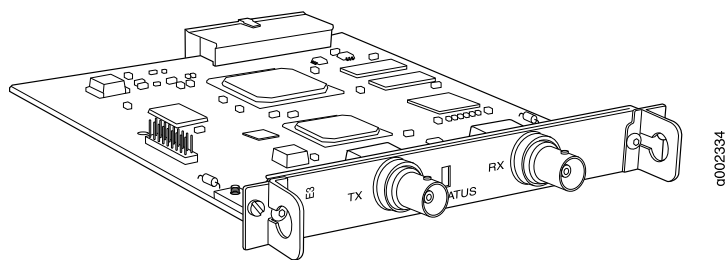
Figure 32: T3 PIM

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 27 on page 52 describes the meaning of the LED states.

Table 27: Status LEDs for T3 and E3 Ports

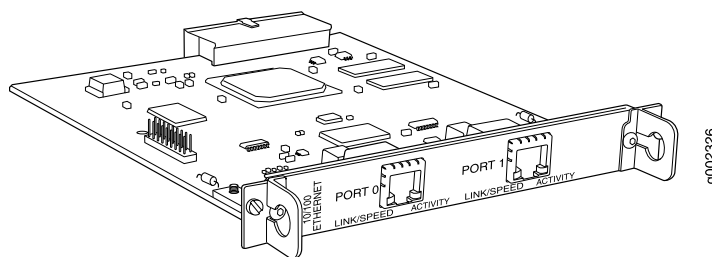
Color	State	Description
Green	On steadily	Online with no alarms or failures.
Red	On steadily	Active with a local alarm. The router has detected a failure.
Yellow	On steadily	<ul style="list-style-type: none"> ■ Loopback mode. ■ T3 (DS3)—Remote endpoint is in red alarm failure. ■ E3—Remote defect indication (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 28 on page 53 describes the meaning of the LEDs.

Table 28: LEDs for Dual-Port Fast Ethernet PIM

Label	Color	State	Description
LINK/SPEED	Green (100 Mbps)	On steadily	Online and link is active.
	Yellow (10 Mbps)		
	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:

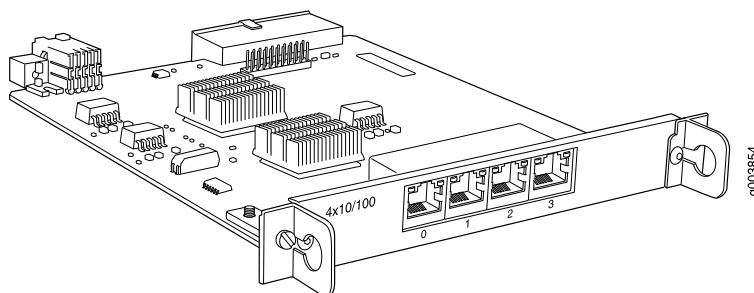
- J4350—Install up to two 4-Port Fast Ethernet ePIMs in slots 3 and 6.
- J6350—Install up to four 4-Port Fast Ethernet ePIMs in slots 2, 3, 5, and 6.



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 29 on page 55 describes the meaning of the LEDs.

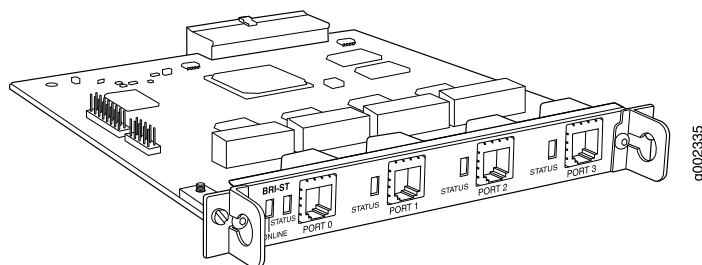
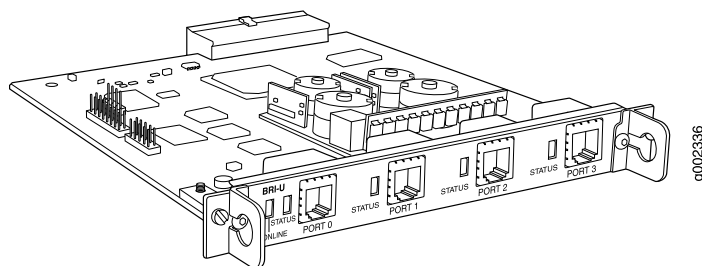
Table 29: LEDs for 4-Port Fast Ethernet ePIM

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 30 on page 56 describes the meaning of the LED states.

Table 30: 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	<ul style="list-style-type: none"> ■ ISDN Layer 1 is active. ■ ISDN Layer 2 is unavailable.
	Red	Disconnected	<ul style="list-style-type: none"> ■ BRI interface port is not connected. ■ 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

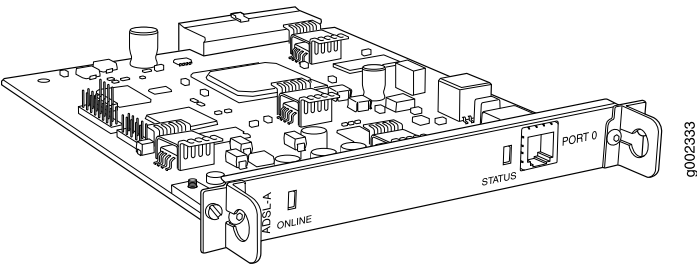
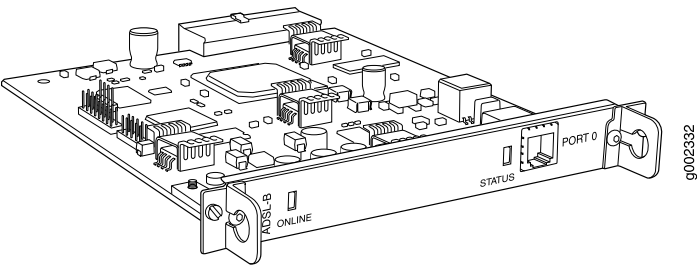


Figure 39: ADSL 2/2+ Annex B PIM



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 31 on page 57 describes the meaning of the LED states.

Table 31: LEDs for ADSL PIMs

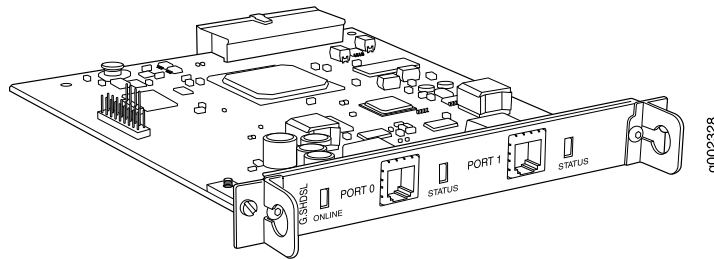
Label	Color	State	Description
ONLINE	Green	On steadily	PIM passed the self-test and is online and operational.
	Unlit	Off	PIM is offline.
STATUS	Green	On steadily	Online with no alarms or failures.
	Red	On steadily	Active with local or remote alarms. The router has detected a failure.

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 32 on page 59 describes the meaning of the LED states.

Table 32: 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

- Preparing for Router Installation on page 63
- Installing and Connecting a Services Router on page 77
- Establishing Basic Connectivity on page 91
- Installing JUNOS Software with Enhanced Services on page 115

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 on page 63
- Rack Requirements on page 64
- Router Environmental Tolerances on page 66
- Fire Safety Requirements on page 66
- Power Guidelines, Requirements, and Specifications on page 67
- Network Cable Specifications on page 74
- ISDN Provisioning on page 74
- Site Preparation Checklist on page 75

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 on page 64
- Rack Size and Strength for J4350 and J6350 Routers on page 65
- Connection to Building Structure on page 65

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.)



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 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 33 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 33: 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) 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	<ul style="list-style-type: none"> ■ J2320 chassis: 1091 BTU/hour (320 W) ■ J2350 chassis: 1195 BTU/hour (350 W) ■ J4350 chassis: 1092 BTU/hour (320 W) ■ 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 (CO₂) and Halotron, are most effective for suppressing electrical fires. Type C fire extinguishers displace the oxygen from the point of combustion to eliminate the fire. For extinguishing fire on or around equipment that draws air from the environment for cooling, use this type of inert oxygen displacement extinguisher instead of an extinguisher that leave residues on equipment.

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers) near Juniper Networks 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 metalically 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 metalically 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 34 on page 69 and Table 35 on page 69 list the AC and DC power system electrical specifications for Services Routers.

Table 34: 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 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 35: 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 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 36 on page 70 lists AC power cord specifications provided for each country or region.

Table 36: 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 36 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 37 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 38 on page 74.

Table 37 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 37: 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 37: 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 38 on page 74 lists the maximum power tokens and maximum heat tokens available for each model.

Table 38: 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 39 on page 75 summarizes the tasks you need to perform when preparing a site for Services Router installation.

Table 39: 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 on page 77
- Unpacking a J-series Services Router on page 78
- Installing J2320 and J2350 Routers on page 79
- Installing J4350 and J6350 Routers on page 80
- Connecting Interface Cables to Services Routers on page 83
- Chassis Grounding on page 83
- Connecting Power on page 84
- Powering a Services Router On and Off on page 89

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.



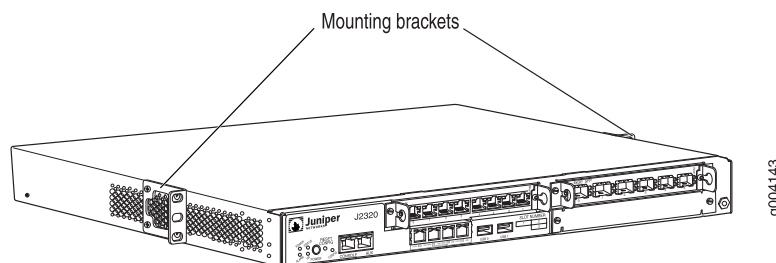
WARNING: The J2320 or J2350 chassis weighs between 14.8 lb (6.7 kg) and 18.2 lb (8.3 kg). Read and follow the lifting guidelines in “Chassis Lifting Guidelines” on page 216.

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

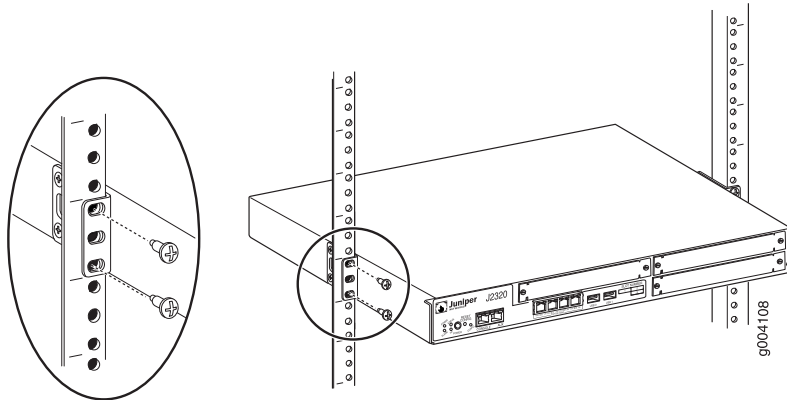
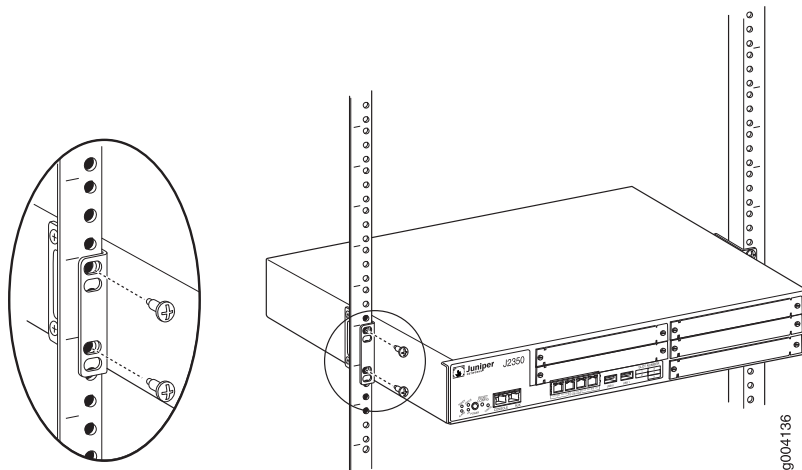


Figure 44: Hanging a J2350 Router in a Rack



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.

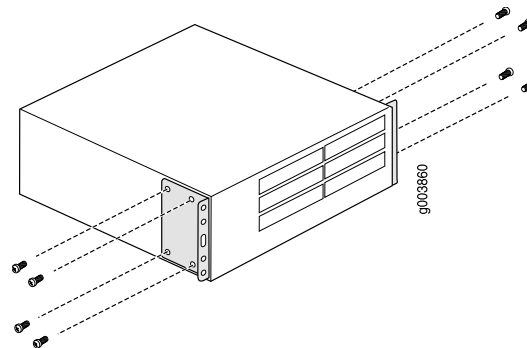


WARNING: The chassis weighs between 23 lb (10.4 kg) and 30.7 lb (13.9 kg). Read and follow the lifting guidelines in “Chassis Lifting Guidelines” on page 216.

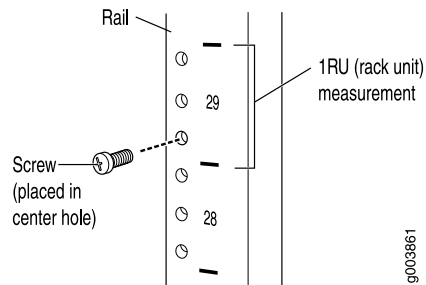
To install the J4350 or J6350 into a rack:

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.

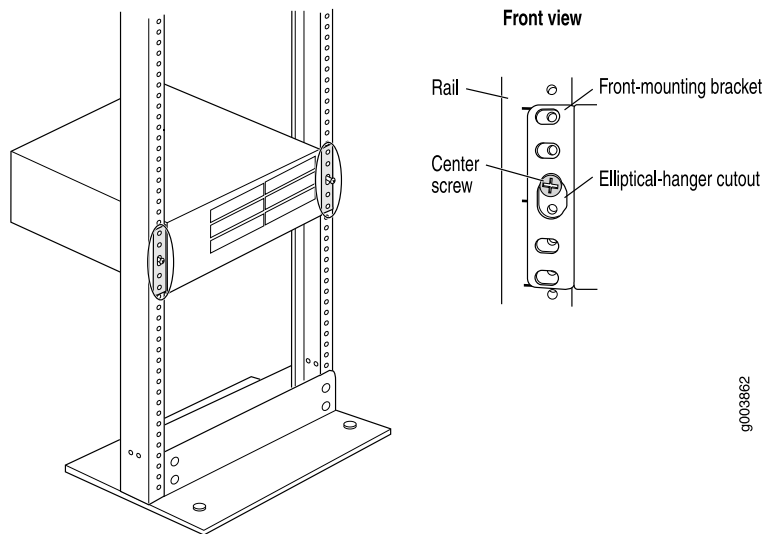
Figure 45: Installing the Mounting Brackets



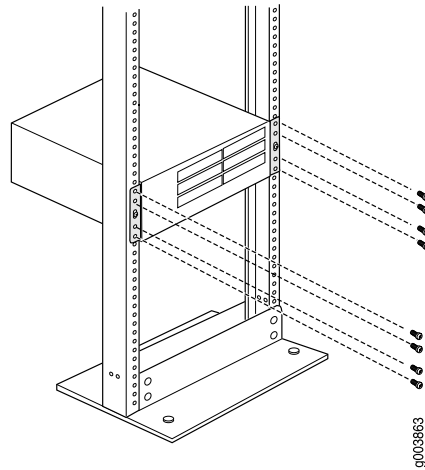
2. Attach a screw to each rack rail in the third hole down from where you want the top of the router to be positioned. Screw only part way in, leaving about ¼ in. (6 mm) distance between the screw head and the rail (see Figure 46 on page 82).

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

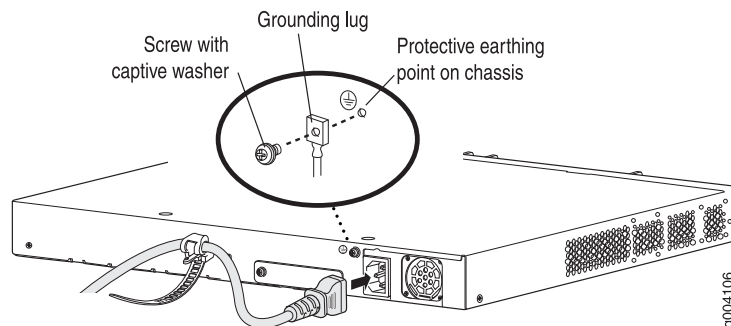
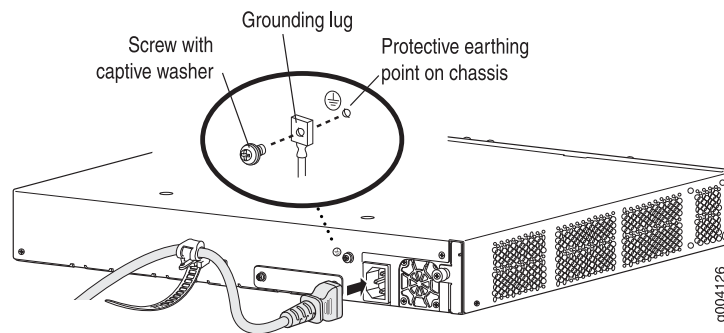
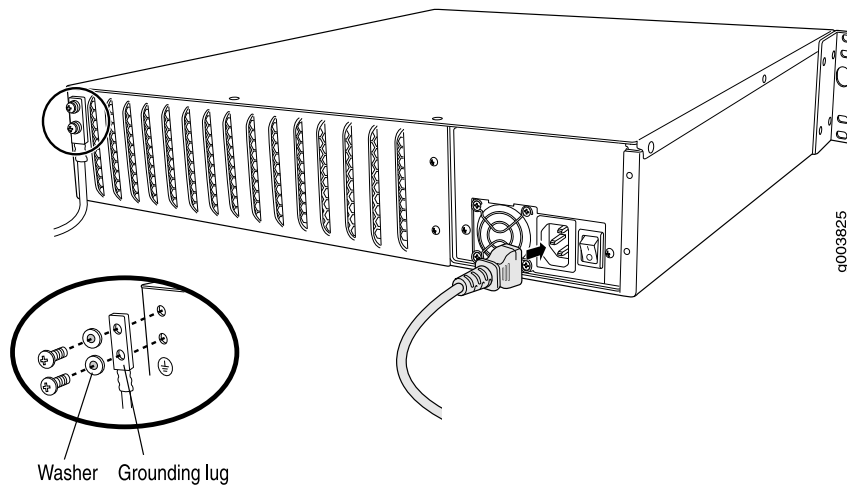


Figure 50: Connecting AC Power to the J2350 Services Router**Figure 51: Connecting AC Power to the J4350 or J6350 Services Router**

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.

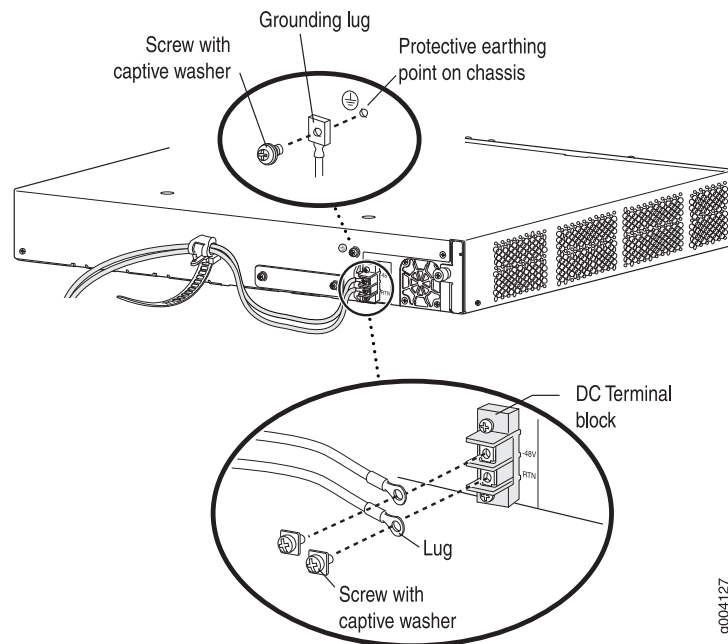
- e. Using one of the removed screws, secure the positive (+) DC source power cable lug to the **RTN** terminal. Tighten the screw until snug. Do not

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

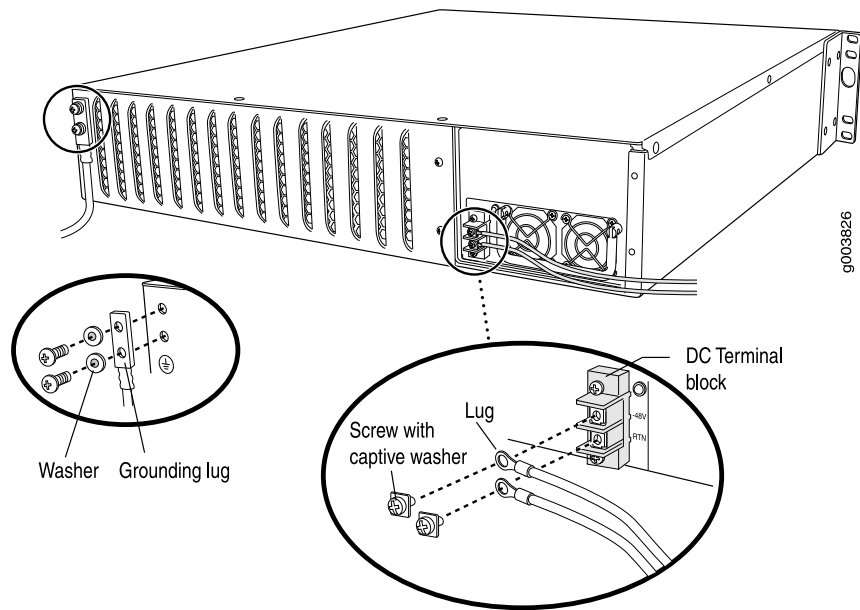
- f. Using the other removed screw, secure the negative (–) DC source power cable lug to the **–48 VDC** terminal. Tighten the screw until snug. Do not overtighten. Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to the screw.
 - g. Dress the power cables appropriately.
 - h. Replace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



g0004127

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 on page 91
- Basic Connectivity Overview on page 92
- Before You Begin on page 95
- Connecting to a Services Router on page 96
- Configuring Basic Settings with J-Web Quick Configuration on page 103
- Configuring Basic Settings Using the CLI Configuration Wizard on page 106
- Configuring Basic Settings with a Configuration Editor on page 110
- Verifying Basic Connectivity and the Configuration on page 113

Basic Connectivity Terms

Before configuring basic connectivity, become familiar with the terms defined in Table 40 on page 91.

Table 40: 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 40: 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 on page 92
- Root Password on page 92
- Time Zone and System Time on page 93
- Network Settings on page 93
- Default Gateway on page 93
- Backup Router on page 94
- Loopback Address on page 94
- Built-In Ethernet Interface Address on page 94
- Management Access on page 95

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 through 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 on page 97
- Connecting to the CLI Locally on page 98
- Connecting to the CLI Remotely on page 100

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.

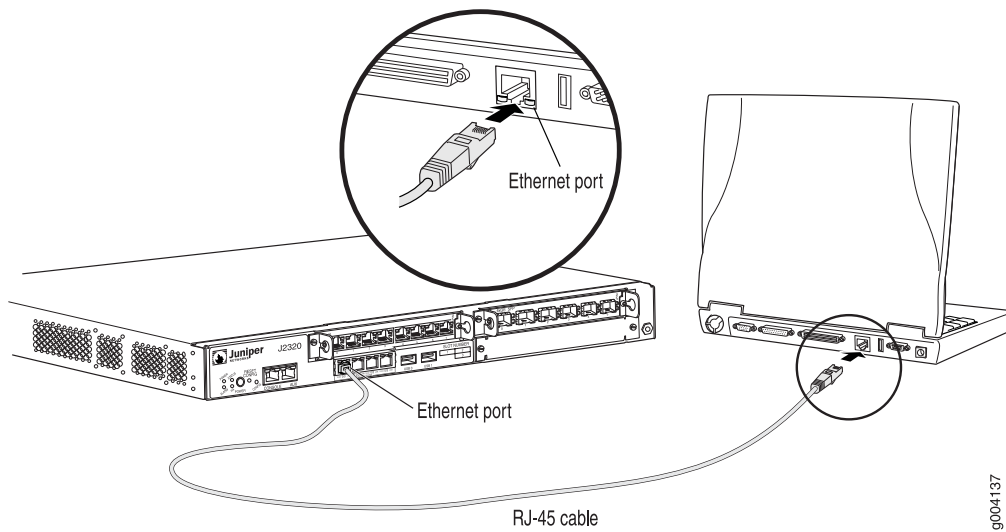
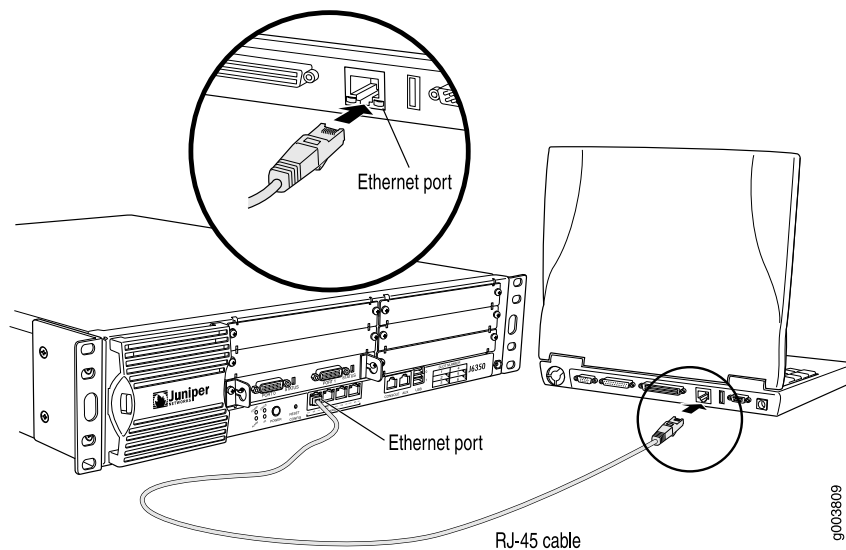
When the Services Router is powered on for the first time, the system looks for a DHCP server, and if it does not find one, it assigns an IP address within the **192.168.1.0/24** subnetwork to any devices connected to it.

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.



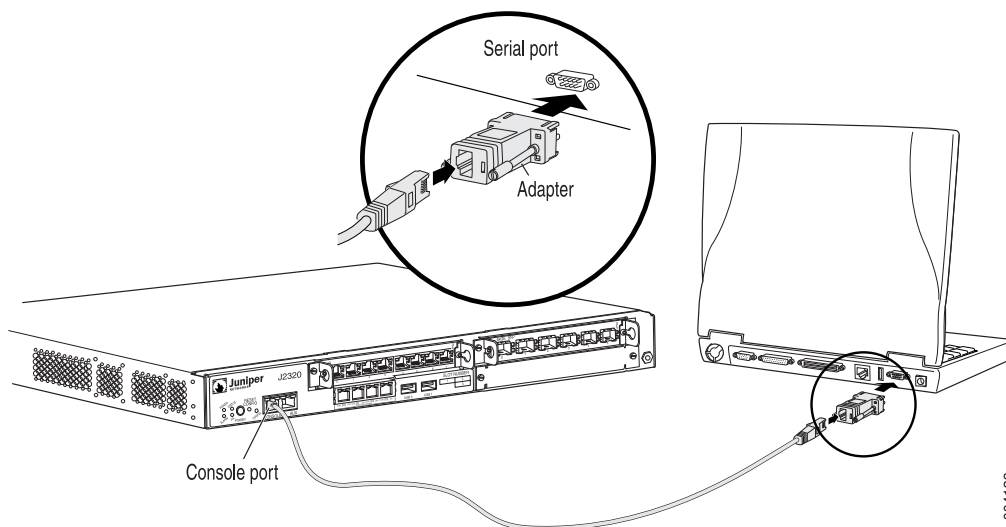
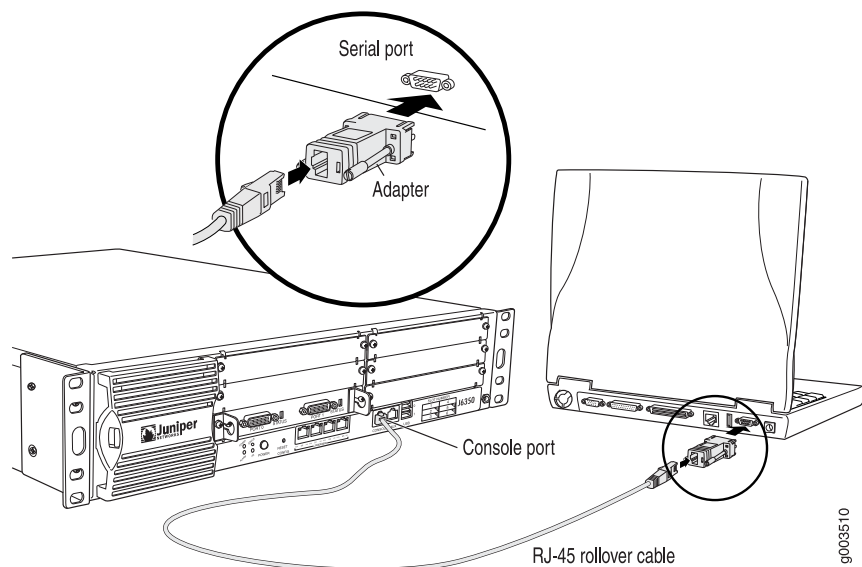
NOTE: Figure 56 on page 100 and Figure 57 on page 100 show a connection to a local management device. A remote connection to the router through a modem requires the cable and connector shown (provided in the router's accessory box), plus a DB-9 female to DB-25 male (or similar) adapter for your modem, 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 on page 101
- Connecting the Modem to the Console Port on page 102
- Connecting to the CLI at the User End on page 102

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.

- 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.

- 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

The screenshot displays the 'Quick Configuration' page with a breadcrumb trail: [Configuration](#) > [Quick Configuration](#) > [Set Up](#). The page is titled 'Quick Configuration' and 'Set Up'.

Identification

- Host Name:
- Domain Name:
- Root Password:
- Verify Root Password:

Time

- Time Zone:
- NTP Servers:
- Current System Time:

Network

- DNS Name Servers:
- Domain Search:
- Default Gateway:
- Loopback Address:
- ge-0/0/0.0 Address:

Management Access

The following access methods are considered insecure as any information sent over them will be sent without encryption and could possibly be intercepted during transmission.

- Allow Telnet Access: ☒
- Allow JUNOScript over Clear-Text Access: ☒

The following access method is considered secure as any information sent over it will be encrypted before transmission.

- Allow SSH Access: ☒

In order to enable HTTPS or JUNOScript over SSL, you will need to visit the SSL configuration page to configure certificates and associations.

At the bottom, there are buttons for , , and .

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 41 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 41: 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. 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 41: 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.	<p>To add an IP address, type it in the box to the left of the Add button, then click Add.</p> <p>To delete an IP address, click on it in the box above the Add button, then click Delete.</p>
Current System Time	Synchronizes the system time with the NTP server, or manually set the system time and date.	<p>■ 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.</p> <p>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.</p> <p>■ To set the time manually, click Set Time Manually. A pop-up window allows you to select the current date and time from lists.</p>
Network		
DNS Name Servers	Specify a DNS server that the router can use to resolve hostnames into addresses.	<p>To add an IP address, type it in the box to the left of the Add button, then click Add.</p> <p>To delete an IP address, click on it in the box above the Add button, then click Delete.</p>
Domain Search	Adds each domain name that the router is included in to the configuration so that they are included in a DNS search.	<p>To add a domain name, type it in the box to the left of the Add button, then click Add.</p> <p>To delete a domain name, click on it in the box above the Add button, then click Delete.</p>
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.	<p>Type a 32-bit IP address and prefix length, in dotted decimal notation.</p> <p>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.</p>
Management Access		

Table 41: 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 42 on page 107.

Table 42: 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. 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): If you enter y(es), the configuration wizard presents the following prompt. 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 42: Basic Configuration Wizard Summary *(continued)*

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

Table 42: Basic Configuration Wizard Summary *(continued)*

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

Table 42: Basic Configuration Wizard Summary *(continued)*

Prompt	Function	Your Action
Would you like to create a new user account? [yes, no] (no): If you enter y(es), the configuration wizard displays the following prompt: Enter a new user name: After you enter a username, the configuration wizard prompts you for an associated password. Enter user password After you enter the password, the configuration wizard requests that you verify it. 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. 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): If you enter y(es), the configuration wizard presents the following prompt: 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 43 on page 110. Determine the values to set on the Services Router in your network.

Table 43: 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 43: 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 44 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 44: Configuring Basic Settings

Task	J-Web Configuration Editor	CLI Configuration Editor
Navigate to the System level in the configuration hierarchy.	<ol style="list-style-type: none"> 1. In the J-Web interface, select Configuration > View and Edit > Edit Configuration. 2. Next to System, click Configure or Edit. 	<p>From the [edit] hierarchy level, enter</p> <p>edit system</p>
Define the hostname of the router.	In the Host name box, type the hostname of the router—for example, routera .	<p>Set the hostname. For example:</p> <p>set host-name routera</p>
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 .	<p>Set the domain name. For example:</p> <p>set domain-name lab.router.net</p>

Table 44: Configuring Basic Settings (continued)

Task	J-Web Configuration Editor	CLI Configuration Editor
Allow SSH remote access.	<ol style="list-style-type: none"> 1. In the Nested configuration section, next to Services, click Configure or Edit. 2. Next to Ssh, click Configure or Edit. 3. Click OK. 4. Click OK a second time to return to the System level in the configuration editor hierarchy. 	Set remote access for SSH: <pre>set services ssh</pre>
Define root authentication for access to the router. NOTE: For readability, the entire key is not shown.	<ol style="list-style-type: none"> 1. In the Nested configuration section, next to Root authentication, click Configure or Edit. 2. Next to Ssh rsa, click Add New Entry. 3. In the Authorized key box, type the RSA password—for example, <code>ssh-rsa AAAAB3Nza...D9Y2gXF9ac==root@routera.lab.router.net</code> 4. Click OK. 5. Click OK a second time to return to the System level in the configuration editor hierarchy. 	Set the root password. For example: <pre>set root-authentication ssh-rsa "ssh-rsa AAAAB3Nza...D9Y2gXF9ac==root@routera.lab.router.net"</pre>
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: <pre>set time-zone America/Los_Angeles</pre>
Define the NTP server that NTP requests can be sent to.	<ol style="list-style-type: none"> 1. In the Nested configuration section, next to Ntp, click Configure or Edit. 2. Next to Server, click Add New Entry. 3. In the Address box, type the NTP server's IP address—for example, <code>10.148.2.21</code> 4. Click OK. 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: <pre>set ntp server 10.148.2.21</pre>
Define the DNS server that receives DNS requests.	<ol style="list-style-type: none"> 1. Next to Name server, click Add New Entry. 2. In the Address box, type the address of the DNS server—for example, <code>10.148.2.32</code>. 3. Click OK. 	Set the address of the DNS server. For example: <pre>set name-server 10.148.2.32</pre>
Add each domain that the router belongs to.	<ol style="list-style-type: none"> 1. Next to Domain search, click Add New Entry. 2. In the Value box, type the name of the domain in which the router is located—for example, <code>lab.router.net</code>. 3. Click OK. 4. Next to Domain search, click Add New Entry. 5. In the Value box, type the name of another domain that the router belongs to—for example, <code>router.net</code>. 6. Click OK. 	Set the domains to be searched. For example: <pre>set domain-search lab.router.net</pre> <pre>set domain-search router.net</pre>

Table 44: 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: set backup router 192.168.2.44
Define the IP address for lo0.0.	<ol style="list-style-type: none"> 1. In the configuration editor hierarchy, next to Interfaces, click Configure or Edit. 2. In the Interface table, locate the lo0 row and click Unit. 3. In the Unit table, click 0, and in the Family section next to Inet, click Configure or Edit. 4. To delete the existing IP address, click the Discard button. Select the Delete Configuration Below This Point option button from the next display. 5. Next to Address, click Add new entry. 6. In the Source box, type the address and prefix length for the loopback interface—for example, 172.16.1.24/32. 7. Click OK. 	<ol style="list-style-type: none"> 1. From the [edit] hierarchy level, enter edit interfaces 2. Delete the existing IP address: delete lo0 unit 0 family inet address 3. Set the IP address and prefix length of lo0.0. For example: set lo0 unit 0 family inet address 172.16.1.24/32
Define the IP address for ge-0/0/0.	<ol style="list-style-type: none"> 1. In the configuration editor hierarchy, next to Interfaces, click Configure or Edit. 2. In the Interface table, locate the ge-0/0/0 row and click Unit. 3. In the Unit table, click 0, and in the Family section next to Inet, click Configure or Edit. 4. To delete the existing IP address, click the Discard button. Select the Delete Configuration Below This Point option button from the next display. 5. Next to Address, click Add new entry. 6. In the Source box, type the address and prefix length for the management interface—for example, 192.168.1.1/24. 7. Click OK. 	<ol style="list-style-type: none"> 1. Delete the existing IP address: delete ge-0/0/0 unit 0 family inet address 2. Set the IP address and prefix length of ge-0/0/0. For example: 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 44 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

- Replacing Hardware Components on page 119
- Troubleshooting a Services Router on page 157
- Contacting Customer Support and Returning Hardware on page 169

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 on page 119
- Replacing the Console Port Cable on page 120
- Replacing a PIM on page 120
- Replacing PIM Cables on page 123
- Removing and Replacing the Chassis Cover on J2320 and J2350 Routers on page 124
- Replacing Internal Compact Flashes on J2320 and J2350 Routers on page 126
- Replacing Internal Compact Flashes on J4350 and J6350 Routers on page 129
- Replacing External Compact Flashes on page 132
- Replacing USB Storage Devices on page 134
- Replacing DRAM Modules on page 136
- Replacing Power System Components on page 139
- Replacing Crypto Accelerator Modules on J2320 and J2350 Routers on page 146
- Replacing Crypto Accelerator Modules on J4350 and J6350 Routers on page 149
- Replacing Air Filters on J2350 Routers on page 153
- Replacing Air Filters on J4350 and J6350 Routers on page 154

Tools and Parts Required

To replace hardware components, you need the tools and parts listed in Table 45 on page 120.

Table 45: Tools and Parts Required

Tool or Part	Components
Electrostatic bag or antistatic mat	All
Electrostatic discharge (ESD) grounding wrist strap	All
Flat-blade screwdriver, approximately 1/4 in. (6 mm)	PIM
Phillips (+) screwdriver, number 1 and number 2	<ul style="list-style-type: none"> ■ Chassis cover ■ Compact flash ■ Crypto Accelerator Module ■ DRAM modules ■ PIM ■ 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 on page 120
- Installing a PIM on page 122

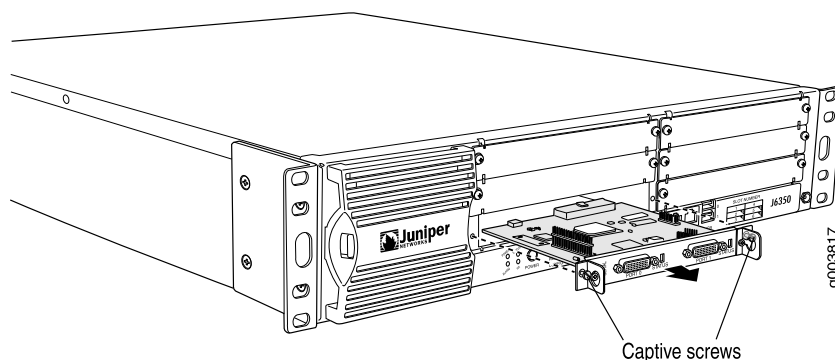
Removing a PIM

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):

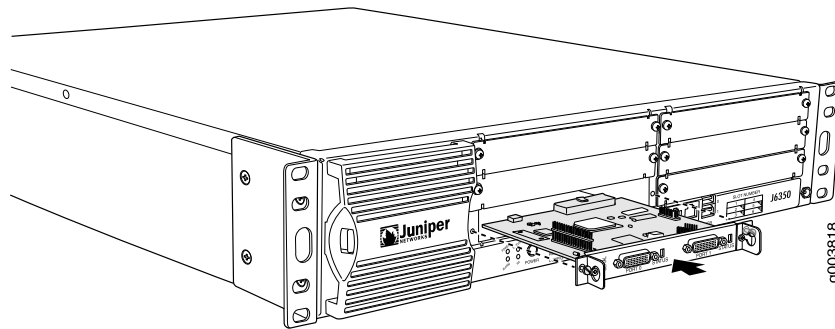
1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the PIM.
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the Services Router is disconnected from earth 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*.

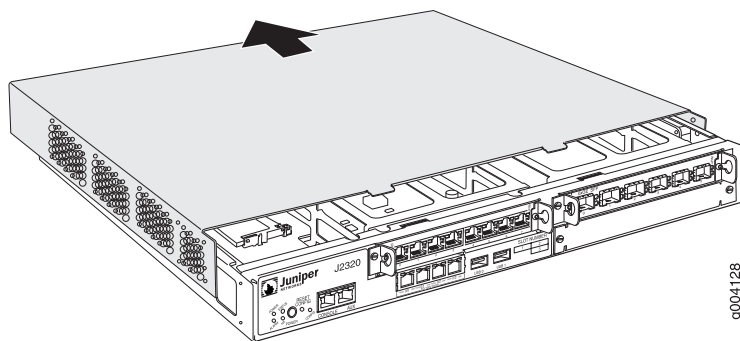
Removing and Replacing the Chassis Cover on J2320 and J2350 Routers

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.

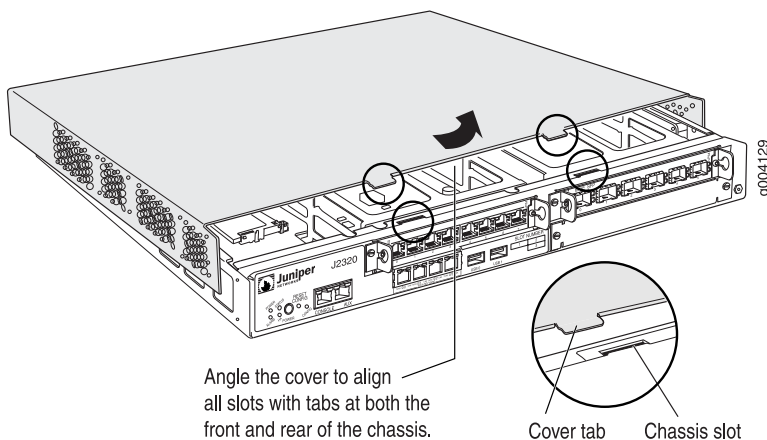
5. With a Phillips screwdriver remove the flat head screws from the rear and sides of the chassis.
6. Position the router so that you face the front panel.
7. Place your hands on the cover and press down while pushing the cover back until the two front tabs disengage from the chassis base (see Figure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

Figure 61: Sliding the Chassis Cover



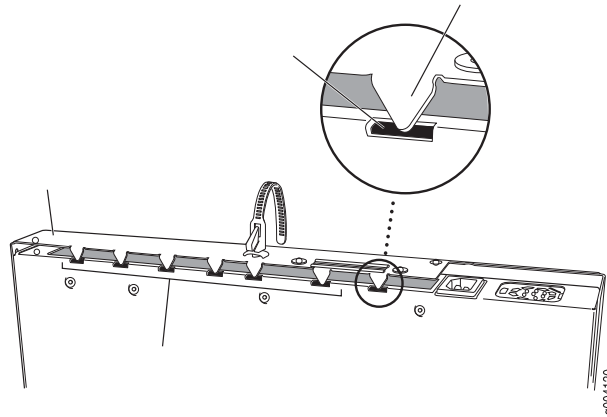
8. Lift the cover upward and pull it away from the tabs on the rear of the chassis (see Figure 62 on page 125).

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

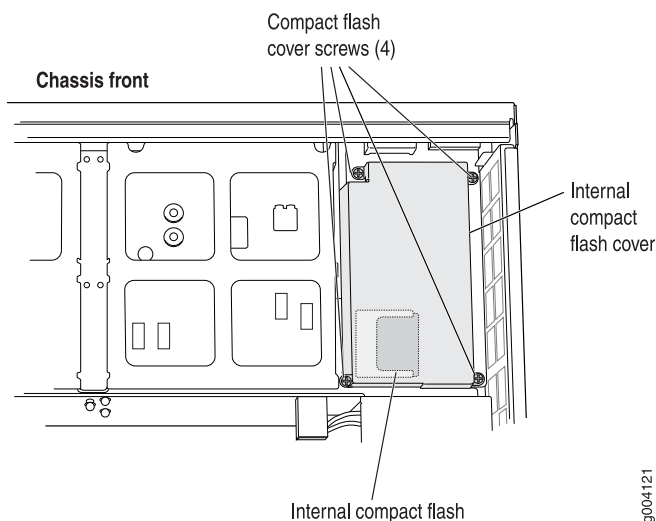
3. Lower the cover fully onto the base, and slide it so that the front tabs match the front slots and the chassis cover and base edges align completely.
4. Insert and tighten the flat head screws with a Phillips screwdriver.
5. Return the router to its installation site, and attach the grounding cable 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

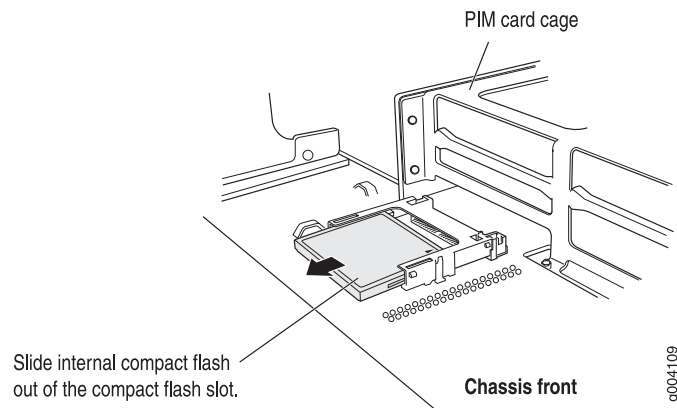
To replace the internal compact flash:

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.)

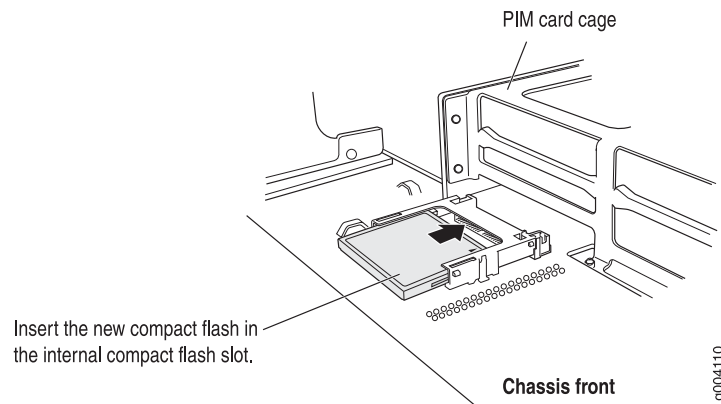


WARNING: If the fans are still rotating, wait until they stop before proceeding with the next step.

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.

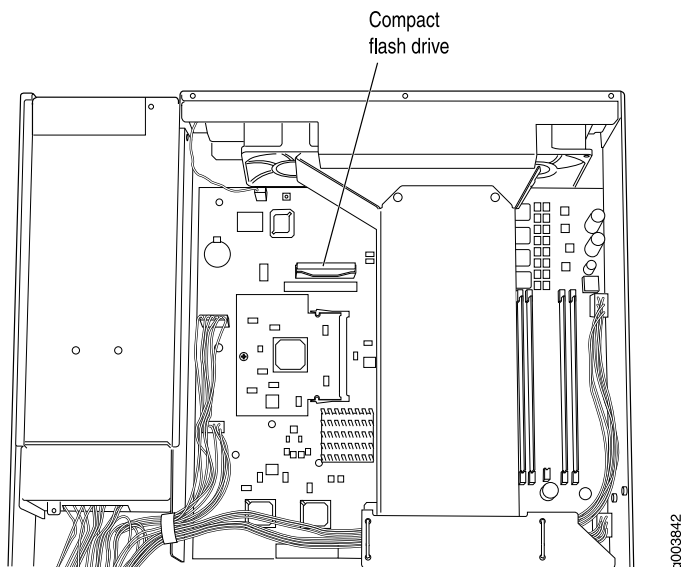
Replacing Internal Compact Flashes on J4350 and J6350 Routers

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

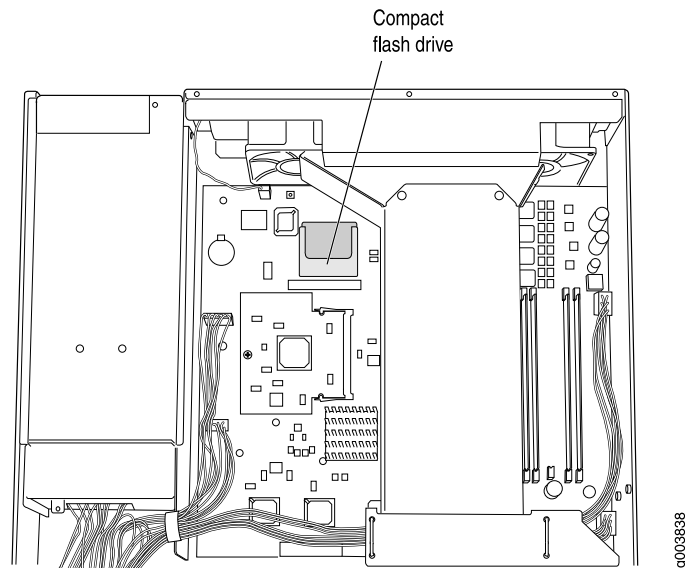


NOTE: Use only compact flash cards purchased from Juniper Networks for your J-series platform and model.

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

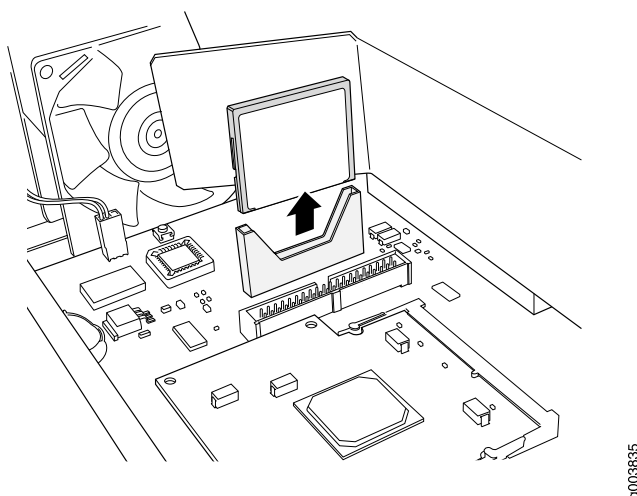
To replace the compact flash:

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.

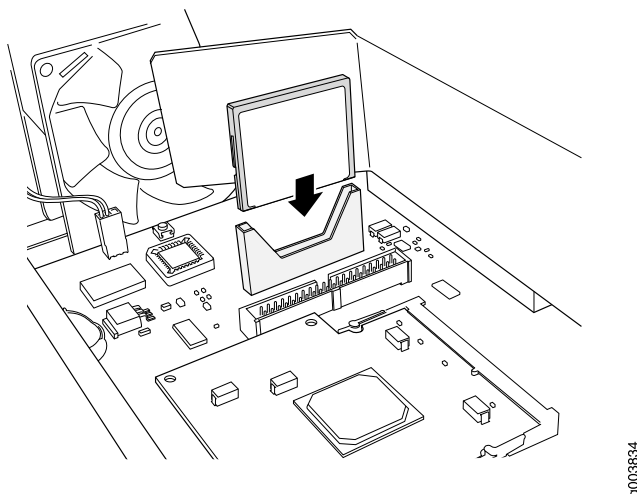


WARNING: If the fans are still rotating, wait until they stop before proceeding with the next step, especially if your compact flash is in the horizontal position (flat against the system board).

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.

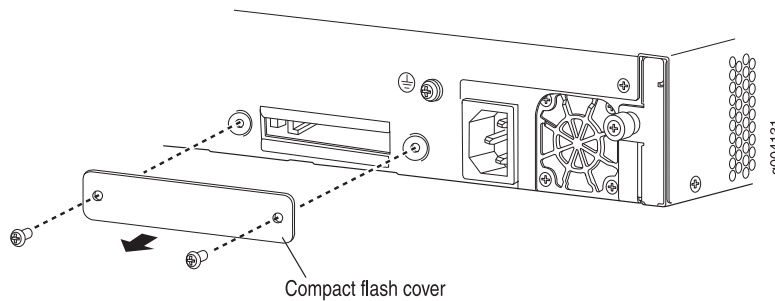
If the **show system storage** output indicates that the router booted from the external compact flash, you need to power off the router before replacing the compact flash.

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).

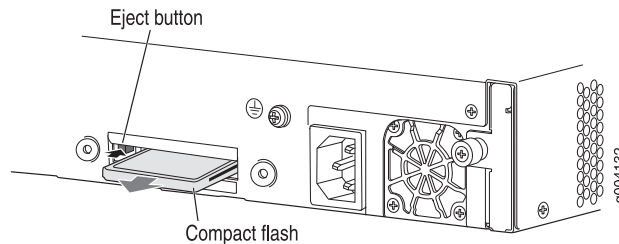
5. With a Phillips screwdriver, loosen the pan head screws that secure the external compact flash cover to the rear of the chassis (see Figure 71 on page 133).

Figure 71: Removing the External Compact Flash Cover



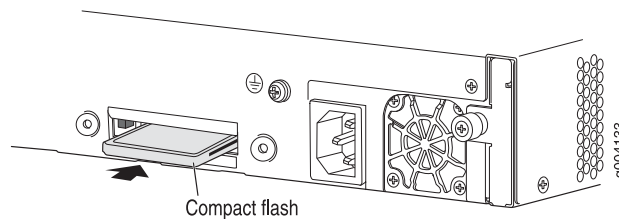
6. Remove the compact flash cover.
7. Eject the external compact flash by pressing the ejector button to the left of the compact flash slot once to unlock the button, and again to eject the compact flash (see Figure 72 on page 133).

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

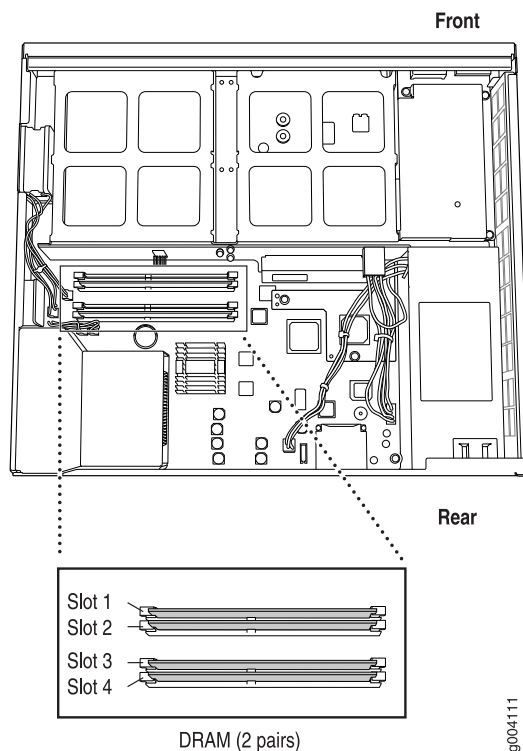
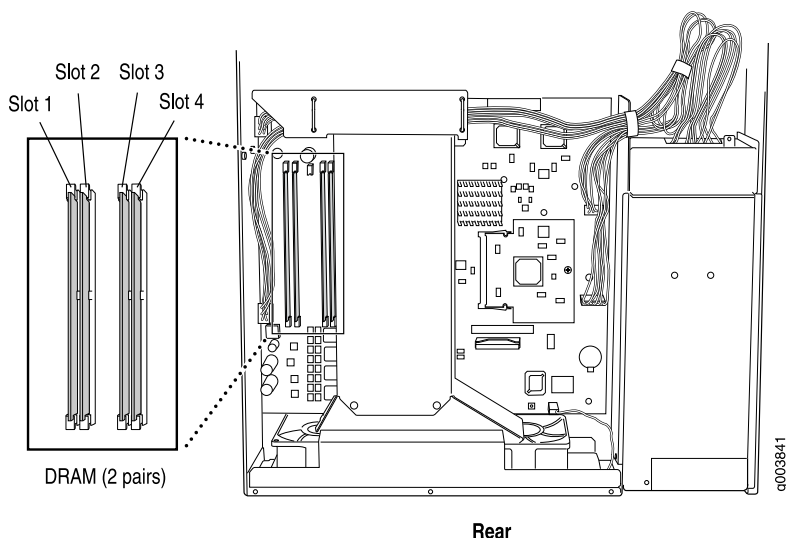


Figure 75: J4350 and J6350 DRAM Location

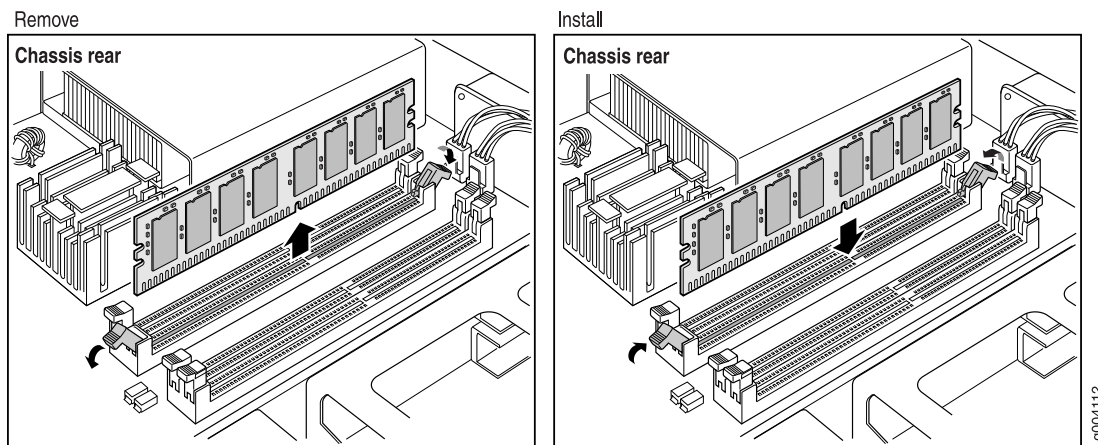
To modify the DRAM configuration, use the following procedures:

- 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):

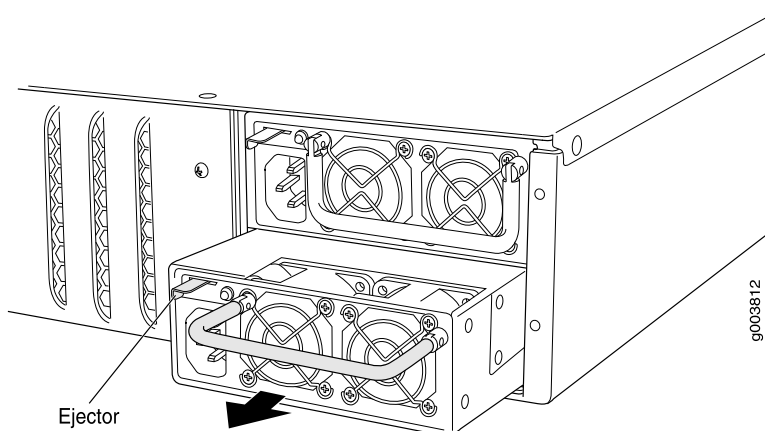
1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.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

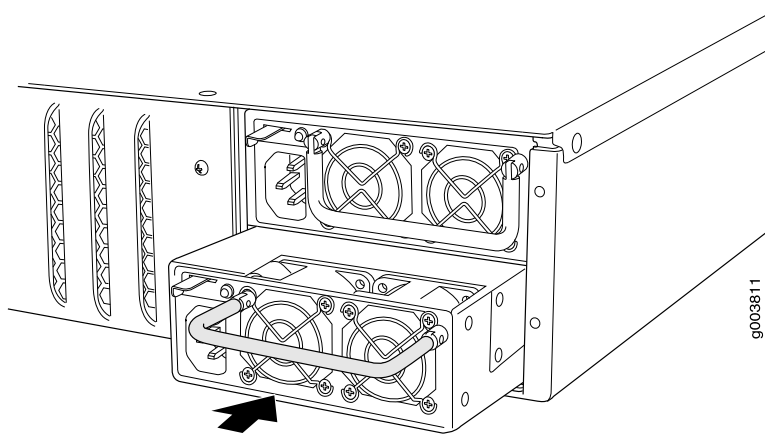
1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.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

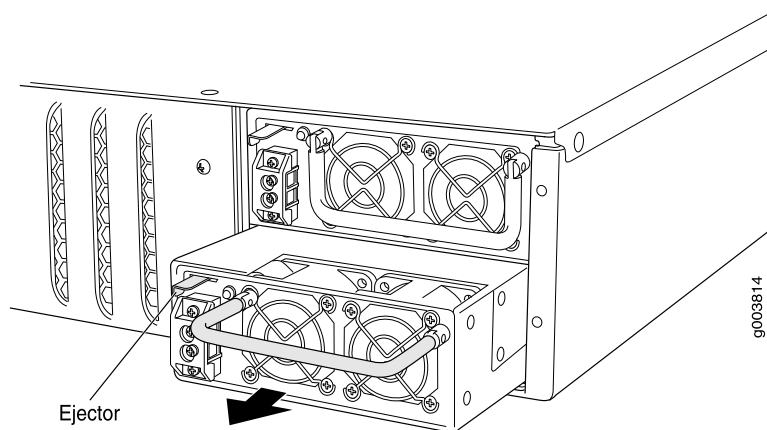
1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the strap to the ESD point on the chassis, or to an outside ESD point if the router is disconnected from earth ground. For more information about ESD, see “Preventing Electrostatic Discharge Damage” on page 201.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

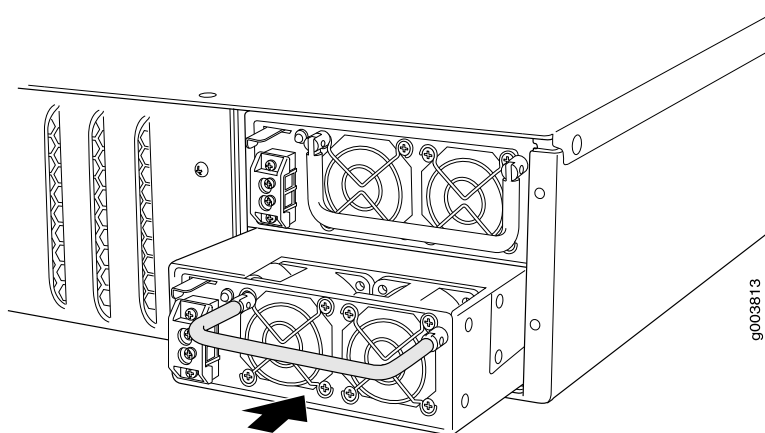
Each screw contains a captive washer to secure a power cable lug to the terminal block.

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.

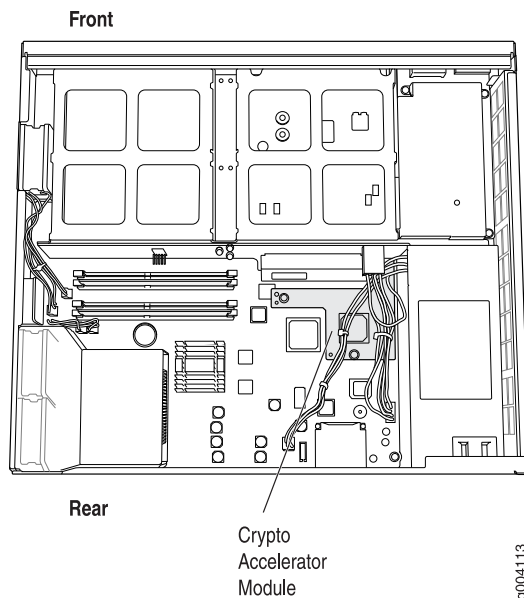
9. Dress the power cables appropriately.
10. Replace the clear plastic cover over the terminal block.
11. Verify that the power cord does not block access to router components or drape where people might trip on it.
12. Press and release the power button to power on the router. Verify that the **POWER** 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

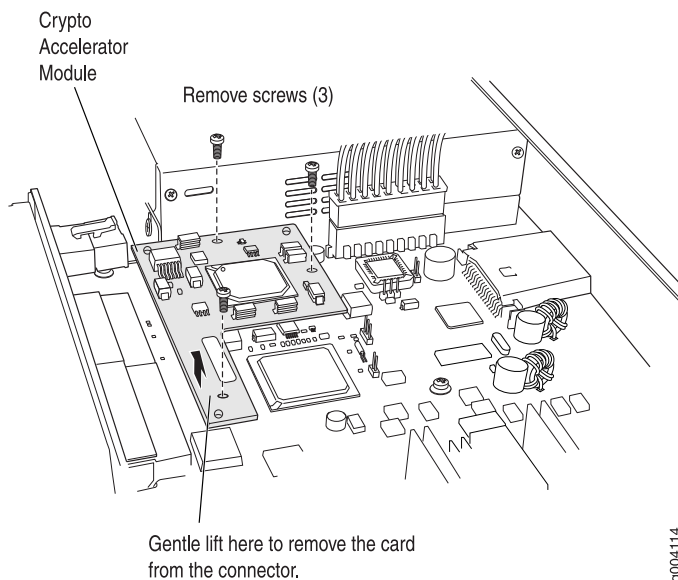


NOTE: If you are installing a Crypto Accelerator Module into a J2320 or J2350 Services Router for the first time, proceed directly to “Installing a J2320 or J2350 Crypto Accelerator Module” on page 148.

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 Accelerator Module, as shown in Figure 82 on page 147.

Figure 82: Removing a J2320 or J2350 Crypto Module



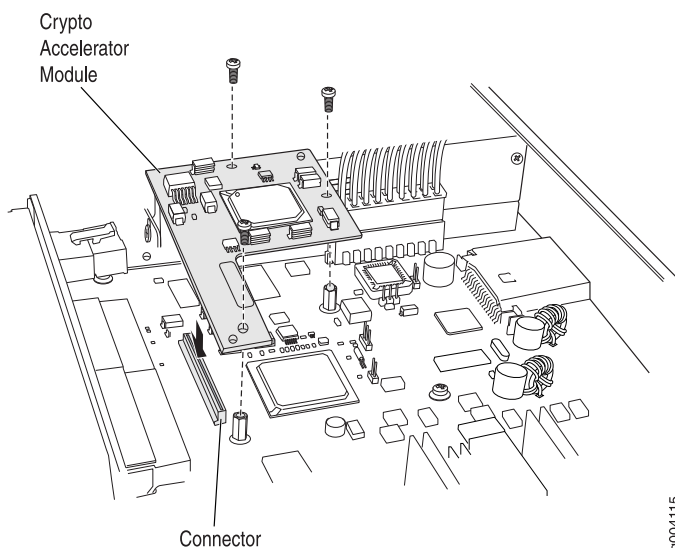
8. Gently lift the Crypto Module to disengage it from the connector on the system board, as shown in Figure 82 on page 147.
9. Place the Crypto Module on the antistatic mat or in the electrostatic bag.

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:
```

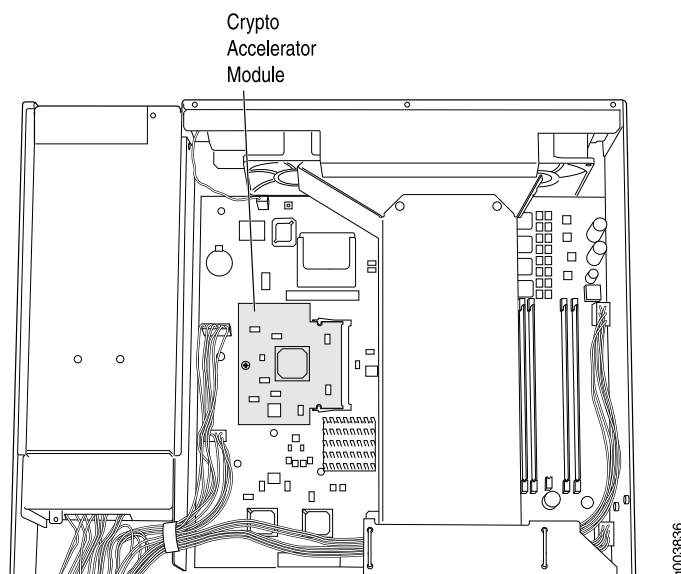
Item	Version	Part number	Serial number	Description
Chassis			JN1086AA8ADA	J4350
Midplane	REV 00	710-012339	NE0664	
System IO	REV 00	710-012315	NE3564	JX350 System IO
Crypto Module				Crypto
Acceleration				
Routing Engine	REV 00	710-012149		RE-J4350-2540
FPC 0				FPC
PIC 0				4x GE Base PIC
Power Supply 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



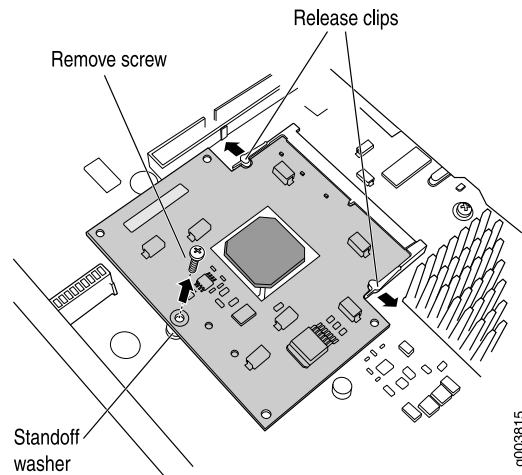
NOTE: If you are installing a Crypto Accelerator Module into a J4350 Services Router for the first time, proceed directly to “Installing a J4350 or J6350 Crypto Accelerator Module” on page 152.

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.

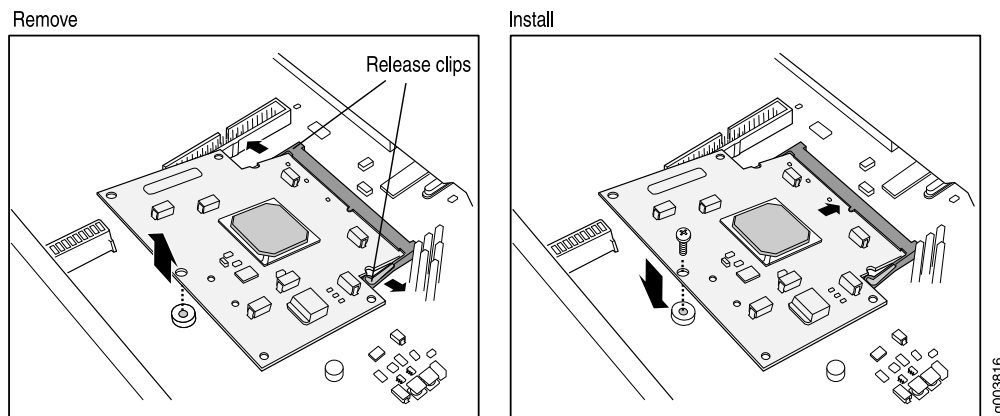
6. Locate the Crypto Module on the system board (see Figure 84 on page 150).
7. Using a Phillips screwdriver remove the screw, as shown in Figure 85 on page 151.

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.

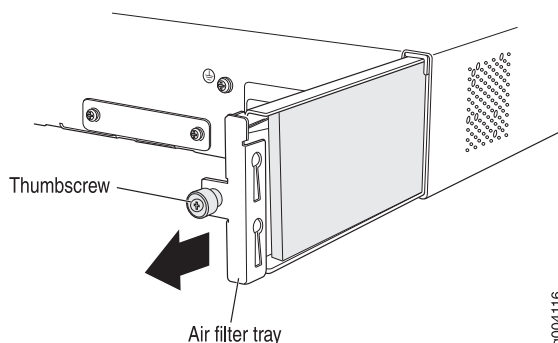
On J2350 routers that comply with Network Equipment Building System (NEBS) criteria, the air intake grid contains a filter. To verify that the system is a NEBS-compliant system, run the **show chassis hardware** command. A NEBS-compliant system displays the term *NEBS* in the output.

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.

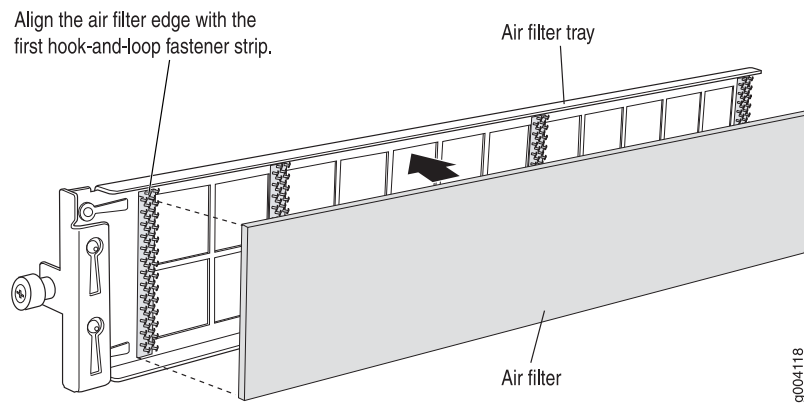
To replace the air filter:

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).

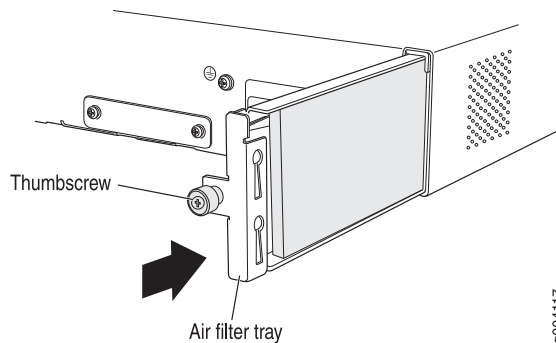
Figure 87: Removing the Air Filter Tray



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

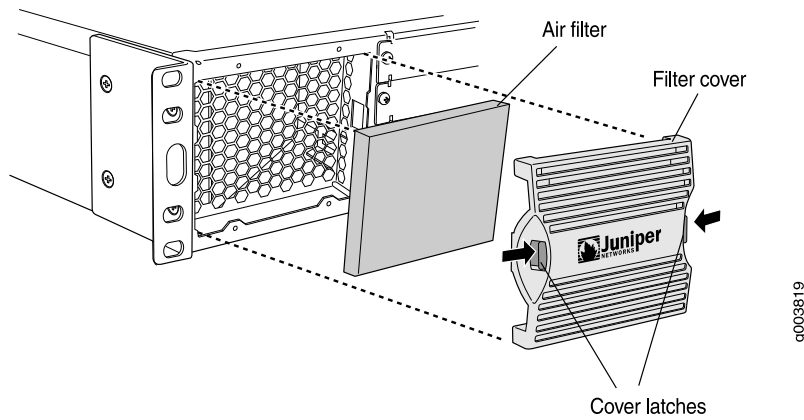
6. Press down on the filter until it is firmly seated against the bottom of the tray.
7. Hold the filter tray with the thumbscrew so that its sheet metal side faces the power supply fan exhaust. The air filter tray is designed to prevent it from being inserted incorrectly (see Figure 89 on page 154).

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 on page 157
- Resetting the Configuration File When the Router Is Inaccessible on page 160
- Recovering the Root Password on page 161
- Recovering Primary Boot Devices on page 164
- Contacting the Juniper Networks Technical Assistance Center on page 167

Troubleshooting Hardware Components

This section contains the following topics:

- Monitoring and Correcting Chassis Alarm Conditions on page 157
- Troubleshooting Power Management on page 159

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 46 on page 158 describes alarms that can occur for a chassis component such as the Routing Engine or a Physical Interface Module (PIM).

Table 46: 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. If you did not configure the router to boot from an alternative boot device, contact JTAC. (See “Requesting Technical Support” on page xxiii.)	Yellow (minor)
PIM	A PIM has failed. 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 <i>JUNOS Software Administration Guide</i> .) If this remedy fails, you must replace the failed Routing Engine. To contact JTAC, see “Requesting Technical Support” on page xxiii.	Yellow (minor)
	Routing Engine temperature is too warm.	<ul style="list-style-type: none"> ■ Check the room temperature. (See “Router Environmental Tolerances” on page 66.) ■ Check the air flow. (See “General Site Guidelines” on page 63.) ■ Check the fans. If you must replace a fan or the Routing Engine, contact JTAC. (See “Requesting Technical Support” on page xxiii.) ■ 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 153 or “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 xxiii.	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 Slot	CPU State	Utilization (%) (C)	Memory Total	Utilization (%) 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	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 reenabling 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 **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.

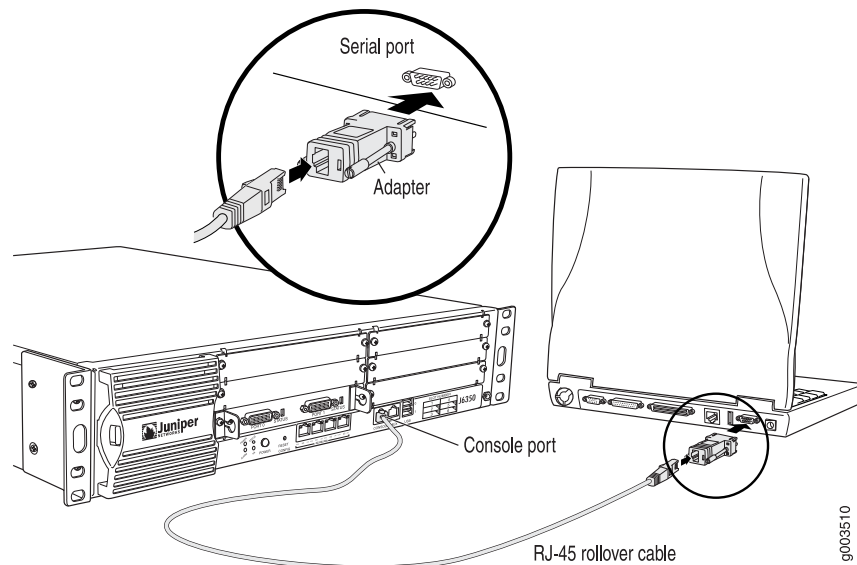


NOTE: You need console access to recover the root password.

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 on page 164
- Recommended Recovery Hardware and Software on page 164
- Configuring Internal Compact Flash Recovery on page 165

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 47 on page 165.

Table 47: 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	<ul style="list-style-type: none"> ■ For systems with PCMCIA controllers, a compact-flash-to-PCMCIA adapter—for example, a Macally PCM-CF compact flash PCMCIA adapter. ■ For systems with a USB port, a USB-to-compact-flash adapter. For example: <ul style="list-style-type: none"> ■ SIIG USB 2.0 Card Reader, model US2274, part number JU-CF0122 ■ MediaGear USB 2.0 Combo 9-in-4, model MGTR100 ■ AVP USB 8-in-1 Card Reader, model UC-28 ■ Inland Multi-Plus Card Reader, part number 08310 ■ HummingBird Multi Card Reader, HCR 81
Recovery Software	
Software appropriate for your system	<ul style="list-style-type: none"> ■ UNIX with PCMCIA drivers ■ Windows 2000, or Windows XP
Systems running Windows require additional software.	<ul style="list-style-type: none"> ■ WinZip, gzip, or a similar compression utility ■ A utility such as the following that allows you to write files to unformatted devices: <ul style="list-style-type: none"> ■ Norton Ghost ■ dd utility from the Cygwin package ■ 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 PCMCIA 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 in 250368+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 on page 169
- Contacting Customer Support on page 172
- Return Procedure on page 172
- Packing a Router or Component for Shipment on page 173

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
FPC 0
PIC 0
PIC           Crypto accelerator
FPC
4x GE Base
```



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 on page 170
- J4350 and J6350 Chassis Serial Number and Agency Labels on page 171
- PIM Serial Number Label on page 172
- Power Supply Serial Number Labels on page 172

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

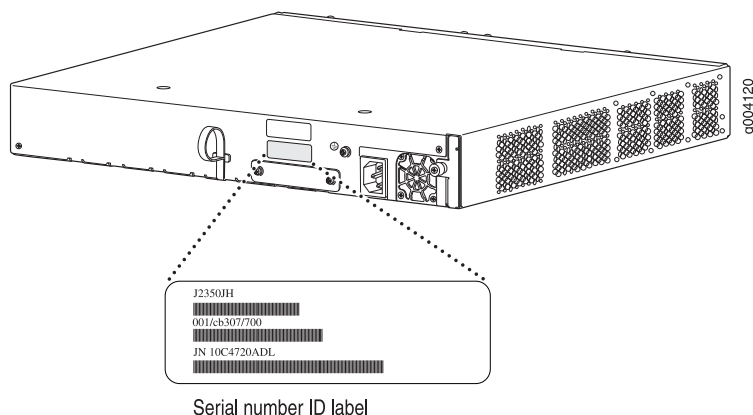
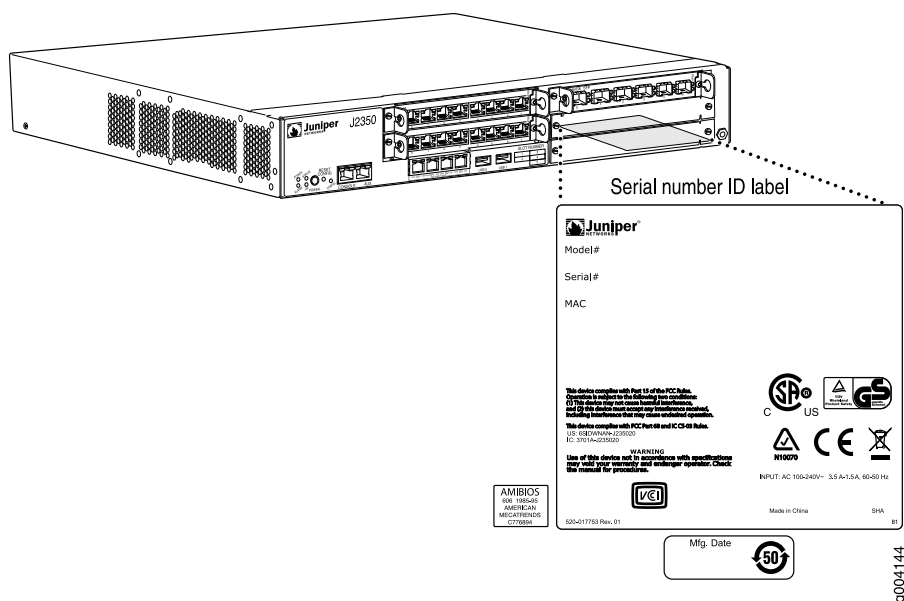


Figure 93: Location of the Agency Labels



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

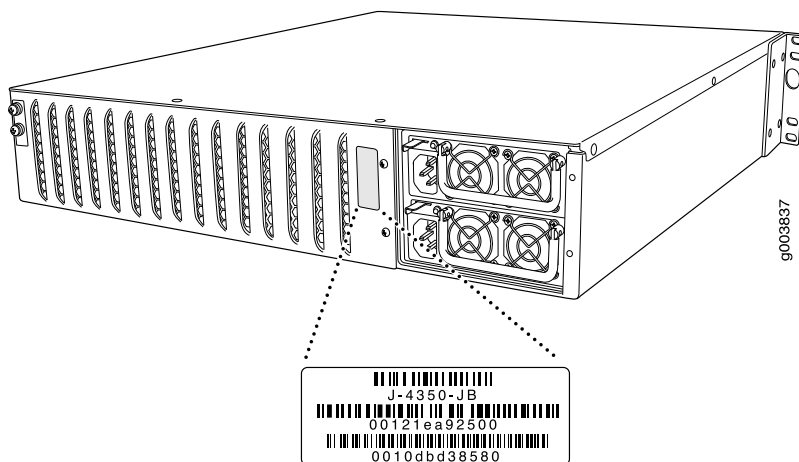
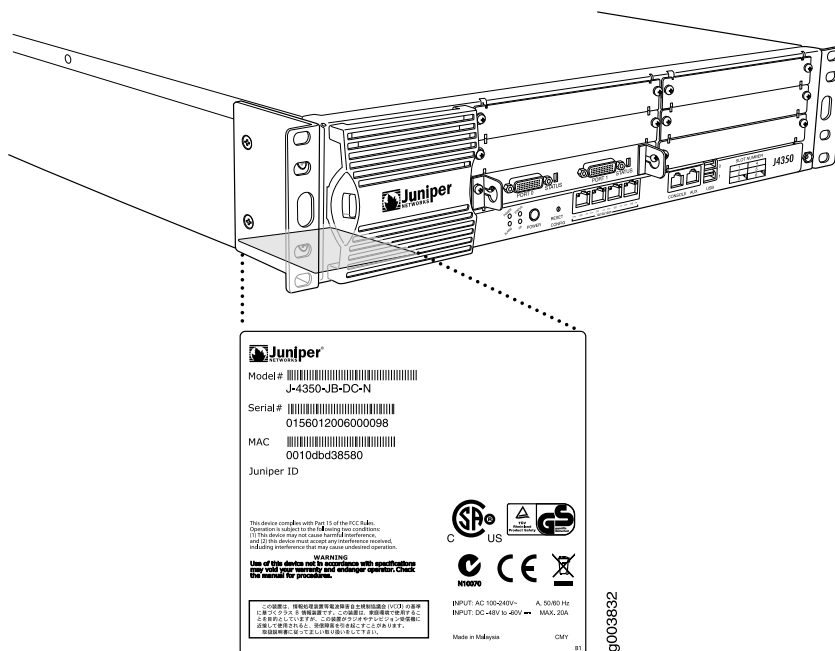


Figure 95: Location of the Agency Labels



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 on page 173
- Packing the Services Router for Shipment on page 174
- Packing Components for Shipment on page 174

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

- Network Cable Specifications and Connector Pinouts on page 179
- Safety and Regulatory Compliance Information on page 197

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 on page 179
- Fast Ethernet RJ-45 Connector Pinout on page 189
- Gigabit Ethernet uPIM RJ-45 Connector Pinout on page 189
- Gigabit Ethernet ePIM RJ-45 Connector Pinout on page 190
- Chassis Console Port Pinouts on page 190
- E1 and T1 RJ-48 Cable Pinouts on page 191
- E3 and T3 BNC Connector Pinout on page 194
- ADSL and G.SHDSL RJ-11 Connector Pinout on page 194
- ISDN RJ-45 Connector Pinout on page 195

Serial PIM Cable Specifications

The 2-port serial PIM uses the cables and connectors summarized in Table 48 on page 179. Pinouts are detailed in Table 49 on page 180 through Table 58 on page 188.

Table 48: 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 49 on page 180
RS-232 DCE	DB-25 female	4-40 threaded jacknuts	13	Table 50 on page 181
RS-422/449 (EIA-449) DTE	DC-37 (DB-37) male	4-40 threaded jackscrews	25	Table 51 on page 181
RS-422/449 (EIA-449) DCE	DC-37 (DB-37) female	4-40 threaded jacknuts	25	Table 52 on page 183

Table 48: 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 53 on page 184
EIA-530A DCE	DB-25 female	4-40 threaded jacknuts	22	Table 54 on page 185
V.35 DTE	M/34 male	Standard (Normally included with M/34 connector shell)	18	Table 55 on page 186
V.35 DCE	M/34 female	Standard (Normally included with M/34 connector shell)	18	Table 56 on page 187
X.21 DTE	DB-15 male	M3 threaded jackscrews	13	Table 57 on page 187
X.21 DCE	DB-15 female	M3 threaded jacknuts	13	Table 58 on page 188

RS-232 DTE Cable Pinout

Table 49: 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 49: 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 50: 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 51: 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 51: 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 52: 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 53: 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 54: 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 55: 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 56: 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 57: X.21 DTE Cable Pinout

LFH-60 Pin	DB-15 Pin	LFH-60 Pairing	Description
15	1	–	Shield Ground

Table 57: 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 58: 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 58: 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 59 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 59: 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 60 on page 189 describes connector pinout information for 8-port and 16-port Gigabit Ethernet uPIM ports.

Table 60: Gigabit Ethernet uPIM RJ-45 Connector Pinout

Pin	Signal Name	Function
1	BI_DA +	Bidirectional pair + A
2	BI_DA-	Bidirectional pair -A

Table 60: 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 61 on page 190 describes connector pinout information for 1-port Gigabit Ethernet ePIM ports.

Table 61: 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 62 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 62: 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 63 on page 191 describes the DB-9 connector pinouts.

Table 63: 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 64 on page 192 through Table 67 on page 193 describe the RJ-48 connector pinouts.

Table 64: 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 65: 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 66: 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 67: 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 67: 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 68 on page 194 describes the RJ-11 connector pinout.

Table 68: 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 69 on page 195 describes the RJ-45 connector pinout.

Table 69: 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 on page 197
- Safety Guidelines and Warnings on page 199
- Agency Approvals on page 232
- Compliance Statements for Environmental Requirements on page 233
- Compliance Statements for EMC Requirements on page 233

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 være 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 on page 199
- Electrical Safety Guidelines and Warnings on page 201
- Installation Safety Guidelines and Warnings on page 216
- Laser and LED Safety Guidelines and Warnings on page 221
- Maintenance and Operational Safety Guidelines and Warnings on page 225

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:

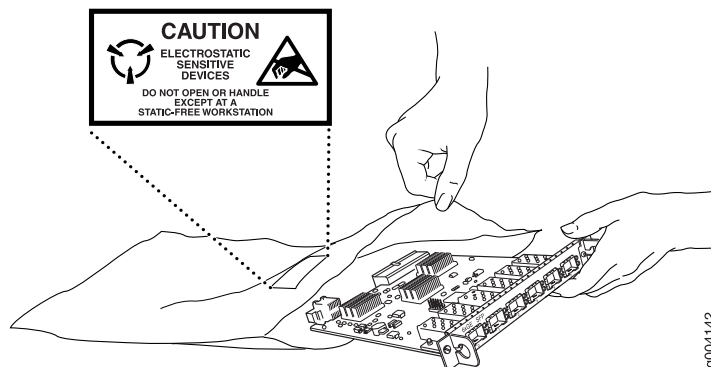
- Always use an ESD wrist strap or ankle strap, and make sure that it is in direct contact with your skin.



CAUTION: For safety, periodically check the resistance value of the ESD strap. The measurement should be in the range of 1 to 10 Mohms.

- When handling any component that is removed from the chassis, make sure the equipment end of your ESD strap is attached to one of the 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

- Power Sources for Redundant Power Supplies on page 205
- DC Power Disconnection Warning on page 205
- DC Power Grounding Requirements and Warning on page 206
- DC Power Wiring Sequence Warning on page 207
- DC Power Wiring Terminations Warning on page 209
- Grounded Equipment Warning on page 210
- Warning Statement for Norway and Sweden on page 211
- In Case of Electrical Accident on page 211
- Multiple Power Supplies Disconnection Warning on page 211
- Power Disconnection Warning on page 213
- TN Power Warning on page 214
- Telecommunication Line Cord Warning on page 215

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 metalically 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 metalically 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。

g017253

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 设备一路供电出现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.

Varoituis 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).

Warning! 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 yhdistettävä kytkentäjäjärjestys on maaajohto maaajohtoon, + RTN varten + RTN, -48 V varten - 48 V. Oikea irrotettava kytkentäjäjärjestys on -48 V varten - 48 V, + RTN varten + RTN, maaajohto maaajohtoon.



WARNING: Attention Câblez l'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 sequência apropriada da fiação é moída para moer, + RTN a + RTN, então -48 V a -48 V. Ao desconectar a potência, a sequência 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.

Warning! 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 johdinliitääntää, esimerkiksi suljettua silmukkaa tai kourumaista liitääntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitääntöjen 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 forcilla con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.



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 isäntälaitte on yhdistetty maahan normaalikäytön aikana.

Attention Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.

Warnung Dieses Gerät muß geerdet werden. Stellen Sie sicher, daß das Host-Gerät während des normalen Betriebs an Erde gelegt ist.



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.

Warning! 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.

Warning! Apparatet 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 Koj e 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 N°. 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 bouwswel 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.



WARNING: Varoitus Kun laite asetetaan telineeseen tai huolletaan sen ollessa telineessä, on noudatettava erityisiä varotoimia järjestelmän vakavuuden säilyttämiseksi, jotta vältetään 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.



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.



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.



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.



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.



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 edifício.
 - Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
 - Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.
 - Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.
-



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 käyttää sellaista kaltevaa pintaa, jonka kaltevuus ylittää 10 astetta.

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

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



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 emitteres 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 ontplofingsgevaar 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 suosittama. 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 on page 233
- European Community on page 235
- Japan on page 236
- United States on page 237

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.



CAUTION: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

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



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

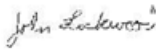
are in conformity with the provisions of the following EC Directives, including all amendments,
and with national legislation implementing these directives:

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

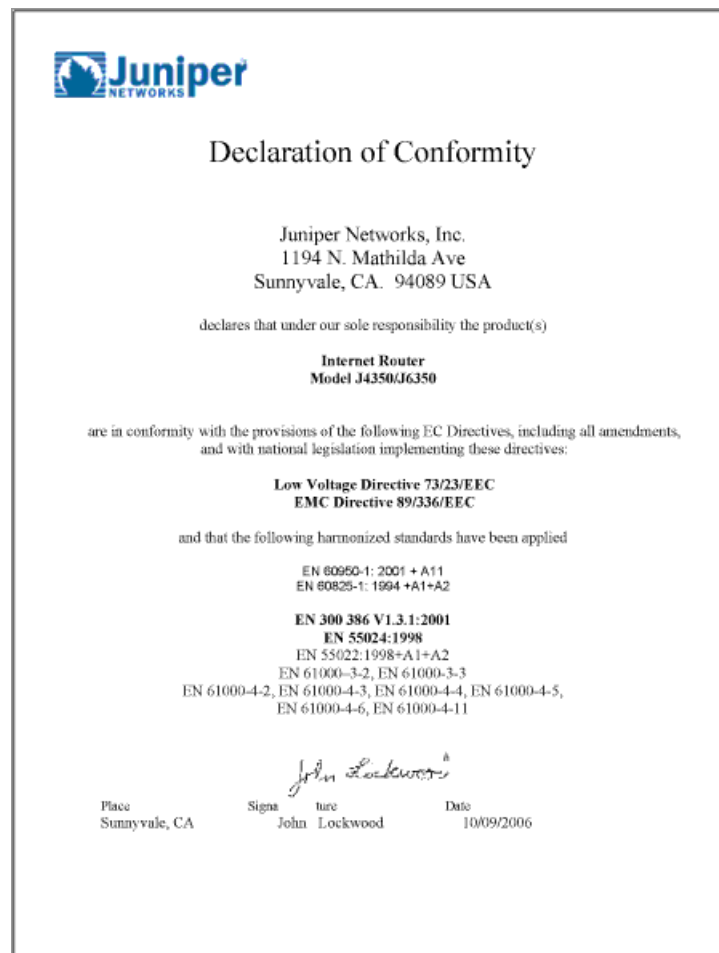
EN 300 386 V1.3.3:2005
EN 55024:1998 +A1 + A2
EN 61000-3-2, EN 61000-3-3
EN 55022:1998+A1(2000)+A2(2003) Class A
EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-6,
EN 61000-4-5, EN 61000-4-11 (-5 and -11 AC only)



Place
Sunnyvale, CA

Signature
John Lockwood

Date
06/20/2007



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

Index

- Index on page 241

Index

Symbols

#, comments in configuration statements.....	xxi
(), in syntax descriptions.....	xxi
4-Port Fast Ethernet ePIM.....	54
4-Port ISDN BRI S/T PIM	
description.....	55
PIM ONLINE LED.....	56
4-Port ISDN BRI U PIM	
description.....	55
PIM ONLINE LED.....	56
< >, in syntax descriptions.....	xxi
[], in configuration statements.....	xxi
{ }, in configuration statements.....	xxi
(pipe), in syntax descriptions.....	xxi

A

AC plug types.....	70
AC power	
connecting power.....	84
cords <i>See</i> AC power cords	
dedicated AC power feed requirement.....	142
electrical specifications.....	69
grounding the router.....	84
installing a J6350 power supply.....	141
J2320 system.....	18
J2350 system.....	18
J4350 system.....	30
J6350 system.....	31
removing a J6350 power supply.....	140
requirements.....	69
safety guidelines.....	203
AC power cords	
electrical specifications.....	70
physical requirements.....	69
plug types.....	70
replacing.....	139
accident, steps to take.....	211
ACTIVITY LED (Dual-Port Fast Ethernet PIM).....	53
adapter, console port	
chassis.....	99, 102
adapters, for compact flash recovery.....	165

addresses

ge-0/0/0 for autoinstallation.....	94
loopback.....	94
management interface.....	94

ADSL PIM

description.....	56
PIM ONLINE LED.....	57

ADSL ports

description.....	56
LED states.....	57
RJ-11 connector pinouts.....	194

agency approvals.....

air filter	
description.....	19, 32
location.....	155
replacing.....	154

airflow

description.....	33
space requirement.....	63

ALARM LED

description.....	15, 28
indications.....	157

alarms

conditions, in chassis components.....	158
LED.....	15, 28

alternative boot media *See* boot devices; USB

altitude requirement.....

Annex A; Annex B *See* ADSL; SHDSL

antistatic mat.....

approvals, agency.....

asymmetric digital subscriber line *See* ADSL

AT modem command.....

AT&D1 modem command.....

AT&K0 modem command.....

AT&W modem command.....

ATDT modem command.....

ATS0 = 1 modem command.....

AUX port.....

auxiliary console port.....

B

backup compact flash, removing.....

backup router

defining (configuration editor).....	113
description.....	94

basic connectivity	
CLI configuration editor	110
establishing	91
J-Web configuration editor	110
Quick Configuration	103
requirements	95
sample configuration	114
verifying	113
battery	
environmental compliance	233
handling	226
lithium	233
blank panel	
for PIM slots	38
for power supply (J6350)	139
blinking	
Fast Ethernet port ACTIVITY LED state (dual-port PIM)	53
Fast Ethernet port link activity LED state (4-port ePIM)	55
Gigabit Ethernet port LED	44
Gigabit Ethernet port TX/RX LED state	17, 29, 46
ISDN BRI ONLINE LED state	56
POWER LED state	14, 27
STATUS (router) LED state	15, 28
boot devices	12, 25
external compact flash	18
boot process, backup router for	94
boot sequence	12, 25
braces, in configuration statements	xxi
brackets	
angle, in syntax descriptions	xxi
square, in configuration statements	xxi
BTUs per hour	66
built-in Ethernet ports <i>See</i> Gigabit Ethernet ports	
buttons	
power	14, 27
RESET CONFIG	160

C

cables	
AC power <i>See</i> AC power cords	
ADSL RJ-11 pinouts	194
arranging for safety	123
chassis console port, DB-9 connector pinouts	191
chassis console port, RJ-45 connector pinouts	190
connecting to network media	83
console port cable (chassis), connecting	99, 102
console port cable (chassis), replacing	120
console port, connecting	162
DC cables <i>See</i> DC power cables	
disconnecting PIM cables	123

E1 RJ-48 pinouts	191
Ethernet cable, connecting	97, 99, 102
Ethernet rollover, connecting	162
Fast Ethernet RJ-45 connector pinout	189
Gigabit Ethernet RJ-45 connector pinouts (ePIM)	190
Gigabit Ethernet RJ-45 connector pinouts (uPIMs)	189
grounding	83
ISDN RJ-45 pinouts	195
PIM, installing	123
PIM, removing	123
reducing radio frequency interference (RFI)	68
serial EIA-530A DCE pinouts	185
serial EIA-530A DTE pinouts	184
serial PIM specifications	179
serial RS-232 DCE pinouts	181
serial RS-232 DTE pinouts	180
serial RS-422/449 (EIA-449) DCE pinouts	183
serial RS-422/449 (EIA-449) DTE pinouts	181
serial V.35 DCE pinouts	187
serial V.35 DTE pinouts	186
serial X.21 DCE pinouts	188
serial X.21 DTE pinouts	187
SHDSL RJ-11 pinouts	194
T1 RJ-48 pinouts	191
Canada, compliance statement	233
case number, for JTAC	172
channelized E1 PIM	49
channelized E1 ports	
description	49
LED states	51
RJ-48 cable pinouts	191
channelized T1 PIM	49
channelized T1 ports	
description	49
LED states	51
RJ-48 cable pinouts	191
chassis	
alarm conditions and remedies	158
component serial number labels	169, 170
cover, replacing (J2320 and J2350)	124
dimensions	11, 24
environmental tolerances	66
grounding	83
heat dissipation	72
J2320	8
J2350	8
J4350	21
J6350	21
lifting guidelines	216
PIM slot numbers	14, 26
power consumption	72
power management, planning	72
power management, troubleshooting	159

- rack requirements.....64
- weight.....11, 24
- checklist, for site preparation.....75
- clear operation, RESET CONFIG button.....160
- clear-text access.....95
- clearance.....63
- CLI configuration editor
 - basic settings.....110
 - initial configuration.....110
- comments, in configuration statements.....xxi
- committed configuration
 - root password requirement.....92
- compact flash
 - backup, replacing.....132
 - description.....12, 25
 - external, description.....18
 - external, J2320 and J2350.....18
 - external, replacing.....132
 - inserting.....131
 - internal, recovering.....164
 - location (horizontal).....130
 - location (vertical).....129
 - minor (yellow) alarm.....158
 - recovering.....164
 - See also* compact flash recovery
 - removing.....131
 - replacing.....126, 129
 - replacing, rotating fans warning.....127, 130
- compact flash recovery
 - adapter for.....165
 - copying the JUNOS image.....165
 - reasons for.....164
 - requirements.....164
- compliance
 - EMC requirements.....233
 - general standards.....232
 - lithium battery.....226
- components
 - packing for shipment.....174
 - replacing.....119
 - serial number label.....169, 170
 - troubleshooting.....157
 - See also* LEDs
- configuration
 - clearing with RESET CONFIG button.....160
 - factory, resetting with RESET CONFIG button.....160
 - root password requirement.....92
- configuration editor *See* CLI configuration editor; J-Web configuration editor
- connection
 - AC power.....84
 - DC power.....86
 - for management.....91
 - network cables.....83
 - to Services Router.....96

- connectivity
 - basic *See* basic connectivity
 - hardware.....77
 - modem (remote) connection.....100
 - regaining lost DHCP lease after initial configuration.....104
 - through J-Web.....97
 - through the CLI locally.....98
 - through the CLI remotely.....100
- console port
 - adapter.....162
 - adapter (chassis).....99, 102
 - auxiliary console port.....17, 30
 - connecting through the CLI locally.....98
 - connecting through the CLI remotely.....100
 - description.....17, 30
 - on chassis, DB-9 connector pinouts.....191
 - on chassis, RJ-45 connector pinouts.....190
 - replacing the cable.....120
 - settings for local CLI connection.....99
 - settings for modem connection at router for remote CLI access.....101
 - settings for modem connection for remote CLI access.....102
- conventions
 - notice icons.....xx
 - text and syntax.....xx
- cooling system
 - airflow requirement.....63
 - description.....19, 32
- Copper Gigabit Ethernet ePIMs
 - overview.....44
 - pinouts.....190
- Copper Gigabit Ethernet uPIMs
 - overview.....41
 - pinouts.....189
- cords *See* AC power cords; cables; DC power cables
- cover, replacing (J2320 and J2350).....124
- Crypto Accelerator Module
 - description.....12, 25
 - installing.....148, 152
 - location.....146, 149
 - removing.....147, 150
- curly braces, in configuration statements.....xxi
- customer support.....xxiii
 - contacting JTAC.....xxiii
 - contacting JTAC for hardware return.....172
 - information required for hardware return.....172
- Cywin, for compact flash recovery.....165

D

- datasheets URL.....35
- DB-9 connector pinouts
 - chassis console port.....191
- DB-9 to DB-25 serial port adapter.....102

DC power	
cables <i>See</i> DC power cables	
connecting power.....	86
dedicated DC power feed requirement.....	145
electrical specifications.....	69
grounding requirements and warning.....	206
grounding the router.....	87
installing a J6350 power supply.....	144
J2320 system.....	18
J2350 system.....	18
J4350 system.....	30
J6350 system.....	31
power disconnection warning.....	205
removing a J6350 power supply.....	143
requirements.....	69
safety guidelines (general).....	204
safety guidelines, power sources for redundant power supplies.....	205
wiring sequence warning.....	207
wiring terminations warning.....	209
DC power cables	
electrical specifications.....	71
physical requirements.....	71
replacing.....	142
usage warning.....	204
dd utility, for compact flash recovery.....	165
Declaration of Conformity.....	235
default gateway	
defining (Quick Configuration).....	105
description.....	93
DHCP (Dynamic Host Configuration Protocol).....	94
DHCP server	
after initial configuration.....	94
before initial configuration.....	94
regaining lost lease after initial configuration.....	104
diagnosis	
chassis.....	158
hardware.....	158
dial-up modem connection <i>See</i> modem connection to router console port	
digital certificate <i>See</i> SSL certificates	
digital subscriber line <i>See</i> ADSL; SHDSL	
DIMMs (dual inline memory modules) <i>See</i> DRAM modules	
DNS (Domain Name System).....	93
DNS server	
defining (configuration editor).....	112
defining (Quick Configuration).....	105
function.....	93
documentation set	
comments on.....	xxiii
list of.....	xxii
domain name.....	92
defining (configuration editor).....	111
defining (Quick Configuration).....	104
<i>See also</i> DNS server	
Domain Name System.....	93
domain search	
defining (configuration editor).....	112
defining (Quick Configuration).....	105
DRAM modules	
installing.....	138
location.....	136
removing.....	137
dry chemical fire extinguishers, prohibited.....	67
DS1 ports <i>See</i> E1 ports; T1 ports	
DS3 ports <i>See</i> E3 ports; T3 ports	
DSL <i>See</i> ADSL; SHDSL	
dual inline memory modules <i>See</i> DRAM modules	
Dual-Port Channelized T1/E1/ISDN PRI PIM.....	49
Dual-Port E1 PIM.....	48
Dual-Port E3 PIM.....	51
Dual-Port Fast Ethernet PIM.....	53
Dual-Port Serial PIM.....	47
Dual-Port T1 PIM.....	48
Dual-Port T3 PIM.....	51
E	
E1 ports	
description.....	48
<i>See also</i> channelized E1 ports	
LED states.....	49
RJ-48 cable pinouts.....	191
E3 ports	
BNC connector pinouts.....	194
description.....	51
LED states.....	52
earth ground <i>See</i> grounding	
earthquakes	
rack-mount requirements.....	65
seismic requirements.....	66
EIA-530A DCE cable pinouts.....	185
EIA-530A DTE cable pinouts.....	184
electrical specifications.....	69
electricity	
safety warnings.....	201
wiring guidelines.....	68
electromagnetic compatibility (EMC) <i>See</i> EMC	
electromagnetic interference (EMI) <i>See</i> EMI	
electrostatic bag, for storing components.....	201
electrostatic discharge, preventing.....	201
EMC (electromagnetic compatibility)	
compliance with requirements.....	233
preventing problems with.....	68
standards.....	232

- EMI (electromagnetic interference)
 - compliance with requirements.....233
 - standards.....232
 - suppressing.....68
 - encrypted access
 - through SSH.....95
 - environmental requirements for operation.....66
 - ePIMs
 - 4-Port Fast Ethernet.....54
 - Copper Gigabit Ethernet.....44
 - SFP Gigabit Ethernet.....44
 - slot locations.....27
 - EPROM.....12, 25
 - ESD (electrostatic discharge), preventing.....201
 - ESD wrist strap
 - verifying resistance, for safety.....201
 - wearing during installation.....21
 - Ethernet cable
 - chassis console DB-9 connector pinouts.....191
 - chassis console, RJ-45 connector pinouts.....190
 - connecting the Services Router to a management device.....97, 99
 - connecting the Services Router to a modem.....102
 - replacing.....120
 - Ethernet ports *See* Fast Ethernet ports *See* Gigabit Ethernet ports
 - Ethernet rollover cable, connecting the router to a management device.....162
 - European Union, compliance statement.....235
 - external compact flash *See* compact flash
- F**
- failures
 - compact flash, USB for.....17, 30
 - PIM, troubleshooting.....158
 - Routing Engine fan, troubleshooting.....158
 - fans
 - description.....19, 32
 - See also* air filter
 - See also* cooling system
 - failure, troubleshooting.....158
 - Fast Ethernet ports
 - 4-Port Fast Ethernet ePIM.....54
 - ACTIVITY status (dual-port PIM).....53
 - Dual-Port Fast Ethernet PIM.....53
 - LED states (4-port ePIM).....55
 - LED states (dual-port PIM).....53
 - link activity (4-port ePIM).....55
 - link status (4-port ePIM).....55
 - LINK/ SPEED status (dual-port PIM).....53
 - RJ-45 connector pinout.....189
 - FCC Part 15 compliance statement.....237
 - FCC Part 68 compliance statement.....237
 - field-replaceable units, replacing.....119
 - filter cover *See* air filter
 - filter, air *See* air filter
 - fire extinguishers
 - prohibited.....67
 - required.....67
 - fire safety requirements.....66
 - fire suppression
 - equipment required.....67
 - shutdown requirement.....66
 - font conventions.....xx
 - FPC, PIM slot number in command
 - displays.....124, 169
 - front panel.....13, 26
 - FRUs (field-replaceable units), replacing.....119
- G**
- G.SHDSL PIM
 - description.....58
 - PIM ONLINE LED.....59
 - G.SHDSL ports *See* SHDSL ports
 - gateway, default.....93
 - ge-0/0/0
 - connecting through J-Web.....97
 - defining address (configuration editor).....113
 - defining address (Quick Configuration).....105
 - for autoinstallation.....94
 - management interface.....94
 - Gigabit Ethernet ePIMs
 - alarms.....46
 - description.....44
 - high-speed slot locations.....46
 - installation.....46
 - LEDs.....46
 - limitations.....46
 - link speeds and transmission modes45
 - SFP, optical interface support.....46
 - Gigabit Ethernet ports
 - built-in.....17, 29
 - copper.....44
 - LED states.....17, 29, 44, 46
 - port 0.....94
 - RJ-45 connector pinouts (ePIM).....190
 - RJ-45 connector pinouts (uPIMs).....189
 - SFP (optical).....43, 45
 - Gigabit Ethernet uPIMs
 - alarms.....44
 - description.....41
 - installation.....43
 - LEDs.....44
 - limitations.....43
 - link speeds and transmission modes43
 - SFP, optical interface support.....44
 - glossary
 - basic connectivity.....91
 - PIMs.....35
 - graceful shutdown.....89

grounding	
cable.....	83
chassis.....	83
DC power requirements and warning.....	206
equipment warning.....	210
grounding lug	
connecting.....	85, 87
gzip utility, for compact flash recovery.....	165

H

HA (high availability) LED	
description.....	16, 29
hardware	
alarm conditions and remedies.....	158
installation and connection.....	77
maintenance.....	119
PIM overview.....	35
product overview.....	3
recommended for compact flash recovery.....	164
replacing components.....	119
returning.....	169
supported platforms.....	xviii
troubleshooting components.....	157
<i>See also</i> LEDs	
hardware features	
components.....	24
front panel.....	13, 26
PIMs.....	35
product overview.....	3
Hayes-compatible modem <i>See</i> modem connection to	
router console port	
heat dissipation, PIMs	
managing.....	72
troubleshooting.....	159
high-speed interfaces <i>See</i> ePIMs	
high-speed slots for ePIMs, location.....	27
hostname.....	92
defining (configuration editor).....	111
defining (configuration wizard).....	107
defining (Quick Configuration).....	104
overview.....	92
<i>See also</i> DNS server	
humidity requirement.....	66
Hyperterminal, for terminal emulation	
local CLI connection.....	99
modem connection at router for remote CLI	
access.....	101
modem connection for remote CLI access.....	102

I

immunity standards.....	232
initial configuration requirements.....	95
injury, steps to take.....	211

installation

AC power supplies (J6350).....	141
air filter.....	154
compact flash.....	126, 129
console port cable (chassis).....	120
Crypto Accelerator Module.....	148, 152
DC power supplies (J6350).....	144
DRAM modules.....	138
initial.....	77
PIM cables.....	123
PIMs.....	122
preparation.....	63
requirements.....	77
restricted access, J2350.....	79
restricted access, J4350 and	
J6350.....	19, 31, 32, 80
safety guidelines and warnings.....	216
site checklist.....	75
site guidelines.....	63
USB storage device.....	135

Integrated Services Digital Network *See* ISDN

interfaces

J2320 overview.....	4
J2320 types supported.....	38
J2350 overview.....	4
J2350 types supported.....	38
J4350 overview.....	5
J4350 types supported.....	39
J6350 overview.....	6
J6350 types supported.....	39

ISDN BRI ports

BRI S/T.....	55
BRI U.....	55
LED states.....	56
provisioning.....	74
RJ-45 connector pinouts.....	195

ISDN PRI PIM.....

ISDN provisioning.....

See also ISDN BRI ports

J

J-series

establishing software connectivity.....	91
hardware replacement.....	119
hardware return.....	169
installation and connection.....	77
models available.....	3
network cables and connectors.....	179
PIMs.....	35
safety and compliance.....	197
site preparation.....	63

J-Web configuration editor

basic settings.....	110
initial configuration.....	110

- J-Web interface
 - configuration editor *See* J-Web configuration editor
 - connecting.....97
 - Quick Configuration *See* Quick Configuration
 - regaining lost DHCP lease after initial configuration.....104
- J-Web Quick Configuration *See* Quick Configuration
- J2320
 - boot devices.....12
 - boot sequence.....12
 - chassis.....8
 - chassis cover, replacing.....124
 - compact flash location.....127
 - compact flash, replacing.....127
 - cooling system.....19
 - electrical specifications.....69
 - external compact flash.....18
 - fans.....19
 - front panel.....13
 - hardware.....7, 20
 - installation.....79
 - interfaces supported.....38
 - mounting brackets.....79
 - overview.....3
 - physical specifications.....11
 - PIMs supported.....38
 - ports supported.....38
 - power management.....72
 - Routing Engine, hardware.....12
 - USB port.....17
- J2350
 - air filter, replacing.....153
 - boot devices.....12
 - boot sequence.....12
 - chassis.....8
 - chassis cover, replacing.....124
 - compact flash location.....127
 - compact flash, replacing.....127
 - cooling system.....19
 - electrical specifications.....69
 - external compact flash.....18
 - fans.....19
 - front panel.....13
 - hardware.....7, 20
 - installation.....79
 - interfaces supported.....38
 - mounting brackets.....79
 - overview.....4
 - physical specifications.....11
 - PIMs supported.....38
 - ports supported.....38
 - power management.....72
 - power system.....18
 - restricted access installation.....79
 - Routing Engine, hardware.....12
 - USB port.....17
- J4350
 - 4-Port Fast Ethernet ePIM.....54
 - 4-Port ISDN BRI S/T PIM.....55
 - 4-Port ISDN BRI U PIM.....55
 - ADSL PIM.....56
 - air filter, replacing.....154
 - boot devices.....25
 - boot sequence.....25
 - chassis.....21
 - cooling system.....32
 - Dual-Port Channelized T1/E1/ISDN PRI PIM.....49
 - Dual-Port E1 PIM.....48
 - Dual-Port Fast Ethernet PIM.....53
 - Dual-Port Serial PIM.....47
 - Dual-Port T1 PIM.....48
 - electrical specifications.....69
 - fans.....32
 - front panel.....26
 - FRUs, replacing.....119
 - G.SHDSL PIM.....58
 - Gigabit Ethernet ePIM.....44
 - Gigabit Ethernet uPIMs.....41
 - hardware.....20
 - hardware components.....24
 - hardware, replacing.....119
 - installation.....80
 - interfaces supported.....39
 - mounting brackets, installing.....81
 - overview.....5
 - physical specifications.....24
 - PIM overview.....38
 - PIMs supported.....39
 - ports supported.....39
 - power management.....72
 - power system.....30
 - restricted access installation.....19, 31, 32, 80
 - Routing Engine, hardware.....25
 - USB port.....30
- J6350
 - 4-Port Fast Ethernet ePIM.....54
 - 4-Port ISDN BRI S/T PIM.....55
 - 4-Port ISDN BRI U PIM.....55
 - ADSL PIM.....56
 - air filter, replacing.....154
 - boot devices.....12, 25
 - boot sequence.....25
 - chassis.....21
 - cooling system.....32
 - Dual-Port Channelized T1/E1/ISDN PRI PIM.....49
 - Dual-Port E1 PIM.....48
 - Dual-Port Fast Ethernet PIM.....53
 - Dual-Port Serial PIM.....47
 - Dual-Port T1 PIM.....48
 - E3 PIM.....51
 - electrical specifications.....69
 - fans.....32

front panel.....	26	E3 port status.....	52
FRUs, replacing.....	119	Fast Ethernet port status (4-port ePIM).....	55
G.SHDSL PIM.....	58	Fast Ethernet port status (dual-port PIM).....	53
Gigabit Ethernet ePIM.....	44	G.SHDSL PIM status.....	59
Gigabit Ethernet uPIMs.....	41	Gigabit Ethernet port status.....	17, 29, 46
hardware.....	20	HA.....	16, 29
hardware components.....	24	ISDN PIM status.....	56
hardware, replacing.....	119	ISDN port status.....	56
installation.....	80	J4350 power supply.....	31
interfaces supported.....	39	J6350 power supply.....	31
mounting brackets, installing.....	81	LAN port status.....	17, 29
overview.....	6	LINK.....	17, 29, 46
physical specifications.....	24	link activity (4-Port Fast Ethernet ePIM).....	55
PIM overview.....	38	link status (4-port ePIM).....	55
PIMs supported.....	39	LINK/ SPEED status (Dual-Port Fast Ethernet PIM).....	53
ports supported.....	39	ONLINE status (ADSL PIM).....	57
power management.....	72	ONLINE status (G.SHDSL PIM).....	59
power supplies <i>See</i> power supplies, J6350		ONLINE status (ISDN BRI PIMs).....	56
restricted access installation.....	19, 31, 32, 80	POWER.....	14, 27
Routing Engine, hardware.....	25	safety warnings.....	221
T3 PIM.....	51	serial port status.....	48
USB port.....	30	SHDSL port status.....	59
Japan, compliance statement.....	236	STATUS (router).....	15, 28
JTAC (Juniper Networks Technical Assistance Center)		T1 port status.....	49
contacting.....	167	T3 port status.....	52
contacting for hardware return.....	172	TX/RX.....	17, 29, 46
information required for hardware return.....	172	lifting guidelines.....	216
Juniper Networks Technical Assistance Center <i>See</i> JTAC		lightening activity warning.....	228
JUNOS CLI		limitations	
connecting locally.....	98	compact flash recovery does not recover	
connecting remotely.....	100	configuration files.....	164
JUNOS software		link activity LED (4-Port Fast Ethernet ePIM).....	55
establishing connectivity.....	91	LINK LED.....	17, 29, 46
release notes, URL.....	xvii	link status LED (4-Port Fast Ethernet ePIM).....	55
JUNOScript API		LINK/ SPEED LED (Dual-Port Fast Ethernet PIM).....	53
defining access (Quick Configuration).....	106	lithium battery compliance.....	233
management access.....	95	lo0.0.....	94
		local connection to the router console port.....	98
L		loopback address	
labels, serial number.....	169, 170	defining (configuration editor).....	113
laptop <i>See</i> management device		defining (Quick Configuration).....	105
lasers		overview.....	94
beam warning.....	223	LX transceiver	
Class 1 product warning.....	222	Gigabit Ethernet ePIM.....	46
open aperture warning.....	224	Gigabit Ethernet uPIM.....	44
safety guidelines.....	222		
LEDs		M	
ACTIVITY status (dual-port PIM).....	53	maintenance	
ADSL PIM status.....	57	AC power cord, replacing.....	139
ADSL port status.....	57	air filter.....	154
ALARM.....	15, 28	console port cable (chassis).....	120
channelized E1 ports.....	51	Crypto Accelerator Module.....	146, 149
channelized T1 ports.....	51	DC power cable, replacing.....	142
Class 1 product warning.....	222	DRAM modules.....	136
E1 port status.....	49		

- external compact flash.....132
- internal compact flash.....126, 129
- PIM cables.....123
- PIMs.....120
- power system.....139
- tools and parts required.....119
- USB storage device.....134
- warnings.....225
- major (red) alarms
 - PIMs.....158
 - Routing Engine.....158
- management access.....95
- management device
 - connecting through the CLI.....100, 162
 - connecting to console port.....162
 - connecting to J-Web.....97, 98
 - recovering root password from.....161
- management interface address
 - after initial configuration.....94
 - before initial configuration.....94
 - defining (configuration editor).....113
 - defining (Quick Configuration).....105
 - during initial configuration.....94
 - loopback.....94
- management interfaces.....94
- management ports.....17, 29
 - See also* management interface address;
 - management interfaces
- manuals
 - comments on.....xxiii
 - list ofxxii
- memory *See* compact flash; DRAM modules; USB
- midplane.....12, 25
- minor (yellow) alarms
 - alternative boot device.....158
 - internal compact flash.....158
 - Routing Engine.....158
- modem commands
 - at remote end.....102
 - at router end.....101
- modem connection to router console port
 - configuring modem at router end.....101
 - configuring modem at user end.....102
 - connecting modem to router.....102
 - overview.....100
- monoammonium phosphate.....67
- mounting brackets
 - installing on J4350 and J6350.....83
 - on J2320 and J2350.....79
- multiple routers
 - safe rack order.....79, 81

N

- NEBS (Network Equipment Building System)
 - identifying NEBS-compliant routers.....32
 - shutdown temperature for NEBS-compliant routers.....19, 32
- network cable pinouts.....179
- Network Equipment Building System *See* NEBS
- Network Time Protocol (NTP) server *See* NTP server
- Norton Ghost utility, for compact flash recovery.....165
- notice icons.....xx
- NT1 device, provisioning information.....74
- NTP server
 - defining (configuration editor).....112
 - defining (Quick Configuration).....105
 - overview.....93

O

- ONLINE LEDs
 - ADSL PIM status.....57
 - channelized E1 ports.....51
 - channelized T1 ports.....51
 - G.SHDSL PIM status.....59
 - ISDN BRI PIM status.....56
- overview
 - J2320.....3
 - J2350.....4
 - J4350.....5
 - J6350.....6

P

- packing materials
 - packing a Services Router for shipment.....174
 - packing components for shipment.....174
 - saving.....78
- parentheses, in syntax descriptions.....xxi
- password *See* root password
- passwords
 - root password, recovering.....161
- PC *See* management device
- personnel warning.....200
- physdiskwrite utility, for compact flash recovery.....165
- PIC *See* PIMs
- PIM number, always 0.....124
- PIMs (Physical Interface Modules)
 - 4-Port Fast Ethernet.....54
 - 4-Port ISDN BRI.....55
 - ADSL.....56
 - cables and connectors.....179
 - Dual-Port Channelized T1/E1/ISDN PRI PIM.....49
 - Dual-Port E1.....48
 - Dual-Port Fast Ethernet.....53
 - Dual-Port Serial.....47
 - Dual-Port T1.....48
 - E351

- failure.....158
- field-replaceable PIMs.....38
- G.SHDSL58
- Gigabit Ethernet ePIMs.....44
- Gigabit Ethernet uPIMs.....41
- heat dissipation.....72
- installing.....122
- installing cables.....123
- LEDs *See* LEDs
- major (red) alarm.....158
- midplane to Routing Engine.....12, 25
- non-hot-swappability.....35, 121, 122
- offline, troubleshooting.....159
- overview.....35
- PIM number, always 0.....124, 169
- power consumption.....72
- power management, planning.....72
- power management, troubleshooting.....159
- removing.....120
- replacing cables.....123
- serial number label.....172
- slot numbering, J2320 and J2350.....14
- slot numbering, J4350 and J6350.....26
- T351
- pinouts
 - ADSL RJ-11 connector.....194
 - chassis console DB-9 connector.....191
 - chassis console port.....190
 - EIA-530A DCE serial cable.....185
 - EIA-530A DTE serial cable.....184
 - Fast Ethernet connector.....189
 - Gigabit Ethernet connector (ePIM).....190
 - Gigabit Ethernet connector (uPIMs).....189
 - ISDN RJ-45 connector.....195
 - RJ-45 chassis console connector.....190
 - RJ-48 connector to DB-15 connector (crossover).....193
 - RJ-48 connector to DB-15 connector (straight).....193
 - RJ-48 connector to RJ-48 connector (crossover).....192
 - RJ-48 connector to RJ-48 connector (straight).....192
 - RS-232 DCE serial cable.....181
 - RS-232 DTE serial cable.....180
 - RS-422/449 (EIA-449) DCE serial cable.....183
 - RS-422/449 (EIA-449) DTE serial cable.....181
 - SHDSL RJ-11 connector.....194
 - V.35 DCE serial cable.....187
 - V.35 DTE serial cable.....186
 - X.21 DCE serial cable.....188
 - X.21 DTE serial cable.....187
- plug types, AC.....70
- ports
 - 0.....94
 - ADSL *See* ADSL ports
 - AUX.....17, 30
 - cables, PIM, installing.....123
 - cables, WAN, removing.....123
 - channelized *See* channelized E1 ports; channelized T1 ports
 - console (chassis).....17, 30
 - See also* console port
 - DS1 *See* E1 ports; T1 ports
 - DS3 *See* E3 ports; T3 ports
 - E1 *See* E1 ports
 - E3 *See* E3 ports
 - G.SHDSL *See* SHDSL ports
 - interface naming.....124
 - ISDN *See* ISDN BRI ports
 - J2320 types supported.....38
 - J2350 types supported.....38
 - J4350 types supported.....39
 - J6350 types supported.....39
 - lo0.0.....94
 - serial *See* serial ports
 - SHDSL *See* SHDSL ports
 - T1 *See* T1 ports
 - T3 *See* T3 ports
 - USB.....17, 30
- power
 - AC power *See* AC power
 - applying.....89
 - button.....14, 27
 - connecting.....84
 - consumption, PIMs.....72
 - DC power *See* DC power
 - grounding requirement.....83
 - LED.....14, 27
 - managing.....72
 - power cables *See* DC power cables
 - power cords *See* AC power cords
 - power supplies *See* power supplies
 - power system *See* power system
 - removing.....89
 - requirements.....69
 - troubleshooting.....159
- power button.....14, 27
- power cables *See* DC power cables
- power cords *See* AC power cords
- POWER LED.....14, 27
- power management
 - planning.....72
 - troubleshooting.....159
- power supplies
 - J2320.....18
 - J2350.....18
 - J4350.....30
 - J6350 *See* power supplies, J6350
 - LED states.....31

power supplies, J6350	
blank panel required in empty slot.....	139
dedicated AC power feed requirement.....	142
dedicated DC power feed requirement.....	145
description.....	31
installing AC.....	141
installing DC.....	144
LED states.....	31
redundancy.....	31
removing AC.....	140
removing DC.....	143
serial number label.....	172
power system	
connecting.....	85, 86
fan.....	19, 32
J2320.....	18
J4350.....	30
J6350.....	31
power supply LED.....	31
preparing for installation.....	63
product disposal.....	231
product overview.....	3
provisioning an ISDN line.....	74

Q

Quick Configuration	
basic settings.....	103
initial configuration.....	103
Set Up page.....	104

R

rack installation	
general requirements.....	64
lifting guidelines.....	216
mounting brackets.....	83
order of multiple routers.....	79, 81
procedure.....	79, 80
safety guidelines and warnings.....	217
securing rack to building.....	65
size requirements.....	64, 65
support for front-mount rack.....	64, 65
ventilation requirement.....	64, 65
radio frequency interference (RFI), reducing.....	68
ramp angle requirement.....	221
read or write error, Routing Engine.....	158
recovering compact flash <i>See</i> compact flash recovery	
red alarms <i>See</i> major alarms	
redundant J6350 power supplies	
description.....	31
safety guidelines for power sources.....	205
regulatory compliance.....	197
release notes, URL.....	xvii

remote connection to router console port	
configuring modem at router end.....	101
configuring modem at user end.....	102
connecting modem to router.....	102
overview.....	100
replacement	
AC power cord.....	139
air filter.....	154
console port cable (chassis).....	120
Crypto Accelerator Module.....	146, 149
DC power cable.....	142
DRAM modules.....	136
external compact flash.....	132
internal compact flash.....	126, 129
PIM cables.....	123
PIMs.....	120
power system (J6350).....	139
tools and parts required.....	119
USB storage device.....	134
request chassis pic fpc-slot command.....	123
reset	
power button for restart.....	14, 27
RESET CONFIG button for factory	
configuration.....	160
RESET CONFIG button	
for factory configuration.....	160
Return Materials Authorization <i>See</i> RMA	
returning hardware.....	169
packing a Services Router for shipment.....	174
packing components for shipment.....	174
procedure.....	172
tools and parts required.....	173
RJ-45 connector pinouts	
chassis console port.....	190
Fast Ethernet port.....	189
Gigabit Ethernet port (ePIM).....	190
Gigabit Ethernet port (uPIMs).....	189
RJ-45 to DB-9 serial port adapter.....	162
chassis console port.....	99, 102
RJ-48 connector to DB-15 connector (crossover)	
pinouts.....	193
RJ-48 connector to DB-15 connector (straight)	
pinouts.....	193
RJ-48 connector to RJ-48 connector (crossover)	
pinouts.....	192
RJ-48 connector to RJ-48 connector (straight)	
pinouts.....	192
RMA (Return Materials Authorization).....	169
number.....	173
packing a Services Router for shipment.....	174
packing components for shipment.....	174
procedure.....	172
tools and parts required.....	173
rollover cable, connecting the console port.....	162

root password	
at initial local connection (none).....	99
at initial remote connection (none).....	103
characteristics.....	92
defining (cli wizard).....	107
defining (configuration editor).....	112
defining (Quick Configuration).....	104
required to commit a configuration.....	92
root password recovery.....	161
router <i>See</i> Services Router	
Routing Engine	
fan.....	19, 32
fan failure.....	158
J2320 functions and components.....	12
J2350 functions and components.....	12
J4350 functions and components.....	25
J6350 functions and components.....	25
major (red) alarm.....	158
midplane to PIMs.....	12, 25
minor (yellow) alarm.....	158
read or write error.....	158
too warm.....	158
RS-232 DCE cable pinouts.....	181
RS-232 DTE cable pinouts.....	180
RS-422/449 (EIA-449) DCE cable pinouts.....	183
RS-422/449 (EIA-449) DTE cable pinouts.....	181

S

S/T port *See* ISDN BRI ports

safety guidelines and warnings

AC power.....	203
battery handling.....	226
DC power (general).....	204
DC power disconnection.....	205
DC power wiring sequence warning.....	207
DC power wiring terminations warning.....	209
DC power, grounding requirements and warning.....	206
DC power, redundant power supplies.....	205
electrical.....	202
general.....	199
grounded equipment.....	210
in case of electrical accident.....	211
installation.....	216
jewelry removal.....	227
lasers and LEDs.....	221
levels.....	197
lightening activity.....	228
maintenance and operation.....	225
multiple power supplies	211
operating temperature.....	229
power disconnection.....	213
product disposal.....	231
rack-mounting.....	217
ramps.....	221

read installation instructions.....	216
telecommunications cord.....	215
TN power system.....	214
safety standards.....	232
fire safety.....	66
sample configuration	
for basic connectivity.....	114
serial number	
chassis components, label.....	169, 170
PIMs.....	172
power supply.....	172
serial ports	
cables and connectors.....	179
Dual-Port Serial PIM.....	47
EIA-530A DCE pinouts.....	185
EIA-530A DTE pinouts.....	184
LED states.....	48
RS-232 DCE pinouts.....	181
RS-232 DTE pinouts.....	180
RS-422/449 (EIA-449) DCE pinouts.....	183
RS-422/449 (EIA-449) DTE pinouts.....	181
V.35 DCE pinouts.....	187
V.35 DTE pinouts.....	186
X.21 DCE pinouts.....	188
X.21 DTE pinouts.....	187
service provider, contacting for ISDN provisioning.....	74
Services Router	
backup.....	94
clearance.....	63
connecting.....	96
establishing software connectivity.....	91
grounding a DC-powered model.....	87
grounding an AC-powered model.....	84
hardware replacement.....	119
hardware return.....	169
installation and connection.....	77
network cables and connectors.....	179
operating environment.....	66
overview.....	3
packing for shipment.....	174
PIM overview.....	35
powering on and off.....	89
preparation checklist.....	75
safety and compliance.....	197
site preparation.....	63
unpacking.....	78
Set Up page	
description.....	103
field summary.....	104
setup	
configuration editor.....	110
Quick Configuration.....	103
requirements.....	95

- SFP Gigabit Ethernet ePIMs
 - optical interface support.....46
 - overview.....44
 - SFPs supported.....45
- SFP Gigabit Ethernet uPIMs
 - optical interface support.....44
 - overview.....41
- SHDSL ports
 - description.....58
 - LED states on a G.SHDSL PIM.....59
 - RJ-11 connector pinouts.....194
- shipping carton
 - packing a Services Router for shipment.....174
 - packing components for shipment.....174
 - saving.....78
- show chassis alarms command.....157
- show chassis fpc pic-status command.....124
- show chassis hardware command
 - identifying NEBS-compliant routers.....32
 - locating component serial numbers.....169
 - verifying Crypto Accelerator Module installation.....149, 152
- show chassis power-ratings command.....159
- show chassis routing-engine command
 - checking CPU temperature.....19, 32
 - checking DRAM amount.....12, 25
 - verifying DRAM installation and configuration.....139
- shutdown
 - graceful.....89
 - immediate.....89
 - temperature *See* shutdown temperature
- shutdown temperature
 - NEBS-compliant routers.....19, 32
 - non-NEBS-compliant routers.....32
- signaling limitations.....68
- site preparation
 - checklist.....75
 - electrical wiring guidelines.....68
 - fire safety.....66
 - for rack installation.....64
 - guidelines.....63
 - operating environment.....66
 - power requirements.....69
- size
 - J2320.....11
 - J2350.....11
 - J4350.....24
 - J6350.....24
 - requirements for rack installation.....64, 65
- slot numbers, PIM
 - chassis diagram.....14, 26
 - displayed as FPC number in command output.....124
- small form-factor pluggable transceivers *See* SFP
- SNMP (Simple Network Management Protocol), no Gigabit Ethernet support.....43, 46
- specifications
 - AC electrical connection.....69
 - AC power cords.....70
 - DC electrical connection.....71
 - DC power cables.....71
 - electrical.....69
 - environmental.....66
 - grounding cable.....83
 - J2320 hardware.....11
 - J2350 hardware.....11
 - J4350 hardware.....24
 - J6350 hardware.....24
 - serial PIM cables and connectors.....179
 - SFP Gigabit Ethernet ePIM.....46
 - SFP Gigabit Ethernet uPIMs.....44
- SSH
 - defining (configuration editor).....112
 - defining access (Quick Configuration).....106
 - management access.....95
- standards compliance.....232
- startup
 - Services Router.....89
 - standby power.....89
- status
 - router.....15, 28
 - See also* STATUS LEDs
- STATUS LEDs
 - ADSL ports.....57
 - channelized E1 ports.....51
 - channelized T1 ports.....51
 - E1 ports.....49
 - E3 ports.....52
 - ISDN ports.....56
 - router status.....15, 27
 - serial ports.....48
 - SHDSL ports.....59
 - T1 ports.....49
 - T3 ports.....52
- storage media
 - recovering internal compact flash.....164
 - replacing the external compact flash.....132
 - replacing the internal compact flash.....126, 129
 - replacing the USB storage device.....134
- support, technical *See* technical support
- SX transceiver
 - Gigabit Ethernet ePIM.....46
 - Gigabit Ethernet uPIM.....44
- symmetric high-speed digital subscriber line *See* SHDSL
- syntax conventions.....xx
- system time
 - defining (Quick Configuration).....105
 - overview.....93
 - synchronizing (configuration editor).....112
 - synchronizing (Quick Configuration).....105

T

T1 ports	
description.....	48
<i>See also</i> channelized T1 ports	
LED states.....	49
RJ-48 cable pinouts.....	191
T3 ports	
BNC connector pinouts.....	194
description.....	51
LED states.....	52
technical publications list.....	xxii
technical support	
contacting JTAC.....	xxiii
contacting JTAC for hardware return.....	172
information required for hardware return.....	172
telecommunications line wire gauge.....	215
Telnet	
defining access (Quick Configuration).....	106
management access.....	95
temperature	
required for operation.....	66
Routing Engine, too warm.....	158
shutdown, NEBS-compliant routers.....	19, 32
shutdown, non-NEBS-compliant routers.....	32
warning.....	229
temperature alarm, air filter replacement for.....	154
terminology	
basic connectivity.....	91
PIMs.....	35
thermal output.....	66
time <i>See</i> system time	
time zone.....	93
defining (configuration editor).....	112
defining (Quick Configuration).....	105
TN power system.....	214
tolerances, environmental.....	66
tools and equipment	
for component replacement.....	119
for hardware return.....	173
troubleshooting	
root password recovery.....	161
troubleshooting a Services Router, hardware components	
chassis alarm conditions.....	158
offline PIMs.....	159
power management.....	159
turning on a Services Router.....	89
TX/RX LED.....	17, 29, 46
Type C fire extinguishers.....	67

U

U port <i>See</i> ISDN BRI ports	
United States, compliance statements.....	237
universal serial bus <i>See</i> USB	
unpacking the router.....	78

uPIMs, Gigabit Ethernet *See* Gigabit Ethernet uPIMs

URLs

datasheets.....	35
PIM information and datasheets.....	35
release notes.....	xvii
return and repair policies.....	173
support.....	167
USB (universal serial bus)	
storage device, installing.....	135
storage device, removing.....	134
storage device, replacing.....	134
USB port.....	17, 30
utilities, for compact flash recovery.....	165

V

V.35 DCE cable pinouts.....	187
V.35 DTE cable pinouts.....	186
ventilation requirement.....	63
verification	
basic connectivity.....	113

W

warnings

battery handling.....	226
DC power cables.....	204
DC power disconnection.....	205
DC power plant and chassis ground.....	71
DC wiring sequence.....	207
DC wiring terminations.....	209
DC-powered J4350 and J6350 routers, restricted access installation only	68
earthed mains socket (Norway and Sweden only).....	211
electrical.....	201
ESD strap to prevent router damage.....	21
follow lifting guidelines.....	79, 81
general.....	199
grounded equipment.....	210
installation.....	216
jewelry removal.....	227
laser and LED.....	221
levels defined.....	197
lightening activity.....	228
maintenance and operational.....	225
multiple power supply disconnection.....	211
operating temperature.....	229
personnel.....	200
power disconnection.....	213
product disposal.....	231
rack-mounting requirements.....	217
ramp angle.....	221
read installation instructions.....	216
restricted access location for DC-powered routers.....	19, 31, 32, 79, 80

rotating fans, compact flash	
replacement.....	127, 130
safe rack order for multiple routers.....	79, 81
telecommunications lines.....	215
TN power system.....	214
weight	
J2320.....	11
J2350.....	11
J4350.....	24
J6350.....	24
rack-mount requirements.....	64, 65
WinZip utility, for compact flash recovery.....	165
wire gauge	
for grounding cables.....	83
for telecommunications lines.....	215
wiring guidelines	
DC wiring sequence warning.....	207
DC wiring terminations warning.....	209
radio frequency interference (RFI).....	68
signaling limitations.....	68
suppressing electromagnetic interference	
(EMI).....	68
X	
X.21 DCE cable pinouts.....	188
X.21 DTE cable pinouts.....	187

