



Junos[®] OS

Interfaces Operations Guide



Published: 2011-05-17

Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

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, Junos, Steel-Belted Radius, NetScreen, and ScreenOS are registered trademarks of Juniper Networks, Inc. in the United States and other countries. The Juniper Networks Logo, the Junos logo, and JunosE are trademarks 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[®] operating system (Junos OS) Interfaces Operations Guide

Copyright © 2011, Juniper Networks, Inc.

All rights reserved.

Revision History

29 January 2003—First Edition

30 May 2004—Second Edition

12 January 2007—Revision 1

July 2010—Revision 2

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 OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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 | xxv |
| Part 1 | Overview of Interfaces | |
| Chapter 1 | Interfaces Overview | 3 |
| Chapter 2 | Investigate Interface Steps and Commands | 15 |
| Part 2 | Investigate T1 Interfaces | |
| Chapter 3 | Monitor T1 Interfaces | 21 |
| Chapter 4 | Use Loopback Testing for T1 Interfaces | 27 |
| Chapter 5 | Locate T1 Alarms and Errors | 39 |
| Part 3 | Investigate T3 Interfaces | |
| Chapter 6 | Monitor T3 Interfaces | 47 |
| Chapter 7 | Use Loopback Testing for T3 Interfaces | 53 |
| Chapter 8 | Locate T3 Alarms and Errors | 65 |
| Part 4 | Investigate ATM Interfaces | |
| Chapter 9 | Determine ATM Interface Type | 73 |
| Chapter 10 | Monitor ATM Interfaces | 83 |
| Chapter 11 | Use Loopback Testing for ATM Interfaces | 99 |
| Chapter 12 | Locate ATM Alarms and Errors | 113 |
| Part 5 | Investigate SONET Interfaces | |
| Chapter 13 | Monitor SONET Interfaces | 123 |
| Chapter 14 | Use Loopback Testing for SONET Interfaces | 131 |
| Chapter 15 | Locate SONET Alarms and Errors | 145 |
| Chapter 16 | Enable SONET Payload Scrambling | 165 |
| Chapter 17 | Check the SONET Frame Checksum | 169 |
| Part 6 | Investigate Fast Ethernet and Gigabit Ethernet Interfaces | |
| Chapter 18 | Monitor Fast Ethernet and Gigabit Ethernet Interfaces | 179 |
| Chapter 19 | Use Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces | 189 |

| | | |
|---------------|--|-----|
| Chapter 20 | Locate the Fast Ethernet and Gigabit Ethernet LINKAlarm and Counters | 201 |
| Part 7 | Investigate Channelized Interfaces | |
| Chapter 21 | Monitor Channelized DS3 Interfaces | 209 |
| Chapter 22 | Use Loopback Testing For Channelized DS3 Interfaces | 223 |
| Chapter 23 | Locate Channelized DS3 Alarms and Errors | 235 |
| Chapter 24 | Monitor Multichannel DS3 Interfaces | 241 |
| Chapter 25 | Use Loopback Testing for Multichannel DS3 Interfaces | 251 |
| Chapter 26 | Locate Multichannel DS3 Alarms and Errors | 265 |
| Chapter 27 | Monitor Channelized OC12 Interfaces | 273 |
| Chapter 28 | Use Loopback Testing for Channelized OC12 Interfaces | 293 |
| Chapter 29 | Locate Channelized OC12 Alarms and Errors | 307 |
| Part 8 | Appendix | |
| Part 9 | Index | |
| | Index | 317 |

Table of Contents

| | | |
|------------------|---|------------|
| | About This Guide | xxv |
| | Objectives | xxv |
| | Audience | xxvi |
| | Supported Routing Platforms | xxvi |
| | Using the Index | xxvii |
| | Using the Examples in This Manual | xxvii |
| | Merging a Full Example | xxvii |
| | Merging a Snippet | xxviii |
| | Document Conventions | xxviii |
| | List of Technical Publications | xxix |
| | Documentation Feedback | xxxii |
| | Requesting Technical Support | xxxiii |
| | Self-Help Online Tools and Resources | xxxiii |
| | Opening a Case with JTAC | xxxiii |
| Part 1 | Overview of Interfaces | |
| Chapter 1 | Interfaces Overview | 3 |
| | Interfaces Covered in These Topics | 3 |
| | T1 Interfaces | 4 |
| | T3 Interfaces | 4 |
| | ATM Interfaces | 4 |
| | SONET Interfaces | 5 |
| | Fast Ethernet and Gigabit Ethernet Interfaces | 5 |
| | Channelized Interfaces | 5 |
| | Interfaces Supported by the Junos OS | 6 |
| | Interface Descriptors | 8 |
| | Interface Naming | 9 |
| | Interface and Router Clock Sources | 13 |
| Chapter 2 | Investigate Interface Steps and Commands | 15 |
| | Investigate Interface Steps | 15 |
| | Monitor Interfaces | 16 |
| | Perform a Loopback Test on an Interface | 16 |
| | Locate Interface Alarms | 18 |

| | | |
|------------------|--|-----------|
| Part 2 | Investigate T1 Interfaces | |
| Chapter 3 | Monitor T1 Interfaces | 21 |
| | Checklist for Monitoring T1 Interfaces | 21 |
| | Monitor T1 Interfaces | 21 |
| | Display the Status of T1 Interfaces | 22 |
| | Display the Status of a Specific T1 Interface | 23 |
| | Display Extensive Status Information for a Specific T1 Interface | 23 |
| | Monitor Statistics for a T1 Interface | 24 |
| Chapter 4 | Use Loopback Testing for T1 Interfaces | 27 |
| | Checklist for Using Loopback Testing for T1 Interfaces | 27 |
| | Diagnose a Suspected Hardware Problem with a T1 Interface | 28 |
| | Create a Loopback | 29 |
| | Create a Physical Loopback | 29 |
| | Configure a Local Loopback | 29 |
| | Set Clocking to Internal | 30 |
| | Verify That the T1 Interface Is Up | 31 |
| | Clear T1 Interface Statistics | 32 |
| | Force the Link Layer To Stay Up | 32 |
| | Configure Encapsulation to Cisco-HDLC | 32 |
| | Configure No-Keepalives | 33 |
| | Verify the Status of the Logical Interface | 34 |
| | Ping the T1 Interface | 35 |
| | Check for T1 Interface Error Statistics | 35 |
| | Diagnose a Suspected Circuit Problem | 37 |
| | Create a Loop from the Router to the Network | 37 |
| | Create a Loop to the Router from Various Points in the Network | 38 |
| Chapter 5 | Locate T1 Alarms and Errors | 39 |
| | Checklist for T1 Alarms and Errors | 39 |
| | Display T1 Alarms and Errors | 39 |
| | Locate Most Common T1 Alarms and Errors | 42 |
| | Locate Loss of Signal and Loss of Frame Alarms | 42 |
| | Locate Alarm Indication Signal Alarms | 43 |
| | Locate an Incoming Yellow Alarm | 43 |
| Part 3 | Investigate T3 Interfaces | |
| Chapter 6 | Monitor T3 Interfaces | 47 |
| | Checklist for Monitoring T3 Interfaces | 47 |
| | Monitor T3 Interfaces | 47 |
| | Display the Status of T3 Interfaces | 48 |
| | Display the Status of a Specific T3 Interface | 48 |
| | Display Extensive Status Information for a Specific T3 Interface | 49 |
| | Monitor Statistics for a T3 Interface | 50 |

| | | |
|-------------------|---|-----------|
| Chapter 7 | Use Loopback Testing for T3 Interfaces | 53 |
| | Checklist for Using Loopback Testing for T3 Interfaces | 53 |
| | Diagnose a Suspected Hardware Problem with a T3 Interface | 54 |
| | Create a Loopback | 55 |
| | Create a Physical Loopback | 55 |
| | Configure a Local Loopback | 55 |
| | Set Clocking to Internal | 56 |
| | Verify That the T3 Interface Is Up | 57 |
| | Clear T3 Interface Statistics | 58 |
| | Force the Link Layer To Stay Up | 58 |
| | Configure Encapsulation to Cisco-HDLC | 58 |
| | Configure No-Keepalives | 59 |
| | Verify the Status of the Logical Interface | 60 |
| | Ping the T3 Interface | 61 |
| | Check for T3 Interface Error Statistics | 61 |
| | Diagnose a Suspected Circuit Problem | 63 |
| | Create a Loop from the Router to the Network | 63 |
| | Create a Loop to the Router from Various Points in the Network | 64 |
| Chapter 8 | Locate T3 Alarms and Errors | 65 |
| | Checklist of Common T3 Alarms and Errors | 65 |
| | Display T3 Alarms and Errors | 66 |
| | Locate Most Common T3 Alarms and Errors | 67 |
| | Locate Loss of Signal and Loss of Frame Alarms | 67 |
| | Locate Alarm Indication Signal Alarms | 68 |
| | Locate an Incoming Yellow Alarm | 69 |
| | Locate IDLE on a T3 Interface | 69 |
| Part 4 | Investigate ATM Interfaces | |
| Chapter 9 | Determine ATM Interface Type | 73 |
| | Checklist for Determining ATM Interface Type | 73 |
| | Determine the ATM Interface Type and Configuration | 74 |
| | Determine the ATM Interface Type | 74 |
| | Check that the ATM Configuration Is Correct | 75 |
| | Check the Configuration of an ATM1 Interface | 75 |
| | Check the Configuration of an ATM2 IQ Interface | 76 |
| | Examples of Incorrect Configurations of ATM Options | 77 |
| | Check the Configuration of the VCI on an ATM1 Interface | 77 |
| | Check the Configuration of the VCI on an ATM2 IQ Interface | 78 |
| | Check the Configuration of Promiscuous Mode on an ATM2 IQ Interface | 80 |
| Chapter 10 | Monitor ATM Interfaces | 83 |
| | Checklist for Monitoring ATM Interfaces | 83 |
| | Monitor ATM Interfaces | 84 |
| | Monitor ATM1 Interfaces | 85 |
| | Display the Status of a Specific ATM1 Interface | 85 |
| | Display Extensive Status Information for a Specific ATM1 Interface | 85 |

| | | |
|-------------------|--|------------|
| | Monitor Statistics for an ATM1 Interface | 87 |
| | Monitor ATM2 IQ Interfaces | 89 |
| | Display the Status of a Specific ATM2 IQ Interface | 89 |
| | Display Extensive Information for a Specific ATM2 Interface | 91 |
| | Monitor Statistics for an ATM2 Interface | 96 |
| Chapter 11 | Use Loopback Testing for ATM Interfaces | 99 |
| | Checklist for Using Loopback Testing for ATM Interfaces | 99 |
| | Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 100 |
| | Create a Loopback | 101 |
| | Create a Physical Loopback | 101 |
| | Configure a Local Loopback | 101 |
| | Set Clocking to Internal | 102 |
| | Verify That the ATM Interface Is Up | 103 |
| | Clear ATM Interface Statistics | 105 |
| | Ping the ATM Interface | 105 |
| | Check for ATM Interface Error Statistics | 106 |
| | Diagnose a Suspected Circuit Problem | 109 |
| | Create a Loop from the Router to the Network | 110 |
| | Create a Loop to the Router from Various Points in the Network | 110 |
| Chapter 12 | Locate ATM Alarms and Errors | 113 |
| | List of Common ATM Alarms and Error | 113 |
| | Display ATM1 and ATM2 Alarms and Errors | 113 |
| Part 5 | Investigate SONET Interfaces | |
| Chapter 13 | Monitor SONET Interfaces | 123 |
| | Checklist for Monitoring SONET Interfaces | 123 |
| | Monitor SONET Interfaces | 123 |
| | Display the Status of SONET Interfaces | 124 |
| | Display the Status of a Specific SONET Interface | 124 |
| | Display Extensive Status Information for a Specific SONET Interface | 125 |
| | Monitor Statistics for a SONET Interface | 127 |
| Chapter 14 | Use Loopback Testing for SONET Interfaces | 131 |
| | Checklist for Using Loopback Testing for SONET Interfaces | 131 |
| | Diagnose a Suspected Hardware Problem with a SONET Interface | 133 |
| | Create a Loopback | 133 |
| | Create a Physical Loopback | 133 |
| | Configure a Local Loopback | 134 |
| | Set Clocking to Internal | 134 |
| | Verify That the SONET Interface Is Up | 135 |
| | Clear SONET Interface Statistics | 137 |
| | Check That the Received and Transmitted Path Trace Are the Same | 137 |
| | Force the Link Layer to Stay Up | 138 |
| | Configure Encapsulation to Cisco-HDLC | 138 |
| | Configure No-Keepalives | 138 |
| | Verify the Status of the Logical Interface | 139 |

| | | |
|-------------------|--|------------|
| | Ping the SONET Interface | 140 |
| | Check for SONET Interface Error Statistics | 141 |
| | Diagnose a Suspected Circuit Problem | 142 |
| | Create a Loop from the Router to the Network | 142 |
| | Create a Loop to the Router from Various Points in the Network | 143 |
| Chapter 15 | Locate SONET Alarms and Errors | 145 |
| | List of Common SONET Alarms and Errors | 145 |
| | Display SONET Alarms and Errors | 146 |
| | Locate Most Common SONET Alarms and Errors | 149 |
| | Locate Loss of Signal Alarms | 150 |
| | Locate Alarm Indication Signal Alarms | 151 |
| | Example of a Router Receiving Only an AIS-P Alarm | 151 |
| | Example of a Router Receiving Both an AIS-L and AIS-P Alarm | 152 |
| | Locate Remote Defect Indication Alarms | 152 |
| | Example of a Router Receiving Only an RDI-P Alarm | 153 |
| | Example of a Router Receiving Both an RDI-L and RDI-P Alarm | 153 |
| | Locate Remote Error Indication Line Errors | 154 |
| | Example of Only an REI-P Counter Incrementing | 154 |
| | Example of Both REI-L and REI-P Counters Incrementing | 155 |
| | Locate Bit Error Rate Alarms | 156 |
| | Locate Payload Label Mismatch Path Alarms | 157 |
| | Locate Loss of Pointer Path Alarms | 160 |
| | Locate Unequipped Payload Alarms | 161 |
| | Locate Phase Lock Loop Alarms | 162 |
| Chapter 16 | Enable SONET Payload Scrambling | 165 |
| | Checklist for Enabling SONET Payload Scrambling | 165 |
| | Understand SONET Payload Scrambling | 165 |
| | Check SONET HDLC Payload Scrambling | 166 |
| | Configure SONET HDLC Payload Scrambling | 167 |
| Chapter 17 | Check the SONET Frame Checksum | 169 |
| | Checklist for Checking the SONET Frame Checksum | 169 |
| | Understand the SONET Frame Checksum | 170 |
| | Check the SONET Frame Checksum | 170 |
| | Examine Output for Framing Errors | 170 |
| | Check the FCS Configuration | 172 |
| | Configure a SONET Frame Checksum | 174 |
| | Return to the Default 16-Bit Checksum | 174 |
| | Configure a 16-Bit Checksum | 174 |
| | Configure a 32-Bit Checksum | 175 |

| | | |
|-------------------|--|------------|
| Part 6 | Investigate Fast Ethernet and Gigabit Ethernet Interfaces | |
| Chapter 18 | Monitor Fast Ethernet and Gigabit Ethernet Interfaces | 179 |
| | Checklist for Monitoring Fast Ethernet and Gigabit Ethernet Interfaces | 179 |
| | Monitor Fast Ethernet and Gigabit Ethernet Interfaces | 180 |
| | Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces | 180 |
| | Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface | 182 |
| | Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface | 183 |
| | Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface | 186 |
| | Fiber-Optic Ethernet Interface Specifications | 187 |
| Chapter 19 | Use Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces | 189 |
| | Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces | 189 |
| | Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface | 190 |
| | Create a Loopback | 191 |
| | Create a Physical Loopback for a Fiber-Optic Interface | 191 |
| | Create a Loopback Plug for an RJ-45 Ethernet Interface | 191 |
| | Configure a Local Loopback | 192 |
| | Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up | 193 |
| | Configure a Static Address Resolution Protocol Table Entry | 194 |
| | Clear Fast Ethernet or Gigabit Ethernet Interface Statistics | 196 |
| | Ping the Fast Ethernet or Gigabit Ethernet Interface | 196 |
| | Check for Fast Ethernet or Gigabit Ethernet Interface Error Statistics | 197 |
| | Diagnose a Suspected Circuit Problem | 199 |
| Chapter 20 | Locate the Fast Ethernet and Gigabit Ethernet LINKAlarm and Counters | 201 |
| | Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters | 201 |
| | Display the Fast Ethernet or Gigabit Ethernet Interface LINK Alarm | 201 |
| | Fast Ethernet and Gigabit Ethernet Counters | 203 |
| Part 7 | Investigate Channelized Interfaces | |
| Chapter 21 | Monitor Channelized DS3 Interfaces | 209 |
| | Checklist for Monitoring Channelized DS3 Interfaces | 209 |
| | Monitor Channelized DS3 Interfaces | 209 |
| | Display the Status of Channelized DS3 Interfaces | 210 |
| | Display the Status of a Specific Channelized DS3 Interface | 211 |
| | Display Extensive Status Information for a Specific Channelized DS3 Interface | 213 |
| | Monitor Statistics for a Channelized DS3 Interface | 218 |

| | | |
|-------------------|--|------------|
| Chapter 22 | Use Loopback Testing For Channelized DS3 Interfaces | 223 |
| | Checklist for Using Loopback Testing for Channelized DS3 Interfaces | 223 |
| | Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface . . | 224 |
| | Create a Loopback | 225 |
| | Create a Physical Loopback | 225 |
| | Configure a Local Loopback | 225 |
| | Verify That the Interface Is Up | 226 |
| | Clear Interface Statistics | 227 |
| | Force the Link Layer to Stay Up | 227 |
| | Configure Encapsulation to Cisco-HDLC | 227 |
| | Configure No-Keepalives | 228 |
| | Verify the Status of the Logical Interface | 229 |
| | Ping the Channelized Interface | 230 |
| | Check for Interface Error Statistics | 230 |
| | Diagnose a Suspected Circuit Problem | 232 |
| | Create a Loop from the Router to the Network | 232 |
| | Create a Loop to the Router from Various Points in the Network | 233 |
| Chapter 23 | Locate Channelized DS3 Alarms and Errors | 235 |
| | Checklist for Channelized DS3 Alarms and Errors | 235 |
| | Display Alarms and Errors for Channelized DS3 Interfaces | 235 |
| Chapter 24 | Monitor Multichannel DS3 Interfaces | 241 |
| | Checklist for Monitoring Multichannel DS3 Interfaces | 241 |
| | Monitor Multichannel DS3 Interfaces | 241 |
| | Display the Status of Channelized Interfaces | 242 |
| | Display the Status of a Specific Channelized Interface | 242 |
| | Display Extensive Status Information for a Specific T3 Interface | 243 |
| | Monitor Statistics for a Channelized Interface | 247 |
| Chapter 25 | Use Loopback Testing for Multichannel DS3 Interfaces | 251 |
| | Checklist for Using Loopback Testing for Multichannel DS3 Interfaces | 251 |
| | Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface . . | 253 |
| | Create a Loopback | 253 |
| | Create a Physical Loopback | 253 |
| | Configure a Local Loopback | 253 |
| | Verify That the Interface Is Up | 254 |
| | Clear Interface Statistics | 255 |
| | Force the Link Layer to Stay Up | 256 |
| | Configure Encapsulation to Cisco-HDLC | 256 |
| | Configure No-Keepalives | 257 |
| | Verify the Status of the Logical Interface | 257 |
| | Ping the Channelized Interface | 258 |
| | Check for Interface Error Statistics | 259 |
| | Diagnose a Suspected Circuit Problem | 262 |
| | Create a Loop from the Router to the Network | 263 |
| | Loop the Entire T3 Interface towards the Network | 263 |
| | Loop a Particular T1 Channel towards the Network | 264 |
| | Create a Loop to the Router from Various Points in the Network | 264 |

| | | |
|-------------------|---|------------|
| Chapter 26 | Locate Multichannel DS3 Alarms and Errors | 265 |
| | Checklist for Locating Multichannel DS3 Alarms and Errors | 265 |
| | Display Alarms and Errors for Channelized DS3 to DS1 Interfaces | 265 |
| | Display Alarms and Errors for Channelized DS3 to DS0 Interfaces | 268 |
| Chapter 27 | Monitor Channelized OC12 Interfaces | 273 |
| | Checklist for Monitoring Channelized OC12 Interfaces | 273 |
| | Monitor Channelized OC12 Interfaces | 274 |
| | Display the Status of Channelized OC12 Interfaces | 274 |
| | Display the Status of a Specific Channelized OC12 Interface | 275 |
| | Display Extensive Status Information for a Specific Channelized OC12 Interface | 275 |
| | Monitor Statistics for a Channelized OC12 Interface | 278 |
| | Monitor Channelized OC12 IQ Interfaces | 279 |
| | Display the Status of a Channelized OC12 IQ Interface | 279 |
| | Display the Status of the Controller Channelized OC12 IQ Interface | 283 |
| | Display the Status of a Specific Channel of a Channelized OC12 IQ Interface | 285 |
| | Display Extensive Status Information for a Channelized OC12 IQ Interface | 287 |
| | Monitor Statistics for a Channelized OC12 IQ Interface | 290 |
| Chapter 28 | Use Loopback Testing for Channelized OC12 Interfaces | 293 |
| | Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces | 293 |
| | Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface | 294 |
| | Create a Loopback | 295 |
| | Create a Physical Loopback | 295 |
| | Configure a Local Loopback | 295 |
| | Verify That the Interface Is Up | 296 |
| | Clear Interface Statistics | 299 |
| | Force the Link Layer to Stay Up | 299 |
| | Configure Encapsulation to Cisco-HDLC | 299 |
| | Configure No-Keepalives | 300 |
| | Verify the Status of the Logical Interface | 301 |
| | Ping the Channelized Interface | 302 |
| | Check for Interface Error Statistics | 302 |
| | Diagnose a Suspected Circuit Problem | 305 |
| | Loop the Entire T3 Interface Towards the Network | 305 |
| | Create a Loop to the Router from Various Points in the Network | 306 |
| Chapter 29 | Locate Channelized OC12 Alarms and Errors | 307 |
| | Checklist for Channelized OC12 Alarms and Errors | 307 |
| | Display Channelized OC12 Alarms and Errors | 307 |
| | Display Channelized OC12 IQ Alarms and Errors | 311 |

| | | |
|--------|-------------|-----|
| Part 8 | Appendix | |
| Part 9 | Index | |
| | Index | 317 |

List of Figures

| | | |
|-------------------|--|------------|
| Part 1 | Overview of Interfaces | |
| Chapter 1 | Interfaces Overview | 3 |
| | Figure 1: Interface Slot, PIC, and Port Locations | 11 |
| | Figure 2: Clock Sources | 14 |
| Part 2 | Investigate T1 Interfaces | |
| Chapter 5 | Locate T1 Alarms and Errors | 39 |
| | Figure 3: Location of an LOS or LOF Alarm in a T1 Network | 42 |
| | Figure 4: Location of an AIS Alarm in a T1 Network | 43 |
| | Figure 5: Location of a Yellow Alarm in a T1 Network | 43 |
| Part 3 | Investigate T3 Interfaces | |
| Chapter 8 | Locate T3 Alarms and Errors | 65 |
| | Figure 6: Location of an LOS or LOF Alarm in a T3 Network | 68 |
| | Figure 7: Location of an AIS Alarm in a T3 Network | 68 |
| | Figure 8: Location of a Yellow Alarm in a T3 Network | 69 |
| Part 4 | Investigate ATM Interfaces | |
| Chapter 11 | Use Loopback Testing for ATM Interfaces | 99 |
| | Figure 9: Local Loopback | 101 |
| | Figure 10: Loop from the Router to the Network | 110 |
| Part 5 | Investigate SONET Interfaces | |
| Chapter 15 | Locate SONET Alarms and Errors | 145 |
| | Figure 11: Example of a SONET Network | 148 |
| | Figure 12: Example of an Upstream or Downstream Failure | 149 |
| | Figure 13: Another Example of an Upstream or Downstream Failure | 149 |
| | Figure 14: Location of an LOS Alarm in a SONET Network | 150 |
| | Figure 15: Example of a Router Receiving Only an AIS-P Alarm | 151 |
| | Figure 16: Example of a Router Receiving Both an AIS-L and an AIS-P Alarm | 152 |
| | Figure 17: Example of a Router Receiving Only an RDI-P Alarm | 153 |
| | Figure 18: Example of a Router Receiving Both an RDI-L and RDI-P Alarm | 154 |
| | Figure 19: Example of a Router Receiving Only an REI-P Counter Incrementing | 155 |
| | Figure 20: Example of a Router Receiving Both An REI-L and REI-P Counter Incrementing | 156 |

| | | |
|-------------------|---|------------|
| Part 6 | Investigate Fast Ethernet and Gigabit Ethernet Interfaces | |
| Chapter 19 | Use Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces | 189 |
| | Figure 21: RJ-45 Ethernet Loopback Plug | 192 |
| Part 7 | Investigate Channelized Interfaces | |
| Chapter 27 | Monitor Channelized OC12 Interfaces | 273 |
| | Figure 22: Sample Configuration of Channelized OC12 IQ Interface | 281 |
| | Figure 23: Controller Interfaces at Different Levels of Channelization | 284 |
| | Figure 24: Specific Channels of a Channelized OC12 IQ Interface | 287 |

List of Tables

| | | |
|------------------|---|------------|
| | About This Guide | xxv |
| | Table 1: Notice Icons | xxviii |
| | Table 2: Technical Documentation for Supported Routing Platforms | xxix |
| | Table 3: Junos OS Network Operations Guides | xxx |
| | Table 4: Junos OS for J-series Services Routers and SRX-series Services Gateways Documentation | xxxii |
| | Table 5: Additional Books Available Through http://www.juniper.net/books . . . | xxxii |
| Part 1 | Overview of Interfaces | |
| Chapter 1 | Interfaces Overview | 3 |
| | Table 6: Interface Types Supported by the Junos OS | 6 |
| Chapter 2 | Investigate Interface Steps and Commands | 15 |
| | Table 7: Commands Used To Monitor Interfaces | 16 |
| | Table 8: Commands Used To Perform Loopback Testing on Interfaces | 17 |
| Part 2 | Investigate T1 Interfaces | |
| Chapter 3 | Monitor T1 Interfaces | 21 |
| | Table 9: Checklist for Monitoring T1 Interfaces | 21 |
| | Table 10: Status of T1 Interfaces | 22 |
| | Table 11: Problem Situations and Actions | 25 |
| Chapter 4 | Use Loopback Testing for T1 Interfaces | 27 |
| | Table 12: Checklist for Using Loopback Testing for T1 Interfaces | 27 |
| Chapter 5 | Locate T1 Alarms and Errors | 39 |
| | Table 13: Checklist for T1 Alarms and Errors | 39 |
| | Table 14: T1 Interface Alarms and Error Definitions | 41 |
| Part 3 | Investigate T3 Interfaces | |
| Chapter 6 | Monitor T3 Interfaces | 47 |
| | Table 15: Checklist for Monitoring T3 Interfaces | 47 |
| | Table 16: Status of T3 Interfaces | 48 |
| | Table 17: Problem Situations and Actions | 51 |
| Chapter 7 | Use Loopback Testing for T3 Interfaces | 53 |
| | Table 18: Checklist for Using Loopback Testing for T3 Interfaces | 53 |
| Chapter 8 | Locate T3 Alarms and Errors | 65 |
| | Table 19: Checklist of Common T3 Alarms and Errors | 65 |

| | | |
|-------------------|---|------------|
| | Table 20: T3 Interface Error Counter Definitions | 67 |
| Part 4 | Investigate ATM Interfaces | |
| Chapter 9 | Determine ATM Interface Type | 73 |
| | Table 21: Checklist for Determining ATM Interface Type | 73 |
| Chapter 10 | Monitor ATM Interfaces | 83 |
| | Table 22: Checklist for Monitoring ATM Interfaces | 83 |
| | Table 23: Status of ATM Interfaces | 84 |
| Chapter 11 | Use Loopback Testing for ATM Interfaces | 99 |
| | Table 24: Checklist for Using Loopback Testing for ATM Interfaces | 99 |
| | Table 25: Problems and Solutions for a Physical Link That Is Down | 105 |
| Chapter 12 | Locate ATM Alarms and Errors | 113 |
| | Table 26: List of Common ATM Alarms and Error | 113 |
| | Table 27: ATM Interface Input and Output Errors | 117 |
| | Table 28: ATM Active Alarms and Defects | 119 |
| Part 5 | Investigate SONET Interfaces | |
| Chapter 13 | Monitor SONET Interfaces | 123 |
| | Table 29: Checklist for Monitoring SONET Interfaces | 123 |
| | Table 30: Status of SONET Interfaces | 124 |
| | Table 31: SONET Error Statistics | 128 |
| Chapter 14 | Use Loopback Testing for SONET Interfaces | 131 |
| | Table 32: Checklist for Using Loopback Testing for SONET Interfaces | 131 |
| | Table 33: Problems and Solutions for a Physical Link That Is Down | 136 |
| Chapter 15 | Locate SONET Alarms and Errors | 145 |
| | Table 34: List of Common SONET Alarms and Errors | 145 |
| | Table 35: STS Path Signal Label Assignments | 159 |
| | Table 36: Location of the Onboard Clock | 163 |
| Chapter 16 | Enable SONET Payload Scrambling | 165 |
| | Table 37: Checklist for Enabling SONET Payload Scrambling | 165 |
| Chapter 17 | Check the SONET Frame Checksum | 169 |
| | Table 38: Checklist for Checking the SONET Frame Checksum | 169 |
| Part 6 | Investigate Fast Ethernet and Gigabit Ethernet Interfaces | |
| Chapter 18 | Monitor Fast Ethernet and Gigabit Ethernet Interfaces | 179 |
| | Table 39: Checklist for Monitoring Fast Ethernet and Gigabit Ethernet Interfaces | 179 |
| | Table 40: Status of Fast Ethernet Interfaces | 180 |
| | Table 41: Status of Gigabit Ethernet Interfaces | 181 |
| | Table 42: Errors to Look For | 184 |
| | Table 43: MAC Statistics Errors | 185 |
| | Table 44: Autonegotiation Information | 185 |
| | Table 45: Fiber-Optic Ethernet Interface Specifications | 187 |

| | | |
|-------------------|--|------------|
| Chapter 19 | Use Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces | 189 |
| | Table 46: Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces | 189 |
| | Table 47: Problems and Solutions for a Physical Link That Is Down | 194 |
| Chapter 20 | Locate the Fast Ethernet and Gigabit Ethernet LINKAlarm and Counters | 201 |
| | Table 48: Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters | 201 |
| | Table 49: Major Fast Ethernet and Gigabit Ethernet Counters | 203 |
| Part 7 | Investigate Channelized Interfaces | |
| Chapter 21 | Monitor Channelized DS3 Interfaces | 209 |
| | Table 50: Checklist for Monitoring Channelized DS3 Interfaces | 209 |
| Chapter 22 | Use Loopback Testing For Channelized DS3 Interfaces | 223 |
| | Table 51: Checklist for Using Loopback Testing for Channelized DS3 Interfaces | 223 |
| Chapter 23 | Locate Channelized DS3 Alarms and Errors | 235 |
| | Table 52: Checklist for Channelized DS3 Alarms and Errors | 235 |
| | Table 53: T1 Media Alarms and Error Definitions | 239 |
| Chapter 24 | Monitor Multichannel DS3 Interfaces | 241 |
| | Table 54: Checklist for Monitoring Multichannel DS3 Interfaces | 241 |
| | Table 55: Problem Situations and Actions | 248 |
| Chapter 25 | Use Loopback Testing for Multichannel DS3 Interfaces | 251 |
| | Table 56: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces | 251 |
| Chapter 26 | Locate Multichannel DS3 Alarms and Errors | 265 |
| | Table 57: Checklist for DS3 Alarms | 265 |
| | Table 58: T1 Media Alarms and Error Definitions | 267 |
| | Table 59: T3 Interface Error Counter Definitions | 270 |
| Chapter 27 | Monitor Channelized OC12 Interfaces | 273 |
| | Table 60: Checklist for Monitoring Channelized OC12 Interfaces | 273 |
| Chapter 28 | Use Loopback Testing for Channelized OC12 Interfaces | 293 |
| | Table 61: Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces | 293 |
| Chapter 29 | Locate Channelized OC12 Alarms and Errors | 307 |
| | Table 62: Checklist for Channelized OC12 Alarms and Errors | 307 |
| | Table 63: T3 Interface Error Counter Definitions | 310 |

About This Guide

This preface provides the following guidelines for using the *Junos[®] operating system (Junos OS) Interfaces Network Operations Guide*:

- Objectives on page xxv
- Audience on page xxvi
- Supported Routing Platforms on page xxvi
- Using the Index on page xxvii
- Using the Examples in This Manual on page xxvii
- Document Conventions on page xxviii
- List of Technical Publications on page xxix
- Documentation Feedback on page xxxii
- Requesting Technical Support on page xxxiii

Objectives

This guide provides operational information helpful in monitoring router interfaces and isolating potential problems. This guide is not directly related to any particular release of the Junos operating system (Junos OS).

For information about configuration statements and guidelines related to the commands described in this reference, see the following configuration guides:

- *Junos Network Interfaces Configuration Guide*—Includes configuration statements and guidelines for bit error rate test (BERT) parameters and Automatic Protection Switching (APS).
- *Junos Services Interfaces Configuration Guide*—Includes configuration statements and guidelines for real-time performance monitoring (RPM) and all services, such as Compressed Real-Time Transport Protocol (CRTP), Data Link Switching (DLSw), flow collection and monitoring, and stateful firewall filters.
- *Junos OS CLI User Guide*—Describes how to use the Junos OS command-line interface (CLI) to configure, monitor, and manage Juniper Networks routing platforms.
- *Junos System Basics Configuration Guide*—Describes Juniper Networks routing platforms, and provides information about how to configure basic system parameters, supported protocols and software processes, authentication, and a variety of utilities for managing your router on the network.

For information about related tasks performed by Network Operations Center (NOC) personnel, see the following network operations guides:

- [Junos OS Baseline Network Operations Guide](#)
- [Junos OS Hardware Network Operations Guide](#)



NOTE: To obtain the most current version of this manual, see the product documentation page on the Juniper Networks Web site, located at <http://www.juniper.net/>.

Audience

This guide is designed for Network Operations Center (NOC) personnel who monitor a Juniper Networks M Series or T Series routing platform.

To use this guide, you need a broad understanding of networks in general, the Internet in particular, networking principles, and network configuration. You must also be familiar with one or more of the following Internet routing protocols:

- Border Gateway Protocol (BGP)
- Routing Information Protocol (RIP)
- Intermediate System-to-Intermediate System (IS-IS)
- Open Shortest Path First (OSPF)
- Internet Control Message Protocol (ICMP) router discovery
- Internet Group Management Protocol (IGMP)
- Distance Vector Multicast Routing Protocol (DVMRP)
- Protocol-Independent Multicast (PIM)
- Multiprotocol Label Switching (MPLS)
- Resource Reservation Protocol (RSVP)
- Simple Network Management Protocol (SNMP)

Supported Routing Platforms

For the features described in this manual, Junos OS currently supports the following routing platforms:

- M Series
- T Series

Using the Index

This guide contains a complete index. For a list and description of glossary terms, see the *Junos OS Comprehensive Index and Glossary*.

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {  
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]  
user@host# edit system scripts  
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:





```
[edit system scripts]  
user@host# load merge relative /var/tmp/ex-script-snippet.conf  
load complete
```

For more information about the **load** command, see the [Junos OS CLI User Guide](#).

Document Conventions

Table 1 on page xxviii defines notice icons used in this guide.

Table 1: Notice Icons

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

List of Technical Publications

Table 2 on page xxix lists the software and hardware guides and release notes for Juniper Networks M-series, MX-series, and T-series routing platforms and describes the contents of each document. Table 3 on page xxx lists the books included in the *Network Operations Guide* series. Table 4 on page xxxi lists the manuals and release notes supporting Junos OS for J-series and SRX-series platforms. All documents are available at <http://www.juniper.net/techpubs/>.

Table 5 on page xxxii lists additional books on Juniper Networks solutions that you can order through your bookstore. A complete list of such books is available at <http://www.juniper.net/books>.

Table 2: Technical Documentation for Supported Routing Platforms

| Book | Description |
|---|---|
| Hardware Documentation | |
| <i>Hardware Guide</i> | Describes how to install, maintain, and troubleshoot routing platforms and components. Each platform has its own hardware guide. |
| <i>PIC Guide</i> | Describes the routing platform's Physical Interface Cards (PICs). Each platform has its own PIC guide. |
| <i>DPC Guide</i> | Describes the Dense Port Concentrators (DPCs) for all MX-series routers. |
| Junos Scope Documentation | |
| <i>Junos Scope Software User Guide</i> | Describes the Junos Scope software graphical user interface (GUI), how to install and administer the software, and how to use the software to manage routing platform configuration files and monitor routing platform operations. |
| Advanced Insight Solutions (AIS) Documentation | |
| <i>Advanced Insight Solutions Guide</i> | Describes the Advanced Insight Manager (AIM) application, which provides a gateway between Junos devices and Juniper Support Systems (JSS) for case management and intelligence updates. Explains how to run AI-Scripts on Juniper Networks devices. |
| Release Notes | |
| <i>Junos OS Release Notes</i> | Summarize new features and known problems for a particular software release, provide corrections and updates to published Junos, Junos XML protocol, and NETCONF manuals, provide information that might have been omitted from the manuals, and describe upgrade and downgrade procedures. |
| <i>Hardware Release Notes</i> | Describe the available documentation for the routing platform and summarize known problems with the hardware and accompanying software. Each platform has its own release notes. |

Table 2: Technical Documentation for Supported Routing Platforms (*continued*)

| Book | Description |
|-------------------------------------|--|
| <i>Junos Scope Release Notes</i> | Contain corrections and updates to the published Junos Scope manual, provide information that might have been omitted from the manual, and describe upgrade and downgrade procedures. |
| <i>AIS Release Notes</i> | Summarize AIS new features and guidelines, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide initial setup, upgrade, and downgrade procedures. |
| <i>AIS AI-Scripts Release Notes</i> | Summarize AI-Scripts new features, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide instructions for automatic and manual installation, including deleting and rolling back. |

Table 3: Junos OS Network Operations Guides

| Book | Description |
|---------------------------|--|
| <i>Baseline</i> | Describes the most basic tasks for running a network using Juniper Networks products. Tasks include upgrading and reinstalling Junos OS, gathering basic system management information, verifying your network topology, and searching log messages. |
| <i>Interfaces</i> | Describes tasks for monitoring interfaces. Tasks include using loopback testing and locating alarms. |
| <i>MPLS</i> | Describes tasks for configuring, monitoring, and troubleshooting an example MPLS network. Tasks include verifying the correct configuration of the MPLS and RSVP protocols, displaying the status and statistics of MPLS running on all routing platforms in the network, and using the layered MPLS troubleshooting model to investigate problems with an MPLS network. |
| <i>MPLS Log Reference</i> | Describes MPLS status and error messages that appear in the output of the show mpls lsp extensive command. The guide also describes how and when to configure Constrained Shortest Path First (CSPF) and RSVP trace options, and how to examine a CSPF or RSVP failure in a sample network. |
| <i>MPLS Fast Reroute</i> | Describes operational information helpful in monitoring and troubleshooting an MPLS network configured with fast reroute (FRR) and load balancing. |
| <i>Hardware</i> | Describes tasks for monitoring M-series and T-series routing platforms. |

To configure and operate a J-series Services Router or an SRX-series Services Gateway running Junos OS, you must also use the configuration statements and operational mode commands documented in Junos configuration guides and command references. To

configure and operate a WX Integrated Services Module, you must also use WX documentation.

Table 4: Junos OS for J-series Services Routers and SRX-series Services Gateways Documentation

| Book | Description |
|---|---|
| J-series and SRX-series Platforms | |
| <i>Junos OS 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 OS 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 OS Administration Guide for Security Devices</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 OS 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>Network and Security Manager: Configuring J Series Services Routers and SRX Series Services Gateways Guide</i> | Explains how to configure, manage, and monitor J-series Services Routers and SRX-series services gateways through NSM. |
| <i>Junos OS Release Notes</i> | Summarize new features and known problems for a particular release of Junos OS, including Junos OS for J-series and SRX-series devices. The release notes also contain corrections and updates to the manuals and software upgrade and downgrade instructions for Junos OS. |
| J-series Only | |
| <i>Junos OS Design and Implementation Guide</i> | Provides guidelines and examples for designing and implementing IPsec VPNs, firewalls, and routing on J-series Services Routers running Junos OS. |
| <i>J Series Services Routers 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 J-series Services Router 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. |

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

| Book | Description |
|--|--|
| <i>Junos OS Migration Guide</i> | Provides instructions for migrating an SSG device running ScreenOS software to Junos OS or upgrading a J-series device to a later version of the Junos OS. |
| <i>WXC Integrated Services Module Installation and Configuration Guide</i> | Explains how to install and initially configure a WXC Integrated Services Module in a J-series Services Router for application acceleration. |

Table 5: Additional Books Available Through <http://www.juniper.net/books>

| Book | Description |
|---|--|
| <i>Interdomain Multicast Routing</i> | Provides background and in-depth analysis of multicast routing using Protocol Independent Multicast sparse mode (PIM SM) and Multicast Source Discovery Protocol (MSDP); details any-source and source-specific multicast delivery models; explores multiprotocol BGP (MBGP) and multicast IS-IS; explains Internet Gateway Management Protocol (IGMP) versions 1, 2, and 3; lists packet formats for IGMP, PIM, and MSDP; and provides a complete glossary of multicast terms. |
| <i>Junos Cookbook</i> | Provides detailed examples of common Junos OS configuration tasks, such as basic router configuration and file management, security and access control, logging, routing policy, firewalls, routing protocols, MPLS, and VPNs. |
| <i>MPLS-Enabled Applications</i> | Provides an overview of Multiprotocol Label Switching (MPLS) applications (such as Layer 3 virtual private networks [VPNs], Layer 2 VPNs, virtual private LAN service [VPLS], and pseudowires), explains how to apply MPLS, examines the scaling requirements of equipment at different points in the network, and covers the following topics: point-to-multipoint label switched paths (LSPs), DiffServ-aware traffic engineering, class of service, interdomain traffic engineering, path computation, route target filtering, multicast support for Layer 3 VPNs, and management and troubleshooting of MPLS networks. |
| <i>OSPF and IS-IS: Choosing an IGP for Large-Scale Networks</i> | Explores the full range of characteristics and capabilities for the two major link-state routing protocols: Open Shortest Path First (OSPF) and IS-IS. Explains architecture, packet types, and addressing; demonstrates how to improve scalability; shows how to design large-scale networks for maximum security and reliability; details protocol extensions for MPLS-based traffic engineering, IPv6, and multitopology routing; and covers troubleshooting for OSPF and IS-IS networks. |
| <i>Routing Policy and Protocols for Multivendor IP Networks</i> | Provides a brief history of the Internet, explains IP addressing and routing (Routing Information Protocol [RIP], OSPF, IS-IS, and Border Gateway Protocol [BGP]), explores ISP peering and routing policies, and displays configurations for both Juniper Networks and other vendors' routers. |
| <i>The Complete IS-IS Protocol</i> | Provides the insight and practical solutions necessary to understand the IS-IS protocol and how it works by using a multivendor, real-world approach. |

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 or topic name
- URL or page number
- Software release version (if applicable)

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or 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/us/en/local/pdf/resource-guides/7100059-en.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/>
- 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: <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

Overview of Interfaces

- Interfaces Overview on page 3
- Investigate Interface Steps and Commands on page 15

CHAPTER 1

Interfaces Overview

This manual describes the steps you take to investigate interface problems. For each interface type, the investigation process is described in three corresponding chapters:

- Monitor the interface
- Perform a loopback test on the interface
- Locate alarms and errors

The monitor interfaces chapter helps you determine the nature of the interface problem. The loopback test chapter provides information to assist you isolate the source of the problem, and the locate alarms and errors chapter explains some of the alarms and errors for that occur on that interface.

This chapter discusses the following topics:

- Interfaces Covered in These Topics on page 3
- Interfaces Supported by the Junos OS on page 6
- Interface Descriptors on page 8
- Interface Naming on page 9
- Interface and Router Clock Sources on page 13

Interfaces Covered in These Topics

This book describes the investigation process for the following interfaces:

- T1
- T3
- Asynchronous Transfer Mode (ATM) 1 and ATM 2 intelligent queuing (IQ)
- SONET
- Fast Ethernet and Gigabit Ethernet
- Channelized DS3
- Multichannel DS3

- Channelized OC12
- Channelized OC12 IQ

T1 Interfaces

T1 is the basic physical layer protocol used by the Digital Signal level 1 (DS1) multiplexing method in North America. A T1 interface operates at a bit rate of 1.544 Mbps and can support 24 DS0 channels. The supported DS1 standards include:

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- AT&T Pub 54014
- ITUG.751, G.703

T3 Interfaces

T3 is the physical layer protocol used by the Digital Signal level 3 (DS3) multiplexing method in North America. A T3 interface operates at a bit rate of 44.736 Mbps. The Junos OS supports payload scrambling and subrate operation on each physical T3 interface. One encapsulation format—Point-to-Point Protocol (PPP), Frame Relay, or High-level Data Link Control (HDLC)—must be configured for the interface. The supported DS3 standards include:

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- Bellcore TR-TSY-000009
- AT&T Pub 54014
- ITU G.751, G.703, G823

ATM Interfaces

ATM is a network protocol designed to facilitate the simultaneous handling of various types of traffic streams (voice, data, and video) at very high speeds over the same physical connection. By always using 53-byte cells, ATM simplifies the hardware design, enabling it to quickly determine the destination address of each cell. This allows simple switching of network traffic at much higher speeds than are easily accomplished using protocols with variable sizes of transfer units, such as Frame Relay and the Transmission Control Protocol/Internet Protocol (TCP/IP).

Although ATM was designed to operate without requiring any other networking protocol, other protocols are frequently segmented and encapsulated across multiple, smaller ATM cells, in effect making ATM a transport mechanism for preexisting technologies such as Frame Relay and the TCP/IP family of protocols.

ATM relies on the concepts of virtual paths and virtual circuits. A virtual path, represented by a specific virtual path identifier (VPI), establishes a route between two devices in a

network. Each VPI can contain multiple virtual circuits, each represented by a virtual circuit identifier (VCI).

VPIs and VCIs are local to the router, which means that only the two devices connected by the VCI or VPI need to know the details of the connection. In a typical ATM network, user data might traverse multiple connections, using many different VPI and VCI connections. Each end device, just as each device in the network, needs to know only the VCI and VPI information for the path to the next device.

With the second-generation ATM2 IQ interface, you can configure virtual path shaping and operation, administration, and maintenance (OAM) F4 cell flows.

SONET Interfaces

SONET is widely used in the USA for very high-speed transmission of voice and data signals across the numerous world-wide fiber-optic networks.

SONET uses LEDs or lasers to transmit a binary stream of light-on and light-off sequences at a constant rate. At the far end, optical sensors convert the pulses of light back to electrical representations of the binary information.

In wavelength-division multiplexing (WDM), light at several different wavelengths (or colors to a human eye) is transmitted on the same fiber segment, greatly increasing the throughput of each fiber cable.

In dense wavelength-division multiplexing (DWDM), many optical data streams at different wavelengths are combined into one fiber.

The basic building block of the SONET hierarchy in the optical domain is OC1; in the electrical domain, the basic building block is STS1. OC1 operates at 51.840 Mbps. OC3 operates at 155.520 Mbps.

A SONET stream can consist of discrete lower-rate traffic flows that have been combined using Time-Division Multiplexing (TDM) techniques. This method is useful, but a portion of the total bandwidth is consumed by the TDM overhead. When a SONET stream consists of only a single, very high-speed payload, it is referred to as operating in concatenated mode. A SONET interface operating in this mode has a “c” added to the rate descriptor. For example, a concatenated OC48 interface is referred to as OC-48c.

Fast Ethernet and Gigabit Ethernet Interfaces

Ethernet was developed in the early 1970s at the Xerox Palo Alto Research Center (PARC) as a data-link control layer protocol for interconnecting computers. It was first widely used at 10 Mbps over coaxial cables and later over unshielded twisted pairs using 10BaseT. More recently, 100BaseTX (Fast Ethernet, 100 Mbps), Gigabit Ethernet (1 Gbps), and 10-Gigabit Ethernet (10 Gbps) have become available.

Channelized Interfaces

Channelized interfaces enable you to configure a number of individual channels that subdivide the bandwidth of a larger interface and minimize the number of Physical Interface Cards (PICs) that an installation requires. Original channelized interfaces provide

a single level of channelization. The newer IQ channelized PICs provide multiple levels of channelization.

Interfaces Supported by the Junos OS

The Junos OS supports a greater range of interfaces than those described in this book. Future revisions of this book will include the steps for monitoring additional interfaces supported by the Junos OS. Table 6 on page 6 lists the interface types supported by the Junos OS and shows the interface name as it appears in a configuration.

Table 6: Interface Types Supported by the Junos OS

| Interface Name in Configuration | Interface Type | Description |
|---------------------------------|----------------------|---|
| ae | Aggregated Ethernet | A virtual aggregated link. |
| as | Aggregated SONET/SDH | A virtual aggregated link. |
| at | ATM1 or ATM2 IQ | Asynchronous Transfer Mode |
| cau4 | Channelized AU-4 IQ | Configured on the Channelized STM1 IQ PIC. |
| coc1 | Channelized OC1 IQ | Configured on the Channelized OC12 IQ PIC. |
| coc12 | Channelized OC12 IQ | Configured on the Channelized OC12 IQ PIC. |
| cstm1 | Channelized STM1 IQ | Configured on the Channelized STM1 IQ PIC. |
| ce1 | Channelized E1 IQ | Configured on the Channelized E1 IQ PIC or Channelized STM1 IQ PIC. |
| ct1 | Channelized T1 IQ | Configured on the Channelized DS3 IQ PIC or Channelized OC12 IQ PIC. |
| ct3 | Channelized T3 IQ | Configured on the Channelized DS3 IQ PIC or Channelized OC12 IQ PIC. |
| cp | Collector | Configured on the Monitoring Services II PIC. |
| ds | DS0 | Configured on the Channelized DS3 to DS0 PIC, Channelized E1 PIC, Channelized OC12 IQ PIC, Channelized DS3 IQ PIC, Channelized E1 IQ PIC, or Channelized STM1 IQ PIC. |
| dsc | Discard | Allows you to identify the ingress point of a denial-of-service (DoS) attack. |
| e1 | E1 | Includes the channelized STM1 to E1 interfaces. |
| e3 | E3 | Includes the E3 IQ interfaces. |

Table 6: Interface Types Supported by the Junos OS (*continued*)

| Interface Name in Configuration | Interface Type | Description |
|---------------------------------|---|--|
| es | Encryption | Allows you to configure a security association (SA) name with a logical interface. |
| fe | Fast Ethernet | 100Base-TX (Fast Ethernet, 100 Mbps). |
| fxp | Management and internal Ethernet | The management Ethernet interface is an out-of-band management interface within the routing platform. The internal Ethernet interface connects the Routing Engine to the Packet Forwarding Engine. |
| ge | Gigabit Ethernet | Includes Gigabit Ethernet IQ interfaces. |
| gr | Generic Route Encapsulation tunnel | Allows you to configure a unicast tunnel using GRE encapsulation. |
| gre | Internally generated | This interface is internally generated and is not configurable. |
| ipH | IP-over-IP encapsulation tunnel | Allows you to configure a unicast tunnel using IP-IP encapsulation. |
| ipip | Internally generated | This interface is internally generated and is not configurable. |
| lo | Loopback | This interface is internally generated. The logical interface lo0.16383 is a non-configurable interface for routing platform control traffic. |
| ls | Link services | Supports bundles that contain links. |
| lsi | Internally generated | This interface is internally generated and is not configurable. |
| ml | Multilink | Includes Multilink Frame Relay and Multilink PPP. |
| mo | Monitoring services | Includes the monitoring services and monitoring services II interfaces. The logical interface mo-fpc/plc/port .16383 is an internally generated, non-configurable interface for routing platform control traffic. |
| mt | Multicast tunnel | Internal routing platform interface for VPNs. |
| mtun | Internally generated | This interface is internally generated and is not configurable. |
| oc3 | OC3 IQ | Configured on the Channelized OC12 IQ PIC. |
| pe | This interface is present on the first-hop routing platform | Encapsulates packets destined for the rendezvous point (RP) routing platform. |

Table 6: Interface Types Supported by the Junos OS (*continued*)

| Interface Name in Configuration | Interface Type | Description |
|---------------------------------|-------------------------------------|--|
| pd | This interface is present on the RP | De-encapsulates packets at the RP. |
| pimd | Internally generated | This interface is internally generated and is not configurable. |
| pime | Internally generated | This interface is internally generated and is not configurable. |
| se | Serial | Includes the EIA-530, V.35, and X.21 interfaces. |
| so | SONET/SDH | Both are widely used methods for very high speed transmission of voice and data signals across the numerous world-wide fiber-optic networks. |
| sp | Adaptive services | The logical interface sp-<i>fpc/pic/port</i>.16383 is an internally generated, non-configurable interface for routing platform control traffic. |
| t1 | T1 | Includes the channelized DS3 to DS1 interfaces. |
| t3 | T3 | Includes the channelized OC12 to DS3 interfaces. |
| tap | Internally generated | This interface is internally generated and is not configurable. |
| vsp | Voice services | The Adaptive Services (AS) Physical Interface Card (PIC) supports the compressed real-time transport protocol (RTP) on this interface. |
| vt | Virtual loopback tunnel | On routing platforms equipped with a Tunnel PIC, enables egress filtering. |

Interface Descriptors

When you configure an interface, you are specifying the properties for a physical interface descriptor. In most cases, the physical interface descriptor corresponds to a single physical device and consists of the following parts:

- The interface name, which defines the media type
- The slot in which the Flexible PIC Concentrator (FPC) is located
- The location on the FPC in which the PIC is installed
- The PIC port
- The channel and logical unit numbers of the interface (optional)

Each physical interface descriptor can contain one or more logical interface descriptors. These allow you to map one or more logical (or virtual) interfaces to a single physical device. Creating multiple logical interfaces is useful for ATM, Frame Relay, and Gigabit Ethernet networks, in which you can associate multiple virtual circuits, data-link connections, or virtual LANs (VLANs) with a single interface device.

Each logical interface descriptor can have one or more family descriptors to define the protocol family that it is associated with and are allowed to run over the logical interface. The following protocol families are supported:

- Internet Protocol version 4 (IPv4)
- Internet Protocol version 6 (IPv6)
- Circuit cross-connect (CCC)
- Translational cross-connect (TCC)
- International Organization for Standardization (ISO)
- Multilink Frame Relay (MLFR)
- Multilink PPP (MLPPP)
- Multiprotocol Label Switching (MPLS)
- Trivial Network Protocol (TNP)

Each family descriptor can have one or more address entries, which associate a network address with a logical interface and hence with the physical interface.

You configure the various interface descriptors as follows:

- Configure the physical interface descriptor by including the **interfaces *interface-name*** statement.
- Configure the logical interface descriptor by including the **unit** statement within the **interfaces *interface-name*** statement.
- Configure the family descriptor by including the **family** statement within the **unit** statement.
- Configure address entries by including the **address** statement within the **family** statement.
- Configure tunnels by including the **tunnel** statement within the **unit** statement.

Interface Naming

Each interface has the following components:

- An interface name that specifies the media type
- The slot where the FPC is located
- The location of the PIC on the FPC
- The PIC port

The interface name uniquely identifies an individual network connector in the system. You use the interface name when configuring interfaces and when enabling various functions and properties, such as routing protocols, on individual interfaces. The system uses the interface name when displaying information about the interface, for example, in the **show interfaces** command.

The interface name is represented by a physical part, a logical part, and a channel part in the following format:

physical<: *channel* >.logical

The channel part of the name is optional for all interfaces except Channelized DS3, E1, OC12, and STM1. For more information about channelized interfaces, see the *Junos Network Interfaces Configuration Guide*.

Physical Part of an Interface Name

The physical part of an interface name identifies the physical device, which corresponds to a single physical network connector. This part of the interface name has the following format:

type-fpc/pic/port

type is the media type, which identifies the network device. See Table 6 on page 6 for information on supported interface types.

fpc identifies the number of the FPC card on which the physical interface is located. Specifically, it is the number of the slot in which the FPC card is installed. M40, M40e, M160, M320, T320, and T640 platforms each have eight FPC slots that are numbered from 0 through 7 from left to right as you are facing the front of the chassis. The M20 routing platform has four FPC slots that are numbered from 0 through 3 from top to bottom as you are facing the front of the chassis. The slot number is printed adjacent to each slot. The M5, M7i, M10, and M10i routing platforms do not use FPCs; you install the PICs individually. The M5 and M7i routing platforms have space for up to four PICs. The M7i routing platform also comes with an integrated Tunnel PIC or an optional integrated AS PIC. The M10 and M10i routing platforms have space for up to eight PICs.

pic identifies the number of the PIC card on which the physical interface is located. Specifically, it is the number of the PIC location on the FPC. The four PIC slots are numbered from 0 through 3. The PIC location is printed on the FPC carrier board. For PICs that occupy more than one PIC location, use the lower location number.

port identifies a specific port on a PIC. The number of ports varies depending on the PIC. The port slot numbers are printed on the PIC.

Logical Part of an Interface Name

The logical unit part of the interface name corresponds to the logical unit number, which can be a number in the range from 0 through 16,384.

Separators in Interface Names

There is a separator of some type between each element of an interface name.

In the physical part of the name, a hyphen (-) separates the media type from the FPC number, and a slash (/) separates the FPC, PIC, and port numbers.

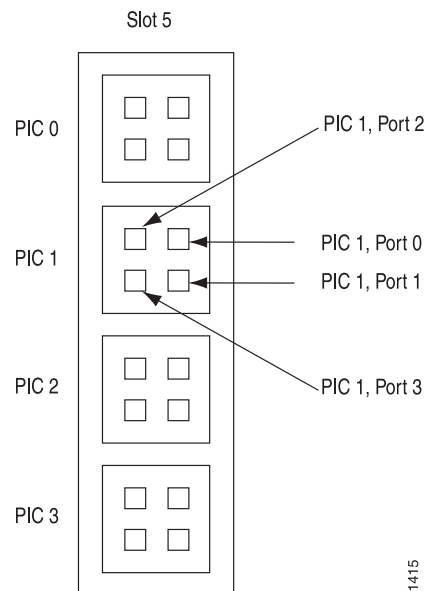
In the virtual part of the name, a period (.) separates the channel and logical unit numbers.

A colon (:) separates the physical and virtual parts of the interface name.

Examples: Interface Names

This section provides examples of naming interfaces. See Figure 1 on page 11 for an example of where the slots, PICs, and ports are located on the M40 router. Examine your PIC to determine the port numbers; all port numbers are marked on the PIC.

Figure 1: Interface Slot, PIC, and Port Locations



For an FPC in slot 1 with two OC3 SONET PICs in PIC positions 0 and 1, each PIC with two ports uses the following names:

```
so-1/0/0.0
so-1/0/1.0
so-1/1/0.0
so-1/1/1.0
```

An OC48 SONET FPC in slot 1 and in concatenated mode appears as a single FPC with a single PIC, which has a single port. If this interface has a single logical unit, the name is as follows:

```
so-1/0/0.0
```

An OC48 SONET FPC in slot 1 and in channelized mode has a number for each channel. For example:

```
so-1/0/0:0
so-1/0/0:1
```

For an FPC in slot 1 with a Channelized OC12 PIC in PIC position 2, the DS3 channels have the following names:

```
t3-1/2/0:0
t3-1/2/0:1
t3-1/2/0:2
...
```

t3-1/2/0:11

For an FPC in slot 1 with four OC12 ATM PICs (the FPC is fully populated), the four PICs, each with a single port and a single logical unit, have the following names:

at-1/0/0.0
at-1/1/0.0
at-1/2/0.0
at-1/3/0.0

Channelized DS3 to DS0 Interface Naming

You can configure 28 T1 channels for each T3 interface. Each T1 link can have up to eight DS0 channel groups, and each channel group can hold any combination of DS0 time slots. To specify the T1 link and DS0 channel group number in the interface name, use colons (:) as separators. For example, a Channelized DS3 to DS0 PIC might have the following physical and virtual interfaces:

DS0/0/0: x : y

where **x** is a T1 link ranging from 0 through 27, and **y** is a DS0 channel group ranging from 0 through 7. See the *Junos Network Interfaces Configuration Guide* for more information about ranges.

Channelized DS3 to DS1 Interface Naming

You can configure 28 T1 channels per T3 interface, and each interface can have logical interfaces. To specify the channel number, include it after the colon (:) in the interface name. For example, a 4-port T3 PIC in FPC 1 and slot 1 will have the following physical interfaces, depending on the media type:

t1-1/1/0: x
t1-1/1/1: x
t1-1/1/2: x
t1-1/1/3: x

x is a channel number ranging from 0 through 27.

Channelized Intelligent Queuing Interface Naming

Channelized interfaces enable you to configure a number of individual channels that subdivide the bandwidth of a larger interface and minimize the number of PICs that an installation requires.



NOTE: Channelized IQ interfaces require M-series Enhanced FPCs.

Wherever the Junos documentation refers to channelized interfaces and PICs without the “intelligent queuing” or “IQ” descriptor, they are referring to the original channelized interfaces and PICs.

You can configure each port of a channelized IQ PIC as a single interface that uses the entire available bandwidth, or partition each port into smaller data channels. Following are the interface names associated with channelized IQ PICs:

- **coc12-fpc/pic/port**—On a Channelized OC12 IQ PIC
- **coc1-fpc/pic/port:channel**—On a Channelized OC12 IQ PIC

- **ct3-fpc/pic/port<:channel>**—On a Channelized OC12 IQ PIC or a Channelized DS3 IQ PIC
- **cstm1-fpc/pic/port**—On a Channelized STM1 IQ PIC
- **cau4-fpc/pic/port:channel**—On a Channelized STM1 IQ PIC
- **ct1-fpc/pic/port<:channel>**—On a Channelized OC12 IQ PIC or a Channelized DS3 IQ PIC
- **ce1-fpc/pic/port<:channel>**—On a Channelized E1 IQ PIC or a Channelized STM1 IQ PIC
- **e1-fpc/pic/port<:channel>**—E1 channels configured on a Channelized E1 IQ or a Channelized STM1 IQ PIC
- **ds-fpc/pic/port<:channel>**— *Nx* DS0 channels configured on a Channelized OC12 IQ PIC, Channelized STM1 IQ PIC, Channelized DS3 IQ PIC, or Channelized E1 IQ PIC
- **so-fpc/pic/port<:channel>**—SONET/SDH channels configure four OC3 channels on a Channelized OC12 IQ PIC, one OC12 channel on a Channelized OC12 IQ PIC, or one STM1 channel on a Channelized STM1 IQ PIC
- **t1-fpc/pic/port<:channel>**—T1 channels configured on a Channelized OC12 IQ PIC or a Channelized DS3 IQ PIC
- **t3-fpc/pic/port<:channel>**—T3 channels configured on a Channelized OC12 IQ PIC or a Channelized DS3 IQ PIC

How Interface Configurations Are Displayed

When you display a configuration, using either the **show** command in configuration mode or the **show configuration** top-level command, interfaces are listed in numerical order as follows:

- From lowest to highest slot number
- From lowest to highest PIC number
- From lowest to highest port number

Interface and Router Clock Sources

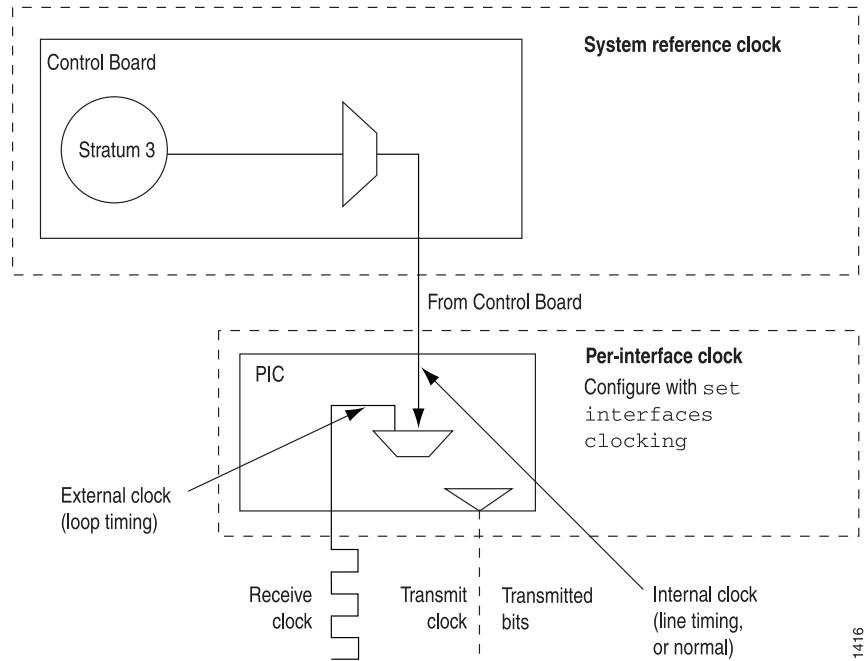
When running a loopback test on T1, T3, ATM, and SONET interfaces, you must configure the *transmit clock*. The transmit clock aligns each outgoing packet transmitted over the router's interfaces. For both the router and interfaces, the clock source can be the router's internal Stratum 3 clock, which resides on the System Control Board (SCB), the System and Switch Board (SSB), the Forwarding Engine Board (FEB), or the Miscellaneous Control Subsystem (MCS) (depending on the router model), or an external clock that is received from the interface you are configuring. For example, interface A can transmit on interface A's received clock (external, loop timing) or the Stratum 3 clock (internal, line timing). Interface A cannot use a clock from any other source.

By default, each interface uses the router's internal Stratum 3 clock. To configure the clock source of each interface, include the **clocking** statement at the **[edit interfaces interface-name]** hierarchy level:

```
[edit interfaces interface-name]
clocking (internal | external);
```

Figure 2 on page 14 illustrates the different clock sources.

Figure 2: Clock Sources



CHAPTER 2

Investigate Interface Steps and Commands

This chapter describes, in a general way, the operational and configuration mode commands you use when investigating interface problems on the following interfaces:

- T1
- T3
- Asynchronous Transfer Mode (ATM) 1 and ATM 2 intelligent queuing (IQ)
- SONET
- Fast Ethernet and Gigabit Ethernet
- Channelized DS3
- Multichannel DS3
- Channelized OC12
- Channelized OC12 IQ

In operational mode, you monitor and troubleshoot the software, network connectivity, and the router by entering command-line interface (CLI) commands. For additional information about operational mode commands, see the *Junos Operational Mode Command Reference*.

In configuration mode, you configure the interfaces by entering configuration mode and creating a hierarchy of configuration statements. For additional information about configuring the router, see the *Junos System Basics Configuration Guide*.

- Investigate Interface Steps on page 15

Investigate Interface Steps

The monitor interfaces chapter helps you determine the nature of the interface problem. The loopback test chapter provides information to help you isolate the source of the problem. The locate alarms and errors chapter explains some of the alarms and errors for the media.

The investigation process for each interface is described in three chapters which cover a different aspect of the process.

1. Monitor Interfaces on page 16
2. Perform a Loopback Test on an Interface on page 16
3. Locate Interface Alarms on page 18

Monitor Interfaces

Problem The following steps are a general outline of how you monitor interfaces to determine the nature of interface problems. For more detailed information on a specific interface, see the corresponding monitor interfaces chapter.

Solution To monitor interfaces, follow these steps:

1. Display the status of an interface.
2. Display the status of a specific interface.
3. Display extensive status information for a specific interface.
4. Monitor statistics for an interface.

Table 7 on page 16 lists and describes the operational mode commands you use to monitor interfaces.

Table 7: Commands Used To Monitor Interfaces

| CLI Command | Description |
|--|---|
| show interfaces terse <i>interface-name</i> For example: show interfaces terse t1* | Displays summary information about the named interfaces. |
| show interfaces <i>interface-name</i> For example: show interfaces t1-x/x/x | Displays static status information about a specific interface. |
| show interfaces <i>interface-name</i> extensive For example: show interfaces t1-x/x/x extensive | Displays very detailed interface information about a specific interface. |
| monitor interface <i>interface-name</i> For example: monitor interface t1-x/x/x | Displays real-time statistics about a physical interface, updated every second. |

Perform a Loopback Test on an Interface

Problem The following steps are a general outline of how you use loopback testing to isolate the source of the interface problem. For more detailed information on a specific interface, see the corresponding loopback chapter.

Solution To use loopback testing for interfaces, follow these steps:

1. Diagnose a suspected hardware problem.
 - a. Create a loopback.
 - b. Set clocking to internal. (Not for Fast Ethernet/Gigabit Ethernet or Multichannel DS3 interfaces.)
 - c. Verify that the status of the interface is up.
 - d. Configure a static address resolution protocol table entry. (Fast Ethernet/Gigabit Ethernet interfaces only)
 - e. Clear the interface statistics.
 - f. Force the link layer to stay up.
 - g. Verify the status of the logical interface.
 - h. Ping the interface.
 - i. Check for interface error statistics.
2. Diagnose a suspected connection problem.
 - a. Create a loop from the router to the network.
 - b. Create a loop to the router from various points in the network.

Table 8 on page 17 lists and describes the operational and configuration mode commands you use to perform loopback testing on interfaces (the commands are shown in the order in which you perform them).

Table 8: Commands Used To Perform Loopback Testing on Interfaces

| CLI Statement or Command | Interface Type | Description |
|--|-----------------------------------|---|
| <code>[edit interfaces <i>interface-name</i> <i>interface- options</i>] set loopback (local remote)</code> | All interfaces | The loopback statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU). To turn off loopback, remove the loopback statement from the configuration. |
| <code>show</code> | All interfaces | Verify the configuration before you commit it. |
| <code>commit</code> | All interfaces | Save the set of changes to the database and cause the changes to take operational effect. Use after you have verified a configuration in all configuration steps. |
| <code>[edit interfaces <i>interface-name</i>] set clocking internal</code> | T1, T3, ATM, and SONET interfaces | The clocking statement at this hierarchy level configures the clock source of the interface to internal. |

Table 8: Commands Used To Perform Loopback Testing on Interfaces
(continued)

| CLI Statement or Command | Interface Type | Description |
|--|--|---|
| <code>show interfaces <i>interface-name</i></code> | Used for all interfaces | Display static status information about a specific interface. |
| <code>[edit interfaces <i>interface-name</i> unit logical-unit-number family inet address address] arp ip-address mac mac-address</code> | Fast Ethernet and Gigabit Ethernet interfaces | The arp statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses. |
| <code>show arp no-resolve</code> | Fast Ethernet and Gigabit Ethernet interfaces | Display the entries in the ARP table without attempting to determine the hostname that corresponds to the IP address (the no-resolve option). |
| <code>clear interfaces statistics <i>interface-name</i></code> | All interfaces | Reset the statistics for an interface to zero. |
| <code>[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc</code> | T1, T3, SONET, and Multichannel DS3 interfaces | The encapsulation statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface. |
| <code>[edit interfaces <i>interface-name</i>] set no-keepalives</code> | T1, T3, SONET, and Multichannel DS3 interfaces | The no-keepalives statement at this level disables the sending of keepalives on the physical interface. |
| <code>show interfaces <i>interface-name</i> terse</code> | T1, T3, and SONET interfaces | Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.) |
| <code>ping interface t1- x/x/x local-IP-address bypass-routing count 1000 rapid</code> | All interfaces | <p>Check the reachability of network hosts by sending ICMP ECHO_REQUEST messages to elicit ICMP ECHO_RESPONSE messages from the specified host.</p> <p>Use the bypass-routing option to ping a local system through an interface that has no route through it.</p> <p>The count option sends 1000 ping requests through the system.</p> <p>Type Ctrl+C to interrupt a ping command.</p> |
| <code>show interfaces <i>interface-name</i> extensive</code> | All interfaces | Display very detailed interface information about a specific interface. |

Locate Interface Alarms

Problem Locating alarms and errors for the media can be a simple process.

Solution To locate interface alarms and errors, use the `show interfaces interface-name extensive` command and examine the output for active alarms and defects.

PART 2

Investigate T1 Interfaces

- Monitor T1 Interfaces on page 21
- Use Loopback Testing for T1 Interfaces on page 27
- Locate T1 Alarms and Errors on page 39

CHAPTER 3

Monitor T1 Interfaces

This chapter describes how to monitor T1 interfaces and begin the process of isolating T1 interface problems when they occur.

- Checklist for Monitoring T1 Interfaces on page 21
- Monitor T1 Interfaces on page 21

Checklist for Monitoring T1 Interfaces

Purpose This topic provides the links and commands for monitoring T1 interfaces and beginning the process of isolating T1 interface problems when they occur.

Action Table 9 on page 21 provides the commands for monitoring T1 interfaces.

Table 9: Checklist for Monitoring T1 Interfaces

| Tasks | Command or Action |
|--|---|
| “Monitor T1 Interfaces” on page 21 | |
| 1. Display the Status of T1 Interfaces on page 22 | show interfaces terse t1* |
| 2. Display the Status of a Specific T1 Interface on page 23 | show interfaces t1-<i>fpc/pic/port</i> |
| 3. Display Extensive Status Information for a Specific T1 Interface on page 23 | show interfaces t1-<i>fpc/pic/port</i> extensive |
| 4. Monitor Statistics for a T1 Interface on page 24 | monitor interface t1-<i>fpc/pic/port</i> |

Monitor T1 Interfaces

By monitoring T1 interfaces, you begin the process of isolating T1 interface problems when they occur.

To monitor your T1 interfaces, follow these steps:

1. Display the Status of T1 Interfaces on page 22
2. Display the Status of a Specific T1 Interface on page 23

3. Display Extensive Status Information for a Specific T1 Interface on page 23
4. Monitor Statistics for a T1 Interface on page 24

Display the Status of T1 Interfaces

Purpose To display the status of T1 interfaces.

Action Use the following Junos OS command-line interface (CLI) operational mode command to display the status of T1 interfaces:

```
user@host> show interfaces terse t1*
```

Sample Output

```
user@host> show interfaces terse t1*
Interface      Admin Link Proto Local Remote
t1-1/0/0       down up --- administratively disabled
t1-1/0/0.0     up   down inet 1.1.1.1/30
t1-1/0/1       up   down --- physical layer down
t1-1/0/1.0     up   down inet 2.2.2.2/30 --- link layer down
t1-1/0/2       up   up
t1-1/0/2.0     up   up   inet 3.3.3.3/30 --- link layer up
t1-1/0/3       up   down
```

Meaning This sample output shows the status of both the physical and logical interfaces. See Table 10 on page 22 for a description of what the output means.

Table 10: Status of T1 Interfaces

| Physical Interface | Logical Interface | Status Description |
|-----------------------------------|-------------------------------------|--|
| t1-1/0/0 Admin Down Link Up | t1-1/0/0.0 Admin Up Link Down | This interface is administratively disabled and the physical link is healthy (Link Up), but the logical interface is not established. The logical interface is administratively enabled (Admin Up), but is down because the physical link is disabled. |
| t1-1/0/1 Admin Up Link Down | t1-1/0/1.0 Admin Up Link Down | This interface is not functioning between the local router and the remote router because both the physical and logical links are down (Link Down). The interface is not administratively disabled because both the physical and logical links are up (Admin Up). |
| t1-1/0/2 Admin Up Link Up | t1-1/0/2.0 Admin Up Link Up | This interface has both the physical and logical links up and running. |
| t1-1/0/3 Admin Up Link Down | | The physical interfaces is added to the configuration, but the logical link is not configured. |

Display the Status of a Specific T1 Interface

Purpose To display the status of a specific T1 interface when you need to investigate its status further.

Action To display the status of a specific T1 interface, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces t1-fpc/pic/port
```

Sample Output

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Last flapped   : 2002-01-01 00:00:35 UTC (00:00:59 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  DSI alarms     : LOF, LOS
  DSI defects    : LOF, LOS
```

Meaning The first line of the sample output shows the status of the link. In this example, the first line shows that the physical link is down. If the first line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets. Also, the output shows loss of frame (LOF) and loss of signal (LOS) alarms active. Any active alarm or defect can cause the interface to be down.

Display Extensive Status Information for a Specific T1 Interface

Purpose To display extensive status information about a specific T1 interface.

Action To display extensive status information about a specific T1 interface, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces t1-fpc/pic/port extensive
```

Sample Output

```
user@host> show interfaces t1-1/1/0 extensive
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20, Generation: 27
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-01-01 00:00:35 UTC (00:01:00 ago)
  Statistics last cleared: 2002-01-01 00:01:03 UTC (00:00:32 ago)
  Traffic statistics:
    Input bytes   : 0 0 bps
    Output bytes  : 0 0 bps
    Input packets : 0 0 pps
```

```

Output packets:                                0                      0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0, L3 incompletes:
0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms :LOF,LOS
DS1  defects  : LOF, LOS
T1 media:
Seconds      Count  State
SEF          32      0 Defect Active
BEE          0       0 OK
AIS          0       0 OK
LOF          32      0 Defect Active
LOS          32      0 Defect Active
YELLOW       0       0 OK
BPV          0       0
EXZ          0       0
LCV          0       0
PCV          32    10667
CS           0       0
LES          0
ES           32
SES          32
SEFS         32
BES          0
UAS          32
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
  Buildout       : 0 to 132 feet
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: Unknown (0)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 1 (0x00)
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %             bps      %      bytes
0 best-effort             0             0    0         0      low  none
1 expedited-forwarding    0             0    0         0      low  none
2 assured-forwarding      0             0    0         0      low  none
3 network-control         0             0    0         0      low  none

```

Meaning The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the T1 interface and investigate the T1 media accordingly. See “Checklist for T1 Alarms and Errors” on page 39 for an explanation of T1 alarms.

Monitor Statistics for a T1 Interface

Purpose To monitor statistics for a T1 interface.

Action To monitor statistics for a T1 interface, use the following Junos OS CLI operational mode command:

```
user@host> monitor interface t1-fpc/pic/port
```

```

Sample Output user@host> monitor interface t1-1/0/0
Seconds: 2                               Time: 00:04:49    Delay: 0/0/1
Interface: t1-1/1/0, Enabled, Link is Down
Encapsulation: PPP, Keepalives, Speed: T1
Traffic statistics:                       Current delta
  Input bytes:                           0 (0 bps)          [0]
  Output bytes:                           0 (0 bps)          [0]
  Input packets:                          0 (0 pps)          [0]
  Output packets:                         0 (0 pps)          [0]
Error statistics:
  Input errors:                           0                  [0]
  Input drops:                             0                  [0]
  Input framing errors:                     0                  [0]
  Policed discards:                         0                  [0]
  L3 incompletes:                           0                  [0]
  L2 channel errors:                        0                  [0]
  L2 mismatch timeouts:                     0                  [0]
  Carrier transitions:                       0                  [0]
  Output errors:                             0                  [0]
  Output drops:                             0                  [0]
  Aged packets:                             0                  [0]
Active alarms : LOF LOS
Active defects: LOF LOS
T1 statistics:
  BPV                                     0                    [0]
  EXZ                                     0                    [0]
  LCV                                     0                    [0]
  PCV                                    40335                  [332]
  CS                                      0                    [0]
Interface warnings:
  o Outstanding DS1 alarm(s)
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Meaning The sample output shows that the T1 interface is enabled but the link is down. The **bps** value is in bytes per second and not bits per second. To calculate bits per second, multiply the **bps** value by 8.

The **monitor** command checks for and displays common interface failures, indicates whether loopback is detected, and shows any increases in framing errors. Use information from this command to help to narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the **set cli terminal** command.

Table 11 on page 25 lists additional problem situations and actions to help you further diagnose a problem.

Table 11: Problem Situations and Actions

| Problem Situation | Action |
|--------------------------------|---|
| Framing errors are increasing. | Check the frame checksum sequence (FCS), scrambling, and subrate configuration. |

Table 11: Problem Situations and Actions *(continued)*

| Problem Situation | Action |
|--|--|
| Framing errors are increasing, and the configuration is correct. | Check the cabling to the router and have the carrier verify the integrity of the line. |
| Input errors are increasing. | Check the cabling to the router and have the carrier verify the integrity of the line. |



.....

NOTE: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

.....

CHAPTER 4

Use Loopback Testing for T1 Interfaces

This chapter describes using loopback testing to isolate T1 interface problems.

- Checklist for Using Loopback Testing for T1 Interfaces on page 27
- Diagnose a Suspected Hardware Problem with a T1 Interface on page 28
- Create a Loopback on page 29
- Set Clocking to Internal on page 30
- Verify That the T1 Interface Is Up on page 31
- Clear T1 Interface Statistics on page 32
- Force the Link Layer To Stay Up on page 32
- Verify the Status of the Logical Interface on page 34
- Ping the T1 Interface on page 35
- Check for T1 Interface Error Statistics on page 35
- Diagnose a Suspected Circuit Problem on page 37

Checklist for Using Loopback Testing for T1 Interfaces

Purpose Table 12 on page 27 provides commands for using loopback testing for T1 interfaces.

Table 12: Checklist for Using Loopback Testing for T1 Interfaces

| Tasks | Command or Action |
|---|---|
| “Diagnose a Suspected Hardware Problem with a T1 Interface” on page 28 | |
| 1. Create a Loopback on page 29 | |
| a. Create a Physical Loopback on page 29 | Connect a T1 loopback plug. |
| b. Configure a Local Loopback on page 29 | [edit interfaces <i>interface-name</i> t1-options] set loopback local show commit |
| 2. Set Clocking to Internal on page 30 | [edit interfaces <i>interface-name</i>] set clocking internal show commit |

Table 12: Checklist for Using Loopback Testing for T1 Interfaces (*continued*)

| Tasks | Command or Action |
|--|--|
| 3. Verify That the T1 Interface Is Up on page 31 | <code>show interfaces t1-fpc/pic/port</code> |
| 4. Clear T1 Interface Statistics on page 32 | <code>clear interfaces statistics t1-fpc/pic/port</code> |
| 5. Force the Link Layer To Stay Up on page 32 | |
| a. Configure Encapsulation to Cisco-HDLC on page 32 | <code>[edit interfaces interface-name]</code> <code>set encapsulation cisco-hdlc</code> <code>show</code> <code>commit</code> |
| b. Configure No-Keepalives on page 33 | <code>[edit interfaces interface-name]</code> <code>set no-keepalives</code> <code>show</code> <code>commit</code> |
| 6. Verify the Status of the Logical Interface on page 34 | <code>show interfaces t1-fpc/pic/port</code> <code>show interfaces t1-fpc/pic/port terse</code> |
| 7. Ping the T1 Interface on page 35 | <code>ping interface t1-fpc/pic/port local-IP-address</code> <code>bypass-routing count 1000 rapid</code> |
| 8. Check for T1 Interface Error Statistics on page 35 | <code>show interfaces t1-fpc/pic/port extensive</code> |
| “Diagnose a Suspected Circuit Problem” on page 37 | |
| 1. Create a Loop from the Router to the Network on page 37 | <code>[edit interfaces interface-name t1-options]</code> <code>set loopback remote</code> <code>show</code> <code>commit</code> |
| 2. Create a Loop to the Router from Various Points in the Network on page 38 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a T1 Interface” on page 28. |

Diagnose a Suspected Hardware Problem with a T1 Interface

Problem Take the following steps to verify if there is a hardware problem with a T1 interface.

Solution To diagnose a suspected hardware problem with a T1 interface, follow these steps:

1. Create a Loopback on page 29
2. Set Clocking to Internal on page 30
3. Verify That the T1 Interface Is Up on page 31
4. Clear T1 Interface Statistics on page 32
5. Force the Link Layer To Stay Up on page 32

6. Verify the Status of the Logical Interface on page 34
7. Ping the T1 Interface on page 35
8. Check for T1 Interface Error Statistics on page 35

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the T1 port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback on page 29
2. Configure a Local Loopback on page 29

Create a Physical Loopback

Action To create a physical loopback at the T1 port, connect a T1 loopback plug to the T1 port. You can make a T1 loopback plug by connecting pin 1 to pin 4 and pin 2 to pin 5 on an RJ-48 plug.

Meaning When you create and test a physical loopback, you are testing the T1 port. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name t1-options
```

2. Configure the loopback:

```
[edit interfaces interface-name t1-options]
user@host# set loopback local
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-1/3/0 t1-options]
user@host# show
loopback local;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-1/3/0 t1-options]
user@host# commit
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Set Clocking to Internal

Purpose You set clocking to internal because there is no external clock source in a loopback connection.

Action To configure clocking to internal, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure the clocking to internal:

```
[edit interfaces interface-name]
user@host# set clocking internal
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# show
clocking internal;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# commit
commit complete
```

Meaning This command saves the clocking change to the configuration database, activates the configuration on the router, and exits configuration mode.

Verify That the T1 Interface Is Up

Purpose Display the status of the T1 interface to determine whether the physical link is up or down.

Action To verify that the status of the T1 interface is up, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces t1-fpc/pic/port
```

Sample Output The following output is for a T1 interface with the physical link up:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16, Framing: ESF
  Device flags   : Present Running Loop-Detected
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 3 (00:00:06 ago), Output: 9 (00:00:06 ago)
  Last flapped   : 2002-01-06 00:59:00 UTC (00:00:40 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1 alarms    : None
  DS1 defects   : None
  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 1.1.1.0/30, Local: 1.1.1.1
```

Meaning The sample output shows that the physical link is up, the loop is detected, and there are no T1 alarms or defects.

Sample Output If the physical link is down, there may be a problem with the port. The following output is an example of the **show interfaces t1-fpc/pic/port** command when the physical link is down:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 32 (00:00:23 ago), Output: 35 (00:00:04 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1 alarms     : LOF, LOS
  DS1 defects    : LOF, LOS
  Logical interface t1-0/0/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
```

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 1.1.1.0/30, Local: 1.1.1.1

Meaning The sample output shows that the physical link is down, the device flags and interface flags are down, and that there are T1 alarms and defects. Verify that the fiber can successfully loop a known good port of the same type by checking for damage to the cable.

Clear T1 Interface Statistics

Purpose You must reset T1 interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current diagnostics.

Action To clear all statistics for the interface, use the following Junos OS CLI operational mode command:

```
user@host> clear interfaces statistics t1-fpc/pic/port
```

Sample Output

```
user@host> clear interfaces statistics t1-1/1/0
user@host>
```

Meaning This command clears the interface statistics counters for interface **t1-1/1/0** only.

Force the Link Layer To Stay Up

To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. You need to force the link layer to stay up by making some configuration changes to the encapsulation and keepalives.

To force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 32
2. Configure No-Keepalives on page 33

Configure Encapsulation to Cisco-HDLC

Action To configure encapsulation on a T1 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure encapsulation to Cisco-HDLC:

```
[edit interfaces interface-name]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# commit
commit complete
```

Meaning This command sets the interface encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a T1 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure no-keepalives:

```
[edit interfaces interface-name]
user@host# set no-keepalives
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-1/3/0]
user@host# commit
commit complete
```

Meaning By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Verify the Status of the Logical Interface

Purpose To verify the status of the logical interface, use the following two Junos OS CLI operational mode commands:

Action `user@host> show interfaces t1-fpc/pic/port`
`user@host> show interfaces t1-fpc/pic/port terse`

Sample Output The following output is for a logical interface that is up:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  Last flapped   : 2002-01-06 01:09:00 UTC (00:00:44 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1 alarms    : None
  DS1 defects    : None
  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Bandwidth: 0
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1

user@host> show interfaces terse t1-1/1/0
Interface      Admin Link Proto Local Remote
t1-1/1/0       up    up
t1-1/1/0.0     up    up  inet  1.1.1.1/30
```

Meaning The sample output for the first command shows that the logical link is up because there are no flags indicating that the link layer is down. The output for the **show interfaces terse** command shows that logical interface **t1-1/0/0** is up.

Sample Output The following output is for a logical interface that is down:

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 14 (00:01:01 ago), Output: 9 (00:00:05 ago)
  Last flapped   : 2002-01-06 01:09:00 UTC (00:03:39 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
```

```
user@host> show interfaces terse t1-1/1/0
```

| Interface | Admin | Link | Proto | Local | Remote |
|------------|-------|------|-------|------------|--------|
| t1-1/1/0 | up | down | | | |
| t1-1/1/0.0 | up | down | inet | 1.1.1.1/30 | |

Ping the T1 Interface

Action To ping the local interface, use the following Junos OS CLI operational mode command:

Meaning This command sends 1000 ping packets out of the interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for T1 Interface Error Statistics

```
user@host> show interfaces t1-fpc/pic/port extensive
```

Sample Output user@host> show interfaces tl-1/1/0 extensive

```

Physical interface: tl-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20, Generation: 32
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 28 (last seen 00:00:02 ago)
    Output: 32 (last sent 00:00:06 ago)
  Last flapped   : 2002-01-06 01:09:00 UTC (00:07:19 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input  bytes :           84682           80 bps
    Output bytes :           92685           0 bps
    Input  packets:            1031           0 pps
    Output packets:            1077           0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 70, L3 incompletes:
    0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  DS1 alarms   : None
  DS1 defects  : None
  T1 media:
    Seconds      Count  State
    SEF          1       1 OK
    BEE          0       0 OK
    AIS          0       0 OK
    LOF          1       1 OK
    LOS          0       0 OK
    YELLOW       1       2 OK
    BPV          1       1
    EXZ          1       1
    LCV          1       2
    PCV          1       6
    CS           0       0
    LES          1
    ES           1
    SES          1
    SEFS         1
    BES          1
    UAS          0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 3
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
    Buildout       : 0 to 132 feet
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: Unknown (0)
  Packet Forwarding Engine configuration:
    Destination slot: 1, PLP byte: 1 (0x00)
    CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                             %      bps      %      bytes
    0 best-effort           0      0      0      0      low  none

```

```

1 expedited-forwarding 0 0 0 0 low none
2 assured-forwarding 0 0 0 0 low none
3 network-control 0 0 0 0 low none
Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34) (Generation 14)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Bandwidth: 0
Protocol inet, MTU: 1500, Flags: None, Generation: 29 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 1.1.1.0/30, Local: 1.1.1.1, Broadcast: Unspecified,
Generation: 36

```

Meaning Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 37
2. Create a Loop to the Router from Various Points in the Network on page 38

Create a Loop from the Router to the Network

Purpose Creating a loop from the router to the network allows the transport-layer engineer to test the router from various points in the network. This helps the engineer isolate where the problem is located.

Action To create a loop from the router to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```

[edit]
user@host# edit interfaces interface-name t1-options

```

2. Configure remote loopback:

```

[edit interfaces interface-name t1-options]
user@host# set loopback remote

```

3. Verify the configuration:

```

user@host# show

```

For example:

```

[edit interfaces t1-1/3/0 t1-options]
user@host# show
loopback remote;

```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-1/3/0 t1-options]
user@host# commit
commit complete
```

Meaning This command loops any traffic from the network back into the network.

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Step 2 through Step 8 in “Diagnose a Suspected Hardware Problem with a T1 Interface” on page 28. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

CHAPTER 5

Locate T1 Alarms and Errors

This chapter describes the most common T1 alarms and errors encountered when investigating line problems on a Juniper Networks router.

- Checklist for T1 Alarms and Errors on page 39
- Display T1 Alarms and Errors on page 39
- Locate Most Common T1 Alarms and Errors on page 42

Checklist for T1 Alarms and Errors

Purpose Table 13 on page 39 provides commands for checking T1 alarms and errors.

Table 13: Checklist for T1 Alarms and Errors

| Tasks | Command or Action |
|--|---|
| “Display T1 Alarms and Errors” on page 39 | <code>show interfaces t1-fpc/pic/port extensive</code> |
| “Locate Most Common T1 Alarms and Errors” on page 42 | |
| 1. Locate Loss of Signal and Loss of Frame Alarms on page 42 | Check the connection between the router port and the first T1 network element. |
| 2. Locate Alarm Indication Signal Alarms on page 43 | Check the T1 network element connected to the T1 interface. |
| 3. Locate an Incoming Yellow Alarm on page 43 | Check the cable between the T1 interface and the directly connected T1 network element. |

Display T1 Alarms and Errors

Purpose To display T1 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces t1-fpc/pic/port extensive`

Sample Output `user@host> show interfaces t1-1/1/0 extensive`
Physical interface: t1-1/1/0, Enabled, Physical link is Down
Interface index: 24, SNMP ifIndex: 20, Generation: 27
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,

```

FCS: 16, Framing: ESF
Device flags   : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times    : Up 0 ms, Down 0 ms
Last flapped   : 2002-01-01 00:00:35 UTC (00:01:00 ago)
Statistics last cleared: 2002-01-01 00:01:03 UTC (00:00:32 ago)
Traffic statistics:
Input bytes   :          0          0 bps
Output bytes  :          0          0 bps
Input packets :          0          0 pps
Output packets:         0          0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0, L3 incompletes:
0, L2 channel errors: 0, L2 mismatch timeouts: 0,
HS link CRC errors: 0, SRAM errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms   : LOF, LOS
DS1 defects  : LOF, LOS
T1 media:
Seconds      Count  State
SEF          32      0 Defect Active
BEE          0       0 OK
AIS          0       0 OK
LOF          32      0 Defect Active
LOS          32      0 Defect Active
YELLOW       0       0 OK
BPV          0       0
EXZ          0       0
LCV          0       0
PCV          32    10667
CS           0       0
LES          0
ES           32
SES          32
SEFS         32
BES          0
UAS          32
HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 1514, Runt threshold: 3
Timeslots     : All active
Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
Buildout      : 0 to 132 feet
DS1 BERT configuration:
BERT time period: 10 seconds, Elapsed: 0 seconds
Induced Error rate: 10e-0, Algorithm: Unknown (0)
Packet Forwarding Engine configuration:
Destination slot: 1, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                        %      bps      %      bytes
0 best-effort            0      0      0      0      low  none
1 expedited-forwarding   0      0      0      0      low  none
2 assured-forwarding     0      0      0      0      low  none
3 network-control        0      0      0      0      low  none

```

Meaning The sample output shows active alarms and active defects. When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down

and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T1 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell).

Table 14 on page 41 lists the T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 14: T1 Interface Alarms and Error Definitions

| T1 Alarm or Error | Definitions |
|-------------------|--------------------------------------|
| SEF | Severely errored frame |
| BEE | Block error event |
| AIS | Alarm indication signal (blue alarm) |
| LOF | Loss of frame |
| LOS | Loss of signal |
| YLW | Yellow alarm |
| BPV | Bipolar violation |
| EXZ | Excessive zeros |
| LCV | Line code violation |
| PCV | Path code violation |
| CS | Controlled slip |
| LES | Line errored seconds |
| ES | Errored seconds |
| SES | Severely errored seconds |
| SEFS | Severely errored frame seconds |
| BES | Bursty errored seconds |
| UAS | Unavailable seconds |

Locate Most Common T1 Alarms and Errors

To locate common alarms and errors, follow these steps:

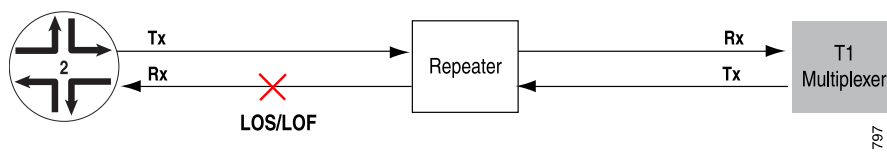
1. Locate Loss of Signal and Loss of Frame Alarms on page 42
2. Locate Alarm Indication Signal Alarms on page 43
3. Locate an Incoming Yellow Alarm on page 43

Locate Loss of Signal and Loss of Frame Alarms

Problem A loss of signal (LOS) or loss of frame (LOF) alarm indicates that a signal could not be detected at the T1 interface.

Solution To locate the LOS or LOF alarm, check the connection between the router port and the first T1 network element. In the example network in Figure 3 on page 42, the X indicates that there is a connection problem between Router2 and the nearest T1 network element.

Figure 3: Location of an LOS or LOF Alarm in a T1 Network



NOTE: Tx represents the transmit port and Rx represents the receive port.

Sample Output

```
user@router2> show interfaces tl-1/1/1 extensive
[... Output truncated...]
DS1  alarms   : LOF, LOS
DS1  defects  : LOF, LOS
T1  media :      Seconds      Count  State
SEF                32           0 Defect Active
BEE                 0           0 OK
AIS                 0           0 OK
LOF                32           0 Defect Active
LOS                32           0 Defect Active
YELLOW             0           0 OK
BPV                 0           0
EXZ                 0           0
LCV                 0           0
PCV                32        10667
CS                  0           0
LES                 0           0
ES                 32           0
SES                 32           0
SEFS                32           0
BES                 0           0
UAS                 32           0
[...Output truncated...]
```

Meaning The sample output shows that Router 2 (Rx) detected a cumulative LOS and LOF alarm for 32 seconds.

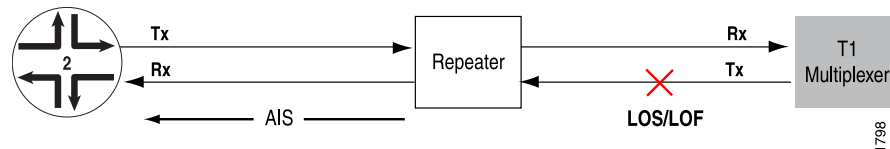
Locate Alarm Indication Signal Alarms

Problem An alarm indication signal (AIS) is a valid framed signal with payload containing a repeating 1010 pattern. An AIS alarm indicates a problem with the line upstream from the T1 network element connected to the T1 interface.

Solution To locate the AIS alarm, have the carrier check the T1 network element connected to the T1 interface and trace the problem.

All diagnostics are from the perspective of Router 2 (the Juniper Networks router). Figure 4 on page 43 illustrates the location of an AIS alarm in a T1 network.

Figure 4: Location of an AIS Alarm in a T1 Network



Meaning In Figure 4 on page 43, the X indicates that there is an LOS or LOF alarm between the repeater and the Tx T1 multiplexer. An AIS alarm is sent from the repeater to Router 2.

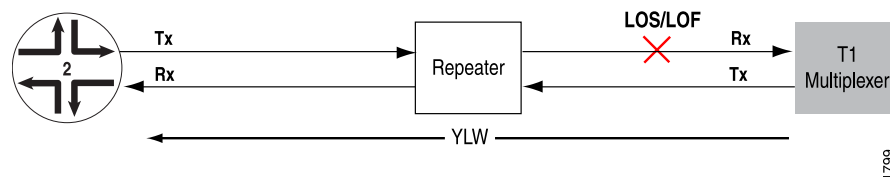
Locate an Incoming Yellow Alarm

Problem An incoming yellow alarm indicates that the T1 network element connected to the T1 interface has a problem with the signal it is receiving from the T1 interface.

Solution To locate the yellow alarm, check the cable between the T1 interface and the directly connected T1 network element.

All diagnostics are from the perspective of Router 2. Figure 5 on page 43 illustrates the location of a yellow alarm in a T1 network.

Figure 5: Location of a Yellow Alarm in a T1 Network



Meaning In Figure 5 on page 43, the T1 multiplexer detects an LOS or LOF alarm on its connection from Router 2 and sends a yellow (YLW) alarm to Router 2.

PART 3

Investigate T3 Interfaces

- Monitor T3 Interfaces on page 47
- Use Loopback Testing for T3 Interfaces on page 53
- Locate T3 Alarms and Errors on page 65

CHAPTER 6

Monitor T3 Interfaces

This chapter describes how to monitor T3 interfaces and begin the process of isolating T3 interface problems when they occur.

- Checklist for Monitoring T3 Interfaces on page 47
- Monitor T3 Interfaces on page 47

Checklist for Monitoring T3 Interfaces

Purpose Table 15 on page 47 provides commands for monitoring T3 interfaces.

Table 15: Checklist for Monitoring T3 Interfaces

| Tasks | Command or Action |
|--|---|
| “Monitor T3 Interfaces” on page 47 | |
| 1. Display the Status of T3 Interfaces on page 48 | show interfaces terse t3* |
| 2. Display the Status of a Specific T3 Interface on page 48 | show interfaces t3-<i>fpc/pic/port</i> |
| 3. Display Extensive Status Information for a Specific T3 Interface on page 49 | show interfaces t3-<i>fpc/pic/port</i> extensive |
| 4. Monitor Statistics for a T3 Interface on page 50 | monitor interface t3-<i>fpc/pic/port</i> |

Monitor T3 Interfaces

By monitoring T3 interfaces, you begin the process of isolating T3 interface problems when they occur.

To monitor T3 interfaces, follow these steps:

1. Display the Status of T3 Interfaces on page 48
2. Display the Status of a Specific T3 Interface on page 48
3. Display Extensive Status Information for a Specific T3 Interface on page 49
4. Monitor Statistics for a T3 Interface on page 50

Display the Status of T3 Interfaces

Purpose To display the status of T3 interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces terse t3*`

Sample Output

```
user@host> show interfaces terse t3*
Interface      Admin Link Proto Local Remote
t3-1/0/0       down up   -   administratively disabled
t3-1/0/0.0     up   down inet  1.1.1.1/30
t3-1/0/1       up   down
t3-1/0/1.0     up   down inet  2.2.2.2/30 - link layer down
t3-1/0/2       up   up
t3-1/0/2.0     up   up   inet  3.3.3.3/30 - link layer up
t3-1/0/3       up   down
```

Meaning The sample output shows the status of both the physical and logical interfaces. See Table 16 on page 48 for a description of what the output means.

Table 16: Status of T3 Interfaces

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|--|
| t3-1/0/0 | t3-1/0/0.0 | This interface is administratively disabled and the physical link is healthy (Link Up), but the logical interface is not established. The logical interface is down because the physical link is disabled (Link Down). |
| Admin Down | Admin Up | |
| Link Up | Link Down | |
| t3-1/0/1 | t3-1/0/1.0 | This interface is not functioning between the local router and the remote router because both the physical and logical links are down (Link Down). The interface is not administratively disabled because both the physical and logical links are up (Admin Up). |
| Admin Up | Admin Up | |
| Link Down | Link Down | |
| t3-1/0/2 | t3-1/0/2.0 | This interface has both the physical and logical links up and running. |
| Admin Up | Admin Up | |
| Link Up | Link Up | |
| t3-1/0/3 | | This interface does not have a logical link configured. |
| Admin Up | | |
| Link Down | | |

Display the Status of a Specific T3 Interface

Purpose To display the status of a specific T3 interface when you need to investigate its status further, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces t3-fpc/pic/port`

Sample Output user@host> show interfaces t3-1/0/0

```
Physical interface: t3-1/0/0, Enabled, Physical link is Down
  Interface index: 9, SNMP ifIndex: 10
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal
  Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive Input: 116 (00:02:32 ago), Output: 185 (00:00:02 ago)
  Input rate     : 0 bps (0 pps), Output rate: 0 bps (0 pps)
  Active alarms  : LOF, LOS
  Active defects : LOF, LOS
  Logical interface t3-1/0/0.0 (Index 12) (SNMP ifIndex 32)
    Flags: Device-down Point-To-Point SNMP-Traps, Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 1.1.1.0/30, Local: 1.1.1.1
```

Meaning The first line of the sample output shows the status of the link. If this line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets.

Display Extensive Status Information for a Specific T3 Interface

Purpose To display extensive status information about a specific T3 interface, use the following Junos OS CLI operational mode command:

Action user@host> show interfaces t3-*fpc/pic/port* extensive

Sample Output user@router> show interfaces t3-1/0/0 extensive

```
Physical interface: t3-1/0/0, Enabled, Physical link is Down
  Interface index: 9, SNMP ifIndex: 10
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal
  Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive statistics:
    Input : 116 (last seen 00:02:59 ago)
    Output: 187 (last seen 00:00:09 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes   :                2552                0 bps
    Output bytes  :                3703                0 bps
    Input packets :                116                0 pps
    Output packets:                161                0 pps
  Input errors: - Input errors
    Errors: 0, Drops: 0, Framing errors: 229, Policed discards: 1
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0
    SRAM errors: 0, HS link CRC errors: 0
  Output errors: - Output errors
    Carrier transitions: 4, Errors: 0, Drops: 0, Aged packets: 0
  Active alarms  : LOF, LOS - DS3 active alarms and defects
  Active defects : LOF, LOS
  DS3 Media:
    Seconds      Count  State - T3 media-specific errors
    PLL Lock     0       0 OK
    Reframing    273     2 Defect Active
    AIS          0       0 OK
    LOF          273     2 Defect Active
```

```

LOS                273                2 Defect Active
IDLE                0                  0 OK
YELLOW             0                  0 OK
BPV                0                  0
EXZ                0                  0
LCV                275                18022125
PCV                0                  0
CCV                0                  0
LES                275
PES                273
PSES               273
CES                273
CSES               273
SEFS               273
UAS                277

HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 3
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Error rate: 10e-0
PFE configuration:
  Destination slot: 1, Stream number: 0, PLP byte: 1 (0x00)
  COS transmit queue bandwidth:
    Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
  COS weighted round robin:
    Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
Logical interface t3-1/0/0.0 (Index 12) (SNMP ifIndex 32)
Flags: Device-down Point-To-Point SNMP-Traps, Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Flags: None
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 1.1.1.0/30, Local: 1.1.1.1, Broadcast: Unspecified

```

Meaning The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the T3 interface and investigate the T3 media accordingly. See “Checklist of Common T3 Alarms and Errors” on page 65 for an explanation of T3 alarms.

Monitor Statistics for a T3 Interface

Purpose To monitor statistics for a T3 interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interface t3-fpc/pic/port`

```

Sample Output user@host> monitor interface t3-1/0/0
router                Seconds: 78                Time: 21:44:15
Interface: t3-1/0/0, Enabled, Link is Down
Encapsulation: Cisco-HDLC, Keepalives, Speed: T3
Traffic statistics:                                     Current Delta
  Input bytes:                0 (0 bps)                [0]
  Output bytes:               207 (184 bps)              [184]
  Input packets:              0 (0 pps)                [0]
  Output packets:             9 (1 pps)                [8]
Encapsulation statistics:
  Input keepalives:           0                        [0]
  Output keepalives:          9                        [8]

```

```

Error statistics:
  Input errors:          0                [0]
  Input drops:          0                [0]
  Input framing errors:  9                [8]
  CCV                   0                [0]
Interface warnings:
  o Received keepalive count is zero
  o Framing errors, check FCS, scrambling and subrate configuration
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Meaning This command checks for and displays common interface failures, indicates whether loopback is detected, and reports any increases in framing errors. Use the information from this command to narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.

Table 17 on page 51 presents problem situations and actions to help you further understand the problem.

Table 17: Problem Situations and Actions

| Problem Situation | Action |
|--|--|
| Framing errors are increasing. | Check the frame check sequence (FCS), scrambling, and subrate configuration. |
| Framing errors are increasing, and the configuration is correct. | Check the cabling to the router and have the carrier verify the integrity of the line. |
| Input errors are increasing. | Check the cabling to the router and have the carrier verify the integrity of the line. |



NOTE: We recommend that you use this command only for troubleshooting purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

CHAPTER 7

Use Loopback Testing for T3 Interfaces

This chapter describes using loopback testing to isolate T3 interface problems.

- Checklist for Using Loopback Testing for T3 Interfaces on page 53
- Diagnose a Suspected Hardware Problem with a T3 Interface on page 54
- Create a Loopback on page 55
- Set Clocking to Internal on page 56
- Verify That the T3 Interface Is Up on page 57
- Clear T3 Interface Statistics on page 58
- Force the Link Layer To Stay Up on page 58
- Verify the Status of the Logical Interface on page 60
- Ping the T3 Interface on page 61
- Check for T3 Interface Error Statistics on page 61
- Diagnose a Suspected Circuit Problem on page 63

Checklist for Using Loopback Testing for T3 Interfaces

Purpose Table 18 on page 53 provides links and commands for using loopback testing to isolate T3 interface problems.

provides commands for using loopback testing for T3 interfaces.

Table 18: Checklist for Using Loopback Testing for T3 Interfaces

| "Diagnose a Suspected Hardware Problem with a T3 Interface" on page 54 | Command or Action |
|--|--|
| 1. Create a Loopback on page 55 | |
| a. Create a Physical Loopback on page 55 | Connect the transmit port to the receive port. |
| b. Configure a Local Loopback on page 55 | [edit interfaces <i>interface-name</i> t3-options] set loopback local show commit |

Table 18: Checklist for Using Loopback Testing for T3 Interfaces (*continued*)

| “Diagnose a Suspected Hardware Problem with a T3 Interface” on page 54 | Command or Action |
|--|--|
| 2. Set Clocking to Internal on page 56 | <pre>[edit interfaces <i>interface-name</i>] set clocking internal show commit</pre> |
| 3. Verify That the T3 Interface Is Up on page 57 | <pre>show interfaces t3-<i>fpc/pic/port</i></pre> |
| 4. Clear T3 Interface Statistics on page 58 | <pre>clear interfaces statistics t3-<i>fpc/pic/port</i></pre> |
| 5. Force the Link Layer To Stay Up on page 58 | |
| a. Configure Encapsulation to Cisco-HDLC on page 58 | <pre>[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc show commit</pre> |
| b. Configure No-Keepalives on page 59 | <pre>[edit interfaces <i>interface-name</i>] set no-keepalives show commit</pre> |
| 6. Verify the Status of the Logical Interface on page 60 | <pre>show interfaces t3-<i>fpc/pic/port</i> show interfaces t3-<i>fpc/pic/port</i> terse</pre> |
| 7. Ping the T3 Interface on page 61 | <pre>ping interface t3-<i>fpc/pic/port</i> local-IP-address bypass-routing count 1000 rapid</pre> |
| 8. Check for T3 Interface Error Statistics on page 61 | <pre>show interfaces t3-<i>fpc/pic/port</i> extensive</pre> |
| “Diagnose a Suspected Circuit Problem” on page 63 | |
| 1. Create a Loop from the Router to the Network on page 63 | <pre>[edit interfaces <i>interface-name</i> t3-options] set loopback remote show commit</pre> |
| 2. Create a Loop to the Router from Various Points in the Network on page 64 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a T3 Interface” on page 54. |

Diagnose a Suspected Hardware Problem with a T3 Interface

Problem When you suspect a hardware problem, take the following steps to help verify if there is a hardware problem.

Solution To diagnose a suspected hardware problem with a T3 interface, follow these steps:

- Create a Loopback on page 55
- Set Clocking to Internal on page 56
- Verify That the T3 Interface Is Up on page 57
- Clear T3 Interface Statistics on page 58
- Force the Link Layer To Stay Up on page 58
- Verify the Status of the Logical Interface on page 60
- Ping the T3 Interface on page 61
- Check for T3 Interface Error Statistics on page 61

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the transmit and receive ports. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback on page 55
2. Configure a Local Loopback on page 55

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port.

Meaning When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name t3-options
```

2. Configure the loopback:

```
[edit interfaces interface-name t3-options]
user@host# set loopback local
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
```

```
user@host# show
loopback local;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# commit
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Set Clocking to Internal

Purpose You set clocking to internal because there is no external clock source in a loopback connection.

Action To configure clocking to internal, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure clocking to internal:

```
[edit interfaces interface-name]
user@host# set clocking internal
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# show
clocking internal;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# commit
commit complete
```

Meaning The clock source for the interface is set to the internal Stratum 3 clock.

Verify That the T3 Interface Is Up

Purpose Display the status of the T3 interface to provide the information you need to determine whether the physical link is up or down.

Action To verify that the status of the T3 interface is up, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces t3-fpc/pic/port
```

Sample Output The following output is for a T3 interface with the physical link up:

```
user@router> show interfaces t3-1/0/0
Physical interface: t3-1/0/0, Enabled, Physical link is Up
  Interface index: 9, SNMP ifIndex: 10
  Link-level type: PPP, MTU: 4474, Clocking: Internal
  Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
  Device flags : Present Running Loop-Detected
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags : Keepalives
  Keepalive Input: 6684 (00:07:51 ago), Output: 6693 (00:06:41 ago)
  NCP state: Down, LCP state: Conf-req-sent
  Input rate : 224 bps (2 pps), Output rate: 240 bps (2 pps)
  Active alarms : None
  Active defects : None
  Logical interface t3-1/0/0.0 (Index 13) (SNMP ifIndex 32)
  Flags: Device-down Hardware-Down Point-To-Point SNMP-Traps
  Encapsulation: PPP
  Protocol inet, MTU: 4470, Flags: Protocol-Down
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
  Destination: 1.1.1.0/30, Local: 1.1.1.1
```

Meaning The sample output shows that the physical link is up, the loop is detected, and there are no T3 alarms or defects.

Sample Output If the physical link is down, there may be a problem with the port. The following output is an example of the `show interfaces t3-fpc/pic/port` command when the physical link is down:

```
user@router> show interfaces t3-1/0/0
Physical interface: t3-1/0/0, Enabled, Physical link is Down
  Interface index: 9, SNMP ifIndex: 10
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal
  Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
  Device flags : Present Running Down
  Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags : Keepalives
  Keepalive Input: 116 (00:02:32 ago), Output: 185 (00:00:02 ago)
  Input rate : 0 bps (0 pps), Output rate: 0 bps (0 pps)
  Active alarms : LOF, LOS
  Active defects : LOF, LOS
  Logical interface t3-1/0/0.0 (Index 12) (SNMP ifIndex 32)
  Flags: Device-down Point-To-Point SNMP-Traps, Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 4470
```

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 1.1.1.0/30, Local: 1.1.1.1

Meaning The sample output shows that the physical link is down, the device flags and interface flags are down, and that there are T3 alarms and defects. Verify that the fiber can successfully loop a known good port of the same type by checking for damage to the cable.

Clear T3 Interface Statistics

Purpose You must reset T3 interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current diagnostics.

Action To clear all statistics for the interface, use the following Junos OS CLI operational mode command:

```
user@host> clear interfaces statistics t3-fpc/pic/port
```

Sample Output

```
user@host> clear interfaces statistics t3-4/0/2
user@host>
```

Meaning This command clears the interface statistics counters for interface **t3-4/0/2** only.

Force the Link Layer To Stay Up

To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. You need to force the link layer to stay up by making some configuration changes to the encapsulation and keepalives.

To force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 58
2. Configure No-Keepalives on page 59

Configure Encapsulation to Cisco-HDLC

Action To configure encapsulation on a T3 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure Cisco-HDLC:

```
[edit interfaces interface-name]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# commit
commit complete
```

Meaning This command sets the interface encapsulation to the Cisco High-Level Data-Link Control (HDLC) transport protocol.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a T3 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure no-keepalives:

```
[edit interfaces interface-name]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# commit
commit complete
```

Meaning By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Verify the Status of the Logical Interface

Purpose To verify the status of the logical interface, use the following two Junos OS CLI operational mode commands:

Action `user@host# show interfaces t3-fpc/pic/port`
`user@host# show interfaces t3-fpc/pic/terse`

Sample Output The following sample output is for a T3 logical interface that is up:

```
user@router> show interfaces t3-1/0/0
Physical interface: t3-1/0/0, Enabled, Physical link is Up
  Interface index: 13, SNMP ifIndex: 12
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, Speed: T3, Loopback:
  None, FCS: 16,
  Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  Logical interface t3-1/0/0.0 (Index 126) (SNMP ifIndex 13)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470, Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
    Destination: 1.1.1.0/30, Local: 1.1.1.1

user@router> show interfaces terse t3-1/0/0
Interface      Admin Link Proto Local              Remote
t3-1/0/0       up    up
t3-1/0/0.0     up    up   inet  1.1.1.1/30
```

Meaning The sample output for the first command shows that the logical link is up because there are no flags indicating that the link layer is down. The output for the `show interfaces terse` command shows that logical interface `t3-1/0/0` is up.

Sample Output The following sample output is for a T3 logical interface that is down:

```
user@router> show interfaces t3-0/2/0
Physical interface: t3-0/2/0, Enabled, Physical link is Up
  Interface index: 13, SNMP ifIndex: 12
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, Speed: T3, Loopback:
  None, FCS: 16,
  Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 9 (00:00:04 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  Logical interface t3-0/2/0.0 (Index 126) (SNMP ifIndex 13)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470, Flags: None
```

```
user@router> show interfaces terse t3-0/2/0
Interface      Admin Link Proto Local                                Remote
t3-0/2/0       up    down
t3-0/2/0.0     up    down inet 1.1.1.1/30
```

Ping the T3 Interface

Meaning This command sends 1000 ping packets out of the interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for T3 Interface Error Statistics

Sample Output

```
user@router> show interfaces t3-1/0/0 extensive
Physical interface: t3-1/0/0, Enabled, Physical link is Down
Interface index: 9, SNMP ifIndex: 10
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal
Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
```

```

Device flags   : Present Running Down
Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive statistics:
  Input : 116 (last seen 00:02:59 ago)
  Output: 187 (last seen 00:00:09 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes :          2552          0 bps
  Output bytes :          3703          0 bps
  Input packets:           116          0 pps
  Output packets:          161          0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 229, Policed discards: 1
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0
  SRAM errors: 0, HS link CRC errors: 0
Output errors:
  Carrier transitions: 4, Errors: 0, Drops: 0, Aged packets: 0
Active alarms   : LOF, LOS
Active defects  : LOF, LOS
DS3 Media:
  Seconds      Count  State
  PLL Lock      0        0 OK
  Reframing     273        2 Defect Active
  AIS            0        0 OK
  LOF            273        2 Defect Active
  LOS            273        2 Defect Active
  IDLE           0        0 OK
  YELLOW         0        0 OK
  BPV            0        0
  EXZ            0        0
  LCV            275    18022125
  PCV            0        0
  CCV            0        0
  LES            275
  PES            273
  PSES           273
  CES            273
  CSES           273
  SEFS           273
  UAS            277
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 3
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Error rate: 10e-0
PFE configuration:
  Destination slot: 1, Stream number: 0, PLP byte: 1 (0x00)
  COS transmit queue bandwidth:
    Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
  COS weighted round robin:
    Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
Logical interface t3-1/0/0.0 (Index 12) (SNMP ifIndex 32)
Flags: Device-down Point-To-Point SNMP-Traps, Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Flags: None

```


Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
 Destination: 1.1.1.0/30, Local: 1.1.1.1, Broadcast: Unspecified

Meaning Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 63
2. Create a Loop to the Router from Various Points in the Network on page 64

Create a Loop from the Router to the Network

Purpose Creating a loop from the router to the network allows the transport-layer engineer to test the router from various points in the network. This helps the engineer isolate where the problem is located.

Action To create a loop from the router to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interface interface-name t3-options
```

2. Configure the remote loopback:

```
[edit interfaces interface-name t3-options]
user@host# set loopback remote
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# show
loopback remote;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# commit
commit complete
```

Meaning This command loops any traffic from the network back into the network.

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network so that you can then perform tests to verify the connection from the router to that loopback in the network.

Action To verify the connection from the router to a loopback in the network, follow Steps 2 through 8 in “Diagnose a Suspected Hardware Problem with a T3 Interface” on page 54.

Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network. By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

CHAPTER 8

Locate T3 Alarms and Errors

This chapter describes the most common T3 alarms and errors you can encounter when investigating line problems on a Juniper Networks router.

- Checklist of Common T3 Alarms and Errors on page 65
- Display T3 Alarms and Errors on page 66
- Locate Most Common T3 Alarms and Errors on page 67

Checklist of Common T3 Alarms and Errors

Purpose Table 19 on page 65 provides links and commands for most common T3 alarms and errors you can encounter when investigating line problems on a Juniper Networks router.

Table 19: Checklist of Common T3 Alarms and Errors

| Tasks | Command or Action |
|--|---|
| “Display T3 Alarms and Errors” on page 66 | <code>show interfaces t3-fpc/pic/port extensive</code> |
| “Locate Most Common T3 Alarms and Errors” on page 67 | |
| 1. Locate Loss of Signal and Loss of Frame Alarms on page 67 | Check the connection between the router port and the first T3 network element. |
| 2. Locate Alarm Indication Signal Alarms on page 68 | Check the T3 network element connected to the T3 interface. |
| 3. Locate an Incoming Yellow Alarm on page 69 | Check the cable between the T3 interface and the directly connected T3 network element. |
| 4. Locate IDLE on a T3 Interface on page 69 | Check that the line is provisioned for service. |



NOTE: T3 is a general term used to refer to the transmission of 44.736-Mbps digital circuits over any media. T3 can be transported over copper, fiber, or radio. DS3 is the term for the electrical signal found at the metallic interface for this circuit where most of the testing is performed.

Display T3 Alarms and Errors

Purpose To display T3 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

Action user@host> show interfaces t3-fpc/pic/port extensive

Sample Output

```

user@host> show interfaces t3-1/0/0 extensive
Physical interface: t3-1/0/0, Enabled, Physical link is Down
Interface index: 9, SNMP ifIndex: 10
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal
Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
Device flags   : Present Running Down
Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive statistics:
  Input : 116 (last seen 00:02:59 ago)
  Output: 187 (last seen 00:00:09 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes   :                2552                0 bps
  Output bytes  :                3703                0 bps
  Input packets:                116                0 pps
  Output packets:               161                0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 229, Policed discards: 1
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0
  SRAM errors: 0, HS link CRC errors: 0
Output errors:
  Carrier transitions: 4, Errors: 0, Drops: 0, Aged packets: 0
Active alarms : LOF, LOS   - DS-3 active alarms and defects
Active defects: LOF, LOS
DS3 Media:
Seconds      Count  State  - T3 media-specific errors
PLL Lock      0         0  OK
Reframing    273         2  Defect Active
AIS           0         0  OK
LOF          273         2  Defect Active
LOS          273         2  Defect Active
IDLE          0         0  OK
YELLOW        0         0  OK
BPV           0         0
EXZ           0         0
LCV          275    18022125
PCV           0         0
CCV           0         0
LES          275
PES          273
PSES         273
CES          273
CES          273
SEFS         273
UAS          277
[...Output truncated...]

```

Meaning The sample output shows active alarms and active defects. When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down

and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 second plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T3 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell).

Table 20 on page 67 lists the T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 20: T3 Interface Error Counter Definitions

| T3 Alarm or Error | Definition |
|-------------------|---|
| AIS | Alarm indication signal |
| EXZ | Excessive zeros |
| FERF | Far-end failures |
| IDLE | Idle code detected |
| LCV | Line code violation |
| LOS | Loss of signal |
| LOF | Loss of frame |
| YLW | Remote defect indication (yellow alarm) |
| PLL | Phase locked loop |

Locate Most Common T3 Alarms and Errors

The following alarms and errors are described in this chapter:

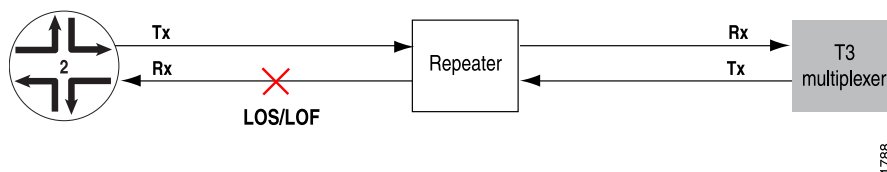
1. Locate Loss of Signal and Loss of Frame Alarms on page 67
2. Locate Alarm Indication Signal Alarms on page 68
3. Locate an Incoming Yellow Alarm on page 69
4. Locate IDLE on a T3 Interface on page 69

Locate Loss of Signal and Loss of Frame Alarms

Problem A loss of signal (LOS) or loss of frame (LOF) alarm indicates that a signal could not be detected at the T3 interface.

Solution To locate the LOS or LOF alarm, check the connection between the router port and the first T3 network element. In the example network in Figure 6 on page 68, the X indicates that there is a connection problem between Router 2 and the nearest T3 network element.

Figure 6: Location of an LOS or LOF Alarm in a T3 Network



NOTE: Tx represents the transmit port and Rx represents the receive port.

Sample Output

```
user@router2> show interfaces t3-1/1/1 extensive
[... Output truncated...]
Active alarms : LOF, LOS
Active defects : LOF, LOS
DS3 Media:
Seconds      Count  State
PLL Lock      0       0 OK
Reframing    273       2 Defect Active
AIS           0       0 OK
LOF          273       2 Defect Active
LOS          273       2 Defect Active
[...Output truncated...]
```

Meaning The sample output shows that Router 2 (Rx) detected a cumulative LOS and LOF for 273 seconds. The defect was declared twice during that time.

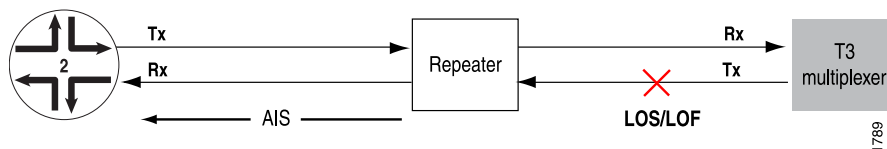
Locate Alarm Indication Signal Alarms

Problem An alarm indication signal (AIS) is a valid framed signal with payload containing a repeating 1010 pattern. An AIS alarm indicates a problem with the line upstream from the T3 network element connected to the T3 interface.

Solution To locate the AIS alarm, have the carrier check the T3 network element connected to the T3 interface and trace the problem.

All diagnostics are from the perspective of Router 2 (the Juniper Networks router). Figure 7 on page 68 illustrates the location of an AIS alarm in a T3 network.

Figure 7: Location of an AIS Alarm in a T3 Network



Meaning In Figure 7 on page 68, the X indicates that there is an LOS or LOF alarm between the repeater and the Tx T3 multiplexer. An AIS alarm is sent from the repeater to Router 2.

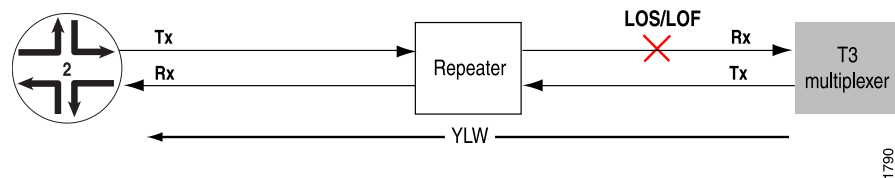
Locate an Incoming Yellow Alarm

Problem An incoming yellow alarm indicates that the T3 network element connected to the T3 interface has a problem with the signal it is receiving from the T3 interface.

Solution To locate the yellow alarm, check the cable between the T3 interface and the directly connected T3 network element.

All diagnostics are from the perspective of Router 2. Figure 8 on page 69 illustrates the location of a yellow alarm in a T3 network.

Figure 8: Location of a Yellow Alarm in a T3 Network



Meaning The T3 multiplexer detects an LOS or LOF on its connection from Router 2 and sends a yellow (YLW) alarm to Router 2.

Locate IDLE on a T3 Interface

Problem The T3 (DS3) IDLE signal is a validly framed DS3 signal with a payload consisting of a repeated 1100 signal. IDLE indicates that the line has not been provisioned for service.

Solution Have the carrier make sure that the line is provisioned for service.

Sample Output

```
user@router2> show interfaces t3-1/1/0
Physical interface: t3-1/1/0, Enabled, Physical link is Down
  Interface index: 13, SNMP ifIndex: 21
  Link-level type: PPP, MTU: 4474, Clocking: Internal
  Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Input rate     : 0 bps (0 pps), Output rate: 0 bps (0 pps)
  Active alarms  : IDLE
  Active defects : IDLE
```


PART 4

Investigate ATM Interfaces

- Determine ATM Interface Type on page 73
- Monitor ATM Interfaces on page 83
- Use Loopback Testing for ATM Interfaces on page 99
- Locate ATM Alarms and Errors on page 113

CHAPTER 9

Determine ATM Interface Type

This chapter describes how to determine the type of Asynchronous Transfer Mode (ATM) interface on your router.

- Checklist for Determining ATM Interface Type on page 73
- Determine the ATM Interface Type and Configuration on page 74
- Determine the ATM Interface Type on page 74
- Check that the ATM Configuration Is Correct on page 75
- Examples of Incorrect Configurations of ATM Options on page 77

Checklist for Determining ATM Interface Type

Purpose Table 21 on page 73 provides links and commands for determining the type of Asynchronous Transfer Mode_(ATM) interface on your router.

Table 21: Checklist for Determining ATM Interface Type

| Tasks | Command or Action |
|--|---|
| “Determine the ATM Interface Type and Configuration” on page 74 | |
| 1. Determine the ATM Interface Type on page 74 | show chassis hardware |
| 2. Check that the ATM Configuration Is Correct on page 75 | |
| a. Check the Configuration of an ATM1 Interface on page 75 | show configuration interfaces at-<i>fpc/pic/port</i> |
| b. Check the Configuration of an ATM2 IQ Interface on page 76 | show configuration interfaces at-<i>fpc/pic/port</i> |
| “Examples of Incorrect Configurations of ATM Options” on page 77 | |

Table 21: Checklist for Determining ATM Interface Type (*continued*)

| Tasks | Command or Action |
|---|--|
| 1. Check the Configuration of the VCI on an ATM1 Interface on page 77 | <pre>show configuration interfaces at-<i>fpc/pic/port</i> show interfaces terse at-<i>fpc/pic/port</i> edit edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> maximum-vcs <i>maximum-vcs</i> show commit show configuration interfaces at-<i>fpc/pic/port</i> run show interfaces terse at-<i>fpc/pic/port</i></pre> |
| 2. Check the Configuration of the VCI on an ATM2 IQ Interface on page 78 | <pre>show configuration interfaces at-<i>fpc/pic/port</i> show interfaces terse at-<i>fpc/pic/port</i> edit edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> delete maximum-vcs show commit show configuration interfaces at-<i>fpc/pic/port</i> run show interfaces terse at-<i>fpc/pic/port</i></pre> |
| 3. Check the Configuration of Promiscuous Mode on an ATM2 IQ Interface on page 80 | <pre>show configuration interfaces at-<i>fpc/pic/port</i> show interfaces terse at-<i>fpc/pic/port</i> edit set interfaces <i>interface-name</i> atm-options pic-type atm 2 show commit show configuration interfaces at-<i>fpc/pic/port</i> run show interfaces terse at-<i>fpc/pic/port</i></pre> |

Determine the ATM Interface Type and Configuration

Purpose When you know the type of ATM interface on your router, you can configure it with the correct configuration options.

For ATM1 and ATM2 intelligent queuing (IQ) interfaces, the Junos OS does not determine from the interface name **at-*fpc/pic/port*** whether your routing platform has an ATM1 or ATM2 IQ Physical Interface Card (PIC) installed.

Action To determine the type of ATM interface on your router and to check your ATM interface configuration, follow these steps:

1. Determine the ATM Interface Type on page 74
2. Check that the ATM Configuration Is Correct on page 75

Determine the ATM Interface Type

Purpose To determine the type of ATM interface on your router, use the following Junos OS command-line interface (CLI) operational mode command:

| | |
|----------------------|--|
| Action | user@host> show chassis hardware |
| Sample Output | <pre> user@host> show chassis hardware Hardware inventory: Item Version Part number Serial number Description Chassis 50992 M10 Midplane REV 03 710-001950 HB2090 Power Supply B Rev 04 740-002497 LJ23082 AC Display REV 04 710-001995 HC5151 Routing Engine 9700000792694801 RE-2.0 FEB REV 06 710-003310 HH0211 E-FEB FPC 0 E-FPC PIC 0 REV 06 750-002992 HP2711 4x F/E, 100 BASE-TX PIC 1 REV 02 750-005718 BE6774 1x OC-12 ATM-II IQ, MM PIC 3 REV 04 750-002971 HC8106 4x OC-3 SONET, MM FPC 1 E-FPC PIC 1 REV 03 750-000612 AA7399 2x OC-3 ATM, MM PIC 3 REV 02 750-000618 AE2070 4x T3 </pre> |
| Meaning | The sample output shows the hardware inventory. The ATM2 IQ interface is in Flexible PIC Concentrator (FPC) slot 0, and PIC slot 1, which translates to at-fpc/pic/port or at-0/1/0 . The ATM1 interface name is at-1/1/0 . |

Check that the ATM Configuration Is Correct

Purpose The supported set of configuration options varies between the ATM1 and ATM2 IQ interfaces. If you configure an ATM1 interface using ATM2 IQ configuration options, the configuration does not commit. The same occurs if you configure an ATM2 IQ interface with ATM1 options. See the *Junos Network Interfaces Configuration Guide* for more information on the options supported for ATM1 and ATM2 IQ interfaces.

1. Check the Configuration of an ATM1 Interface on page 75
2. Check the Configuration of an ATM2 IQ Interface on page 76

Check the Configuration of an ATM1 Interface

Purpose The Junos OS assumes an ATM1 interface configuration if you include the **maximum-vcs** statement without the **pic-type** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level,

Action To check the configuration of an ATM1 interface, use the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

Sample Output 1

```

user@host> show configuration interfaces at-0/1/0
atm-options {
    vpi 1 {
        maximum-vcs 1024;
    }
}
unit 100 {
    vci 1.100;
    family inet {
        address 25.25.25.2/30;
    }
}

```

```
    }  
  }
```

Sample Output 2

```
user@host> show configuration interfaces at-1/0/0  
atm-options {  
  pic-type atm1;  
  vpi 0 maximum-vcs 256;  
  vpi 1 maximum-vcs 512;  
}
```

Meaning The sample output shows the correct configuration of an ATM1 interface. Sample output 1 shows the **maximum-vcs** statement configured on an ATM interface. Because the **pic-type** statement is not included in the configuration, this interface is assumed to be an ATM1 interface. Use the **show chassis hardware** command to verify that the interface is an ATM1. Otherwise this could be the incorrect configuration of an ATM2 IQ interface. Sample output 2 shows the correct configuration of an ATM1 interface with the **pic-type** statement and the **maximum-vcs** statement.

See the *Junos Network Interfaces Configuration Guide*, for more information on configuring ATM1 interfaces.

Check the Configuration of an ATM2 IQ Interface

Purpose ATM2 IQ interfaces must *not* have the **maximum-vcs** statement included in the configuration.

Action To check the configuration on an ATM2 IQ interface, use the following CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

Sample Output 1

```
user@host> show configuration interfaces at-0/1/0  
atm-options {  
  vpi 1;  
}  
unit 100 {  
  vci 1.100;  
  family inet {  
    address 25.25.25.1/30;  
  }  
}
```

Sample Output 2

```
user@host> show configuration interfaces at-2/2/0  
atm-options {  
  pic-type atm2 ;  
  vpi 1;  
}  
unit 100 {  
  encapsulation ether-over-atm-llc;  
  vci 1.100;  
  shaping {  
    vbr peak 66k sustained 66k burst 40;  
  }  
  family inet {  
    address 192.168.5.1/24;  
  }  
}
```

```
}
[...Output truncated...]
```

Meaning The sample output shows the correct configuration of an ATM2 IQ interface. The first example shows that the interface **at-0/1/0** has ATM options configured and the logical interface **at-0/1/0.100**. Sample output 2 shows another interface **at-2/2/0** with the PIC type configured.



NOTE: The ATM2 IQ interface does *not* have the `maximum-vcs` statement included in the configuration.

See the *Junos Network Interfaces Configuration Guide*, for more information on configuring ATM2 IQ interfaces.

Examples of Incorrect Configurations of ATM Options

Purpose Even though ATM1 and ATM2 IQ interfaces may be configured with the incorrect options, the configuration may commit but the logical interface may not come up. Here are some examples of incorrectly configured options:

1. Check the Configuration of the VCI on an ATM1 Interface on page 77
2. Check the Configuration of the VCI on an ATM2 IQ Interface on page 78
3. Check the Configuration of Promiscuous Mode on an ATM2 IQ Interface on page 80

Check the Configuration of the VCI on an ATM1 Interface

Purpose If your configuration of the virtual channel identifier (VCI) is incorrect, the logical interface is not created.

Action To check that VCI is configured correctly on your ATM1 interface, follow these steps:

1. Check the configuration with the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

For example, the following output shows an *incorrectly* configured ATM1 interface:

```
user@host> show configuration interfaces at-1/2/0

atm-options {
  vpi 1;
} <<< the maximum-vcs statement is missing
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.2/30;
  }
}
```

2. Check if the logical interface unit 100 is created with the following command:

```
user@host> show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is not created:

```
user@host> show interfaces terse at-1/2/0

Interface           Admin Link Proto Local           Remote
at-1/2/0             up    up
<<< missing logical interface at-1/2/0.100
```

3. Include the **maximum-vcs** statement in the configuration:

```
user@host> edit
user@host# edit interfaces interface-name atm-options vpi vpi-identifier
maximum-vcs maximum-vcs
user@host# show
user@host# commit
```

For example, the following output shows a *correctly* configured ATM1 interface:

```
user@host> show configuration interfaces at-0/1/0
atm-options {
  vpi 1 {
    maximum-vcs 1024;
  }
}
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.2/30;
  }
}
```

1. Check that the logical interface is created with the following command:

```
user@host> run show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is created:

```
user@host# run show interfaces terse at-1/2/0

Interface           Admin Link Proto Local           Remote
at-1/2/0             up    up
at-1/2/0.100         up  up  inet 25.25.25.2/30
```

Meaning The steps above show that initially the logical interface **at-1/2/0.100** is not created because the **maximum-vcs** statement is not included in the ATM1 configuration. When that statement is included, the logical interface is created.

Check the Configuration of the VCI on an ATM2 IQ Interface

Purpose If your configuration of the VCI is incorrect, the logical interface is not created.

Action To check that VCI is configured correctly on your ATM2 IQ interface, follow these steps:

1. Check the configuration with the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

For example, the following output shows an *incorrectly* configured ATM2 IQ interface:

```
user@host> show configuration interfaces at-0/1/0
```



```

atm-options {
  vpi 1 {
    maximum-vcs 200; <<< incorrectly included
  }
}
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.1/30;
  }
}

```

2. Check if the logical interface unit 100 is created with the following command:

```
user@host> show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is not created:

```

user@host> show interfaces terse at-0/1/0

Interface          Admin Link Proto Local          Remote
at-0/1/0           up    up
<<< missing logical interface at-0/1/0.100

```

3. Delete the incorrect **maximum-vcs** statement from the configuration:

```

user@host> edit
user@host# edit interfaces interface-name atm-options vpi vpi-identifier
user@host# delete maximum-vcs
user@host# show
user@host# commit

```

For example, the following output shows a *correctly* configured ATM2 IQ interface:

```

user@host> show configuration interfaces at-0/1/0

atm-options {
  vpi 1 {
  }
}
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.1/30;
  }
}

```

4. Check that the logical interface is created with the following command:

```
user@host> show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is created:

```

user@host> show interfaces terse at-0/1/0

Interface          Admin Link Proto Local          Remote
at-0/1/0           up    up
at-0/1/0.100      up  up  inet 25.25.25.1/30

```

Meaning The steps above show that initially the logical interface **at-0/1/0.100** is not created because the **maximum-vcs** statement is included in the ATM2 IQ configuration. When that statement is deleted, the logical interface is created.

Check the Configuration of Promiscuous Mode on an ATM2 IQ Interface

Purpose If your configuration of promiscuous mode is incorrect, the logical interface is not created. ATM2 IQ interfaces must have the **pic-type atm2** statement included if you are including the **promiscuous-mode** statement in the configuration.

Action To check that promiscuous mode is configured correctly on your ATM2 IQ interface, follow these steps:

1. Check the configuration with the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

For example, the following output shows promiscuous mode *incorrectly* configured on an ATM2 IQ interface:

```
user@host> show configuration interfaces at-1/2/0

encapsulation atm-ccc-cell-relay;
atm-options {
    promiscuous-mode { <<< the pic-type statement is missing
        vpi 1;
    }
}
unit 1 {
    vpi 1;
}
```

2. Check if the logical interface unit 1 is created with the following command:

```
user@host> run show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is not created:

```
user@host# run show interfaces terse at-0/1/0

Interface           Admin Link Proto Local           Remote
at-0/1/0             up      up
<<< missing logical interface at-0/1/0.1
```

3. Include the **pic-type** statement in the configuration:

```
user@host> edit
user@host# set interfaces interface-name atm-options pic-type atm2
user@host# show
user@host# commit
```

For example, the following output shows promiscuous mode correctly configured on an ATM2 IQ interface:

```
user@host> show configuration interfaces at-0/1/0

encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm2;
```

```

        promiscuous-mode {
            vpi 1;
        }
    }
    unit 1 {
        vpi 1;
    }

```

4. Check that the logical interface is created with the following command:

```
user@host> run show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is created:

```
user@host# run show interfaces terse at-0/1/0
```

| Interface | Admin | Link | Proto | Local | Remote |
|------------|-------|------|-------|-------|--------|
| at-0/1/0 | up | up | | | |
| at-0/1/0.1 | up | up | ccc | | |

Meaning The steps above show that initially the logical interface **at-0/1/0.1** is not created because the **pic-type** statement is not included with the **promiscuous-mode** statement in the ATM2 IQ configuration. When that statement is included, the logical interface is created.

CHAPTER 10

Monitor ATM Interfaces

This chapter describes how to monitor Asynchronous Transfer Mode (ATM) interfaces and begin the process of isolating ATM interface problems when they occur.

- Checklist for Monitoring ATM Interfaces on page 83
- Monitor ATM Interfaces on page 84
- Monitor ATM1 Interfaces on page 85
- Monitor ATM2 IQ Interfaces on page 89

Checklist for Monitoring ATM Interfaces

Purpose Table 22 on page 83 provides links and commands for monitoring Asynchronous Transfer Mode (ATM) interfaces and begin the process of isolating ATM interface problems when they occur.

Table 22: Checklist for Monitoring ATM Interfaces

| Tasks | Command or Action |
|--|--|
| “Monitor ATM Interfaces” on page 84 | <code>show interfaces terse at*</code> |
| “Monitor ATM1 Interfaces” on page 85 | |
| 1. Display the Status of a Specific ATM1 Interface on page 85 | <code>show interfaces at-<i>fpc/pic/port</i></code> |
| 2. Display Extensive Status Information for a Specific ATM1 Interface on page 85 | <code>show interfaces at-<i>fpc/pic/port</i> extensive</code> |
| 3. “Monitor Statistics for an ATM1 Interface” on page 87 | <code>monitor interface at-<i>fpc/pic/port</i></code> |
| “Monitor ATM2 IQ Interfaces” on page 89 | |
| 1. Display the Status of a Specific ATM2 IQ Interface on page 89 | <code>show interfaces terse at-<i>fpc/pic/port</i></code> <code>show interfaces at-<i>fpc/pic/port</i></code> |
| 2. Display Extensive Information for a Specific ATM2 Interface on page 91 | <code>show interfaces at-<i>fpc/pic/port</i> extensive</code> |
| 3. Monitor Statistics for an ATM2 Interface on page 96 | <code>monitor interface at-<i>fpc/pic/port</i></code> |

Monitor ATM Interfaces

Purpose By monitoring ATM interfaces, you begin the process of isolating ATM interface problems when they occur. The following command provides the status of all ATM interfaces on the router. See “Checklist for Determining ATM Interface Type” on page 73 for information on how to determine the ATM interface type.

Action To display the status of all ATM interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces terse at*
```

Sample Output The following sample output is for an ATM1 interface:

```
user@host> show interfaces terse at*
Interface           Admin Link Proto Local           Remote
at-2/0/0            up   up
at-2/2/0.100        up   up   inet  10.16.5.1/24
at-2/2/0.101        up   up   inet  10.16.250.253/30
at-2/2/0.200        up   up   inet  20.20.20.1/30
at-2/2/0.300        up   up   inet  30.30.30.1/30
at-2/2/0.400        up   up   inet  40.40.40.1/30
at-2/2/0.32767      up   up
at-2/0/1            up   down
at-2/0/1.10         up   down inet  10.10.100.1/30
```

Meaning The sample output lists only the ATM interfaces and shows the status of both the physical and logical interfaces. See Table 23 on page 84 for a description of what the output means. You cannot determine from this output whether the interfaces are ATM1 or ATM2 intelligent queuing (IQ). See “Checklist for Determining ATM Interface Type” on page 73 for information on how to determine the ATM interface type.

Table 23: Status of ATM Interfaces

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|---|
| at-2/0/0 | at-2/0/0.100 | Both the physical and logical links are up and running on this interface. By default on an ATM interface, if the physical link is up, the logical link is also up. However, for ATM1 or ATM2 IQ interfaces with an ATM encapsulation and OAM configured for the VC, even if the physical interface is up, the logical link for a VC can be down due to a VC misconfiguration. |
| Admin Up | Admin Up | |
| Link Up | Link Up | |
| at-2/0/1 | at-2/0/1.10 | The physical link is down on this interface and therefore the logical interface is down also. |
| Admin Up | Admin Up | |
| Link Down | Link Down | |

Monitor ATM1 Interfaces

To monitor an ATM1 interface, follow these steps:

1. Display the Status of a Specific ATM1 Interface on page 85
2. Display Extensive Status Information for a Specific ATM1 Interface on page 85
3. Monitor Statistics for an ATM1 Interface on page 87

Display the Status of a Specific ATM1 Interface

Purpose To display the status of a specific ATM interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces at-fpc/pic/port`

Meaning The first line of the sample output shows that the physical link is down and therefore the logical link is down also. This means that the interface cannot pass packets.

Further down the sample output, look for active alarms and defects. If there are any, and to further diagnose the problem, see “Display Extensive Status Information for a Specific ATM1 Interface” on page 85 to display more extensive information about the ATM interface and the physical interface that is down.

Display Extensive Status Information for a Specific ATM1 Interface

Purpose To display extensive status information about a specific interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces at-fpc/pic/port extensive`

Sample Output

```
user@host> show interfaces at-2/0/1 extensive
Physical interface: at-2/0/1, Enabled, Physical link is Down
  Interface index: 23, SNMP ifIndex: 43, Generation: 22
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: None, Payload scrambler: Enabled
  Device flags   : Present Running Down
  Link flags     : None
  Hold-times    : Up 0 ms, Down 0 ms
  Statistics last cleared: 2002-07-29 14:28:14 EDT (00:18:00 ago)
  Traffic statistics:
    Input bytes  :                0                0 bps
    Output bytes :                0                0 bps
    Input packets:                0                0 pps
    Output packets:            0                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  SONET alarms   : LOL, LOS
  SONET defects  : LOL, LOF, LOS, SEF, AIS-L, AIS-P, RDI-P, PLM-P
  SONET PHY:
    Seconds      Count  State
    PLL Lock      0      0 OK
    PHY Light    1079      0 Light Missing
```

SONET section:

| | | | |
|--------|------|---|---------------|
| BIP-B1 | 0 | 0 | |
| SEF | 1079 | 0 | Defect Active |
| LOS | 1079 | 0 | Defect Active |
| LOF | 1079 | 0 | Defect Active |
| ES-S | 1079 | | |
| SES-S | 1079 | | |
| SEFS-S | 1079 | | |

SONET line:

| | | | |
|---------|------|---|---------------|
| BIP-B2 | 0 | 0 | |
| REI-L | 0 | 0 | |
| RDI-L | 0 | 0 | OK |
| AIS-L | 1079 | 0 | Defect Active |
| BERR-SF | 0 | 0 | OK |
| BERR-SD | 0 | 0 | OK |
| ES-L | 1079 | | |
| SES-L | 1079 | | |
| UAS-L | 1079 | | |
| ES-LFE | 0 | | |
| SES-LFE | 0 | | |
| UAS-LFE | 0 | | |

SONET path:

| | | | |
|---------|------|---|---------------|
| BIP-B3 | 0 | 0 | |
| REI-P | 0 | 0 | |
| LOP-P | 0 | 0 | OK |
| AIS-P | 1079 | 0 | Defect Active |
| RDI-P | 1079 | 0 | Defect Active |
| UNEQ-P | 0 | 0 | OK |
| PLM-P | 1079 | 0 | Defect Active |
| ES-P | 1079 | | |
| SES-P | 1079 | | |
| UAS-P | 1079 | | |
| ES-PFE | 1079 | | |
| SES-PFE | 1079 | | |
| UAS-PFE | 1079 | | |

Received SONET overhead:

| | | | | |
|---------|------------|-----------------|------------|--------|
| F1 | : 0x00, J0 | : 0x00, K1 | : 0xff, K2 | : 0xff |
| S1 | : 0x00, C2 | : 0xff, C2(cmp) | : 0x13, F2 | : 0x00 |
| Z3 | : 0x00, Z4 | : 0x00, S1(cmp) | : 0x00, V5 | : 0x00 |
| V5(cmp) | : 0x00 | | | |

Transmitted SONET overhead:

| | | | | |
|----|------------|------------|------------|--------|
| F1 | : 0x00, J0 | : 0x01, K1 | : 0x00, K2 | : 0x00 |
| S1 | : 0x00, C2 | : 0x13, F2 | : 0x00, Z3 | : 0x00 |
| Z4 | : 0x00, V5 | : 0x00 | | |

ATM status:

| | |
|------------|------|
| HCS state: | Hunt |
| LOC | : OK |

ATM Statistics:

Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0, Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 381110991, Output idle cell count: 18446744069795695321, Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0, Input bad CRCs: 0, Input OAM cell no buffers: 0

PFE configuration:

Destination slot: 2

| CoS transmit queue | Bandwidth | Buffer | Priority | Limit |
|------------------------|-----------|---------|----------|-------|
| | % bps | % bytes | | |
| 0 best-effort | 0 0 | 0 0 | low | none |
| 1 expedited-forwarding | 0 0 | 0 0 | low | none |


```

2 assured-forwarding      0          0 0          0      low  none
3 network-control          0          0 0          0      low  none
Logical interface at-2/0/1.10 (Index 30) (SNMP ifIndex 65) (Generation 29)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
  Input bytes :              0
  Output bytes :             0
  Input packets:             0
  Output packets:            0
Local statistics:
  Input bytes :              0
  Output bytes :             0
  Input packets:             0
  Output packets:            0
Transit statistics:
  Input bytes :              0          0 bps
  Output bytes :             0          0 bps
  Input packets:             0          0 pps
  Output packets:            0          0 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 32 Route table: 0
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 192.168.100.0/30, Local: 192.168.100.1, Broadcast:
Unspecified, Generation: 61
  VCI 2.100
    Flags: Active
    Total down time: 0 sec, Last down: Never
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input bytes :              0
      Output bytes :             0
      Input packets:             0
      Output packets:

```

Meaning The sample output is for an OC3 ATM interface and shows the statistics for the SONET media, as well as the **Input** and **Output** ATM errors. Error details include input and output errors, active alarms and defects, and media-specific errors.

If the physical link is down, look at the active alarms and defects for the ATM interface and check the ATM media accordingly. See “List of Common ATM Alarms and Error” on page 113 for an explanation of ATM alarms.

Monitor Statistics for an ATM1 Interface

Purpose To monitor statistics for an ATM1 interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interface at-fpc/pic/port`



CAUTION: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

```

Sample Output user@host> monitor interface at-2/0/0
host                               Seconds: 68                               Time: 13:52:33
                                          Delay: 0/0/2

Interface: at-2/0/0, Enabled, Link is Up
Encapsulation: ATM-PVC, Speed: OC3
Traffic statistics:
Input bytes:                        1528168 (2142968 bps)      [1528000]
Output bytes:                       1540192 (2165880 bps)      [1540000]
Input packets:                      1002 (175 pps)          [1000]
Output packets:                     1002 (175 pps)          [1000]
Error statistics:
Input errors:                       0                      [0]
Input drops:                       0                      [0]
Input framing errors:               0                      [0]
Policed discards:                  0                      [0]
L3 incompletes:                    0                      [0]
L2 channel errors:                 0                      [0]
L2 mismatch timeouts:              0                      [0]
Carrier transitions:                0                      [0]
Output errors:                     0                      [0]
Output drops:                      0                      [0]
Aged packets:                      0                      [0]
ATM statistics:
Input cell count                    33049                  [33034]
Input invalid vc                    0                      [0]
Output cell count                   89231368868            [23664462]
Output idle cell count 18446744072746574220 [23631438]
Active alarms : None
Active defects: None
SONET error counts/seconds:
LOS count                          0                      [0]
LOF count                          0                      [0]
SEF count                          0                      [0]
ES-S                               0                      [0]
SES-S                               0                      [0]
SONET statistics:
BIP-B1                             0                      [0]
BIP-B2                             0                      [0]
REI-L                              0                      [0]
BIP-B3                             0                      [0]
REI-P                              0                      [0]
Received SONET overhead: F1        : 0x00 J0        : 0x00Z
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Meaning The sample output checks for and displays common interface failures and any increases in framing errors. Information from this command can help you narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.

Monitor ATM2 IQ Interfaces

To monitor an ATM2 interface, follow these steps:

1. Display the Status of a Specific ATM2 IQ Interface on page 89
2. Display Extensive Information for a Specific ATM2 Interface on page 91
3. Monitor Statistics for an ATM2 Interface on page 96

Display the Status of a Specific ATM2 IQ Interface

Purpose To display the status of a specific ATM2 IQ interface, use the following Junos OS CLI operational mode commands:

Action `user@host> show interfaces terse at-fpc/pic/port`
`user@host> show interfaces at-fpc/pic/port`

Sample Output 1

```
user@host> show interfaces terse at-2/2/0
Interface           Admin Link Proto Local Remote
at-2/2/0            up    up
at-2/2/0.100        up    up   inet  10.16.5.1/24
at-2/2/0.101        up    up   inet  10.16.250.253/30
at-2/2/0.200        up    up   inet  20.20.20.1/30
at-2/2/0.300        up    up   inet  30.30.30.1/30
at-2/2/0.400        up    up   inet  40.40.40.1/30
at-2/2/0.32767      up    up
```

Sample Output 2

```
user@host> show interfaces at-2/2/0
Physical interface: at-2/2/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 26
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC12, Loopback: None,
  Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags     : None
  CoS queues    : 4 supported
  Current address: 00:90:69:d6:d5:3a
  Last flapped  : 2004-05-03 14:32:52 UTC (02:41:35 ago)
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  SONET alarms  : None
  SONET defects : None
  VPI 1
    Flags: Active
    Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input packets: 0
    Output packets: 18
  Logical interface at-2/2/0.100 (Index 67) (SNMP ifIndex 36)
    Flags: Point-To-Multipoint SNMP-Traps Encapsulation: Ether-over-ATM-LLC
  Input packets : 0
  Output packets: 7
    Protocol inet, MTU: 1500
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 172.16.5/24, Local: 172.16.5.1, Broadcast: 172.16.5.255
  VCI 1.100
    Flags: Active, Shaping, Multicast
```

```
VBR, Peak: 66kbps, Sustained: 66kbps, Burst size: 40
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
Input packets : 0
Output packets: 14
Logical interface at-2/2/0.101 (Index 68) (SNMP ifIndex 37)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 2
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 172.16.250.252/30, Local: 172.16.250.253, Broadcast:
172.16.250.255
  VCI 1.101
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    Input packets : 0
    Output packets: 2
Logical interface at-2/2/0.200 (Index 69) (SNMP ifIndex 8280)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 20.20.20.0/30, Local: 20.20.20.1, Broadcast: 20.20.20.3
  VCI 1.200
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    Input packets : 0
    Output packets: 0
Logical interface at-2/2/0.300 (Index 70) (SNMP ifIndex 8281)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 30.30.30.0/30, Local: 30.30.30.1, Broadcast: 30.30.30.3
  VCI 1.300
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    Input packets : 0
    Output packets: 0
Logical interface at-2/2/0.400 (Index 72) (SNMP ifIndex 8282)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 40.40.40.0/30, Local: 40.40.40.1, Broadcast: 40.40.40.3
  VCI 1.400
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    Input packets : 0
```

```

Output packets: 0
Logical interface at-2/2/0.32767 (Index 71) (SNMP ifIndex 27)
Flags: Point-To-Multipoint No-Multicast SNMP-Traps Encapsulation: ATM-VCMUX
Input packets : 0
Output packets: 0
VCI 1.4
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
Input packets : 0
Output packets: 0

```

Meaning The first line of the sample output shows that the physical link and all logical links are up. This means that the interface can pass packets.

Further down the sample output, look for active alarms and defects. If there are any, and to further diagnose the problem, see “Display Extensive Information for a Specific ATM2 Interface” on page 91 to display more extensive information about the ATM interface and the physical interface that is down.

Display Extensive Information for a Specific ATM2 Interface

Purpose To display extensive status information about a specific ATM2 interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces at-fpc/pic/port extensive`

Sample Output

```

user@host> show interfaces at-2/2/0 extensive
Physical interface: at-2/2/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 26, Generation: 21
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC12, Loopback: None,
  Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags    : None
  CoS queues    : 4 supported
  Hold-times    : Up 0 ms, Down 0 ms
  Current address: 00:90:69:d6:d5:3a
  Last flapped  : 2004-05-03 14:32:52 UTC (02:42:30 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes :                0                0 bps
    Output bytes :             1600                0 bps
    Input packets:                0                0 pps
    Output packets:             18                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0,
    L2 channel errors: 0, L2 mismatch timeouts: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:      Queued packets  Transmitted packets  Dropped packets

    0 assured-forw          18              18              0

    1 expedited-fo           0              0              0

    2 best-effort            0              0              0

```

```

3 network-cont                                0                                0                                0

SONET alarms : None
SONET defects : None
SONET PHY:
Seconds      Count  State
  PLL Lock    0      0 OK
  PHY Light    0      0 OK
SONET section:
  BIP-B1       1     13
  SEF          0      0 OK
  LOS          0      0 OK
  LOF          0      0 OK
  ES-S         1
  SES-S        0
  SEFS-S       0
SONET line:
  BIP-B2       1     196
  REI-L        1     291
  RDI-L        0      0 OK
  AIS-L        0      0 OK
  BERR-SF      0      0 OK
  BERR-SD      0      0 OK
  ES-L         1
  SES-L        0
  UAS-L        0
  ES-LFE       1
  SES-LFE      0
  UAS-LFE      0
SONET path:
  BIP-B3       1     36
  REI-P        1     211
  LOP-P        0      0 OK
  AIS-P        0      0 OK
  RDI-P        0      0 OK
  UNEQ-P       0      0 OK
  PLM-P        0      0 OK
  ES-P         1
  SES-P        0
  UAS-P        0
  ES-PFE       1
  SES-PFE      0
  UAS-PFE      0
Received SONET overhead:
  F1 : 0x00, J0 : 0x00, K1 : 0x00, K2 : 0x00
  S1 : 0x00, C2 : 0x13, C2(cmp) : 0x13, F2 : 0x00
  Z3 : 0x00, Z4 : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
  F1 : 0x00, J0 : 0x01, K1 : 0x00, K2 : 0x00
  S1 : 0x00, C2 : 0x13, F2 : 0x00, Z3 : 0x00
  Z4 : 0x00
ATM status:
  HCS state: Sync
  LOC : OK
ATM Statistics:
  Uncorrectable HCS errors: 177, Correctable HCS errors: 3, Tx cell FIFO
overruns: 0,
  Rx cell FIFO overruns: 0, Rx cell FIFO underruns: 0, Input cell count: 4,
  Output cell count: 13785683517, Output idle cell count: 0, Output VC queue
drops: 0,
  Input no buffers: 0, Input length errors: 0, Input timeouts: 0, Input invalid

```

```

VCs: 2,
  Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:
  Destination slot: 2
  VPI 1
    Flags: Active
    Total down time: 0 sec, Last down: Never
    Traffic statistics:
      Input bytes :          0
      Output bytes :         1600
      Input packets:          0
      Output packets:         18
  Logical interface at-2/2/0.100 (Index 67) (SNMP ifIndex 36) (Generation 11)
    Flags: Point-To-Multipoint SNMP-Traps Encapsulation: Ether-over-ATM-LLC
    Traffic statistics:
      Input bytes :          0
      Output bytes :         896
      Input packets:          0
      Output packets:         7
    Local statistics:
      Input bytes :          0
      Output bytes :         896
      Input packets:          0
      Output packets:         7
    Transit statistics:
      Input bytes :          0          0 bps
      Output bytes :          0          0 bps
      Input packets:          0          0 pps
      Output packets:         0          0 pps
    Protocol inet, MTU: 1500, Generation: 17, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 172.16.5/24, Local: 172.16.5.1, Broadcast: 172.16.5.255,
    Generation: 16
    VCI 1.100
      Flags: Active, Shaping, Multicast
      VBR, Peak: 66kbps, Sustained: 66kbps, Burst size: 40
      Total down time: 0 sec, Last down: Never
      EPD threshold: 0, Transmit weight cells: 0
      ATM per-VC transmit statistics:
        Tail queue packet drops: 0
      Traffic statistics:
        Input bytes :          0
        Output bytes :         1512
        Input packets:          0
        Output packets:         14
    Logical interface at-2/2/0.101 (Index 68) (SNMP ifIndex 37) (Generation 12)
      Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
      Traffic statistics:
        Input bytes :          0
        Output bytes :         200
        Input packets:          0
        Output packets:         2
      Local statistics:
        Input bytes :          0
        Output bytes :         200
        Input packets:          0
        Output packets:         2
      Transit statistics:
        Input bytes :          0          0 bps
        Output bytes :          0          0 bps

```

```
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Generation: 18, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 172.16.250.252/30, Local: 172.16.250.253, Broadcast:
172.16.250.255,
Generation: 18
VCI 1.101
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 184
Input packets: 0
Output packets: 2
Logical interface at-2/2/0.200 (Index 69) (SNMP ifIndex 8280) (Generation 13)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Generation: 19, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 20.20.20.0/30, Local: 20.20.20.1, Broadcast: 20.20.20.3,
Generation: 20
VCI 1.200
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Logical interface at-2/2/0.300 (Index 70) (SNMP ifIndex 8281) (Generation 14)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
```



```

Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Generation: 20, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 30.30.30.0/30, Local: 30.30.30.1, Broadcast: 30.30.30.3,
Generation: 22
VCI 1.300
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Logical interface at-2/2/0.400 (Index 72) (SNMP ifIndex 8282) (Generation 15)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Generation: 21, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 40.40.40.0/30, Local: 40.40.40.1, Broadcast: 40.40.40.3,
Generation: 24
VCI 1.400
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Logical interface at-2/2/0.32767 (Index 71) (SNMP ifIndex 27) (Generation 9)
Flags: Point-To-Multipoint No-Multicast SNMP-Traps Encapsulation: ATM-VCMUX
Traffic statistics:
Input bytes : 0

```

```

Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
VCI 1.4
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0

```

Meaning The sample output is for an OC12 ATM interface and shows the statistics for the SONET media, as well as the **Input** and **Output** ATM errors. Error details include input and output errors, active alarms and defects, and media-specific errors.

If the physical link is down, look at the active alarms and defects for the ATM interface and check the ATM media accordingly. See “List of Common ATM Alarms and Error” on page 113 for an explanation of ATM alarms.

Monitor Statistics for an ATM2 Interface

Purpose To monitor statistics for an ATM2 interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interface at-fpc/pic/port`



CAUTION: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

```

Sample Output user@host> monitor interface at-2/2/0
host                               Seconds: 5                               Time: 17:16:49
                                                                    Delay: 3/0/3

Interface: at-2/2/0, Enabled, Link is Up
Encapsulation: ATM-PVC, Speed: OC12
Traffic statistics:
Input bytes: 0 (0 bps)
Output bytes: 1600 (0 bps)
Input packets: 0 (0 pps)
Output packets: 18 (0 pps)
Error statistics:
Input errors: 0
Input drops: 0
Input framing errors: 0
Policed discards: 0
Current delta
[0]
[0]
[0]
[0]
[0]
[0]
[0]
[0]

```

```

L3 incompletes:                0                [0]
L2 channel errors:             0                [0]
L2 mismatch timeouts:         0                [0]
Carrier transitions:           1                [0]
Output errors:                 0                [0]
Output drops:                  0                [0]
Aged packets:                  0                [0]
ATM statistics:
  Input cell count              4                [0]
  Input invalid vc              2                [0]
  Output cell count             13908633088      [8484369]
  Output idle cell count        0                [0]
Active alarms : NoneActive defects: NoneSONET error countsZ      [0]

```

Meaning The sample output checks for and displays common interface failures and any increases in framing errors. Information from this command can help you narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.

CHAPTER 11

Use Loopback Testing for ATM Interfaces

This chapter describes the steps for using loopback testing to isolate Asynchronous Transfer Mode (ATM) interface problems. The steps for loopback testing apply to both ATM1 and ATM2 intelligent queuing (IQ) interfaces.

- Checklist for Using Loopback Testing for ATM Interfaces on page 99
- Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface on page 100
- Create a Loopback on page 101
- Set Clocking to Internal on page 102
- Verify That the ATM Interface Is Up on page 103
- Clear ATM Interface Statistics on page 105
- Ping the ATM Interface on page 105
- Check for ATM Interface Error Statistics on page 106
- Diagnose a Suspected Circuit Problem on page 109

Checklist for Using Loopback Testing for ATM Interfaces

Purpose Table 24 on page 99 provides links and commands for using Loopback Testing for ATM interfaces.

Table 24: Checklist for Using Loopback Testing for ATM Interfaces

| Tasks | Command or Action |
|--|---|
| “Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface” on page 100 | |
| 1. Create a Loopback on page 101 | |
| a. Create a Physical Loopback on page 101 | Connect the transmit port to the receive port. |
| b. Configure a Local Loopback on page 101 | <code>[edit interfaces <i>interface-name</i> (sonet-options) t3-options]) set loopback local show commit</code> |

Table 24: Checklist for Using Loopback Testing for ATM Interfaces (*continued*)

| Tasks | Command or Action |
|---|---|
| 2. Set Clocking to Internal on page 102 | <code>[edit interfaces <i>interface-name</i>] set clocking internal show commit</code> |
| 3. Verify That the ATM Interface Is Up on page 103 | <code>show interfaces at-<i>fpc/port/pic</i></code> |
| 4. Clear ATM Interface Statistics on page 105 | <code>clear interfaces statistics at-<i>fpc/port/pic</i></code> |
| 5. Ping the ATM Interface on page 105 | <code>ping interface at-<i>fpc/port/pic</i> local-IP-address bypass-routing count 1000 rapid</code> |
| 6. Check for ATM Interface Error Statistics on page 106 | <code>show interfaces at-<i>fpc/port/pic</i> extensive</code> |
| “Diagnose a Suspected Circuit Problem” on page 109 | |
| 1. Create a Loop from the Router to the Network on page 110 | <code>[edit interfaces <i>interface-name</i> (sonet-options t3-options)] set loopback remote show commit</code> |
| 2. Create a Loop to the Router from Various Points in the Network on page 110 | Perform Steps 2 through 6 from “Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface” on page 100. |

Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface

Problem When you suspect a hardware problem, perform the following steps to verify if there is a hardware problem.

Solution To diagnose a suspected hardware problem with an ATM1 or ATM2 IQ interface, follow these steps:

1. Create a Loopback on page 101
2. Set Clocking to Internal on page 102
3. Verify That the ATM Interface Is Up on page 103
4. Clear ATM Interface Statistics on page 105
5. Ping the ATM Interface on page 105
6. Check for ATM Interface Error Statistics on page 106

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the transmit and receive ports.

If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

- Create a Physical Loopback on page 101
- Configure a Local Loopback on page 101

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port using a known good cable.



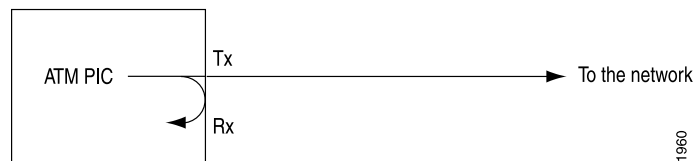
NOTE: Make sure you use single-mode fiber for a single-mode port and multimode fiber for a multimode port for SONET media.

Meaning When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Purpose Because ATM interfaces can be either SONET or T3, you use the **sonet-options** or **t3-options** statements to configure a local loopback. Figure 9 on page 101 illustrates a local loopback configured for an ATM interface.

Figure 9: Local Loopback



Action To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

[edit]

user@host# edit interfaces *interface-name* (sonet-options | t3-options)

2. Configure the loopback:

[edit interfaces *interface-name* (sonet-options | t3-options)]

```
user@host# set loopback local
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]  
user@host# show  
loopback local;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]  
user@host# commit  
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Set Clocking to Internal

Purpose Clocking is set to internal because there is no external clock source in a loopback connection.

Action To configure clocking to internal, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]  
user@host# edit interfaces interface-name
```

2. Configure the clocking to internal:

```
user@host# set clocking internal
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0]  
user@host# show  
clocking internal;
```

4. Commit the change:


```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0]
user@host# commit
commit complete
```

Meaning The clock source for the interface is set to the internal Stratum 3 clock.

Verify That the ATM Interface Is Up

Purpose Displaying the status of the ATM interface provides the information you need to determine whether the physical link is up or down.

Action To verify that the status of the ATM interface is up, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces at-fpc/pic/port
```

Sample Output 1 The following sample output is for an OC3 ATM interface:

```
user@host> show interfaces at-2/0/0
Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 22, SNMP ifIndex: 42
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: Local, Payload scrambler: Enabled
  Device flags : Present Running
  Link flags    : None
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  SONET alarms : None
  SONET defects : None
  Logical interface at-2/0/0.0 (Index 29) (SNMP ifIndex 49)
    Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.168.1.0/30, Local: 192.168.1.1
    VCI 1.100
      Flags: Active
      Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input packets: 0
    Output packets: 0
```

Sample Output 2 The following sample output is for a T3 ATM interface:

```
user@host> show interfaces at-0/1/0
Physical interface: at-0/1/0, Enabled, Physical link is Up
  Interface index: 90, SNMP ifIndex: 18
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
None, Payload scrambler: Enabled,
  Mode: C/Bit parity, Line buildout: 10, ATM Encapsulation: PLCP
  Device flags : Present Running
  Link flags    : None
  Current address: 00:90:69:0c:c0:1f
```

```

Last flapped   : 2002-08-14 16:25:07 UTC (00:00:42 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
Active alarms  : None
Active defects : None

```

Sample Output 3 The following sample output is for an OC3 ATM interface:

```

user@host> show interfaces at-2/0/1
Physical interface: at-2/0/1, Enabled, Physical link is Down
  Interface index: 23, SNMP ifIndex: 43
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: None, Payload scrambler: Enabled
  Device flags : Present Running Down
  Link flags    : None
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  SONET alarms  : LOL, LOS
  SONET defects : LOL, LOF, LOS, SEF, AIS-L, AIS-P, RDI-P, PLM-P
  Logical interface at-2/0/1.10 (Index 30) (SNMP ifIndex 65)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 192.168.100.0/30, Local: 192.168.100.1
    VCI 2.100
      Flags: Active
      Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input packets:          0
    Output packets:         0

```

Sample Output 4 The following sample output is for a T3 ATM interface:

```

user@host> show interfaces at-0/1/0
Physical interface: at-0/1/0, Enabled, Physical link is Down
  Interface index: 90, SNMP ifIndex: 18
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
None, Payload scrambler: Enabled,
  Mode: C/Bit parity, Line buildout: 10, ATM Encapsulation: PLCP
  Device flags : Present Running Down
  Link flags    : None
  Current address: 00:90:69:0c:c0:1f
  Last flapped   : 2002-08-09 11:36:15 UTC (5d 04:14 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : PLL, LOF, LOS
  Active defects : PLL, LOF, LOS

```

Meaning Sample output 1 shows that the physical link is up and there are no SONET alarms or defects.

Sample output 2 shows that the physical link is up and there are no active alarms or defects.

Sample output 3 shows that the physical link, the device flags, and interface flags are down, and that there are SONET alarms and defects. When you see that the physical link is down, there may be a problem with the port.

Sample output 4 shows that the physical link, the device flags, and interface flags are down, and that there are active alarms and defects. When you see that the physical link is down, there may be a problem with the port.

For more information about problem situations and actions to take for a physical link that is down, see Table 25 on page 105.

Table 25: Problems and Solutions for a Physical Link That Is Down

| Problem | Actions |
|--|--|
| Cable mismatch | Verify that the cable connection is correct. |
| Damaged fiber or coax cable or dirty fiber cable | Verify that the cable can successfully loop a known good port of the same type. |
| Too much or too little optical attenuation (for an OC3 or OC12 ATM interface) | Verify that the attenuation is correct per the PIC optical specification. |
| The transmit port is not transmitting within the dBm optical range per the specifications (for an OC3 or OC12 ATM interface) | Verify that the Tx power of the optics is within range of the PIC optical specification. |

Clear ATM Interface Statistics

| | |
|----------------------|---|
| Purpose | You must reset ATM interface statistics before you initiate the ping test. Resetting the statistics provides a clean start so that previous input or output errors and packet statistics do not interfere with the current investigation. |
| Action | To clear all statistics for the interface, use the following Junos OS CLI operational mode command: <pre>user@host> clear interfaces statistics at-fpc/pic/port</pre> |
| Sample Output | <pre>user@host> clear interfaces statistics at-4/0/2 user@host></pre> |
| Meaning | This command clears the interface statistics counters for interface at-4/0/2 only. |

Ping the ATM Interface

| | |
|----------------|---|
| Purpose | After you have put the port in a local loopback, run the ping test using the following Junos OS CLI operational mode command: |
| Action | <pre>user@host> ping interface at-fpc/pic/port-IP-address bypass-routing count 1000 rapid</pre> |

```
Sample Output user@host> ping interface at-2/0/0.0 192.168.1.1 bypass-routing count 1000 rapid
PING 192.168.1.1 (192.168.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 192.168.1.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.423/0.740/26.822/0.829 ms
```

Meaning This command sends 1000 ping packets out of the interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for ATM Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with JTAC.

Action To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces at-fpc/pic/port extensive
```

Sample Output The following sample output is for an OC3 ATM interface:

```

user@host> show interfaces at-2/0/0 extensive
Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 22, SNMP ifIndex: 42, Generation: 21
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: None, Payload scrambler: Enabled
Device flags      : Present Running
Link flags        : None
Hold-times        : Up 0 ms, Down 0 ms
Statistics last cleared: 2002-07-29 14:28:14 EDT (00:00:26 ago)
Traffic statistics:
  Input  bytes   :                      0          0 bps
  Output bytes   :                      0          0 bps
  Input  packets :                      0          0 pps
  Output packets :                      0          0 pps
Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
SONET alarms      : None
SONET defects     : None
SONET PHY:
  Seconds          Count  State
  PLL Lock         0      0    OK
  PHY Light        0      0    OK
SONET section:
  BIP-B1           0      0

```

```

SEF          0          0 OK
LOS          0          0 OK
LOF          0          0 OK
ES-S         0
SES-S        0
SEFS-S       0
SONET line:
BIP-B2       0          0
REI-L        0          0
RDI-L        0          0 OK
AIS-L        0          0 OK
BERR-SF      0          0 OK
BERR-SD      0          0 OK
ES-L         0
SES-L        0
UAS-L        0
ES-LFE       0
SES-LFE      0
UAS-LFE      0
SONET path:
BIP-B3       0          0
REI-P        0          0
LOP-P        0          0 OK
AIS-P        0          0 OK
RDI-P        0          0 OK
UNEQ-P       0          0 OK
PLM-P        0          0 OK
ES-P         0
SES-P        0
UAS-P        0
ES-PFE       0
SES-PFE      0
UAS-PFE      0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00
ATM status:
HCS state:   Sync
LOC         :    OK
ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 8830024,
Output idle cell count: 8830026,
Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
PFE configuration:
Destination slot: 2
CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %      bps      %      bytes
0 best-effort           0          0  0          0      low      none
1 expedited-forwarding  0          0  0          0      low      none
2 assured-forwarding    0          0  0          0      low      none
3 network-control       0          0  0          0      low      none

```

```

Logical interface at-2/0/0.0 (Index 29) (SNMP ifIndex 49) (Generation 28)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
  Input bytes : 0
  Output bytes : 0
  Input packets: 0
  Output packets: 0
Local statistics:
  Input bytes : 0
  Output bytes : 0
  Input packets: 0
  Output packets: 0
Transit statistics:
  Input bytes : 0 0 bps
  Output bytes : 0 0 bps
  Input packets: 0 0 pps
  Output packets: 0 0 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 31 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
  Destination: 192.168.1.0/30, Local: 192.168.1.1, Broadcast: Unspecified,
Generation: 59
VCI 1.100
Flags: Active
Total down time: 0 sec, Last down: Never
ATM per-VC transmit statistics:
  Tail queue packet drops: 0
Traffic statistics:
  Input bytes : 0
  Output bytes : 0
  Input packets: 0
  Output packets: 0

```

Sample Output The following sample output is for a T3 ATM interface:

```

user@host> show interfaces at-0/1/0 extensive
Physical interface: at-0/1/0, Enabled, Physical link is Up
Interface index: 90, SNMP ifIndex: 18, Generation: 89
Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
None, Payload scrambler: Enabled,
Mode: C/Bit parity, Line buildout: 10, ATM Encapsulation: PLCP
Device flags : Present Running
Link flags : None
Hold-times : Up 0 ms, Down 0 ms
Current address: 00:90:69:0c:c0:1f
Last flapped : 2002-08-14 16:25:07 UTC (00:00:21 ago)
Statistics last cleared: 2002-08-14 16:25:26 UTC (00:00:02 ago)
Traffic statistics:
  Input bytes : 0 0 bps
  Output bytes : 0 0 bps
  Input packets: 0 0 pps
  Output packets: 0 0 pps
Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
Active alarms : None
Active defects : None
DS3 media: Seconds Count State
  PLL Lock 0 0 OK

```

```

Reframing                0          0 OK
AIS                      0          0 OK
LOF                      0          0 OK
LOS                      0          0 OK
YELLOW                   0          0 OK
EXZ                      0          0
LCV                      0          0
PCV                      0          0
FERR                     0          0
LES                      0
PES                      0
PSES                     0
SEFS                     0
UAS                      0
PLCP defects:           Seconds      Count  State
LOF                     0          0
YELLOW                  0          0
ATM defects:           Seconds      Count  State
LCD                     0          0
ATM status:
HCS state:      Sync
LOC      :      OK
PLCP statistics (errored seconds):
Framing errors           : 0(0)
Bit interleaved parity errors: 0(0)
Far end block errors      : 0(0)
ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 96041,
Output idle cell count: 96040,
Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:
Destination slot: 0
CoS transmit queue          Bandwidth      Buffer Priority  Limit
                             %      bps      %      bytes
0 best-effort               95    42499200  95         0    low    none
3 network-control           5     2236800   5         0    low    none

```

Meaning Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with the JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Purpose When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 110
2. Create a Loop to the Router from Various Points in the Network on page 110

Create a Loop from the Router to the Network

Purpose Creating a loop from the router to the network allows the transport-layer engineer to test the router from various points in the network. This helps the engineer isolate where the problem might be located. Figure 10 on page 110 illustrates a loop from a router to the network.

Figure 10: Loop from the Router to the Network



Action To create a loop from the router to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name (sonet-options | t3-options)
```

2. Configure the remote loopback:

```
[edit interfaces interface-name (sonet-options | t3-options)]
user@host# set loopback remote
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# show
loopback remote;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# commit
commit complete
```

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 6 in “Diagnose a Suspected Hardware Problem with an ATM1 or ATM2

IQ Interface" on page 100. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

CHAPTER 12

Locate ATM Alarms and Errors

This chapter describes the most common Asynchronous Transfer Mode (ATM) alarms and errors on both ATM1 and ATM2 intelligent queuing (IQ) interfaces that you can encounter on a Juniper Networks router.

- List of Common ATM Alarms and Error on page 113
- Display ATM1 and ATM2 Alarms and Errors on page 113

List of Common ATM Alarms and Error

Purpose Table 26 on page 113 provides links and commands for the most common Asynchronous Transfer Mode (ATM alarms and error on both ATM1 and ATM2 IQ interfaces that you can encounter on a Juniper Networks router.

Table 26: List of Common ATM Alarms and Error

| Tasks | Command or Action |
|---|--|
| “Display ATM1 and ATM2 Alarms and Errors” on page 113 | <p>show interfaces at-fpc/pic/port extensive</p> <p>See “List of Common SONET Alarms and Errors” on page 145.</p> <p>See “Checklist of Common T3 Alarms and Errors” on page 65.</p> |

Display ATM1 and ATM2 Alarms and Errors

Purpose The alarms and errors that appear on an ATM1 or an ATM2 IQ interface are identical. ATM alarms and errors are dependent on the ATM interface media. If the ATM interface is an OC3 or OC12 interface media, the media statistics are SONET statistics. If the ATM interface is a T3 interface media, the media statistics are T3 statistics.

For information on determining the type of ATM interface on your router, see “Checklist for Determining ATM Interface Type” on page 73.

Action To display ATM alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

user@host>show interfaces at-fpc/pic/port extensive

Sample Output 1 user@host> show interfaces at-2/0/0 extensive

```

Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 22, SNMP ifIndex: 42, Generation: 21
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: None, Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Statistics last cleared: 2002-07-29 14:28:14 EDT (00:00:26 ago)
  Traffic statistics:
    Input bytes   :                0                0 bps
    Output bytes  :                0                0 bps
    Input packets :                0                0 pps
    Output packets:                0                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  SONET alarms   : None
  SONET defects  : None
  SONET PHY:
    Seconds      Count  State
    PLL Lock     0       0 OK
    PHY Light    0       0 OK
  SONET section:
    BIP-B1       0       0
    SEF          0       0 OK
    LOS          0       0 OK
    LOF          0       0 OK
    ES-S         0
    SES-S        0
    SEFS-S       0
  SONET line:
    BIP-B2       0       0
    REI-L        0       0
    RDI-L        0       0 OK
    AIS-L        0       0 OK
    BERR-SF      0       0 OK
    BERR-SD      0       0 OK
    ES-L         0
    SES-L        0
    UAS-L        0
    ES-LFE       0
    SES-LFE      0
    UAS-LFE      0
  SONET path:
    BIP-B3       0       0
    REI-P        0       0
    LOP-P        0       0 OK
    AIS-P        0       0 OK
    RDI-P        0       0 OK
    UNEQ-P       0       0 OK
    PLM-P        0       0 OK
    ES-P         0
    SES-P        0
    UAS-P        0
    ES-PFE       0
    SES-PFE      0
    UAS-PFE      0
  Received SONET overhead:

```

```

F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00
ATM status:
HCS state: Sync
LOC      : OK
ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 8830024,
Output idle cell count: 8830026,
Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
PFE configuration:
Destination slot: 2
CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                        %      bps      %      bytes
0 best-effort            0      0      0      0      low  none
1 expedited-forwarding  0      0      0      0      low  none
2 assured-forwarding    0      0      0      0      low  none
3 network-control        0      0      0      0      low  none
Logical interface at-2/0/0.0 (Index 29) (SNMP ifIndex 49) (Generation 28)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 31 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.1.0/30, Local: 192.168.1.1, Broadcast: Unspecified,
Generation: 59
VCI 1.100
Flags: Active
Total down time: 0 sec, Last down: Never
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0

```

Meaning Sample output 1 shows the error statistics for an OC3 ATM interface. SONET alarms and errors fall into three different areas of the output: section, line, and path. See “List of Common SONET Alarms and Errors” on page 145 for information on SONET alarms.

Sample Output 2

```

user@host> show interfaces at-3/1/0 extensive
Physical interface: at-3/1/0, Enabled, Physical link is Up
  Interface index: 57, SNMP ifIndex: 66, Generation: 56
  Description: customer
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
  None,
  Payload scrambler: Disabled, Mode: C/Bit parity, Line build-out: 10, ATM
  Encapsulation: PLCP
  Device flags   : Present Running
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Statistics last cleared: 2002-07-30 15:36:58 UTC (00:00:02 ago)
  Traffic statistics:
    Input bytes   :           270798           1067704 bps
    Output bytes  :          2260295          8911952 bps
    Input packets :           2001           986 pps
    Output packets:           2506          1235 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0,
    L2 channel errors: 0, L2 mismatch timeouts: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  Active alarms : None
  Active defects : None
  DS3 media:
    Seconds      Count  State
    PLL Lock     0       0 OK
    Reframing    0       0 OK
    AIS          0       0 OK
    LOF          0       0 OK
    LOS          0       0 OK
    YELLOW       0       0 OK
    EXZ          0       0
    LCV          0       0
    PCV          0       0
    FERR         0       0
    LES         0
    PES         0
    PSES        0
    SEFS        0
    UAS         0
  PLCP defects:
    Seconds      Count  State
    LOF          0       0
    YELLOW       0       0
  ATM defects:
    Seconds      Count  State
    LCD          0       0
  ATM status:
    HCS state:   Hunt
    LOC        :   OK
  PLCP statistics (errored seconds):
    Framing errors      : 0(0)
    Bit interleaved parity errors: 0(0)
    Far end block errors : 0(0)
  ATM Statistics:
    Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
    0,

```

```

Rx cell FIFO overruns: 0, Rx cell FIFO underruns: 0, Input cell count: 7716,
Output cell count: 191980, Output idle cell count: 144302, Output VC queue
drops: 0,
Input no buffers: 0, Input length errors: 0, Input timeouts: 0, Input invalid
VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
PFE configuration:
Destination slot: 3
CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %      bps      %      bytes
0 best-effort            0            0  0            0      low  none
1 expedited-forwarding   0            0  0            0      low  none
2 assured-forwarding     0            0  0            0      low  none
3 network-control        0            0  0            0      low  none
Logical interface at-3/1/0.0 (Index 25) (SNMP ifIndex 85) (Generation 44)
Flags: Point-To-Point Inverse-ARP SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes :          270798
Output bytes :         2260295
Input packets:          2001
Output packets:         2506
Local statistics:
Input bytes :          0
Output bytes :          0
Input packets:          0
Output packets:         0
Transit statistics:
Input bytes :          270798          1067704 bps
Output bytes :         2260295          8911952 bps
Input packets:          2001           986 pps
Output packets:         2506          1235 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 51 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.65.176/30, Local: 10.10.65.177, Broadcast: Unspecified,
Generation: 88
VCI 0.5
Flags: Active, Inverse-ARP
Total down time: 0 sec, Last down: Never
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes :          270798
Output bytes :         2260295
Input packets:          2001
Output packets:         2506

```

Meaning Sample output 2 shows the error statistics for a T3 ATM interface. See “Checklist of Common T3 Alarms and Errors” on page 65 for information on T3 alarms.

Table 27 on page 117 describes the input and output errors that appear in the extensive output for an ATM interface.

Table 27: ATM Interface Input and Output Errors

| Error | Description | Reason for Error |
|---------------------|---|------------------|
| Input Errors | | |
| Errors | Sum of the incoming frame aborts and frame check sequence (FCS) errors. | |

Table 27: ATM Interface Input and Output Errors (*continued*)

| | | |
|-----------------------------|--|--|
| Drops | Number of packets dropped by the output queue of the I/O Manager ASIC. | If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's random early detection (RED) mechanism. |
| Invalid VCs | Number of cells that arrived for a nonexistent virtual circuit (VC). | |
| Framing errors | Sum of ATM Adaptation Layer (AAL5) packets that have FCS errors, AAL5 packets that have reassembly timeout errors, and AAL5 packets that have length errors. | |
| Policed discards | Frames that the incoming packet match code discarded because they were not recognized or of interest. | Usually, this field reports protocols that the Junos OS does not handle. |
| L3 incompletes | Number of packets discarded due to the packets failing Layer 3 header checks. | Increments when the incoming packet fails Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header would be discarded and this counter would increment. |
| L2 channel errors | Errors that occurred when the software could not find a valid logical interface for an incoming frame. | This counter increments when the software cannot find a valid logical interface for an incoming frame. |
| L2 mismatch timeouts | Count of malformed or short packets. | Count of malformed or short packets that cause the incoming packet handler to discard the frame as unreadable. |
| Output Errors | | |
| Carrier transitions | Number of times the interface went from down to up. | This number should not increment quickly and should increase only when the cable is unplugged, the far-end system is powered down and up, or a similar problem occurs. If it increments quickly (perhaps once every 10 seconds), then the cable, the far-end system, or the Physical Interface Card (PIC) is broken. |
| Errors | Sum of the outgoing frame aborts and FCS errors. | |
| Drops | Number of packets dropped by the output queue of the I/O Manager ASIC. | If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. |
| Aged packets | Number of packets that remained in shared packet SDRAM for so long that the system automatically purged them. | The value in this field should never increment. If it does, it is most likely a software bug or possibly broken hardware. |

Table 28 on page 119 lists ATM media-specific alarms and defects that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router or trigger the red or yellow alarm LED on the craft

interface. For complete explanations of most of these alarms and defects, see Chapter 6 in *GR-253, Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria*.

Table 28: ATM Active Alarms and Defects

| Alarm | Description |
|----------------------|--------------------------------------|
| AIS | Alarm indication signal |
| AIS-L | Alarm indication signal (line) |
| AIS-P | Alarm indication signal (path) |
| BERR | Bit error rate |
| BERR-SD | Bit error rate defect—signal degrade |
| BERR-SF | Bit error rate fault—signal fail |
| EXZ | Excessive zeros |
| FERF | Far end receive failures |
| IDLE | Idle code detected |
| LCD | Loss of cell delineation |
| LCV | Line code violation |
| LOC | Loss of cell delineation |
| LOF | Loss of frame |
| LOL | Loss of light |
| LOP | Loss of pointer |
| LOS | Loss of signal |
| PLL | Phase-locked loop out of lock |
| PLCP_LOF | Loss of PLCP frame alarm |
| PLCP_YLW PLCP | Alarm at the remote end |
| PLM-P | Payload label mismatch |
| RDI | Remote defect indication |
| RDI-L | Remote defect indication (line) |

Table 28: ATM Active Alarms and Defects (*continued*)

| | |
|--------------|---|
| RDI-P | Remote defect indication (path) |
| REI | Remote error indication |
| SEF | Severely errored frame |
| UNEQ | Unequipped |
| YLW | Remote defect indication (yellow alarm) |

PART 5

Investigate SONET Interfaces

- Monitor SONET Interfaces on page 123
- Use Loopback Testing for SONET Interfaces on page 131
- Locate SONET Alarms and Errors on page 145
- Enable SONET Payload Scrambling on page 165
- Check the SONET Frame Checksum on page 169

CHAPTER 13

Monitor SONET Interfaces

This chapter describes how to monitor SONET interfaces and begin the process of isolating SONET interface problems when they occur.

- Checklist for Monitoring SONET Interfaces on page 123
- Monitor SONET Interfaces on page 123

Checklist for Monitoring SONET Interfaces

Purpose Table 29 on page 123 provides links and commands for monitoring SONET interfaces and begin the process of isolating SONET interface problems when they occur.

Table 29: Checklist for Monitoring SONET Interfaces

| Tasks | Command or Action |
|--|---|
| “Monitor SONET Interfaces” on page 123 | |
| 1. Display the Status of SONET Interfaces on page 124 | show interfaces terse so* |
| 2. Display the Status of a Specific SONET Interface on page 124 | show interfaces so-<i>fpc/pic/port</i> |
| 3. Display Extensive Status Information for a Specific SONET Interface on page 125 | show interfaces so-<i>fpc/pic/port</i> extensive |
| 4. Monitor Statistics for a SONET Interface on page 127 | monitor interface so-<i>fpc/pic/port</i> |

Monitor SONET Interfaces

Purpose By monitoring SONET interfaces, you begin the process of isolating SONET interface problems when they occur.

To monitor your SONET interface, follow these steps:

1. Display the Status of SONET Interfaces on page 124
2. Display the Status of a Specific SONET Interface on page 124
3. Display Extensive Status Information for a Specific SONET Interface on page 125
4. Monitor Statistics for a SONET Interface on page 127

Display the Status of SONET Interfaces

Purpose To display the status of SONET interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces terse so*`

Meaning The sample output lists only the SONET interfaces. It shows the status of both the physical and logical interfaces.

For a description of what the output means, see Table 30 on page 124.

Table 30: Status of SONET Interfaces

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|---|
| so-1/0/0 | so-1/0/0.0 | This interface has both the physical and logical links up and running. |
| Admin Up | Admin Up | |
| Link Up | Link Up | |
| so-1/1/1 | so-1/1/1.0 | This interface is administratively disabled. The physical link is healthy (Link Up), but the logical link is not established end to end (Link Down). |
| Admin Down | Admin Up | |
| Link Up | Link Down | |
| so-3/0/1 | so-3/0/1.0 | This interface is administratively enabled and the physical link is healthy (Link Up), but the logical interface is not established end to end (Link Down). |
| Admin Up | Admin Up | |
| Link Up | Link Down | |
| so-5/3/0 | so-5/3/0.0 | This interface has the physical link down and the logical interface is down also. |
| Admin Up | Admin Up | |
| Link Down | Link Down | |

Display the Status of a Specific SONET Interface

Purpose To display the status of a specific SONET interface when you need to investigate its status further, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces so-fpc/pic/port`

Sample Output The following sample output is for an interface with the physical link down:

```
user@router> show interfaces so-1/1/1
Physical interface: so-1/1/1, Enabled, Physical link is Down
Interface index: 17, SNMP ifIndex: 16
Description: router-02 pos 4/0
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode
Speed: OC3, Loopback: None, CRC: 32, Payload scrambler: Enabled
```

```

Device flags      : Present Running Down
Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
Link flags       : Keepalives
Keepalive Input: 621 (00:02:57 ago), Output: 889 (00:00:09 ago)
Input rate       : 0 bps (0 pps), Output rate: 0 bps (0 pps)
Active alarms    : LOL, LOS
Active defects   : LOL, LOF, LOS, SEF, AIS-L, AIS-P, PLM-P
Logical interface so-1/1/1.0 (Index 18) (SNMP ifIndex 30)
  Description: router-02 pos 4/0
  Flags: Device-down Point-To-Point SNMP-Traps, Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 4470
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
      Destination: 10.10.10.48/30, Local: 10.10.10.50
  Protocol iso, MTU: 4469

```

Meaning The first line of the sample output shows that the physical link is down. This means that the physical link is unhealthy and cannot pass packets. Further down the sample output, look for active alarms and defects. When you see this situation, to further diagnose the problem, see “Display Extensive Status Information for a Specific SONET Interface” on page 125 to display more extensive information about the SONET interface and the physical interface that is down.

Sample Output The following output is for an interface with the physical layer up and the link layer down:

```

user@router> show interfaces so-3/0/1
Physical interface: so-3/0/1, Enabled, Physical link is Up
  Interface index: 28, SNMP ifIndex: 55
  Description: Customer ABC
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode, Speed:
OC3,
  Loopback: None, FCS: 16, Payload scrambler: Enabled
  Device flags      : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags       : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 113 (00:00:02 ago), Output: 119 (00:00:02 ago)
  Input rate       : 80 bps (0 pps)
  Output rate      : 88 bps (0 pps)
  SONET alarms     : None
  SONET defects    : None
  Logical interface so-3/0/1.0 (Index 22) (SNMP ifIndex 56)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 192.168.2.124/30, Local: 192.168.2.125

```

Meaning The sample output shows that the link layer is down. This means that the logical interface is not established end to end. When you see this situation, to further diagnose the problem, see “Monitor Statistics for a SONET Interface” on page 127 to monitor statistics for the SONET interface and the logical interface that is down.

Display Extensive Status Information for a Specific SONET Interface

Purpose To display extensive status information about a specific interface, use the following Junos OS CLI operational mode command:

```

Action      user@host> show interfaces so-fpc/pic/port extensive

Sample Output user@router> show interfaces so-1/1/1 extensive
Physical interface: so-1/1/1, Enabled, Physical link is Down
Interface index: 17, SNMP ifIndex: 16
Description: router-02 pos 4/0
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode
Speed: OC3, Loopback: None, CRC: 32, Payload scrambler: Enabled
Device flags   : Present Running Down
Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive statistics:
  Input : 621 (last seen 00:05:35 ago)
  Output: 905 (last seen 00:00:07 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes :          378736540          0 bps
  Output bytes :          6786356          0 bps
  Input packets:          225924          0 pps
  Output packets:         104798          0 pps
Input errors:
  Errors: 8, Drops: 0, Framing errors: 4181286, Runts: 0, Giants: 8
  Policed discards: 9474, L3 incompletes: 0, L2 channel errors: 0
  L2 mismatch timeouts: 3, HS link CRC errors: 0, HS link FIFO overflows: 0
Output errors:
  Carrier transitions: 2, Errors: 0, Drops: 0, Aged packets: 0
  HS link FIFO underflows: 0
Active alarms   : LOL, LOS <-- SONET active alarms and defects
Active defects : LOL, LOF, LOS, SEF, AIS-L, AIS-P, PLM-P
SONET PHY:      Seconds      Count State <-- SONET media-specific
errors
  PLL Lock      0          0 OK
  PHY Light     328        1 Light Missing
SONET section: <-- SONET section errors
  BIP-B1        0          0
  SEF           329        3 Defect Active
  LOS           329        2 Defect Active
  LOF           329        2 Defect Active
  ES-S          329
  SES-S         329
  SEFS-S        329
SONET line:
  BIP-B2        0          0
  REI-L         0          0
  RDI-L         0          0 OK
  AIS-L         328        1 Defect Active
  BERR-SF       0          0 OK
  BERR-SD       0          0 OK
  ES-L          329
  SES-L         329
  UAS-L         318
  ES-LFE        0
  SES-LFE       0
  UAS-LFE       0
SONET path:
  BIP-B3        0          0
  REI-P         0          0
  LOP-P         1          1 OK
  AIS-P         328        1 Defect Active
  RDI-P         0          0 OK
  UNEQ-P        0          0 OK

```



```

PLM-P          328          1 Defect Active
ES-P           329
SES-P           329
UAS-P           318
ES-PFE          0
SES-PFE          0
UAS-PFE          0
[...Output truncated...]

```

Meaning The sample output details where the errors might be occurring. Error details include input and output errors, active alarms and defects, and media-specific errors. The SONET section, line, and path errors help narrow down the source of the problem.

If the physical link is down, look at the active alarms and defects for the SONET interface and troubleshoot the SONET media accordingly. See “List of Common SONET Alarms and Errors” on page 145 for an explanation of SONET alarms.

Monitor Statistics for a SONET Interface

Purpose To monitor statistics for a SONET interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interface so-fpc/pic/port`



CAUTION: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

Sample Output

```

user@router> monitor interface so-1/1/1
router                               Seconds: 168                               Time: 15:48:50
Interface: so-1/1/1, Enabled, Link is Down
Encapsulation: Cisco-HDLC, Keepalives, Speed: OC3
Traffic statistics:
Input bytes:          375527568 (0 bps)          Current Delta [0]
Output bytes:         6612857 (0 bps)          [475]
Input packets:        224001 (0 pps)          [0]
Output packets:       102090 (0 pps)          [20]
Encapsulation statistics:
Input keepalives:      0                      [0]
Output keepalives:     176                    [17]
Error statistics:
Input errors:          0                      [0]
Input drops:           0                      [0]
Input framing errors:  179                    [17]
Policed discards:      47                    [0]
L3 incompletes:        0                      [0]
L2 channel errors:     0                      [0]
L2 mismatch timeouts:  0                      [0]
Carrier transitions:    1                      [0]
Output errors:         0                      [0]
Output drops:          0                      [0]
F2      : 0x00 Z3      : 0x00 Z4      : 0x00
Interface warnings:
o Received keepalive count is zero

```

o Framing errors are increasing, check FCS configuration and link
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

Meaning This output checks for and displays common interface failures, whether or not loopback is detected, and any increases in framing errors. Information from this command can help you narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.

The statistics in the second column are the cumulative statistics since the last time they were cleared using the `clear interfaces statistics interface-name` command. The statistics in the third column are the statistics since the `monitor interface interface-name` command was executed.

If the framing errors are increasing, verify that the frame check sequence (FCS) and scrambling configuration match on both ends of the connection. If the configuration is correct, check the cabling to the router and have the carrier verify the integrity of the line.

If the input errors are increasing, check the cabling to the router and have the carrier verify the integrity of the line.

If you are sending output keepalives but are not receiving any input keepalives, verify that the encapsulation and keepalive configurations match on both ends of the connection.

Table 31 on page 128 lists and describes the SONET error statistics in the output for the `monitor interface` command. The output fields are listed in the order in which they appear in the output.

Table 31: SONET Error Statistics

| Output Field | Output Field Description |
|-----------------------------|--|
| Input errors | Sum of the incoming frame aborts and FCS errors. |
| Input drops | Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's random early detection (RED) mechanism. |
| Input framing errors | The number of packets that have FCS errors. |
| Policed discards | Frames that the incoming packet match code discarded because they were not recognized or of interest. Usually, this field reports protocols that the Junos OS does not handle. |
| L3 incompletes | Increments when the incoming packet fails Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header would be discarded and this counter would increment. |
| L2 channel errors | Increments when the software cannot find a valid logical interface for an incoming frame. |

Table 31: SONET Error Statistics (*continued*)

| Output Field | Output Field Description |
|-----------------------------|---|
| L2 mismatch timeouts | Count of malformed or short packets that cause the incoming packet handler to discard the frame as unreadable. |
| Carrier transitions | Number of times the interface has gone from down to up. This number should not increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or a similar problem occurs. If it increments quickly (perhaps once every 10 seconds), then the cable, the far-end system, or the PIC is broken. |
| Output errors | Sum of the outgoing frame aborts and FCS errors. Because output errors are rare, hardware problems, configuration, or software bugs might contribute to the cause of them. Use the output of the show interfaces type-fpc/pic/port extensive command for more details about which output errors are incrementing. Also, analyze the system or interface load to determine if those areas are contributing to the cause of the problem. If the problem persists, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net , or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States). |
| Output drops | Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. |

Use Loopback Testing for SONET Interfaces

This chapter describes the steps for using loopback testing to isolate SONET interface problems.

- Checklist for Using Loopback Testing for SONET Interfaces on page 131
- Diagnose a Suspected Hardware Problem with a SONET Interface on page 133
- Create a Loopback on page 133
- Set Clocking to Internal on page 134
- Verify That the SONET Interface Is Up on page 135
- Clear SONET Interface Statistics on page 137
- Check That the Received and Transmitted Path Trace Are the Same on page 137
- Force the Link Layer to Stay Up on page 138
- Verify the Status of the Logical Interface on page 139
- Ping the SONET Interface on page 140
- Check for SONET Interface Error Statistics on page 141
- Diagnose a Suspected Circuit Problem on page 142

Checklist for Using Loopback Testing for SONET Interfaces

Purpose Table 32 on page 131 provides links and commands for using loopback testing to isolate SONET interface problems.

Table 32: Checklist for Using Loopback Testing for SONET Interfaces

| Tasks | Command or Action |
|--|--|
| “Diagnose a Suspected Hardware Problem with a SONET Interface” on page 133 | |
| 1. Create a Loopback on page 133 | |
| a. Create a Physical Loopback on page 133 | Connect the transmit port to the receive port. |

Table 32: Checklist for Using Loopback Testing for SONET Interfaces (*continued*)

| Tasks | Command or Action |
|--|--|
| b. Configure a Local Loopback on page 134 | <code>[edit interfaces <i>interface-name</i> sonet-options] set loopback local show commit</code> |
| 2. Set Clocking to Internal on page 134 | <code>[edit interfaces <i>interface-name</i>] set clocking internal show commit</code> |
| 3. Verify That the SONET Interface Is Up on page 135 | <code>show interfaces so-<i>fpc/pic/port</i></code> |
| 4. Clear SONET Interface Statistics on page 137 | <code>clear interfaces statistics so-<i>fpc/pic/port</i></code> |
| 5. Check That the Received and Transmitted Path Trace Are the Same on page 137 | <code>show interfaces so-<i>fpc/pic/port</i> extensive</code> |
| 6. Force the Link Layer to Stay Up on page 138 | |
| a. Configure Encapsulation to Cisco-HDLC on page 138 | <code>[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc show commit</code> |
| b. Configure No-Keepalives on page 138 | <code>[edit interfaces <i>interface-name</i>] set no-keepalives show commit</code> |
| 7. Verify the Status of the Logical Interface on page 139 | <code>show interfaces so-<i>fpc/pic/port</i> show interfaces so-<i>fpc/pic/port</i> terse</code> |
| 8. Ping the SONET Interface on page 140 | <code>ping interface so-<i>fpc/pic/port</i> local-IP-address bypass-routing count 1000 rapid</code> |
| 9. Check for SONET Interface Error Statistics on page 141 | <code>show interfaces so-<i>fpc/pic/port</i> extensive</code> |
| “Diagnose a Suspected Circuit Problem” on page 142 | |
| 1. Create a Loop from the Router to the Network on page 142 | <code>[edit interfaces <i>interface-name</i> sonet-options] set loopback remote show commit</code> |
| 2. Create a Loop to the Router from Various Points in the Network on page 143 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a SONET Interface” on page 133. |

Diagnose a Suspected Hardware Problem with a SONET Interface

Problem When you suspect a hardware problem, take the following steps to verify if there is a problem.

Solution To diagnose a suspected hardware problem with the SONET interface, follow these steps:

- Create a Loopback on page 133
- Set Clocking to Internal on page 134
- Verify That the SONET Interface Is Up on page 135
- Clear SONET Interface Statistics on page 137
- Check That the Received and Transmitted Path Trace Are the Same on page 137
- Force the Link Layer to Stay Up on page 138
- Verify the Status of the Logical Interface on page 139
- Ping the SONET Interface on page 140
- Check for SONET Interface Error Statistics on page 141

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the transmit and receive ports. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback on page 133
2. Configure a Local Loopback on page 134

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port using a known good fiber cable.



NOTE: Make sure you use a single-mode fiber for a single-mode port and multimode fiber for a multimode port. (For OC192, you must use the appropriate attenuation.)

Meaning When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name sonet-options
```

2. Configure the local loopback:

```
[edit interfaces interface-name sonet-options]
user@host# set loopback local
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-1/0/0 sonet-options]
user@host# show
loopback local;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0 sonet-options]
user@host# commit
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Set Clocking to Internal

Purpose Clocking is set to internal because there is no external clock source in a loopback connection.

Action To configure clocking to internal, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure clocking to internal:


```
[edit interfaces interface-name]
user@host# user@host# commit
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-1/0/0]
user@host# show
clocking internal;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0]
user@host# commit
commit complete
```

Meaning The clock source for the interface is set to the internal Stratum 3 clock.

Verify That the SONET Interface Is Up

Purpose Displaying the status of the SONET interface provides the information you need to determine whether the physical link is up or down.

Action To verify that the SONET interface is up, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces so-fpc/pic/port
```

Sample Output 1 The following output is for a SONET interface with the physical link up:

```
user@host# show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
Loopback: None, FCS: 16,
Payload scrambler: Enabled
Device flags   : Present Running Loop-Detected
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 0 (never), Output: 0 (never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
Input rate      : 48 bps (0 pps)
Output rate     : 56 bps (0 pps)
SONET alarms    : None
SONET defects   : None
Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470, Flags: Protocol-Down
```

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1

Meaning Sample output 1 shows that the physical link is up, the loop is detected, and there are no SONET alarms or defects.

If the physical link is up, continue with “Check That the Received and Transmitted Path Trace Are the Same” on page 137.

Sample Output 2 When you see that the physical link is down, there might be a problem with the port. Sample output 2 shows that the physical link is down:

```
user@host# show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Down
Interface index: 21, SNMP ifIndex: 45
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
Loopback: None, FCS: 16,
Payload scrambler: Enabled
Device flags : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 0 (never), Output: 0 (never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)
SONET alarms : LOL, LOS
SONET defects : LOL, LOF, LOS, SEF, AIS-L, AIS-P
Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470, Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1
```

Meaning The sample output shows that the physical link is down, the device flags and interface flags are down, and there are SONET alarms and defects.

Table 33 on page 136 lists problem situations and actions for a physical link that is down.

Table 33: Problems and Solutions for a Physical Link That Is Down

| Problem | Action |
|---|--|
| Cable mismatch | Verify that the fiber connection is correct. |
| Damaged and/or dirty cable | Verify that the fiber can successfully loop a known good port of the same type. |
| Too much or too little optical attenuation | Verify that the attenuation is correct per the PIC optical specifications. |
| The transmit port is not transmitting within the dBm optical range per the specifications | Verify that the Tx power of the optics is within range of the PIC optical specification. |

Clear SONET Interface Statistics

| | |
|----------------------|--|
| Purpose | You must reset SONET interface statistics before you initiate the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current diagnostics. |
| Action | To clear all statistics for the interface, use the following Junos OS CLI operational mode command: <pre>user@host> clear interfaces statistics so-fpc/pic/port</pre> |
| Sample Output | <pre>user@host> clear interfaces statistics so-4/0/2 user@host></pre> |
| Meaning | This command clears the interface statistics counters for interface so-4/0/2 only. |

Check That the Received and Transmitted Path Trace Are the Same

| | |
|----------------------|---|
| Purpose | The received and transmitted path trace shows whether the transmitted path trace is looped back. |
| Action | To check that the received path trace matches the transmitted path trace, use the following Junos OS CLI operational mode command: <pre>user@host> show interfaces so-fpc/pic/port extensive</pre> |
| Sample Output | <pre>user@host# show interfaces so-2/2/0 extensive Physical interface: so-2/2/0, Enabled, Physical link is Up Interface index: 21, SNMP ifIndex: 45, Generation: 20 [...Output truncated...] Received path trace: host so-2/2/0 70 6c 75 74 6f 6e 69 63 20 73 6f 2d 32 2f 32 2f host so-2/2/ 30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d 0a Transmitted path trace: host so-2/2/0 70 6c 75 74 6f 6e 69 63 20 73 6f 2d 32 2f 32 2f host so-2/2/ 30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 [...Output truncated...]</pre> |
| Meaning | <p>This transmitted and received path trace information is near the end of the output. The sample output shows that the transmitted and received path trace are the same. When there is a loopback, the transmitted and received path trace should be the same. If they are, continue with “Force the Link Layer to Stay Up” on page 138.</p> <p>If the transmitted and received path trace are not the same, the physical loopback cable is probably on the wrong port, or is incorrectly connected. In this case, verify the connection again.</p> |

Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. You need to force the link layer to stay up by making some configuration changes to the encapsulation and keepalives.

To force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 138
2. Configure No-Keepalives on page 138

Configure Encapsulation to Cisco-HDLC

Action To configure encapsulation on a SONET physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure Cisco-HDLC:

```
[edit interfaces interface-name]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-1/0/0]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0]
user@host# commit
commit complete
```

Meaning This command sets the interface encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a SONET physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure no-keepalives:

```
[edit interfaces interface-name]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-1/0/0]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0]
user@host# commit
commit complete
```

Meaning By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Verify the Status of the Logical Interface

Purpose To verify the status of the logical interface, use the following two Junos OS CLI operational mode commands:

Action

```
user@host> show interfaces so-fpc/pic/port
user@host> show interfaces so-fpc/pic/port terse
```

Sample Output 1 The following sample output displays the information for a logical interface that is up:

```
user@host> show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode, Speed:
OC3, Loopback: None
FCS: 16, Payload scrambler: Enabled
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : No-Keepalives
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
SONET alarms   : None
SONET defects  : None
Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1

user@host> show interfaces so-2/2/0 terse
```

| Interface | Admin | Link | Proto | Local | Remote |
|------------|-------|------|-------|-------------|--------|
| so-2/2/0 | up | up | | | |
| so-2/2/0.0 | up | up | inet | 10.0.2.1/24 | |

Meaning The **show interfaces** command in sample output 1 shows that the logical link is up because there are no flags indicating that the link layer is down. The output for the **show interfaces terse** command shows that logical interface **so-2/2/0.0** is up.

Sample Output 2 The following sample output displays the information for a logical interface that is down:

```

user@host> show interfaces so-2/2/0
Physical interface: so-2/2/0, Enabled, Physical link is Up
Interface index: 21, SNMP ifIndex: 45
Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode, Speed:
OC3, Loopback: None,
FCS: 16, Payload scrambler: Enabled
Device flags : Present Running Loop-Detected
Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 14 (00:00:05 ago), Output: 14 (00:00:05 ago)
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)
SONET alarms : None
SONET defects : None
Logical interface so-2/2/0.0 (Index 7) (SNMP ifIndex 33)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Flags: None
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.0.2/24, Local: 10.0.2.1

user@host> show interfaces so-2/2/0 terse
Interface      Admin Link Proto Local      Remote
so-2/2/0       up    down
so-2/2/0.0     up    down  inet  10.0.2.1/24

```

Meaning Both commands in sample output 2 show that the logical interface is down. The first command shows that the link layer, device, and destination route are all down. The second command shows that logical interface **so-2/2/0.0** is down.

Ping the SONET Interface

Purpose To ping the local interface and verify the loopback connection, use the following Junos OS CLI operational mode command:

Action user@host> ping interface so-*fpc/pic/port* local-IP-address bypass-routing count 1000 rapid

Sample Output

```

user@host# ping interface so-2/2/0 10.0.2.1 bypass-routing count 1000 rapid
PING 10.0.2.1 (10.0.2.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.0.2.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.374/0.446/9.744/0.754 ms

```

Meaning This command sends 1000 ping packets out of the interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for SONET Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with JTAC.

Action To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

```

user@host# show interfaces so-2/2/0 extensive
Physical interface: so-2/2/0, Enabled, Physical link is Up
[...Output truncated...]
Statistics last cleared: 2002-04-24 10:39:40 EDT (00:13:26 ago)
Traffic statistics:
Input bytes :                169686                0 bps
Output bytes :                179802                0 bps
Input packets:                 2101                0 pps
Output packets:               2102                0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops: 0,
Policed discards: 0, L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts:
0, HS link CRC errors: 0, HS link FIFO overflows: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO
underflows: 0
SONET alarms : None
SONET defects : None
SONET PHY:
Seconds      Count  State
PLL Lock      0      0 OK
PHY Light      0      0 OK
SONET section:
BIP-B1         0      0
SEF            0      0 OK
LOS            0      0 OK
LOF            0      0 OK
ES-S           0

```

```

SES-S                0
SEFS-S              0
SONET line:
BIP-B2              0          0
REI-L              0          0
RDI-L              0          0 OK
AIS-L              0          0 OK
BERR-SF            0          0 OK
BERR-SD            0          0 OK
ES-L               0
SES-L              0
UAS-L              0
ES-LFE             0
SES-LFE            0
UAS-LFE            0
SONET path:
BIP-B3              0          0
REI-P              0          0
LOP-P              0          0 OK
AIS-P              0          0 OK
RDI-P              0          0 OK
UNEQ-P             0          0 OK
PLM-P              0          0 OK
ES-P               0
SES-P              0
UAS-P              0
ES-PFE             0
SES-PFE            0
UAS-PFE            0
[...Output truncated...]

```

Meaning Check for any error statistics that may appear in the section, line, and path areas of the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Purpose When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 142
2. Create a Loop to the Router from Various Points in the Network on page 143

Create a Loop from the Router to the Network

Purpose Creating a loop from the router to the network allows the transport-layer engineer to test the router from various points in the network. This helps the engineer isolate where the problem might be located.

Action To create a loop from the router to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name sonet-options
```

2. Configure the remote loopback:

```
[edit interfaces interface-name sonet-options]
user@host# set loopback remote
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-1/0/0 sonet-options]
user@host# show
loopback remote;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces so-1/0/0 sonet-options]
user@host# commit
commit complete
```

Meaning This command loops any traffic from the network back into the network.

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 8 in “Diagnose a Suspected Hardware Problem with a SONET Interface” on page 133. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

Locate SONET Alarms and Errors

This chapter describes the most common SONET alarms and errors you can encounter when investigating line problems on a Juniper Networks router. For a useful reference for details on SONET interfaces, refer to the Telcordia/Bellcore Standard GR-253 CORE, available from www.telcordia.com.

- List of Common SONET Alarms and Errors on page 145
- Display SONET Alarms and Errors on page 146
- Locate Most Common SONET Alarms and Errors on page 149
- Locate Loss of Signal Alarms on page 150
- Locate Alarm Indication Signal Alarms on page 151
- Locate Remote Defect Indication Alarms on page 152
- Locate Remote Error Indication Line Errors on page 154
- Locate Bit Error Rate Alarms on page 156
- Locate Payload Label Mismatch Path Alarms on page 157
- Locate Loss of Pointer Path Alarms on page 160
- Locate Unequipped Payload Alarms on page 161
- Locate Phase Lock Loop Alarms on page 162

List of Common SONET Alarms and Errors

Purpose Table 34 on page 145 provides links and commands for the most common SONET alarms and errors you can encounter when investigating line problems on a Juniper Networks router.

Table 34: List of Common SONET Alarms and Errors

| Tasks | Command or Action |
|--|---|
| “Display SONET Alarms and Errors” on page 146 | <code>show interfaces so-fpc/pic/port extensive</code> |
| “Locate Most Common SONET Alarms and Errors” on page 149 | |
| 1. Locate Loss of Signal Alarms on page 150 | Check the connection between the router port and the first SONET network element. |

Table 34: List of Common SONET Alarms and Errors (*continued*)

| Tasks | Command or Action |
|---|---|
| 2. Locate Alarm Indication Signal Alarms on page 151 | Downstream from the router, check the path-terminating equipment, section-terminating equipment, and line-terminating equipment for a loss of signal or loss of frame. |
| 3. Locate Remote Defect Indication Alarms on page 152 | Upstream from the router, check the path-terminating equipment, section-terminating equipment, and line-terminating equipment for a loss of signal or loss of frame. |
| 4. Locate Remote Error Indication Line Errors on page 154 | Upstream from the router, check the line-terminating equipment and path-terminating equipment for an error in the B2 or B3 byte. |
| 5. Locate Bit Error Rate Alarms on page 156 | Check the following: <ul style="list-style-type: none"> • Optical fiber • Optical transmitter and receiver • Clocking • Attenuation in the optical signal |
| 6. Locate Payload Label Mismatch Path Alarms on page 157 | Check the received and transmitted C2 byte. |
| 7. Locate Loss of Pointer Path Alarms on page 160 | Check that both sides of the connection are configured for concatenate or nonconcatenate mode. |
| 8. Locate Unequipped Payload Alarms on page 161 | Check provisioning with the SONET provider, and if possible, check the configuration of the add/drop multiplexer (ADM). |
| 9. Locate Phase Lock Loop Alarms on page 162 | Investigate the timing source, and configure the clocking to external or internal depending on the situation. |

Display SONET Alarms and Errors

Action To display SONET alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

```
user@host> show interfaces so-1/1/1 extensive
[...Output truncated...]
Active alarms : None
Active defects : None
SONET PHY:
Seconds      Count  State
PLL Lock      0       0  OK
PHY Light      0       0  OK
SONET section:
BIP-B1        0       0
SEF           0       0  OK
LOS           0       0  OK
LOF           0       0  OK
ES-S          0
SES-S         0
```

```

SEFS-S                                0
SONET line:
BIP-B2                                0          0
REI-L                                 0          0
RDI-L                                 0          0 OK
AIS-L                                 0          0 OK
BERR-SF                               0          0 OK
BERR-SD                               0          0 OK
ES-L                                  0
SES-L                                  0
UAS-L                                  0
ES-LFE                                0
SES-LFE                                0
UAS-LFE                                0
SONET path:
BIP-B3                                0          0
REI-P                                 0          0
LOP-P                                 0          0 OK
AIS-P                                 0          0 OK
RDI-P                                 0          0 OK
UNEQ-P                                0          0 OK
PLM-P                                 0          0 OK
ES-P                                  0
SES-P                                  0
UAS-P                                  0
ES-PFE                                0
SES-PFE                                0
UAS-PFE                                0
[...Output truncated...]

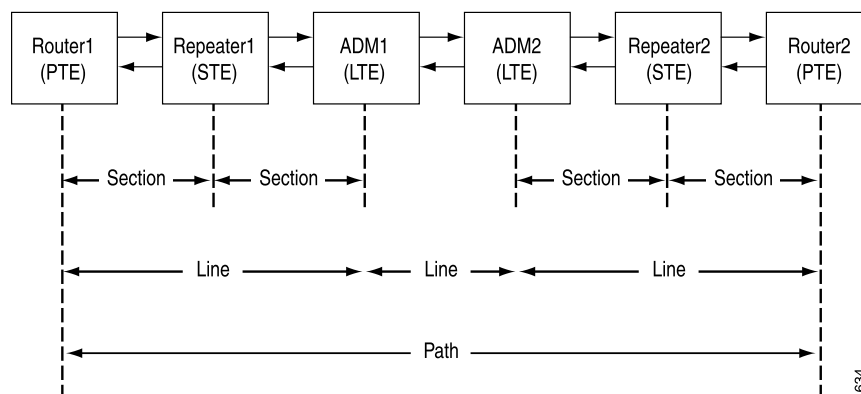
```

Meaning The sample output shows where you find SONET alarms and errors. SONET alarms and errors fall into three different areas of the output: section, line, and path.

Section, line, and path errors occur over different spans of the SONET network and between different pieces of equipment. Figure 11 on page 148 shows an example of a SONET network with the section, line, and path areas delimited. Figure 11 on page 148 also shows the different pieces of equipment that comprise a SONET network:

- A router, usually a path-terminating equipment (PTE)
- An add/drop multiplexer (ADM), usually a line-terminating equipment (LTE)
- A repeater, usually a section-terminating equipment (STE)

Figure 11: Example of a SONET Network



SONET Section The SONET section is the connection between two STEs. The STE performs the simple regeneration of the SONET signal to the next SONET equipment span between itself, the PTE, and the ADM. For example, Repeater 1 (STE) regenerates the SONET signal between itself and ADM1, and the section between itself and Router 1 (PTE). The STE checks to make sure that the incoming SONET frame, arriving from a directly connected neighbor, is good. An STE does not have any knowledge of the rest of the span.

An STE looks at the section overhead bytes of the SONET frame even though it can rewrite the other overhead bytes if an alarm is generated.

SONET Line The SONET line is the span between two LTEs. The LTE pays particular attention to the line overhead bytes of the SONET frame, can add and remove payload, and has more knowledge of the SONET network than the STEs. The LTE does not do the final processing of the SONET payload as does the PTE. The ADM is an LTE.

SONET Path The SONET path is the span between two PTEs. The PTE is the final destination where the SONET frame is terminated and the payload it carries is processed. A PTE pays particular attention to the path overhead bytes of the SONET frame.

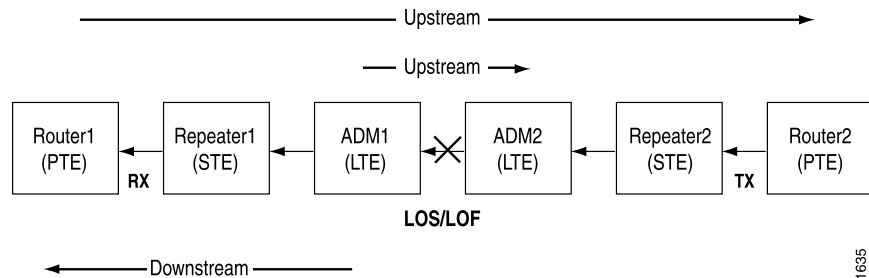
SONET System Hierarchy The SONET system hierarchy is comprised of PTEs, LTEs, and STEs. The characteristics of each are as follows:

- The main role of a PTE is to read the path overhead bytes. However, it also reads the line overhead bytes and the section overhead bytes. Therefore the PTE also plays the role of an LTE and an STE.
- The main role of an LTE is to read the line overhead bytes. However, it also reads the section overhead bytes. Therefore the LTE also plays the role of an STE.
- An STE reads only the section overhead bytes of the SONET frame. (See Figure 12 on page 149.)

Upstream and Downstream The terms *upstream* and *downstream* are used in defining SONET alarms and errors. The terms are meaningful when viewed from the point of view of the failure in the circuit.

For example, in Figure 12 on page 149 the failure occurs in the section between ADM 1 and ADM 2. The signal is transmitted from Router 2 in the direction of Router 1 (from right to left). In this example, Router 1, Repeater 1, and ADM 1 are downstream from the failure. ADM 2, Repeater 2, and Router 2 are upstream from the failure.

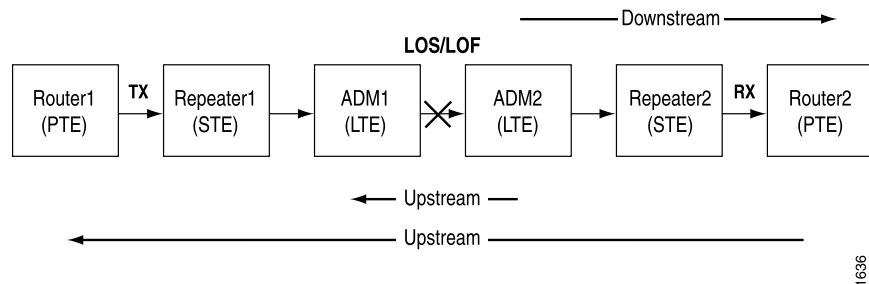
Figure 12: Example of an Upstream or Downstream Failure



The failure sends an alarm from ADM 1 to Router 1 in the direction of the signal transmission (downstream). Alarms are also sent from ADM1 to ADM2 and from Router1 to Router2 in the opposite direction of the signal transmission (upstream).

In Figure 13 on page 149, the failure is also between ADM 1 and ADM 2. However, the signal is transmitted from Router 1 in the direction of Router 2 (from left to right). Router 2, Repeater 2, and ADM 2 are downstream from the failure. ADM 1, Repeater 1, and Router 1 are upstream from the failure.

Figure 13: Another Example of an Upstream or Downstream Failure



This failure sends an alarm from ADM 2 to Router 2 in the direction of the signal transmission (downstream). Alarms are also sent from ADM 2 to ADM 1 and from Router 2 to Router 1 in the opposite direction of the signal transmission (upstream).

All diagnostics are from the perspective of the PTE (the Juniper Networks router). Although the exact source of the problem can be difficult to find without having access to the LTE or the STE, you can at least determine from the PTE output whether the problem is remote or local.

Locate Most Common SONET Alarms and Errors

Problem This information describes the most common SONET alarms and errors you can encounter when investigating line problems on a Juniper Networks router.

Solution The following alarms and errors are described in this section:

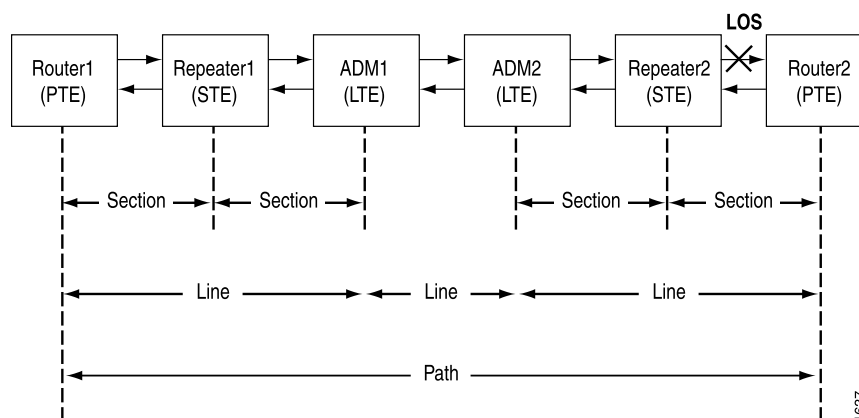
- Locate Loss of Signal Alarms on page 150
- Locate Alarm Indication Signal Alarms on page 151
- Locate Remote Defect Indication Alarms on page 152
- Locate Remote Error Indication Line Errors on page 154
- Locate Bit Error Rate Alarms on page 156
- Locate Payload Label Mismatch Path Alarms on page 157
- Locate Loss of Pointer Path Alarms on page 160
- Locate Unequipped Payload Alarms on page 161
- Locate Phase Lock Loop Alarms on page 162

Locate Loss of Signal Alarms

Problem A loss of signal (LOS) alarm indicates that there is a physical link problem with the connection to the router receive port from the neighboring SONET equipment transmit port.

Solution To locate the LOS alarm, check the connection between the router port and the first SONET network element. In the example network in Figure 14 on page 150, the X indicates that there is a connection problem between Repeater 2 and Router 2.

Figure 14: Location of an LOS Alarm in a SONET Network



To display SONET alarms and errors, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output user@router2> show interfaces so-1/1/1 extensive

[... Output truncated...]

Active alarms : LOL, PLL, LOS

Active defects : LOL, PLL, LOF, LOS , SEF, AIS-L, AIS-P, PLM-P

| SONET PHY: | Seconds | Count | State |
|------------|---------|-------|----------------|
| PLL Lock | 51 | 0 | PLL Lock Error |
| PHY Light | 51 | 0 | Light Missing |


```

SONET section:
  BIP-B1          0          0
  SEF             51          0 Defect Active
  LOS 51          0 Defect Active
  LOF             51          0 Defect Active
[...Output truncated...]

```

Meaning The sample output shows at the time the command was run, Router 2 continued to be in a LOS alarm state for around 51 seconds.

Locate Alarm Indication Signal Alarms

Purpose An alarm indication signal (AIS) is sent downstream to signal an error condition. There are two types of AIS alarms:

- Alarm indication signal path (AIS-P) is sent by an LTE to a downstream PTE when an LOS or LOF is detected on a upstream SONET section.
- Alarm indication signal line (AIS-L) is sent by an STE to a downstream LTE when an LOS or LOF is detected on an incoming SONET section.

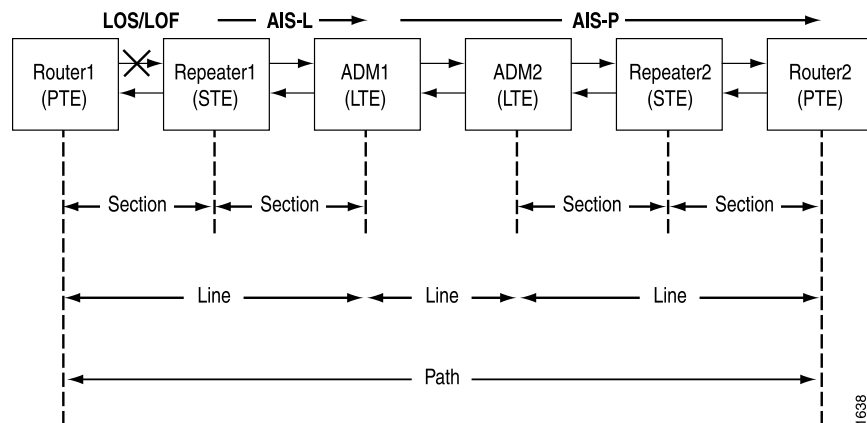
1. Example of a Router Receiving Only an AIS-P Alarm on page 151
2. Example of a Router Receiving Both an AIS-L and AIS-P Alarm on page 152

Example of a Router Receiving Only an AIS-P Alarm

Problem Figure 15 on page 151 shows a router receiving only an AIS-P alarm. The X indicates that the LOS or LOF occurs in the section between Router 1 and Repeater 1.

Solution All diagnostics are from the perspective of Router 2 (the Juniper Networks router).

Figure 15: Example of a Router Receiving Only an AIS-P Alarm



Meaning In Figure 15 on page 151, the progression of events occurring after the failure is as follows:

1. Repeater 1 detects an LOS or LOF on an incoming SONET section.
2. Repeater 1 sends an AIS-L downstream to ADM1 (LTE).

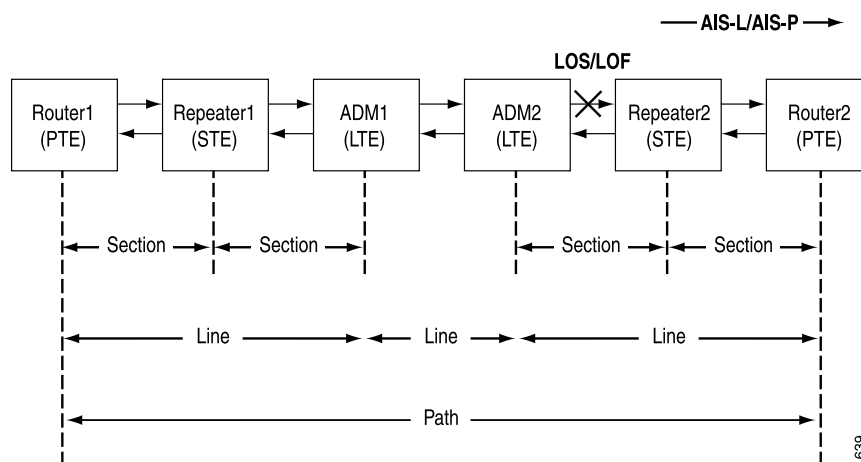
3. ADM 1 sends an AIS-P to Router 2 (PTE).
4. The only alarm that Router 2 receives is the AIS-P alarm from ADM 1.

Example of a Router Receiving Both an AIS-L and AIS-P Alarm

Problem Figure 16 on page 152 shows a router receiving both an AIS-L and AIS-P Alarm. The X indicates that the LOS or LOF occurs in the section between ADM 2 and Repeater 2.

Solution All diagnostics are from the perspective of Router 2 (the Juniper Networks router).

Figure 16: Example of a Router Receiving Both an AIS-L and an AIS-P Alarm



What It Means In Figure 16 on page 152, the progression of events occurring after the failure is as follows:

1. Repeater 2 detects an LOS or LOF on the incoming section.
2. Repeater 2 sends an AIS-L and AIS-P downstream to Router 2.
3. Router 2 receives both an AIS-L and an AIS-P from Repeater 2.

Locate Remote Defect Indication Alarms

A remote defect indication (RDI) is sent upstream to signal an error condition. There are two types of RDI alarms:

- Remote defect indication line (RDI-L) is sent upstream to a peer LTE when an alarm indication signal line (AIS-L) or low-level defects are detected.
- Remote defect indication path (RDI-P) is sent upstream to a peer PTE when a defect in the signal, typically an AIS-P, is detected.

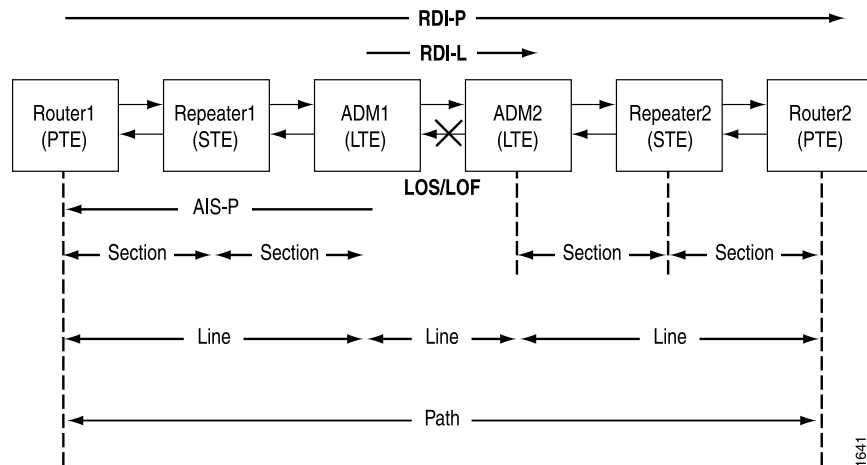
1. Example of a Router Receiving Only an RDI-P Alarm on page 153
2. Example of a Router Receiving Both an RDI-L and RDI-P Alarm on page 153

Example of a Router Receiving Only an RDI-P Alarm

Problem Figure 17 on page 153 shows a router receiving only an RDI-P Alarm. The X indicates that the LOS or LOF occurs in the section between ADM 1 and ADM 2.

Solution All diagnostics are from the perspective of Router 2 (the Juniper Networks router).

Figure 17: Example of a Router Receiving Only an RDI-P Alarm



What It Means In Figure 17 on page 153, the progression of events occurring after the failure is as follows:

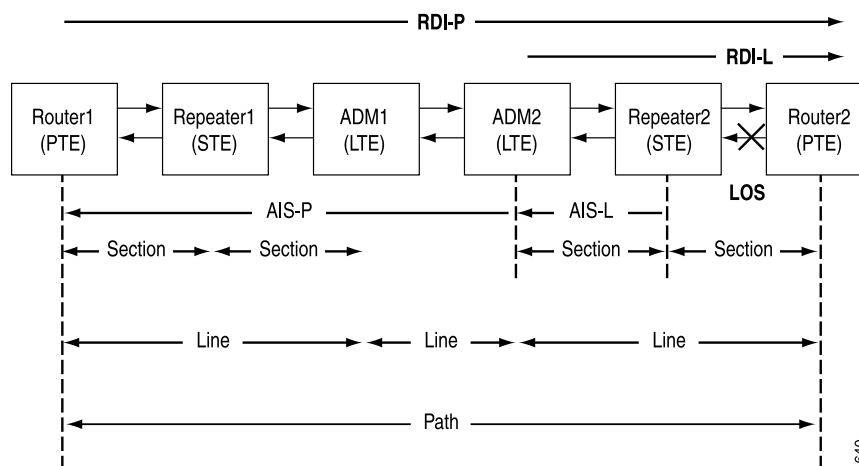
1. ADM 1 detects an LOS or LOF on an incoming SONET section.
2. ADM 1 sends an RDI-L to ADM 2.
3. ADM 1 sends an AIS-P downstream to Router 1.
4. Router 1 sends an RDI-P upstream to Router 2.
5. Router 2 only receives an RDI-P alarm.

Example of a Router Receiving Both an RDI-L and RDI-P Alarm

Problem Figure 18 on page 154 shows router receiving both an RDI-L and RDI-P Alarm. The X indicates that the LOS occurs in the section between Repeater 2 and Router 2.

Solution All diagnostics are from the perspective of Router 2 (the Juniper Networks router).

Figure 18: Example of a Router Receiving Both an RDI-L and RDI-P Alarm



Meaning In Figure 18 on page 154, the progression of events occurring after the failure is as follows:

1. Repeater 2 detects an LOS on an incoming section.
2. Repeater 2 sends an AIS-L downstream to ADM 2.
3. ADM 2 sends an RDI-L upstream to Router 2.
4. ADM 2 sends an AIS-P downstream to Router 1.
5. Router 1 sends an RDI-P upstream to Router 2.
6. Router 2 receives both RDI-P and RDI-L alarms.

Locate Remote Error Indication Line Errors

Purpose A remote error indication (REI) is sent upstream to signal an error condition. There are two types of REI alarms:

- Remote error indication line (REI-L) is sent to the upstream LTE when errors are detected in the B2 byte.
- Remote error indication path (REI-P) is sent to the upstream PTE when errors are detected in the B3 byte.

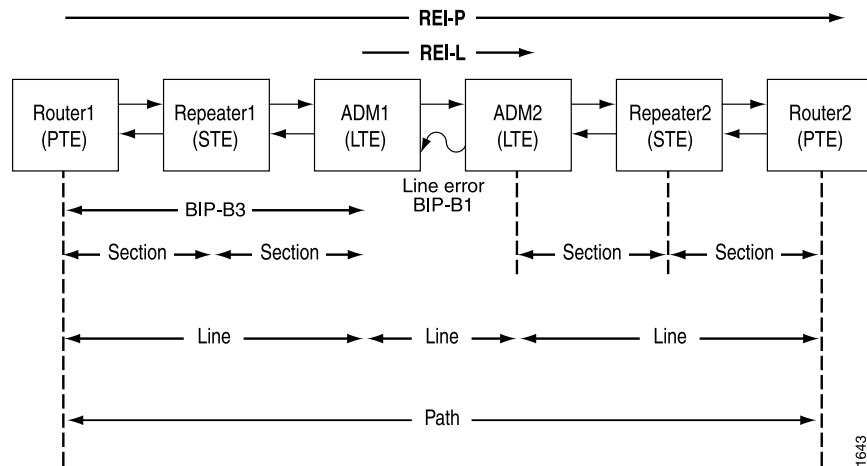
1. Example of Only an REI-P Counter Incrementing on page 154
2. Example of Both REI-L and REI-P Counters Incrementing on page 155

Example of Only an REI-P Counter Incrementing

Problem Figure 19 on page 155 shows an REI-P Counter Incrementing. The wavy line indicates that there is a line error in the section between ADM 1 and ADM 2.

Solution All diagnostics are from the perspective of Router 2 (the Juniper Networks router).

Figure 19: Example of a Router Receiving Only an REI-P Counter Incrementing



Meaning In Figure 19 on page 155, the progression of events occurring after the failure is as follows:

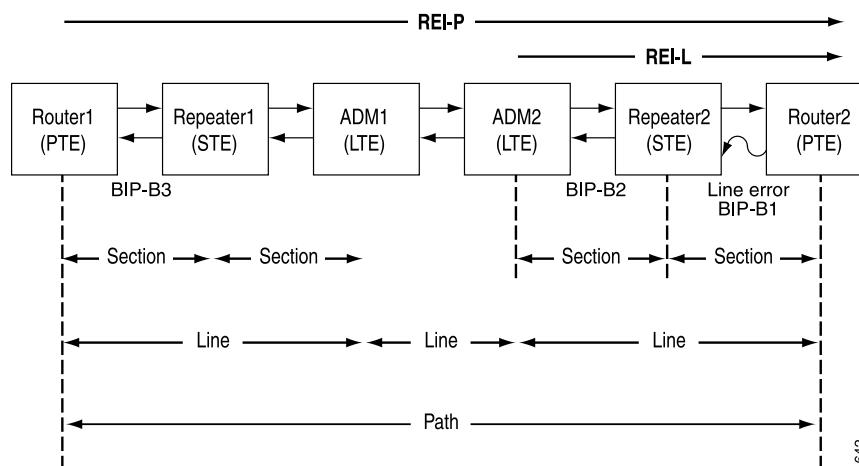
1. ADM 1 detects parity errors in the B1 byte.
2. ADM 1 sends an REI-L upstream to ADM 2.
3. Router 1 detects parity errors in the B3 byte.
4. Router 1 sends an REI-P upstream to Router 2.
5. Router 2 only sees an REI-P incrementing counter.

Example of Both REI-L and REI-P Counters Incrementing

Problem Figure 20 on page 156 shows both REI-L and REI-P Counters Incrementing. The wavy line indicates that there is a line error in the section between Repeater 2 and Router 2.

Solution All diagnostics are from the perspective of Router 2 (the Juniper Networks router).

Figure 20: Example of a Router Receiving Both An REI-L and REI-P Counter Incrementing



Meaning In Figure 20 on page 156, the progression of events occurring after the failure is as follows:

1. Repeater 2 detects some parity errors in the B1 byte from a corrupted SONET frame.
2. ADM 2 detects parity errors in the B2 byte.
3. ADM 2 sends an REI-L upstream to Router 2.
4. Router 1 detects parity errors in the B3 byte.
5. Router 1 sends back an REI-P upstream to Router 2.
6. Router 2 sees incrementing REI-L and REI-P errors.

Locate Bit Error Rate Alarms

Problem Bit error rate (BER) alarms are declared when the number of BIP-B2 errors hits a certain threshold. Depending on the threshold, there are two types of BER alarms. In both cases the interface is taken down.

- Bit error rate-signal degrade (BERR-SD) is declared when a bit error rate of 10^{-6} is reached.
- Bit error rate-signal failure (BERR-SF) is declared when a bit error rate of 10^{-3} is reached.

Solution To display SONET alarms and errors, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

The following sample output displays a BERR-SD error:

```
user@router2> show interfaces so-1/1/1 extensive
[... Output truncated...]
Active alarms : BERR-SD
```

| | | | |
|--------------------------|---------|-------|---------------|
| Active defects : BERR-SD | | | |
| SONET PHY: | Seconds | Count | State |
| PLL Lock | 0 | 0 | OK |
| PHY Light | 0 | 0 | OK |
| SONET section: | | | |
| BIP-B1 | 22 | 101 | |
| SEF | 0 | 0 | OK |
| LOS | 0 | 0 | OK |
| LOF | 0 | 0 | OK |
| ES-S | 22 | | |
| SES-S | 0 | | |
| SEFS-S | 0 | | |
| SONET line: | | | |
| BIP-B2 | 22 | 103 | |
| REI-L | 0 | 0 | |
| RDI-L | 0 | 0 | OK |
| AIS-L | 0 | 0 | OK |
| BERR-SF | 0 | 0 | OK |
| BERR-SD | 11 | 53 | Defect Active |
| ES-L | 22 | | |
| SES-L | 4 | | |
| UAS-L | 2 | | |
| ES-LFE | 0 | | |
| SES-LFE | 0 | | |
| UAS-LFE | 0 | | |
| SONET path: | | | |
| BIP-B3 | 22 | 166 | |
| REI-P | 0 | 0 | |
| LOP-P | 0 | 0 | OK |
| AIS-P | 0 | 0 | OK |
| RDI-P | 0 | 0 | OK |
| UNEQ-P | 0 | 0 | OK |
| PLM-P | 0 | 0 | OK |
| ES-P | 22 | | |
| SES-P | 3 | | |
| UAS-P | 1 | | |
| ES-PFE | 0 | | |
| SES-PFE | 0 | | |
| UAS-PFE | 0 | | |

Meaning Bit error rates can be caused by any of the following situations:

- Degrading optical fiber
- Optical transmitter or receiver problems
- Dirty fiber-optic connector
- Clocking issues
- Too much attenuation in the optical signal
- BIP-B1 and BIP-B3 are not used in the BER alarm calculations

Locate Payload Label Mismatch Path Alarms

Problem Payload mismatch path (PLM-P) alarms are reported by PTEs because the SONET byte used to determine the PLM-P alarm is located in the path overhead (the C2 byte). PLM-P alarms occur when the C2 byte received does not match the C2 byte transmitted by the

PTE; for example, when the received C2 value is **0xcf**, the transmitted C2 value must also be **0xcf**.



NOTE: When the received C2 byte has a value of **0x01**, the PTE accepts this value (regardless of the PTE setting) since **0x01** is considered a wildcard value.

Solution To display SONET alarms and errors, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

```
user@router2> show interfaces so-1/1/1 extensive
[...Output truncated...]
SONET alarms   : PLM-P
SONET defects  : PLM-P
[...Output truncated...]
SONET path:
  BIP-B3                0          0
  REI-P                 0          0
  LOP-P                 0          0 OK
  AIS-P                 0          0 OK
  RDI-P                 2          1 OK
  UNEQ-P                0          0 OK
  PLM-P                96          1 Defect Active
  ES-P                  0
  SES-P                  0
  UAS-P                  0
  ES-PFE                 2
  SES-PFE                 2
  UAS-PFE                 0
Received SONET overhead:
  F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x13 , C2(cmp) : 0xcf, F2      : 0x00
  Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
  V5(cmp) : 0x00
Transmitted SONET overhead:
  F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0xcf , F2      : 0x00, Z3      : 0x00
  Z4      : 0x00, V5      : 0x00
```

Meaning In the **SONET path** section of the sample output, the PLM-P counter is incrementing and defective. In the **Received SONET overhead** and **Transmitted SONET overhead** sections, the received C2 value is **0x13** and the transmitted C2 value is **0xcf**. The C2 byte mismatch has caused a PLM-P alarm.

The C2 byte tells the PTE what kind of information is in the synchronous payload envelope (SPE). For example, when the SPE contains Asynchronous Transfer Mode (ATM) cells, the C2 byte has a value of **0x13**. If a Packet over SONET (POS) card is used on the Juniper Networks router, the link does not come up and a PLM-P alarm is raised (since the Juniper Networks router sends **0xcf** and receives **0x13**). However, if the C2 byte has a value of

0x01, the PTE accepts this value (regardless of what the PTE is set to) since **0x01** is considered a wildcard value.

The SONET specifications have assigned a small handful of values (of the 256 possible binary values), but Juniper Networks routers only use a few of these (**0xcf** or **0x16** for POS, **0x13** for ATM, and so on). Table 35 on page 159 shows the synchronous transport signal (STS) path signal label assignments as described in Issue 3 (Sept. 2000) of the GR-253 CORE.

Table 35: STS Path Signal Label Assignments

| Code (Hex) | Content of the STS SPE |
|------------|--|
| 00 | Unequipped |
| 01 | Equipped - Nonspecific Payload |
| 02 | VT-Structured STS1 SPE a |
| 03 | Locked VT Mode a |
| 04 | Asynchronous Mapping for DS3 |
| 12 | Asynchronous Mapping for DS4NA |
| 13 | Mapping for ATM |
| 14 | Mapping for DQDB |
| 15 | Asynchronous Mapping for FDDI |
| 16 | HDLC-over-SONET Mapping |
| FE | O.181 Test Signal (TSS1 to TSS3) Mapping b |

On POS interfaces, Juniper Networks routers by default accept a C2 value of either **0xcf** or **0x16**. Any other values raise a PLM-P alarm. An important thing to remember is that the C2 byte value of **0x16** is a standardized value (per RFC 2615, G.707, and GR-253) used for POS interfaces. **0xcf** is used by default since much SONET equipment still uses this value. If you need to change this byte, use the **rfc-2615** option as follows:

```
user@host# set interface so-fpc/pic/port sonet-options rfc-2615
```

This option changes the following values:

```
C2 byte 22 (0x16)
FCS 32
payload-scrambling (this was already the default)
```

Locate Loss of Pointer Path Alarms

Problem A loss of pointer path (LOP-P) alarm indicates a possible provisioning problem and occurs when the Juniper Networks router cannot determine a valid payload pointer. The Juniper Networks router monitors the H1/H2 bytes, located in the line overhead area. This alarm is usually discovered upon initial provisioning of SONET circuits, and is not generally seen after the router has been deployed in the network for some time.

Solution To display SONET alarms and errors, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

```
user@host> show interfaces so-1/1/1 extensive
[...Output truncated...]
SONET alarms : LOP
SONET defects : LOP
SONET PHY:
  PLL Lock          Seconds    Count    State
  PHY Light         0          0      OK
SONET section:
  BIP-B1            0          0
  SEF               0          0      OK
  LOS               0          0      OK
  LOF               0          0      OK
  ES-S              0
  SES-S             0
  SEFS-S            0
SONET line:
  BIP-B2            0          0
  REI-L             0          0
  RDI-L             0          0      OK
  AIS-L             0          0      OK
  BERR-SF           0          0      OK
  BERR-SD           0          0      OK
  ES-L              0
  SES-L             0
  UAS-L             0
  ES-LFE            0
  SES-LFE           0
  UAS-LFE           0
SONET path:
  BIP-B3            0          0
  REI-P             0          0
  LOP-P            174      0 Defect Active
  AIS-P             0          0      OK
  RDI-P             0          0      OK
  UNEQ-P            0          0      OK
  PLM-P             0          0      OK
  ES-P              174
  SES-P             174
  UAS-P             174
  ES-PFE            0
  SES-PFE           0
  UAS-PFE           0
[...Output truncated...]
```

Meaning The sample output shows that an LOP-P alarm occurred for 174 seconds. An LOP-P alarm can occur when the ADM on the other end is configured for nonconcatenate mode, while the Juniper Networks router is configured for concatenate mode (the default setting). In this instance, the pointer word in the required STS frame does not have the concatenation indicator set.

The condition of 8, 9, or 10 consecutive frames without valid pointer values can raise an LOP-P alarm.



NOTE: Although Juniper routers do not report pointer adjustments, an LOP-P alarm will not occur as long as the pointer adjustments stay within tolerance levels.

Locate Unequipped Payload Alarms

Problem An unequipped payload (UNEQ-P) alarm indicates a possible provisioning problem and occurs when the Juniper Networks router detects a value of 0x00 in the C2 byte.

Solution To display SONET alarms and errors, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output

```
user@host> show interfaces so-1/1/1 extensive
[...Output truncated...]
SONET alarms : UNEQ-P
SONET defects : UNEQ-P
SONET PHY:
  PLL Lock          0          0 OK
  PHY Light         0          0 OK
SONET section:
  BIP-B1            0          0
  SEF               0          0 OK
  LOS               0          0 OK
  LOF               0          0 OK
  ES-S              0
  SES-S             0
  SEFS-S            0
SONET line:
  BIP-B2            0          0
  REI-L             0          0
  RDI-L             0          0 OK
  AIS-L             0          0 OK
  BERR-SF           0          0 OK
  BERR-SD           0          0 OK
  ES-L              0
  SES-L             0
  UAS-L             0
  ES-LFE            0
  SES-LFE           0
  UAS-LFE           0
SONET path:
  BIP-B3            0          0
  REI-P             0          0
```

```

LOP-P          0          0 OK
AIS-P          0          0 OK
RDI-P          0          0 OK
UNEQ-P         10          2 Defect Active
PLM-P          0          0 OK
ES-P           10
SES-P          10
UAS-P          0
ES-PFE         0
SES-PFE        0
UAS-PFE        0
[...Output truncated...]

```

Meaning The sample output shows that an UNEQ-P alarm occurred within 10 seconds and was declared twice. An UNEQ-P alarm can occur when the ADM on the other end has not provisioned the SPE. An UNEQ-P alarm sets the STS SPE to all zeros when it is provisioned. If the alarm occurs, the problem is probably with the configuration of the ADM. Since the UNEQ-P is not a common alarm reported by Juniper Networks routers, it is a good idea to first check with the SONET provider.

Locate Phase Lock Loop Alarms

Problem The phase lock loop (PLL) alarm occurs when the PLL cannot lock on to a timing device, and indicates a possible hardware or network timing problem.

Solution To display SONET alarms and errors, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

Sample Output user@host> show interfaces so-1/1/1 extensive

```
[...Output truncated...]
```

Active alarms : PLL

Active defects : PLL

| SONET PHY: | Seconds | Count | State |
|----------------|---------|------------------|-------|
| PLL Lock | 26 | 0 PLL Lock Error | |
| PHY Light | 0 | 0 | OK |
| SONET section: | | | |
| BIP-B1 | 0 | 0 | |
| SEF | 0 | 0 | OK |
| LOS | 0 | 0 | OK |
| LOF | 0 | 0 | OK |
| ES-S | 0 | | |
| SES-S | 0 | | |
| SEFS-S | 0 | | |
| SONET line: | | | |
| BIP-B2 | 0 | 0 | |
| REI-L | 0 | 0 | |
| RDI-L | 3 | 3 | OK |
| AIS-L | 0 | 0 | OK |
| BERR-SF | 0 | 0 | OK |
| BERR-SD | 0 | 0 | OK |
| ES-L | 0 | | |
| SES-L | 0 | | |
| UAS-L | 0 | | |
| ES-LFE | 0 | | |
| SES-LFE | 0 | | |

```

UAS-LFE                                0
SONET path:
BIP-B3                                0          0
REI-P                                0          0
LOP-P                                0          0 OK
AIS-P                                0          0 OK
RDI-P                                0          0 OK
UNEQ-P                                0          0 OK
PLM-P                                0          0 OK
ES-P                                  0
SES-P                                  0
UAS-P                                  0
ES-PFE                                0
SES-PFE                                0
UAS-PFE                                0
[...Output truncated...]

```

Meaning The sample output shows a PLL alarm lasting for 26 seconds. You must investigate the timing source to diagnose the problem. The timing source is derived from an incoming SONET circuit (when **clock external** is configured), or from the onboard Stratum 3 clock (when **clock internal** is configured). Internal clocking is the default for Juniper Networks routers.

The cause of the problem differs depending on the type of system board on the router. (See Table 36 on page 163.) For example:

- On the M20 and M40 Internet router OC48-SM-IR PIC and the M160 Internet router OC192 board, the problem might be caused by the following:
 - An out-of-tolerance clock coming from the far end, if clocking external is configured.
 - An out-of-tolerance clock coming from the far end or a problem with the board being unable to lock on to its internal clock to derive the transmit clock, if clocking internal is configured.
- On OC3 and OC12 PICs, the PIC not establishing a lock to the onboard clock to derive the outgoing clock.

To further diagnose the problem, try the following:

- Configure clocking to external. If the alarm disappears, the board might not have locked to the internal clock used to derive the outgoing clock.
- Configure clocking to internal and make sure that a loopback fiber is plugged in. If the PLL alarm persists, it is most likely a hardware problem. However, you may not be able to determine if the direction is on the inbound or outbound side of the board.

Table 36 on page 163 shows the location of the onboard clock on the various system boards of Juniper Networks routers.

Table 36: Location of the Onboard Clock

| Router | System Board |
|-------------------------------|---|
| M5, M10, M20, and M40 routers | System Control Board (SCB), System and Switch Board (SSB), Switching and Forwarding Module (SFM), and Single Board Router (SBR) |

Table 36: Location of the Onboard Clock *(continued)*

| Router | System Board |
|--|---------------------------------------|
| OC48-SM-IR PIC used on the M20 and M40 routers | Flexible PIC Concentrator (FPC) |
| M40e and M160 routers | Miscellaneous Control Subsystem (MCS) |
| T-series routing platforms | SONET Clock Generator (SCG) |

CHAPTER 16

Enable SONET Payload Scrambling

This chapter describes SONET payload scrambling and how to check and configure it.

- Checklist for Enabling SONET Payload Scrambling on page 165
- Understand SONET Payload Scrambling on page 165

Checklist for Enabling SONET Payload Scrambling

Table 37 on page 165 provides links and commands for SONET payload scrambling and how to check and configure it.

Table 37: Checklist for Enabling SONET Payload Scrambling

| Tasks | Command or Action |
|--|---|
| “Understand SONET Payload Scrambling” on page 165 | |
| 1. Check SONET HDLC Payload Scrambling on page 166 | <code>show configuration interfaces interface-name</code> <code>show interfaces interface-name</code> |
| 2. Configure SONET HDLC Payload Scrambling on page 167 | <code>[edit]</code> <code>edit interfaces so-fpc/pic/port sonet-options</code> <code>set payload-scrambler</code> <code>show</code> <code>commit</code> |

Understand SONET Payload Scrambling

SONET payload scrambling preserves data integrity. Scrambling is designed to randomize the digital bits (pattern of 1s and 0s) carried in the Asynchronous Transfer Mode (ATM) cells (physical layer frame). Randomizing the digital bits can prevent continuous, long strings of all 1s or all 0s. Transitions between 1s and 0s are used by some physical layer protocols to maintain clocking. SONET interfaces support two levels of scrambling, as follows:

- SONET frame scrambling mode required by the International Telecommunications Union Telecommunication Standardization (ITU-T) GR-253 standard. This mode uses a $1 + x^6 + x^7$ algorithm to scramble the section overhead of the SONET frame. It does not scramble the first row of the section overhead.

- Cell payload scrambling is optional and is defined in ITU-T I.432, section 4.5.3. This mode randomizes the bits in the payload portion of an ATM cell to make sure that the beginning of each new cell is recognized. It leaves the 5-byte header unscrambled.

Synchronous Transport System (STS) stream scrambling must be enabled on every SONET device and is the default for SONET interfaces.

Cell payload scrambling or SONET High-level Data Link Control (HDLC) scrambling can be enabled or disabled, and on Juniper routers is enabled by default to provide better link stability. Both sides of a connection must either use scrambling or not use it.



NOTE: HDLC payload scrambling conflicts with traffic shaping configured using leaky bucket properties. If you configure leaky bucket properties, you must disable payload scrambling because the software rejects configurations that have both features enabled. For more information, see the *Junos Network Interfaces Configuration Guide*

On a Channelized OC12 interface, the SONET **payload-scrambler** statement is ignored. To configure scrambling on the DS3 channels on the interface, include the **t3-options payload-scrambler** statement in the configuration for each DS3 channel.

1. Check SONET HDLC Payload Scrambling on page 166
2. Configure SONET HDLC Payload Scrambling on page 167

Check SONET HDLC Payload Scrambling

Purpose If you find that payload scrambling is not enabled, you might want to enable or configure it because it provides better link stability when it is working.

Action In the Junos OS command-line interface (CLI) operational mode, you can use one of the following two commands to check for SONET HDLC control payload scrambling:

```
user@host> show configuration interfaces | interface-name
```

or

```
user@host> show interfaces interface-name
```

Sample Output 1

```
user@host> show configuration interfaces so-0/0/0
encapsulation cisco-hdlc;
sonet-options {
    payload-scrambler;
}
unit 0 {
    family inet {
        address 9.0.0.2/32 {
            destination 9.0.0.1;
        }
    }
    family mpls;
}
```


Sample Output 2 user@host> show configuration interfaces so-0/0/0

```

encapsulation cisco-hdlc;
sonet-options {
    no-payload-scrambler;
}
unit 0 {
    family inet {
        address 9.0.0.2/32 {
            destination 9.0.0.1;
        }
    }
    family mpls;
}

```

Sample Output 3 user@host> show interfaces so-0/0/1

```

Physical interface: so-0/0/1, Enabled, Physical link is Up
  Interface index: 48, SNMP ifIndex: 114
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 32,
  Payload scrambler: Disabled
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 70627 (00:00:07 ago), Output: 70791 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Opened, mpls: Not-configured

  Input rate      : 78056456 bps (6504 pps)
  Output rate     : 78044840 bps (6503 pps)
  SONET alarms    : None
  SONET defects   : None
  Logical interface so-0/0/1.0 (Index 61) (SNMP ifIndex 118)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.168.50.0/30, Local: 192.168.50.1
    Protocol iso, MTU: 4470, Flags: None

```

Meaning Sample output 1 shows that the SONET interface payload scrambling has been enabled.

Sample output 2 shows that HDLC payload scrambling has been disabled. If you use the **show configuration** or **show configuration interfaces** command, you must scroll to the particular interface for payload scrambling status.

Sample output 3 shows that payload scrambling has been disabled. To explicitly configure payload scrambling, see “Configure SONET HDLC Payload Scrambling” on page 167.

Configure SONET HDLC Payload Scrambling

Purpose You might want to configure SONET HDLC payload scrambling (which is the configurable cell payload scrambling mentioned earlier) if it has been disabled. Configuring payload scrambling provides better link stability.



NOTE: Payload scrambling is the default for Juniper Networks routers. To return to the default, that is, to re-enable payload scrambling, delete the `no-payload-scrambler` statement from the configuration.

Action To explicitly configure HDLC payload scrambling, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces so-fpc/pic/port sonet-options
```

2. Configure payload scrambling:

```
[edit interfaces so-fpc/pic/port sonet-options]
user@host# set payload-scrambler
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-0/0/0 sonet-options]
user@host# show
payload-scrambler;
```

4. Commit the configuration:

```
user@host# commit
```

Check the SONET Frame Checksum

This chapter describes the SONET frame checksum and how to check and configure it.

- Checklist for Checking the SONET Frame Checksum on page 169
- Understand the SONET Frame Checksum on page 170
- Check the SONET Frame Checksum on page 170
- Configure a SONET Frame Checksum on page 174

Checklist for Checking the SONET Frame Checksum

Purpose Table 38 on page 169 provides links and commands for SONET frame checksum and how to check and configure it.

Table 38: Checklist for Checking the SONET Frame Checksum

| Tasks | Command or Action |
|--|--|
| “Understand the SONET Frame Checksum” on page 170 | |
| “Check the SONET Frame Checksum” on page 170 | |
| 1. Examine Output for Framing Errors on page 170 | <code>show interfaces <i>interface-name</i> extensive</code> |
| 2. Check the FCS Configuration on page 172 | <code>show configuration interfaces <i>interface-name</i></code> <code>show interfaces <i>interface-name</i></code> |
| “Configure a SONET Frame Checksum” on page 174 | |
| 1. Return to the Default 16-Bit Checksum on page 174 | <code>[edit]</code> <code>edit interfaces <i>so-fpc/pic/port</i> sonet-options</code> <code>delete fcs 32</code> <code>show</code> <code>commit</code> |
| 2. Configure a 16-Bit Checksum on page 174 | <code>[edit]</code> <code>edit interfaces <i>so-fpc/pic/port</i> sonet-options</code> <code>set fcs 16</code> <code>show</code> <code>commit</code> |

Table 38: Checklist for Checking the SONET Frame Checksum (*continued*)

| Tasks | Command or Action |
|--|---|
| 3. Configure a 32-Bit Checksum on page 175 | <pre>[edit] edit interfaces so-fpc/pic/port sonet-options set (fcs 32 rfc-2615) show commit</pre> |

Understand the SONET Frame Checksum

Problem The SONET frame checksum is a calculation that is added to a frame for error control purposes. SONET frame checksum is used in High-Level Data Link Control (HDLC), Frame Relay, and other data-link layer protocols. For example, Router A calculates the frame check sequence (FCS) and adds it to the outgoing message. Router B, on receiving the message recalculates the FCS and compares it to the FCS from Router A. If there is a difference, both sides of the connection might not match in relation to the FCS configuration.

Solution This chapter describes the following tasks:

- Check the SONET Frame Checksum on page 170
- Configure a SONET Frame Checksum on page 174

Check the SONET Frame Checksum

Purpose If you are having problems with a connection, check that the FCS matches on both sides of the connection.

To check the SONET frame checksum, follow these steps:

1. Examine Output for Framing Errors on page 170
2. Check the FCS Configuration on page 172

Examine Output for Framing Errors

Purpose By examining the output for an interface, you can determine if framing errors are incrementing in the absence of any SONET alarms or defects.

Action From the Junos OS command-line interface (CLI) operational mode, use the following command to check for framing errors:

```
user@host> show interfaces interface-name extensive
```

Sample Output

```
user@router1> show interfaces so-1/0/0 extensive
Physical interface: so-1/0/0, Enabled, Physical link is Up
Interface index: 13, SNMP ifIndex: 18, Generation: 12
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
Loopback: None, FCS:16 , Payload scrambler: Enabled
Device flags   : Present Running
Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
```

```

Link flags      : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 6 (last seen 00:00:52 ago)
  Output: 11 (last sent 00:00:05 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Opened, mpls: Conf-req-sent

CHAP state: Not-configured
Last flapped   : 2002-11-01 22:28:30 UTC (1w5d 23:26 ago)
Statistics last cleared: 2002-11-14 21:52:51 UTC (00:01:50 ago)
Traffic statistics:
  Input bytes :          692          0 bps
  Output bytes:          716         32 bps
  Input packets:           23          0 pps
  Output packets:          72          0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 27, Runts: 0, Giants: 0, Bucket drops: 0,
  Policed discards: 0, L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, HS link
  FIFO overflows: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO
  underflows: 0
SONET alarms :None
SONET defects :None
SONET PHY:
  Seconds      Count  State
  PLL Lock     0       0 OK
  PHY Light    0       0 OK
SONET section:
  BIP-B1       0       0
  SEF          0       0 OK
  LOS         0       0 OK
  LOF         0       0 OK
  ES-S        0
  SES-S       0
  SEFS-S      0
SONET line:
  BIP-B2       0       0
  REI-L        0       0
  RDI-L        0       0 OK
  AIS-L        0       0 OK
  BERR-SF      0       0 OK
  BERR-SD      0       0 OK
  ES-L         0
  SES-L        0
  UAS-L        0
  ES-LFE       0
  SES-LFE      0
  UAS-LFE      0
SONET path:
  BIP-B3       0       0
  REI-P        0       0
  LOP-P        0       0 OK
  AIS-P        0       0 OK
  RDI-P        0       0 OK
  UNEQ-P       0       0 OK
  PLM-P        0       0 OK
  ES-P         0
  SES-P        0

```

```

UAS-P                                0
ES-PFE                              0
SES-PFE                              0
UAS-PFE                              0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0xcf, C2(cmp) : 0xcf, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0xcf, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00
Received path trace: router2 so-1/3/1
73 6c 69 70 70 65 72 79 20 73 6f 2d 31 2f 33 2f  router2 so-1/3/1
31 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d 0a .....
Transmitted path trace: router1 so-1/0/0
68 61 69 72 79 20 73 6f 2d 31 2f 30 2f 30 00 00  router1 so-1/0/0
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
HDLCD configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 4484, Runt threshold: 3
Packet Forwarding Engine configuration:
Destination slot: 1, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort            95      147744000 95      0      low      none
3 network-control        5       7776000  5       0      low      none
Logical interface so-1/0/0.0 (Index 8) (SNMP ifIndex 108) (Generation 9)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470, Generation: 15, Route table: 1
  Flags: Is-Primary
  Addresses, Flags: Dest-route-down Is-Default Is-Preferred Is-Primary
    Destination: 1.1.6.1, Local: 1.1.6.2, Broadcast: Unspecified, Generation:
15
  Protocol iso, MTU: 4470, Generation: 16, Route table: 1
    Flags: Is-Primary
  Protocol mpls, MTU: 4458, Generation: 17, Route table: 1
    Flags: Protocol-Down, Is-Primary

```

Meaning The sample output shows that Router 1 is configured for FCS 16, that framing errors have incremented to 27, and that there are no SONET alarms or defects. Incrementing framing errors, in the absence of any SONET alarms or defects, are a symptom of SONET frame checksum errors.

Check the FCS Configuration

Purpose If you are having problems with a connection, check your router's FCS configuration and, if possible, the FCS configuration on the router on the other side of the connection.

Action From the Junos OS CLI operational mode, use one of the following two commands to check the SONET frame checksum:

```
user@host> show configuration interfaces |interface-name
```

or

```
user@host> show interfacesinterface-name
```



NOTE: The option to display a specific configuration with the `show configuration` command hierarchy was introduced in Junos OS Release 5.3.

Sample Output 1

```
user@host> show configuration interfaces so-0/0/0
encapsulation cisco-hdlc;
sonet-options {
fcs 32;
    payload-scrambler;
}
unit 0 {
    family inet {
        address 9.0.0.2/32 {
            destination 9.0.0.1;
        }
    }
    family mpls;
}
```

Sample Output 2

```
user@host> show interfaces so-0/0/1
Physical interface: so-0/0/1, Enabled, Physical link is Up
  Interface index: 48, SNMP ifIndex: 114
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
Loopback: None, FCS: 32,
  Payload scrambler: Disabled
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 70627 (00:00:07 ago), Output: 70791 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Opened, mpls: Not-configured

  Input rate      : 78056456 bps (6504 pps)
  Output rate     : 78044840 bps (6503 pps)
  SONET alarms    : None
  SONET defects   : None
  Logical interface so-0/0/1.0 (Index 61) (SNMP ifIndex 118)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.168.50.0/30, Local: 192.168.50.1
    Protocol iso, MTU: 4470, Flags: None
```

Meaning Sample output 1 shows that FCS 32 is configured. If you use the `show configuration` or `show configuration interfaces` command, you must scroll to the particular interface for the FCS configuration status.

Meaning Sample output 2 shows that FCS 32 is configured. To change the FCS configuration, see “Return to the Default 16-Bit Checksum” on page 174, “Configure a 16-Bit Checksum” on page 174, or “Configure a 32-Bit Checksum” on page 175.

Configure a SONET Frame Checksum

Purpose After you have checked the FCS and determined that a problem exists, you might need to do one of the following, depending on the situation:



NOTE: By default, SONET interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment may not support 32-bit checksums.

- Return to the Default 16-Bit Checksum on page 174
- Configure a 16-Bit Checksum on page 174
- Configure a 32-Bit Checksum on page 175

Return to the Default 16-Bit Checksum

Action To return to the default 16-bit frame checksum, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces so-fpc/pic/port sonet-options
```
2. Delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete fcs 32
```
3. Verify the deletion:

```
user@host# show
```
4. Commit the configuration:

```
user@host# commit
```

Configure a 16-Bit Checksum

Action To explicitly configure the 16-bit checksum, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces so-fpc/pic/port sonet-options
```
2. Configure the 16-bit checksum:

```
[edit interfaces so-fpc/pic/port sonet-options]
user@host# set fcs 16
```
3. Verify the configuration:


```
user@host# show
```

For example:

```
[edit interfaces so-0/0/0 sonet-options]
user@host# show
fcs 16;
```

4. Commit the configuration:

```
user@host# commit
```

Configure a 32-Bit Checksum

Action To explicitly configure the 32-bit checksum, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces so-fpc/pic/port sonet-options
```

2. Configure the 32-bit checksum:

```
[edit interfaces so-fpc/pic/port sonet-options]
user@host# set (fcs 32 | rfc-2615)
```



NOTE: The `rfc-2615` statement automatically configures the interface to use FCS 32 and changes the C2 byte to 0x16, as per the RFC.

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces so-0/0/0 sonet-options]
user@host# show
fcs 32;
```

or

```
[edit interfaces so-0/0/0 sonet-options]
user@host# show
rfc-2615;
```

1. Commit the configuration:

```
user@host# commit
```



NOTE: On a Channelized OC12 interface, the `sonet-options fcs` statement is not supported. To configure FCS on each DS3 channel, you must include the `t3-options fcs` statement in the configuration for each channel.

PART 6

Investigate Fast Ethernet and Gigabit Ethernet Interfaces

- Monitor Fast Ethernet and Gigabit Ethernet Interfaces on page 179
- Use Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces on page 189
- Locate the Fast Ethernet and Gigabit Ethernet LINKAlarm and Counters on page 201

Monitor Fast Ethernet and Gigabit Ethernet Interfaces

This chapter describes how to monitor Fast Ethernet and Gigabit Ethernet interfaces, and begin the process of isolating Fast Ethernet and Gigabit Ethernet interface problems when they occur.

- Checklist for Monitoring Fast Ethernet and Gigabit Ethernet Interfaces on page 179
- Monitor Fast Ethernet and Gigabit Ethernet Interfaces on page 180
- Fiber-Optic Ethernet Interface Specifications on page 187

Checklist for Monitoring Fast Ethernet and Gigabit Ethernet Interfaces

Purpose Table 39 on page 179 provides links and commands for monitoring Fast Ethernet and Gigabit Ethernet interfaces, and begin the process of isolating Fast Ethernet and Gigabit Ethernet interface problems when they occur.

Table 39: Checklist for Monitoring Fast Ethernet and Gigabit Ethernet Interfaces

| Tasks | Command or Action |
|--|--|
| “Monitor Fast Ethernet and Gigabit Ethernet Interfaces” on page 180 | |
| 1. Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces on page 180 | <code>show interfaces terse (fe* ge*)</code> |
| 2. Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface on page 182 | <code>show interfaces (fe-fpc/pic/port ge-fpc/pic/port)</code> |
| 3. Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface on page 183 | <code>show interfaces (fe-fpc/pic/port ge-fpc/pic/port) extensive</code> |
| 4. Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface on page 186 | <code>monitor interface (fe-fpc/pic/port ge-fpc/pic/port)</code> |
| 5. Fiber-Optic Ethernet Interface Specifications on page 187 | |

Monitor Fast Ethernet and Gigabit Ethernet Interfaces

Purpose By monitoring Fast Ethernet and Gigabit Ethernet interfaces, you begin to isolate Fast Ethernet and Gigabit Ethernet interface problems when they occur.

To monitor your Fast Ethernet and Gigabit Ethernet interfaces, follow these steps:

1. Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces on page 180
2. Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface on page 182
3. Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface on page 183
4. Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface on page 186

Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces

Purpose To display the status of Fast Ethernet or Gigabit Ethernet interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces terse (fe* | ge*)`

Sample Output

```
user@host> show interfaces terse fe*
Interface      Admin Link Proto Local Remote
fe-2/1/0       up    up
fe-2/1/0.0     up    up   inet  10.116.115.217/29
fe-3/0/2       up    down
fe-3/0/2.0     up    down
fe-3/0/3       up    up
fe-3/0/3.0     up    up   inet  192.168.223.65/30
fe-4/1/0       down  up
fe-4/1/0.0     up    down inet  10.150.59.133/30
fe-4/1/1       up    up
fe-4/1/1.0     up    up   inet  10.150.59.129/30
fe-4/1/2       up    down
fe-4/1/2.0     up    down
```

Meaning The sample output lists only the Fast Ethernet interfaces. It shows the status of both the physical and logical interfaces.

For a description of what the output means, see Table 40 on page 180.

Table 40: Status of Fast Ethernet Interfaces

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|--|
| fe-2/1/0 | fe-2/1/0.0 | This interface has both the physical and logical links up and running. |
| Admin Up | Admin Up | |
| Link Up | Link Up | |

Table 40: Status of Fast Ethernet Interfaces (*continued*)

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|---|
| fe-3/0/2 | fe-3/0/2.0 | This interface has the physical link down, the link layer down, or both down (Link Down). The logical link is also down as a result. |
| Admin Up | Admin Up | |
| Link Down | Link Down | |
| fe-4/1/0 | fe-4/1/0.0 | This interface is administratively disabled and the physical link is healthy (Link Up), but the logical interface is not established. The logical interface is down because the physical link is disabled. |
| Admin Down | Admin Up | |
| Link Up | Link Down | |
| fe-4/1/2 | fe-4/1/2.0 | This interface has both the physical and logical links down. |
| Admin Up | Admin Up | |
| Link Down | Link Down | |

Sample Output

```

user@host> show interfaces terse ge*
Interface      Admin Link Proto Local Remote
ge-2/2/0       down down
ge-2/2/0.0     up   down inet  65.113.23.105/30
ge-2/3/0       up   up
ge-2/3/0.0     up   up   inet  65.115.56.57/30
ge-3/1/0       up   up
ge-3/1/0.0     up   up   inet  65.115.56.193/30
ge-3/2/0       up   down

```

Meaning This sample output lists only the Gigabit Ethernet interfaces. It shows the status of both the physical and logical interfaces. See Table 41 on page 181 for a description of what the output means.

Table 41: Status of Gigabit Ethernet Interfaces

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|---|
| ge-2/2/0 | ge-2/2/0.0 | This interface is administratively disabled (Admin Down). Both the physical and logical links are down (Link Down). |
| Admin Down | Admin Up | |
| Link Down | Link Down | |
| ge-2/3/0 | ge-2/3/0.0 | This interface has both the physical and logical links up and running. |
| Admin Up | Admin Up | |
| Link Up | Link Up | |

Table 41: Status of Gigabit Ethernet Interfaces (*continued*)

| Physical Interface | Logical Interface | Status Description |
|--------------------|-------------------|---|
| ge-3/2/0 | ge-3/2/0.0 | This interface has both the physical link and the logical interface down. |
| Admin Up | Admin Up | |
| Link Down | Link Down | |

Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface

Purpose To display the status of a specific Fast Ethernet or Gigabit Ethernet interface when you need to investigate its status further, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces (fe-fpc/pic/port | ge-fpc/pic/port)`

Sample Output 1 The following sample output is for a Fast Ethernet interface with the physical link up:

```
user@host> show interfaces fe-2/1/0
Physical interface: fe-2/1/0, Enabled, Physical link is Up
  Interface index: 31, SNMP ifIndex: 35
  Description: customer connection
  Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
  Speed: 100mbps, Loopback: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link flags     : None
  Current address: 00:90:69:86:71:1b, Hardware address: 00:90:69:86:71:1b
  Input rate     : 25768 bps (11 pps), Output rate: 1576 bps (3 pps)
  Active alarms  : None
  Active defects : None
  Logical interface fe-2/1/0.0 (Index 2) (SNMP ifIndex 43)
    Flags: SNMP-Traps, Encapsulation: ENET2
    Protocol inet, MTU: 1500, Flags: Is-Primary
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.116.151.218/29, Local: 10.119.115.217
      Broadcast: 10.116.151.225
```

Sample Output 2 The following output is for a Gigabit Ethernet interface with the physical link up:

```
user@host> show interfaces ge-3/1/0
Physical interface: ge-3/1/0, Enabled, Physical link is Up
  Interface index: 41, SNMP ifIndex: 55
  Description: customer connection
  Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
  Speed: 1000mbps, Loopback: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link flags     : None
  Current address: 00:90:69:85:71:99, Hardware address: 00:90:69:85:71:99
  Input rate     : 7412216 bps (1614 pps), Output rate: 2431184 bps (1776 pps)
  Active alarms  : None
  Active defects : None
  Logical interface ge-3/1/0.0 (Index 11) (SNMP ifIndex 57)
    Flags: SNMP-Traps, Encapsulation: ENET2
```



```

Protocol inet, MTU: 1500
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.117.65.192/30, Local: 10.115.65.193
Broadcast: 10.115.65.195

```

Meaning The first line of sample output 1 and 2 shows that the physical link is up. This means that the physical link is healthy and can pass packets. Further down the sample output, look for active alarms and defects. If you see active alarms or defects, to further diagnose the problem, see Step 3, “Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface” on page 183, to display more extensive information about the Fast Ethernet interface and the physical interface that is down.

Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface

Purpose To display extensive status information about a specific Fast Ethernet or Gigabit Ethernet interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces (fe-fpc/pic/port | ge-fpc/pic/port) extensive`

Sample Output The following sample output is for a Fast Ethernet interface:

```

user@router> show interfaces fe-1/3/3 extensive
Physical interface: fe-1/3/3, Enabled, Physical link is Up
Interface index: 47, SNMP ifIndex: 38
Description: Test
Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
Speed: 100mbps, Loopback: Disabled, Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps
Link flags   : None
Current address: 00:90:69:8d:2c:de, Hardware address: 00:90:69:8d:2c:de
Statistics last cleared: 2002-01-11 23:03:09 UTC (1w2d 23:54 ago)
Traffic statistics:
Input bytes :          373012658          0 bps
Output bytes :          153026154        1392 bps
Input packets:          1362858          0 pps
Output packets:          1642918          3 pps
Input errors:
Errors: 0 , Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 503660
L3 incompletes: 1 , L2 channel errors: 0 , L2 mismatch timeouts: 0
FIFO errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Collisions: 0, Drops: 0, Aged packets: 0
HS link CRC errors: 0, FIFO errors: 0
Active alarms : None
Active defects : None
MAC statistics:

```

| | Receive | Transmit |
|--------------------|-----------|-----------|
| Total octets | 439703575 | 177452093 |
| Total packets | 1866532 | 1642916 |
| Unicast packets | 972137 | 1602563 |
| Broadcast packets | 30 | 2980 |
| Multicast packets | 894365 | 37373 |
| CRC/Align errors | 0 | 0 |
| FIFO errors | 0 | 0 |
| MAC control frames | 0 | 0 |
| MAC pause frames | 0 | 0 |
| Oversized frames | 0 | |
| Jabber frames | 0 | |

```

Fragment frames                                0
VLAN tagged frames                            0
Code violations                                0
Filter statistics:
Input packet count                            1866532
Input packet rejects                           0
  Input DA rejects                           503674
  Input SA rejects                             0
Output packet count                            1642916
Output packet pad count                        0
Output packet error count                      0
CAM destination filters: 5, CAM source filters: 0
Autonegotiation information:
  Negotiation status: Complete, Link partner status: OK
  Link partner: Full-duplex, Flow control: None
PFE configuration:
  Destination slot: 1, Stream number: 15
  CoS transmit queue bandwidth:
    Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
  CoS weighted round-robin:
    Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
Logical interface fe-1/3/3.0 (Index 8) (SNMP ifIndex 69)
Description: Test
Flags: SNMP-Traps, Encapsulation: ENET2
Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.115.107.192/29, Local: 10.115.107.193
    Broadcast: 10.115.107.199

```

Meaning The sample output shows where the errors might be occurring and includes autonegotiation information. See Table 42 on page 184 for a description of errors to look for.

Table 42: Errors to Look For

| Error | Meaning |
|--------------------------|---|
| Policed discards | Discarded frames that were not recognized or were not of interest. |
| L2 channel errors | Packets for which the router could not find a valid logical interface. For example, the packet is for a virtual LAN (VLAN) that is not configured on the interface. |
| MTU | The maximum transmission unit (MTU) must match the interface of either the router at the remote end of the Fast Ethernet or Gigabit Ethernet link, or that of the switch. |
| Input DA rejects | Number of packets with a destination Media Access Control (MAC) address that is not on the accept list. It is normal to see this number increment. |
| Input SA rejects | Number of packets with a source MAC address that is not on the accept list. This number only increments when source MAC address filtering is configured. |

If the physical link is down, look at the active alarms and defects for the Fast Ethernet or Gigabit Ethernet interface and diagnose the Fast Ethernet or Gigabit Ethernet media accordingly. See “Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters” on page 201 for an explanation of Fast Ethernet and Gigabit Ethernet alarms.

Table 43 on page 185 lists and describes some MAC statistics errors to look for.

Table 43: MAC Statistics Errors

| Error | Meaning |
|---------------------------|---|
| CRC/Align errors | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |
| MAC control frames | The number of MAC control frames. |
| MAC pause frames | The number of MAC control frames with pause operational code. |
| Jabber frames | <p>The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error.</p> <p>Note that this definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms.</p> |
| Fragment frames | <p>The total number of packets received that were less than 64 octets in length (excluding framing bits, but including FCS octets), and had either an FCS error an alignment error.</p> <p>Note that it is entirely normal for fragment frames to increment because both runts (which are normal occurrences due to collisions) and noise hits are counted.</p> |

Autonegotiation is the process that connected Ethernet interfaces use to communicate the information necessary to interoperate. Table 44 on page 185 explains the autonegotiation information of the **show interface *interface-name* extensive** command output.

Table 44: Autonegotiation Information

| Autonegotiation Field Information | Explanation |
|---|--|
| Negotiation status: Incomplete | The Negotiation status field shows Incomplete when the Ethernet interface has the speed or link mode configured. |
| Negotiation status: No autonegotiation | The Negotiation status field shows No autonegotiation when the remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation. |
| Negotiation status: Complete Link partner status: OK | The Negotiation status field shows Complete and the Link partner field shows OK when the Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process completes successfully. |
| Link partner: Half-duplex | The Link partner field can be Full-duplex or Half-duplex depending on the capability of the attached Ethernet device. |
| Flow control: Symmetric/asymmetric | The Flow control field displays the types of flow control supported by the remote Ethernet device. |

Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface

Purpose To monitor statistics for a Fast Ethernet or Gigabit Ethernet interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interface (fe-fpc/pic/port | ge-fpc/pic/port)`



CAUTION: We recommend that you use the `monitor interface fe-fpc/pic/port` or `monitor interface ge-fpc/pic/port` command only for diagnostic purposes. Do not leave these commands on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

Sample Output The following sample output is for a Fast Ethernet interface:

```
user@host> monitor interface fe-2/1/0
Interface: fe-2/1/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 100mbps
Traffic statistics:
  Input bytes:          282556864218 (14208 bps)      [40815]
  Output bytes:         42320313078 (384 bps)        [890]
  Input packets:        739373897 (11 pps)           [145]
  Output packets:       124798688 (1 pps)            [14]
Error statistics:
  Input errors:          0                          [0]
  Input drops:           0                          [0]
  Input framing errors:  0                          [0]
  Policed discards:     6625892                     [6]
  L3 incompletes:       75                          [0]
  L2 channel errors:    0                          [0]
  L2 mismatch timeouts: 0                          [0]
  Carrier transitions:   1                          [0]
  Output errors:         0                          [0]
  Output drops:         0                          [0]
  Aged packets:         0                          [0]
Active alarms : None
Active defects: None
Input MAC/Filter statistics:
  Unicast packets       464751787                   [154]
  Packet error count    0                          [0]
```

Meaning Use the information from this command to help narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.

The statistics in the second column are the cumulative statistics since the last time they were cleared using the `clear interfaces statistics interface-name` command. The statistics

in the third column are the cumulative statistics since the **monitor interface *interface-name*** command was executed.

If the input errors are increasing, verify the following:

1. Check the cabling to the router and have the carrier verify the integrity of the line. To verify the integrity of the cabling, make sure that you have the correct cables for the interface port. Make sure you have single-mode fiber cable for a single-mode interface and multimode fiber cable for a multimode interface.
2. For a fiber-optic connection, measure the received light level at the receiver end and make sure that it is within the receiver specification of the Ethernet interface. See Table 45 on page 187 for the fiber-optic Ethernet interface specifications.
3. Measure the transmit light level on the Tx port to verify that it is within specification. See Table 45 on page 187 for the optical specifications.

Fiber-Optic Ethernet Interface Specifications

Table 45 on page 187 shows the specifications for fiber-optic interfaces for Juniper Networks routers.

Table 45: Fiber-Optic Ethernet Interface Specifications

| Fiber-Optic Ethernet Interface | Length | Wavelength | Average Launch Power | Receiver Saturation | Receiver Sensitivity |
|--|--|-----------------|----------------------|---------------------|--|
| Gigabit Ethernet | | | | | |
| Duplex SC connector | | | | | |
| LH optical interface | 49.5-mile 70-km reach on 8.2-micrometer SMF | 1480 to 1580 nm | -3 to +2 dBm | -3 dBm | -23 dBm (BER 10 ⁻¹²) for SMF |
| LX optical interface | 6.2-mile 10-km reach on 9/125-micrometer SMF 1804.5-ft 550-m reach on 62.5/125- and 50/125-micrometer MMF | 1270 to 1355 nm | -11 to -3 dBm | -3 dBm | -19 dBm |
| SX optical interface | 656-ft 200-m reach on 62.5/125-micrometer MMF 1640-ft 500-m reach on 50/125-micrometer MMF | 830 to 860 nm | -9.5 to -4 dBm | -3 dBm | -17 dBm |
| Fast Ethernet 8-Port | | | | | |
| FX optical interface with MT-RJ connector | 1.24-mile 2-km reach on 62.5/125-micrometer MMF | 1270 to 1380 nm | -20 to -14 dBm | -14 dBm | -34 dBm |

Use Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces

This chapter describes the steps you take to isolate Fast Ethernet and Gigabit Ethernet interface problems.

- Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces on page 189
- Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface on page 190
- Create a Loopback on page 191
- Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up on page 193
- Configure a Static Address Resolution Protocol Table Entry on page 194
- Clear Fast Ethernet or Gigabit Ethernet Interface Statistics on page 196
- Ping the Fast Ethernet or Gigabit Ethernet Interface on page 196
- Check for Fast Ethernet or Gigabit Ethernet Interface Error Statistics on page 197
- Diagnose a Suspected Circuit Problem on page 199

Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces

Purpose Table 46 on page 189 provides links and commands for the steps you take to isolate Fast Ethernet and Gigabit Ethernet interface problems.

Table 46: Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces

| Tasks | Command or Action |
|--|---|
| “Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface” on page 190 | |
| 1. Create a Loopback on page 191 | |
| a. Create a Physical Loopback for a Fiber-Optic Interface on page 191 | Connect the transmit port to the receive port. |
| b. Create a Loopback Plug for an RJ-45 Ethernet Interface on page 191 | Cross pin 1 (TX+) and pin 3 (RX+) together, and pin 2 (TX-) and pin 6 (RX-) together. |

Table 46: Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces (*continued*)

| Tasks | Command or Action |
|---|---|
| c. Configure a Local Loopback on page 192 | <code>[edit interfaces <i>interface-name</i> (fastether-options gigether-options))] set loopback show commit</code> |
| 2. Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up on page 193 | <code>show interfaces (fe-fpc/pic/port ge-fpc/pic/port)</code> |
| 3. Configure a Static Address Resolution Protocol Table Entry on page 194 | <code>show interfaces ge-fpc/pic/port [edit interfaces <i>interface-name</i> unit logical-unit-number family inet address <i>address</i>] set arp <i>ip-address</i> mac <i>mac-address</i> show commit run show arp no-resolve</code> |
| 4. Clear Fast Ethernet or Gigabit Ethernet Interface Statistics on page 196 | <code>clear interfaces statistics fe-fpc/pic/port ge-fpc/pic/port</code> |
| 5. Ping the Fast Ethernet or Gigabit Ethernet Interface on page 196 | <code>ping remote-IP-address bypass-routing interface (fe-fpc/pic/port ge-fpc/pic/port count 100 rapid</code> |
| 6. Check for Fast Ethernet or Gigabit Ethernet Interface Error Statistics on page 197 | <code>show interfaces (fe-fpc/pic/port ge-fpc/pic/port) extensive</code> |
| “Diagnose a Suspected Circuit Problem” on page 199 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface” on page 190. |

Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface

Problem When you suspect a hardware problem, take the following steps to help verify if there is a problem.

Solution To diagnose a suspected hardware problem with the Ethernet interface, follow these steps:

- Create a Loopback on page 191
- Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up on page 193
- Configure a Static Address Resolution Protocol Table Entry on page 194
- Clear Fast Ethernet or Gigabit Ethernet Interface Statistics on page 196
- Ping the Fast Ethernet or Gigabit Ethernet Interface on page 196
- Check for Fast Ethernet or Gigabit Ethernet Interface Error Statistics on page 197

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the transmit and receive ports. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback for a Fiber-Optic Interface on page 191
2. Create a Loopback Plug for an RJ-45 Ethernet Interface on page 191
3. Configure a Local Loopback on page 192

Create a Physical Loopback for a Fiber-Optic Interface

Action To create a physical loopback at the port, connect the transmit port to the receive port using a known good fiber cable.



NOTE: Make sure you use single-mode fiber for a single-mode port and multimode fiber for a multimode port.

Meaning When you create and then test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Create a Loopback Plug for an RJ-45 Ethernet Interface

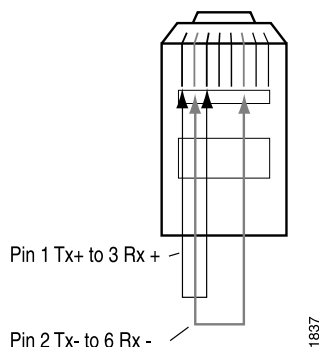
Action To create a loopback plug, cross pin 1 (TX+) and pin 3 (RX+) together, and cross pin 2 (TX-) and pin 6 (RX-) together. You need the following equipment to create the loopback:

- A 6-inch long CAT5 cable
- An RJ-45 connector
- A crimping tool

Figure 21 on page 192 illustrates how to create a loopback plug for an RJ-45 Ethernet interface.

Figure 21: RJ-45 Ethernet Loopback Plug

RJ-45 Ethernet Loopback Plug



Meaning When you create and then test a physical loopback, you are testing the RJ-45 interface of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name (fastether-options | gigether-options)
```

2. Configure the local loopback:

```
[edit interfaces interface-name (fastether-options | gigether-options)]
user@host# set loopback
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces fe-1/0/0 fastether-options]
user@host# show
loopback;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces fe-1/0/0 fastether-options]
user@host# commit
commit complete
```

When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports. On an Ethernet interface, you cannot create a remote loopback, therefore there is no option to

use a **local** or **remote** statement. Simply including the **loopback** statement at the **[edit interfaces interface-name (fastether-options | gigether-options)]** hierarchy level, places the interface into local loopback mode.



NOTE: Remember to delete the loopback statement after completing the test.

Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up

Purpose Display the status of the Fast Ethernet or Gigabit Ethernet interface to provide the information you need to determine whether the physical link is up or down.

Action To verify that the status of the Fast Ethernet or Gigabit Ethernet interface is up, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces (fe-fpc/port | ge-fpc/pic/port)
```

Sample Output

```
user@host# show interfaces fe-1/3/0
Physical interface: fe-1/3/0, Enabled, Physical link is Up
  Interface index: 44, SNMP ifIndex: 35
  Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
  Speed: 100mbps, Loopback: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link flags     : None
  Current address: 00:90:69:8d:2c:db, Hardware address: 00:90:69:8d:2c:db
  Input rate     : 0 bps (0 pps), Output rate: 0 bps (0 pps)
  Active alarms : None
  Active defects : None
  MAC statistics:
    Input octets: 0, Input packets: 0, Output octets: 0, Output packets: 0
  Filter statistics:
    Filtered packets: 0, Padded packets: 0, Output packet errors: 0
  Autonegotiation information:
    Negotiation status: Incomplete, Link partner status: OK
    Link partner: Full-duplex, Flow control: None
```

Meaning The sample output shows that the link is up and there are no alarms in this loopback configuration. When an internal loopback is configured, the physical loopback should come up without an alarm.

Sample Output When you see that the physical link is down, there may be a problem with the port. The following output is an example of the `show interfaces fe-fpc/pic/port` command when the physical link is down:

```
user@router> show interfaces fe-1/3/0
Physical interface: fe-1/3/0, Enabled, Physical link is Down
  Interface index: 44, SNMP ifIndex: 35
  Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
  Speed: 100mbps, Loopback: Disabled, Flow control: Enabled
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps
```

```

Link flags      : None
Current address: 00:90:69:8d:2c:db, Hardware address: 00:90:69:8d:2c:db
Input rate     : 0 bps (0 pps), Output rate: 0 bps (0 pps)
Active alarms : LINK
Active defects : LINK
MAC statistics:
  Input octets: 0, Input packets: 0, Output octets: 0, Output packets: 0
Filter statistics:
  Filtered packets: 0, Padded packets: 0, Output packet errors: 0
Autonegotiation information:
  Negotiation status: Incomplete, Link partner status: Down
  Reason: Link partner autonegotiation failure
  Link partner: Half-duplex, Flow control: None

```

Meaning The sample output shows that the physical link is down and there are active alarms and defects.

Table 47 on page 194 presents problem situations and actions for a physical link that is down.

Table 47: Problems and Solutions for a Physical Link That Is Down

| Problem | Action |
|---|---|
| Cable mismatch | Verify that the fiber connection is correct. |
| Damaged and/or dirty cable | Verify that the fiber can successfully loop a known good port of the same type. |
| Too much or too little optical attenuation | Verify that the attenuation is correct per the PIC optical specifications. |
| The transmit port is not transmitting within the dBm optical range per the specifications | Verify that the Tx power of the optics is within range of the PIC optical specification. |
| Mismatch between the cable type and the port | Verify that a single-mode fiber cable is connected to a single-mode interface and that a multimode fiber cable is connected to a multimode interface. (This problem does not always cause the physical link to go down; errors and dropped packets are sometimes the result.) |

Configure a Static Address Resolution Protocol Table Entry

Purpose Configure a static Address Resolution Protocol (ARP) entry to allow a packet to be sent out of a looped Ethernet interface.



NOTE: Remove the static ARP entry at the end of the loop test after you have completed the ping test, checked interface statistics, and monitored interface traffic.

Action To configure a static ARP table entry for a Gigabit Ethernet interface, follow these steps. You can follow the same procedure to configure a static ARP entry for a Fast Ethernet interface.

1. Find the Media Access Control (MAC) address for the Gigabit Ethernet interface:

```
user@host> show interfaces ge-fpc/pic/port
```

2. In configuration mode, go to the following hierarchy level:

```
[edit]
```

```
user@host# edit interfaces interface-name unit logical-unit-number family inet address address
```

3. Configure the static ARP entry:

```
user@host# set arp ip-address mac mac-address
```



NOTE: The MAC address used should be the same as the physical address of the port being tested because this allows the port to receive the frames when you run the ping test.

4. Verify the configuration:

```
user@host# show
```

5. Commit the configuration:

```
user@host# commit
```

6. Verify that the static ARP entry is installed:

```
user@host# run show arp no-resolve
```

Sample Output

```
user@host> show interfaces ge-7/2/1
Physical interface: ge-7/2/1, Enabled, Physical link is Down
Interface index: 44, SNMP ifIndex: 35
Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
Speed: 100mbps, Loopback: Disabled, Flow control: Enabled
Device flags   : Present Running Down
Interface flags: Hardware-Down SNMP-Traps
Link flags     : None
Current address: 00:90:69:8d:2c:db, Hardware address: 00:90:69:8d:2c:db
Input rate     : 0 bps (0 pps), Output rate: 0 bps (0 pps)
[edit interfaces ge-7/2/1 unit 0 family inet address 10.108.120.1/30]

user@host# set arp 10.108.120.2 mac 00:90:69:8d:2c:db
[edit interfaces ge-7/2/1 unit 0 family inet address 10.108.120.1/30]

user@host# show
arp 10.108.120.2 mac 00:90:69:8d:2c:db;
[edit interfaces ge-7/2/1 unit 0 family inet address 10.108.120.1/30]

user@host# commit
commit complete
[edit interfaces ge-7/2/1 unit 0 family inet address 10.108.120.1/30]
```

```

user@host# run show arp no-resolve
MAC Address      Address      Interface    Flags
00:90:69:8d:2c:db 10.108.120.2 ge-7/2/1.0   permanent
00:e0:34:bb:8c:40 209.211.135.1 fxp0.0       none
00:a0:a5:28:0c:70 209.211.135.8 fxp0.0       none
00:a0:a5:12:12:c7 209.211.135.10 fxp0.0       none
00:90:ab:3c:68:a0 209.211.135.31 fxp0.0       none
08:00:20:a1:53:15 209.211.135.65 fxp0.0       none
00:a0:cc:66:3e:85 209.211.135.98 fxp0.0       none
Total entries: 7

```

Meaning The sample output is for Step 1 through Step 6 and shows that a static ARP entry was configured on Gigabit Ethernet interface **ge-7/2/1**. The MAC address used is the same as the physical address of the port being tested because this allows the port to receive the frames when you run the ping test. The port is working as expected if you see that the time to live (TTL) expired; if you do not receive a response to your ping test, it indicates a hardware problem.

Clear Fast Ethernet or Gigabit Ethernet Interface Statistics

Purpose You must reset the Fast Ethernet and Gigabit Ethernet interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current diagnostics.

Action To clear all statistics for the interface, use the following Junos OS CLI operational mode command:

```
user@host> clear interfaces statistics (fe-fpc/pic/port | ge-fpc/pic/port)
```

Sample Output user@host> clear interfaces statistics ge-7/2/0
user@host>

Meaning This command clears the interface statistics counters for the Gigabit Ethernet interface only.

Ping the Fast Ethernet or Gigabit Ethernet Interface

Purpose Use the ping command to verify the loopback connection.

Action To send ping packets from the Ethernet interface, use the following Junos OS CLI operational mode command:

```
user@host> ping remote-IP-address bypass-routing interface (fe-fpc/pic/port |
ge-fpc/pic/port) count 100 rapid
```

Sample Output user@router> ping 10.108.120.2 bypass-routing interface ge-7/2/1 count 100 rapid
PING 10.108.120.2 (10.108.120.2): 56 data bytes
36 bytes from 10.108.120.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
4 5 00 0054 e871 0 0000 01 01 cc5c 10.108.120.1 10.108.120.2
.36 bytes from 10.108.120.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
4 5 00 0054 e874 0 0000 01 01 cc59 10.108.120.1 10.108.120.2

```
.36 bytes from 10.108.120.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e878 0 0000 01 01 cc55 10.108.120.1 10.108.120.2
.36 bytes from 10.108.120.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e87c 0 0000 01 01 cc51 10.108.120.1 10.108.120.2
.36 bytes from 10.108.120.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e880 0 0000 01 01 cc4d 10.108.120.1 10.108.120.2
.36 bytes from 10.108.120.1: Time to live exceeded
Vr HL TOS Len ID Flg off TTL Pro cks Src Dst
 4 5 00 0054 e884 0 0000 01 01 cc49 10.108.120.1 10.108.120.2
.36 bytes from 10.108.120.1: Time to live exceeded
```

Meaning The sample output shows that the time to live (TTL) expired, indicating that the link is receiving the frames from the ping test. The MAC address used is the same as the physical address of the port being tested because this allows the port to accept the frames from the ping test. As the packet is looped over the link, you expect to receive a TTL exceeded message for each ping sent. These messages are generated because the ping packets are repeatedly looped between the router and the physical loopback. When the packet is sent to the other end of the link, which does not exist, the loopback returns the packet back to the same interface, where it is again subjected to the Packet Forwarding Engine fabric for routing. After the route lookup, the TTL is decremented, and the packet is again sent out of the looped interface. This process repeats until the packet is either lost, or the TTL expires with subsequent TTL expired message displayed. Should any errors occur, the packet is discarded and a time-out error is displayed, rather than the expected TTL expired message. Note that the default TTL for ICMP echo packets in Junos OS is 64. This means a given test packet must be successfully sent and received 63 times before a TTL expired message can be generated. You can alter the TTL value to adjust the tolerance for loss, for example, a value of 255 is the most demanding test because now the packet must be sent and received error free 254 times.

Check for Fast Ethernet or Gigabit Ethernet Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with the Juniper Networks Technical Assistance Center (JTAC).

Action To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces (fe-fpc/pic/port | ge-fpc/pic/port) extensive
```

Sample Output

```
user@router> show interfaces ge-7/2/1 extensive
Physical interface: ge-7/2/1, Enabled, Physical link is Up
Interface index: 25, SNMP ifIndex: 32, Generation: 41
Description: Test
Link-level type: Ethernet, MTU: 4470, Speed: 1000mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Disabled
Device flags   : Present Running
Interface flags: SNMP-Traps
Link flags     : None
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:90:69:4c:17:b1, Hardware address: 00:90:69:4c:17:b1
Statistics last cleared: 2002-01-07 17:53:19 UTC (2w2d 03:20 ago)
Traffic statistics:
```

```

Input bytes :          3799515503823          0 bps
Output bytes :          7325566425           0 bps
Input packets:          4628009535           0 pps
Output packets:          30678225            0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0
Output errors:
  Carrier transitions: 14, Errors: 0, Drops: 0, Collisions: 0, Aged packets:
0,
  FIFO errors: 0, HS link CRC errors: 0
Active alarms :None
Active defects : None
MAC statistics:
  Receive          Transmit
Total octets      3883579444813      7880356346
Total packets     4628009534         30678237
Unicast packets   4627879788         29893563
Broadcast packets          30         464
Multicast packets 129716           784210
CRC/Align errors   0               0
FIFO errors        0               0
MAC control frames 0               0
MAC pause frames   0               0
Oversized frames   0
Jabber frames      0
Fragment frames    0
VLAN tagged frames 0
Code violations     0
Filter statistics:
Input packet count      4628009244
Input packet rejects    0
Input DA rejects        0
Input SA rejects        0
Output packet count     30678237
Output packet pad count  856248
Output packet error count 0
CAM destination filters: 9, CAM source filters: 0
Autonegotiation information:
Negotiation status: Complete, Link partner status: Ok, Link partner:
Full-duplex,
Flow control: None
PFE configuration:
Destination slot: 7
CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                        %      bps      %      bytes
0 best-effort            0      0      0      0      low  none
1 expedited-forwarding   0      0      0      0      low  none
2 assured-forwarding     0      0      0      0      low  none
3 network-control        0      0      0      0      low  none
Logical interface ge-7/2/1.0 (Index 23) (SNMP ifIndex 48) (Generation 38)
Description: To Cosine Left 23/1
Flags: SNMP-Traps Encapsulation: ENET2
Protocol inet, MTU: 4456, Flags: None, Generation: 85 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.108.120.0/30, Local: 10.108.120.1, Broadcast: 10.108.120.3,

Generation: 81
Protocol iso, MTU: 4453, Flags: None, Generation: 86 Route table: 0

```


Meaning Check for any error statistics. There should not be any input or output errors. If there are any persistent input or output errors, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Purpose When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may create a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Step 2 through Step 8 in “Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface” on page 190. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

CHAPTER 20

Locate the Fast Ethernet and Gigabit Ethernet LINK Alarm and Counters

This chapter describes the LINK alarm and major counters associated with Fast Ethernet and Gigabit Ethernet interfaces. The LINK alarm is the only Fast Ethernet or Gigabit Ethernet alarm encountered when isolating line problems on a Juniper Networks router.

- Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters on page 201
- Display the Fast Ethernet or Gigabit Ethernet Interface LINK Alarm on page 201
- Fast Ethernet and Gigabit Ethernet Counters on page 203

Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters

Purpose Table 48 on page 201 provides links and commands for locating LINK alarm and major counters associated with Fast Ethernet and Gigabit Ethernet interfaces.

Table 48: Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters

| Tasks | Command or Action |
|--|--|
| "Display the Fast Ethernet or Gigabit Ethernet Interface LINK Alarm" on page 201 | <code>show interfaces (fe-fpc/pic/port ge-fpc/pic/port) extensive</code> |
| "Fast Ethernet and Gigabit Ethernet Counters" on page 203 | |

Display the Fast Ethernet or Gigabit Ethernet Interface LINK Alarm

Problem To display the Fast Ethernet or Gigabit Ethernet LINK alarm, use the following Junos OS command-line interface (CLI) operational mode command:

Solution `user@host> show interfaces (fe-fpc/pic/port | ge-fpc/pic/port) extensive`

Sample Output The following sample output is for a Fast Ethernet interface:

```

user@host> show interfaces fe-1/3/3 extensive
Physical interface: fe-1/3/3, Enabled, Physical link is Down
  Interface index: 47, SNMP ifIndex: 38
  Description: Test
  Link-level type: Ethernet, MTU: 1514, Source filtering: Disabled
  Speed: 100mbps, Loopback: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link flags     : None
  Current address: 00:90:69:8d:2c:de, Hardware address: 00:90:69:8d:2c:de
  Statistics last cleared: 2002-01-11 23:03:09 UTC (1w2d 23:54 ago)
  Traffic statistics:
    Input bytes :          373012658          0 bps
    Output bytes :          153026154        1392 bps
    Input packets:          1362858          0 pps
    Output packets:          1642918          3 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 503660
    L3 incompletes: 1, L2 channel errors: 0, L2 mismatch timeouts: 0
    FIFO errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Collisions: 0, Drops: 0, Aged packets: 0
    HS link CRC errors: 0, FIFO errors: 0
  Active alarms : LINK
  Active defects : LINK
  MAC statistics:
    Receive          Transmit
    Total octets      439703575    177452093
    Total packets     1866532      1642916
    Unicast packets   972137      1602563
    Broadcast packets      30        2980
    Multicast packets  894365      37373
    CRC/Align errors    0          0
    FIFO errors         0          0
    MAC control frames  0          0
    MAC pause frames    0          0
    Oversized frames    0          0
    Jabber frames       0          0
    Fragment frames     0          0
    VLAN tagged frames  0          0
    Code violations     0          0
  Filter statistics:
    Input packet count      1866532
    Input packet rejects     0
    Input DA rejects        503674
    Input SA rejects         0
    Output packet count           1642916
    Output packet pad count       0
    Output packet error count     0
    CAM destination filters: 5, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Complete, Link partner status: OK
    Link partner: Full-duplex, Flow control: None
  PFE configuration:
    Destination slot: 1, Stream number: 15
    CoS transmit queue bandwidth:
      Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
    CoS weighted round-robin:
      Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
  Logical interface fe-1/3/3.0 (Index 8) (SNMP ifIndex 69)
    Description: Test
    Flags: SNMP-Traps, Encapsulation: ENET2

```

```
Protocol inet, MTU: 1500, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.115.107.192/29, Local: 10.115.107.193
Broadcast: 10.115.107.199
```

Meaning The sample output shows where the alarm and other errors might be occurring and any counters that are incrementing. The only alarm associated with Fast Ethernet or Gigabit Ethernet interfaces is the LINK alarm. A LINK alarm indicates a physical problem. To isolate where the physical problem might be occurring, conduct loopback testing. See “Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces” on page 189 for information on conducting a loopback test.



NOTE: Since link status is polled once every second, some items that require fast link down detection, such as Multiprotocol Label Switching (MPLS) fast reroute, take longer to execute.

Fast Ethernet and Gigabit Ethernet Counters

Problem Table 49 on page 203 shows the major counters that appear in the output for the **show interfaces fe-fpc/pic/port extensive** and the **show interfaces ge-fpc/pic/port extensive** commands. These counters generally increment when there is a problem with a Fast Ethernet or Gigabit Ethernet interface. In the **Counters** column, the counters are listed in the order in which they are displayed in the output.

Table 49: Major Fast Ethernet and Gigabit Ethernet Counters

| Counter | Description | Reason for Increment |
|-------------------------|--|--|
| Input Errors: | | |
| Errors | The sum of the incoming frame aborts and frame check sequence (FCS) errors. | |
| Policed discards | The frames discarded by the incoming packet match code. | The frames were discarded because they were not recognized or of interest. Usually, this field reports protocols that the Junos OS does not handle. |
| Drops | The number of packets dropped by the output queue of the I/O Manager application-specific integrated circuit (ASIC). | If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's random early detection (RED) mechanism. |
| L3 incompletes | The number of packets discarded due to the packets failing Layer 3 header checks. | This counter increments when the incoming packet fails Layer 3 (usually IPv4) checks of the header. For example, a frame with less than 20 bytes of available IP header would be discarded and this counter would increment. |

Table 49: Major Fast Ethernet and Gigabit Ethernet Counters (*continued*)

| Counter | Description | Reason for Increment |
|--|--|--|
| L2 channel errors | The errors that occur when the software could not find a valid logical interface (such as fe-1/2/3.0) for an incoming frame. | This error increments when, for example, a lookup for a virtual LAN (VLAN) fails. |
| L2 mismatch timeouts | The count of malformed or short packets. | The malformed or short packets cause the incoming packet handler to discard the frame and be unreadable. |
| FIFO errors | The number of first in, first out (FIFO) errors in the receive direction as reported by the ASIC on the Physical Interface Card (PIC). | The value in this field should always be 0. If this value is not zero, cabling could be badly organized or the PIC could be broken. |
| Output Errors | | |
| Errors | The sum of outgoing frame aborts and FCS errors. | |
| Collisions | The number of Ethernet collisions. | The Fast Ethernet PIC supports only full-duplex operation, so this number should always remain 0. If it is incrementing, there is a software bug. |
| Drops | The number of packets dropped by the output queue of the I/O Manager ASIC. | If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. |
| Aged packets | The number of packets that remained in shared packet SDRAM for so long that the system automatically purged them. | The value in this field should never increment. If it increments, it is probably a software bug or broken hardware. |
| HS link FCS errors, FIFO errors | The number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. | The value in this field should always be 0. If it increments, either the FPC or the PIC is broken. |
| Miscellaneous Counters | | |
| Input DA rejects | The number of packets that the filter rejected because the destination Media Access Control (MAC) address of the packet is not on the accept list. | It is normal for this value to increment. When it increments very quickly and no traffic is entering the router from the far-end system, either there is a bad Address Resolution Protocol (ARP) entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local router (which the router is rejecting). |
| Output packet pad count | The number of packets that the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. | Usually, padding is done only on small ARP packets, but some very small Internet Protocol (IP) packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist, or it is misconfigured. |

Table 49: Major Fast Ethernet and Gigabit Ethernet Counters (*continued*)

| Counter | Description | Reason for Increment |
|--|--|--|
| Output packet error count | Number of packets with an indicated error that the filter was given to transmit. | These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. |
| CAM destination filters, CAM source filters | The number of entries in the content-addressable memory (CAM) dedicated to destination and source MAC address filters. | There can be up to 64 source entries. If source filtering is disabled, which is the default, the value for these fields should be 0. |

PART 7

Investigate Channelized Interfaces

- Monitor Channelized DS3 Interfaces on page 209
- Use Loopback Testing For Channelized DS3 Interfaces on page 223
- Locate Channelized DS3 Alarms and Errors on page 235
- Monitor Multichannel DS3 Interfaces on page 241
- Use Loopback Testing for Multichannel DS3 Interfaces on page 251
- Locate Multichannel DS3 Alarms and Errors on page 265
- Monitor Channelized OC12 Interfaces on page 273
- Use Loopback Testing for Channelized OC12 Interfaces on page 293
- Locate Channelized OC12 Alarms and Errors on page 307

Monitor Channelized DS3 Interfaces

This chapter describes how to monitor Channelized DS3 interfaces and begin the process of isolating Channelized DS3 interface problems when they occur.

- Checklist for Monitoring Channelized DS3 Interfaces on page 209
- Monitor Channelized DS3 Interfaces on page 209

Checklist for Monitoring Channelized DS3 Interfaces

Purpose Table 50 on page 209 provides links and commands for how to monitor Channelized DS3 interfaces and begin the process of isolating Channelized DS3 interface problems when they occur.

Table 50: Checklist for Monitoring Channelized DS3 Interfaces

| Tasks | Command or Action |
|--|--|
| “Monitor Channelized DS3 Interfaces” on page 209 | |
| 1. Display the Status of Channelized DS3 Interfaces on page 210 | show interfaces terse t1* |
| 2. Display the Status of a Specific Channelized DS3 Interface on page 211 | show interfaces t1-fpc/pic/port:channel |
| 3. Display Extensive Status Information for a Specific Channelized DS3 Interface on page 213 | show interfaces t1-fpc/pic/port:channel extensive |
| 4. Monitor Statistics for a Channelized DS3 Interface on page 218 | monitor interfaces t1-fpc/pic/port:channel |

Monitor Channelized DS3 Interfaces

Purpose By monitoring Channelized DS3 interfaces, you begin the process of isolating Channelized DS3 interface problems when they occur.

To monitor your Channelized DS3 interfaces, follow these steps:

1. Display the Status of Channelized DS3 Interfaces on page 210
2. Display the Status of a Specific Channelized DS3 Interface on page 211

3. Display Extensive Status Information for a Specific Channelized DS3 Interface on page 213
4. Monitor Statistics for a Channelized DS3 Interface on page 218

Display the Status of Channelized DS3 Interfaces

Purpose To display the status of Channelized DS3 interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

Action user@host> show interfaces t1* terse

Sample Output 1

```
user@host> show interfaces t1* terse
Interface           Admin Link Proto Local Remote
t1-1/2/0:1          up    down
t1-1/2/0:2          up    down
t1-1/2/0:3          up    down
t1-1/2/0:4          up    down
t1-1/2/0:5          up    up
t1-1/2/0:5.0        up    up   inet  172.16.1.33/30
t1-1/2/0:6          up    up
t1-1/2/0:6.0        up    up   inet  172.16.1.37/30
t1-1/2/0:7          up    up
t1-1/2/0:7.0        up    up   inet  172.16.1.41/30
t1-1/2/0:8          up    down
t1-1/2/0:9          up    down
t1-1/2/0:10         up    down
t1-1/2/0:11         up    up
t1-1/2/0:11.0       up    up   inet  172.16.1.45/30
t1-1/2/0:12         up    up
t1-1/2/0:12.0       up    up   inet  172.16.1.49/30
t1-1/2/0:13         up    up
t1-1/2/0:13.0       up    up   inet  172.16.1.53/30
t1-1/2/0:14         up    up
t1-1/2/0:14.0       up    up   inet  172.16.1.153/30
t1-1/2/0:15         up    up
t1-1/2/0:15.0       up    up   inet  172.16.1.177/30
t1-1/2/0:16         up    up
t1-1/2/0:16.0       up    up   inet  172.16.1.181/30
t1-1/2/0:17         up    up
t1-1/2/0:17.0       up    up   inet  172.16.1.129/30
t1-1/2/0:18         up    up
t1-1/2/0:18.0       up    up   inet  172.16.1.133/30
t1-1/2/0:19         up    down
t1-1/2/0:19.0       up    down inet  172.16.1.137/30
t1-1/2/0:20         up    down
t1-1/2/0:21         up    down
t1-1/2/0:22         up    down
t1-1/2/0:23         up    down
t1-1/2/0:24         up    down
t1-1/2/0:25         up    down
t1-1/2/0:26         up    down
t1-1/2/0:27         up    down
t1-1/2/0:28         up    down
```

Sample Output 2

```
user@host> show interfaces t1* terse
Interface           Admin Link Proto Local Remote
t1-0/3/3:0          down down
t1-0/3/3:0.0        up    down inet  10.10.10.1/30
t1-0/3/3:1          up    up
```

```

t1-0/3/3:1.0      up    up    inet  10.10.10.5/30
t1-0/3/3:2        up    up
t1-0/3/3:2.0      up    up    inet  10.10.10.53/30

```

Meaning The sample output shows the status of both the physical and logical interfaces. Sample output 1 shows that 12 of the possible 28 channels have IP addresses and are connected. Of the 12 connected channels, the last channel (**t1-1/2/0:19.0**) is currently down.

Sample output 2 shows that all links are up except for interface **t1-0/3/3:0**, which has both the physical and logical links down.

Display the Status of a Specific Channelized DS3 Interface

Purpose To display the status of a specific Channelized DS3 interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces t1-fpc/pic/port:channel`

Sample Output 1

```

user@host> show interfaces t1-1/2/0:5
Physical interface: t1-1/2/0:5, Enabled, Physical link is Up
Interface index: 181, SNMP ifIndex: 210
Description: T1 to Tombstone - Circuit # 123456789
Link-level type: PPP , MTU: 1504, Clocking: Internal , Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,
Parent: ct3-1/2/0 Interface index 173
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive: Input: 6898 (00:00:48 ago), Output: 6874 (00:00:07 ago)
LCP state: Opened
NCP state: inet: Opened , inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped  : 2004-05-11 16:01:30 EDT (5d 02:41 ago)
Input rate    : 2648 bps (6 pps)
Output rate   : 14608 bps (4 pps)
DS1 alarms   : None
DS1 defects   : None

Logical interface t1-1/2/0:5.0 (Index 86) (SNMP ifIndex 238)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 68.71.141.32/30, Local: 68.71.141.33, Broadcast:
68.71.141.35

```

Sample Output 2

```

user@host> show interfaces t1-0/3/3:2
Physical interface: t1-0/3/3:2, Enabled, Physical link is Up
Interface index: 239, SNMP ifIndex: 127
Description:
Link-level type: Cisco-HDLC , MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Mode: M23, Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives

```

```

Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 124789 (00:00:08 ago), Output: 125379 (00:00:04 ago)
CoS queues      : 4 supported
Last flapped    : 2004-04-30 09:12:44 UTC (2w0d 10:45 ago)
Input rate      : 3984 bps (10 pps)
Output rate     : 56328 bps (14 pps)
DS1  alarms    : None
DS3  alarms    : None
DS1  defects   : None
DS3  defects   : None
Logical interface tl-0/3/3:2.0 (Index 132) (SNMP ifIndex 236)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Input packets : 33897375
Output packets: 40673351
  Protocol inet, MTU: 1500
    Flags: No-Redirects, uRPF, uRPF-loose
    Addresses, Flags: Primary Is-Preferred Is-Primary
      Destination: 10.10.10.52/30, Local: 10.10.10.53,
      Broadcast: 10.10.10.55

```

Sample Output 3

```

user@host> show interfaces tl-1/2/0:1
Physical interface: tl-1/2/0:1, Enabled, Physical link is Down
  Interface index: 177, SNMP ifIndex: 205
  Description: T1 to Bedrock #1 - RESERVED
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  CoS queues     : 4 supported
  Last flapped   : 2004-04-02 09:12:49 EST (6w2d 08:29 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1 alarms    : AIS, LOF
  DS1 defects   : AIS, LOF

```

Sample Output 4

```

user@host> show interfaces tl-1/2/0:19
Physical interface: tl-1/2/0:19, Enabled, Physical link is Down
  Interface index: 148, SNMP ifIndex: 224
  Description: T1 to Rock City #6 - Circuit # 987654321
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags    : Keepalives
  Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)
  LCP state: Conf-req-sent
  NCP state: inet: Down , inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Not-configured
  CoS queues      : 4 supported
  Last flapped    : 2004-05-14 15:56:43 EDT (2d 02:47 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  DS1  alarms    : AIS, LOF
  DS1  defects   : AIS, LOF

```

```

Logical interface t1-1/2/0:19.0 (Index 91) (SNMP ifIndex 256)
Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation:
PPP
Protocol inet, MTU: 1500
Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 68.71.141.136/30, Local: 68.71.141.137, Broadcast:
68.71.141.139

```

Meaning The first line of the output shows the status of the channel. If this line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets.

Sample output 1 shows a channel that is connected and operating correctly. You can verify the following information to check that the interface is functioning correctly:

- Encapsulation used on the physical interface, **Link-level type: PPP**
- Reference clock source, **Clocking: Internal**
- Frame checksum sequence, **FCS: 16**
- Physical layer framing format used on the link, **Framing: ESF**

Because the link-level type is Point-to-Point Protocol (PPP), the link control protocol (LCP) state is **Opened**, and the network control protocol (NCP) state has one protocol, **NCP::inet:Opened**, indicating that the link is healthy. There are no DS1 alarms or defects.

Sample output 2 shows a channel that is connected and operating correctly. However, this channel has Cisco HDLC configured as the link-level type and a logical interface (**t1-0/3/3:2.0**) configured.

Sample output 3 shows a channel that is not connected, **Physical link is Down**. Loopback is not configured, **Loopback: None**, and the input and output counters are zero. In addition, there are alarm indication signal (AIS) and loss of frame (LOF) alarms and defects.

Sample output 4 shows a channel that is assigned but down, **Physical link is Down**. Information about the physical interfaces shows the device flags are **Present Running Down**, and one of the interface flags is **Hardware-Down**. In addition, interface protocol initialization failed to complete successfully on logical interface **t1-1/2/0:19.0**, **Flags: Hardware-Down Device-Down**.

Display Extensive Status Information for a Specific Channelized DS3 Interface

Purpose To display the status of Channelized DS3 interfaces, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces t1-fpc/pic/port:channel extensive`

Sample Output 1

```

user@host> show interfaces t1-1/2/0:5 extensive
Physical interface: t1-1/2/0:5, Enabled, Physical link is Up
Interface index: 181, SNMP ifIndex: 210, Generation: 96
Description: T1 to Tombstone - Circuit # 123456789
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,

```

```

Parent: ct3-1/2/0 Interface index 173
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 6910 (last seen 00:00:21 ago)
  Output: 6886 (last sent 00:00:04 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : 2004-05-11 16:01:30 EDT (5d 02:53 ago)
Statistics last cleared: 2004-05-11 23:43:42 EDT (4d 19:10 ago)
Traffic statistics:
  Input bytes :          551301316          4432 bps
  Output bytes :         4091306894          2696 bps
  Input packets:          5231609           6 pps
  Output packets:         4867661           3 pps
Input errors:
  Errors: 47, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
398, L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort          4820512             4804578             24909

  1 expedited-fo           0                 0                 0

  2 assured-forw           0                 0                 0

  3 network-cont          63083             63083              0

DS1 alarms :None
DS1 defects :None
T1 media:
  SEF      5      4 OK
  BEE     246    127 OK
  AIS              0           0 OK
  LOF              0           0 OK
  LOS              0           0 OK
  YELLOW          0           0 OK
  BPV              0           0
  EXZ              0           0
  LCV             246         538
  PCV              0           0
  CS               0           0
  LES              0
  ES               0
  SES              8
  SEFS             12
  BES              0
  UAS              0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0

```



```

Timeslots      : All active
Line encoding: B8ZS, Byte encoding: Nx64K
Buildout       : 0 to 132 feet
Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x01)
Logical interface t1-1/2/0:5.0 (Index 86) (SNMP ifIndex 238) (Generation 111)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 117, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 68.71.141.32/30, Local: 68.71.141.33, Broadcast: 68.71.141.35,
  Generation: 169
Even though there are counts in the t1 media section of the output, notice how
the " State" column has all " OK"

```

Sample Output 2 user@host> show interfaces t1-0/3/3:2 extensive

```

Physical interface: t1-0/3/3:2, Enabled, Physical link is Up
Interface index: 239, SNMP ifIndex: 127, Generation: 122
Description:
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Mode: M23, Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 124790 (last seen 00:00:03 ago)
  Output: 125379 (last sent 00:00:09 ago)
CoS queues     : 4 supported
Last flapped   : 2004-04-30 09:12:44 UTC (2w0d 10:45 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes   :          2930724407          9560 bps
  Output bytes  :          9983871242         78464 bps
  Input packets:          17011460           14 pps
  Output packets:         20390813           19 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 233516,
  L3 incompletes: 1, L2 channel errors: 0, L2 mismatch timeouts: 0,
  HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 17341, Aged packets: 0
DS1 alarms :None
DS3 alarms :None
DS1 defects:None
DS3 defects:None
T1 media:

```

| | Seconds | Count | State |
|--------|---------|-------|-------|
| SEF | 0 | 0 | OK |
| BEE | 1 1 OK | | |
| AIS | 0 | 0 | OK |
| LOF | 0 | 0 | OK |
| LOS | 0 | 0 | OK |
| YELLOW | 7 | 1 | OK |
| BPV | 0 | 0 | |
| EXZ | 0 | 0 | |
| LCV | 1 | 1029 | |

```

PCV                0          0
CS                 0          0
LES                0
ES                 0
SES                1
SEFS               2
BES                0
UAS                0
DS3 media:         Seconds      Count  State
PLL Lock           0          0 OK
Reframing          0          0 OK
AIS                0          0 OK
LOF                0          0 OK
LOS                0          0 OK
IDLE               0          0 OK
YELLOW             7          1 OK
BPV                1        65535
EXZ                1        65535
LCV                2       131070
PCV                1        1079
LES                1
PES                1
PSES              1
SEFS               0
UAS                0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0   95  95      20265434   9981112904   17341         0
Queue1    5   5       125379     2758338         0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : 1-24
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled,
  Idle cycle flag: flags, Start end flag: shared
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 2 (0x2e)
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort            95      1459200  95         0      low  none
3 network-control        5        76800   5         0      low  none
Logical interface t1-0/3/3:2.0 (Index 132) (SNMP ifIndex 236) (Generation 69)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Traffic statistics:
  Input bytes :      5789719245
  Output bytes :    19909405752
  Input packets:      33897585
  Output packets:    40673646
Local statistics:
  Input bytes :      2930724407
  Output bytes :    9983871242
  Input packets:      17011460
  Output packets:    20390813
Transit statistics:
  Input bytes :      2858994838      14784 bps
  Output bytes :    9925534510      286584 bps

```

```

Input packets:          16886125          25 pps
Output packets:         20282833          38 pps
Protocol inet, MTU: 1500, Generation: 80, Route table: 0
Flags: No-Redirects, uRPF, uRPF-loose
RPF Failures: Packets: 0, Bytes: 0
Addresses, Flags: Primary Is-Preferred Is-Primary
Destination: 10.10.10.52/30, Local: 10.10.10.53,
Broadcast: 10.10.10.55, Generation: 159

```

Sample Output 3

```

user@host> show interfaces tl-1/2/0:19 extensive
Physical interface: tl-1/2/0:19, Enabled, Physical link is Down
Interface index: 148, SNMP ifIndex: 224, Generation: 110
Description: T1 to Rock City - Circuit # 987654321
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,
Parent: ct3-1/2/0 Interface index 173
Device flags   : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times    : Up 0 ms, Down 0 ms
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 0 (last seen: never)
  Output: 0 (last sent: never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpl:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : 2004-05-14 15:56:43 EDT (2d 03:01 ago)
Statistics last cleared: 2004-04-09 13:30:02 EDT (5w2d 05:28 ago)
Traffic statistics:
  Input bytes :          89198          0 bps
  Output bytes :         90532          0 bps
  Input packets:         6371          0 pps
  Output packets:        6448          0 pps
Input errors:
  Errors: 271124, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed
discards: 266254, L3 incompletes: 0,
  L2 channel errors: 2, L2 mismatch timeouts: 2, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 32, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets  Dropped packets

  0 best-effort              0              0              0
  1 expedited-fo             0              0              0
  2 assured-forw             0              0              0
  3 network-cont            6448            6448              0

DS1 alarms : AIS, LOF
DS1 defects : AIS, LOF
T1 media:
Seconds      Count  State
SEF          33     31 OK
BEE          53     47 OK
AIS    3201537  15 Defect Active
LOF    3202041  16 Defect Active
LOS              0      0 OK

```

```

YELLOW                1023435          0 OK
BPV                   0                0
EXZ                   0                0
LCV                   53              72
PCV                   0                0
CS                    0                0
LES                   3202041
ES                    3202041
SES                   3202060
SEFS                  3202102
BES                   0
UAS                   3202160
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots       : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout        : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x04)
Logical interface t1-1/2/0:19.0 (Index 91) (SNMP ifIndex 256) (Generation 115)

Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP

Protocol inet, MTU: 1500, Generation: 121, Route table: 0
Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 68.71.141.136/30, Local: 68.71.141.137, Broadcast:
68.71.141.139, Generation: 179

```

Meaning The sample output shows very detailed interface information which includes where any errors might be occurring. The first line of the output indicates if the link is up. Sample output 1 and 2 show that both links are up. Sample output 3 shows that the link is down. The main sections of the output to examine are:

- DS1 alarms
- DS1 defects
- T1 media

Both sample output 1 and 2 show no DS1 alarms or defects. Sample output 3 shows AIS and LOF alarms and defects. For more information about AIS and LOF alarms and defects, see “List of Common SONET Alarms and Errors” on page 145.

Even though there are counts in the T1 media section of the output in sample output 1 and 2, the **State** column indicates that the media are **OK**. However, sample output 3, in which the link is down, shows that the AIS and LOF defects are active.

Monitor Statistics for a Channelized DS3 Interface

Purpose To display the status of Channelized DS3 interfaces, use the following Junos OS CLI operational mode command:

```

Action      user@host> monitor interfaces t1-fpc/pic/port:channel

Sample Output user@host> monitor interfaces t1-1/2/0:5
host        Seconds: 35          Time: 19:02:34
                                                    Delay: 0/0/27

Interface: t1-1/2/0:5, Enabled, Link is Up
Encapsulation: PPP, Keepalives, Speed: T1
Traffic statistics:
    Input bytes:          551635800 (1768 bps)          [16596]
    Output bytes:         4094623791 (71376 bps)       [64020]
    Input packets:        5234195 (2 pps)              [211]
    Output packets:       4872090 (8 pps)              [147]
Encapsulation statistics:
    Input keepalives:     6918                        [1]
    Output keepalives:    6893                        [0]
    LCP state: Opened
Error statistics:
    Input errors:         47                          [0]
    Input drops:          0                          [0]
    Input framing errors: 0                          [0]
    Policed discards:     398                        [0]
    L3 incompletes:       0                          [0]
    L2 channel errors:    0                          [0]
    L2 mismatch timeouts: 0                          [0]
    Carrier transitions:  0                          [0]
    Output errors:        0                          [0]
    Output drops:         0                          [0]
    Aged packets:         0                          [0]
Active alarms : None
Active defects: None
T1 statistics:
    BPV                   0                          [0]
    EXZ                   0                          [0]
    LCV                   538                        [0]
    PCV                   0                          [0]
    CS                    0                          [0]
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

```

Sample Output 2 user@host> monitor interface t1-0/3/3:2
host        Seconds: 9          Time: 10:36:11
                                                    Delay: 3/3/3

Interface: t1-0/3/3:2, Enabled, Link is Up
Encapsulation: Cisco-HDLC, Keepalives, Speed: T1
Traffic statistics:
    Input bytes:          2931288250 (43936 bps)       [427]
    Output bytes:         9987968300 (93512 bps)       [207]
    Input packets:        17017904 (106 pps)           [14]
    Output packets:       20398890 (109 pps)           [26]
Encapsulation statistics:
    Input keepalives:     124817                      [0]
    Output keepalives:    125405                      [0]
Error statistics:
    Input errors:         0                          [0]
    Input drops:         0

```

```

[0]
Input framing errors:          0
[0]
Input runs:                    0          [0]
Input giants:                  0          [0]
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Sample Output 3

```

user@host> monitor tl-1/2/0:19
host      Seconds: 9              Time: 19:05:23              Delay: 0/0/68

Interface: tl-1/2/0:19, Enabled, Link is Down
Encapsulation: PPP, Keepalives, Speed: T1
Traffic statistics:
Input bytes:                    89198 (0 bps)          [0]
Output bytes:                   90532 (0 bps)          [0]
Input packets:        6371 (0 pps)          [0]
Output packets:       6448 (0 pps)          [0]
Encapsulation statistics:
Input keepalives:              0          [0]
Output keepalives:             0          [0]
LCP state: Conf-req-sent
Error statistics:
Input errors:                   271124          [0]
Input drops:                    0          [0]
Input framing errors:           0          [0]
Policed discards:               266254          [0]
L3 incompletes:                 0          [0]
L2 channel errors:              2          [0]
L2 mismatch timeouts:           2          [0]
Carrier transitions:            32          [0]
Output errors:                  0          [0]
Output drops:                   0          [0]
Aged packets:                   0          [0]
Active alarms: AIS LOF
Active defects: AIS LOF
T1 statistics:
BPV                             0          [0]
EXZ                             0          [0]
LCV                             72          [0]
PCV                             0          [0]
CS                              0          [0]
Interface warnings:
o Outstanding DS1 alarm(s)
o INET NCP is not Opened
o LCP state is not Opened
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Meaning The sample output shows common interface failures, indicates whether loopback is detected, and shows increases in framing errors. Use information from this command to help narrow down possible causes of an interface problem.

The output in the examples is static, however, the counters in real time change as they are updated every second. The counters in sample output 3 show that there is no traffic for the interface that is down, and that it has active alarms, defects, and there are interface warnings.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.



CAUTION: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

CHAPTER 22

Use Loopback Testing For Channelized DS3 Interfaces

This chapter describes using loopback testing to isolate Channelized DS3 interface problems.

- Checklist for Using Loopback Testing for Channelized DS3 Interfaces on page 223
- Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface on page 224
- Create a Loopback on page 225
- Verify That the Interface Is Up on page 226
- Clear Interface Statistics on page 227
- Force the Link Layer to Stay Up on page 227
- Verify the Status of the Logical Interface on page 229
- Ping the Channelized Interface on page 230
- Check for Interface Error Statistics on page 230
- Diagnose a Suspected Circuit Problem on page 232

Checklist for Using Loopback Testing for Channelized DS3 Interfaces

Purpose Table 51 on page 223 provides links and commands for using loopback testing to isolate Channelized DS3 interface problems.

Table 51: Checklist for Using Loopback Testing for Channelized DS3 Interfaces

| Tasks | Command or Action |
|--|---|
| “Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 224 | |
| 1. Create a Loopback on page 225 | |
| a. Create a Physical Loopback on page 225 | Connect the TX port to the RX port. |
| b. Configure a Local Loopback on page 225 | <code>[edit interfaces <i>interface name</i> (t3-options t1-options)]</code> <code>set loopback local</code> <code>show</code> <code>commit</code> |

Table 51: Checklist for Using Loopback Testing for Channelized DS3 Interfaces (*continued*)

| Tasks | Command or Action |
|---|---|
| 2. Verify That the Interface Is Up on page 226 | <code>show interfaces t1-fpc/pic/port:channel</code> <code>show interfaces t3-fpc/pic/port:channel</code> |
| 3. Clear Interface Statistics on page 227 | <code>clear interfaces statistics t1-fpc/pic/port:channel</code> |
| 4. Force the Link Layer to Stay Up on page 227 | |
| a. Configure Encapsulation to Cisco-HDLC on page 227 | <code>[edit interfaces interface-name]</code> <code>set encapsulation cisco-hdlc</code> <code>show</code> <code>commit</code> |
| b. Configure No-Keepalives on page 228 | <code>[edit interfaces interface-name]</code> <code>set no-keepalives</code> <code>show</code> <code>commit</code> |
| 5. Verify the Status of the Logical Interface on page 229 | <code>show interfaces t1-fpc/pic/port:channel</code> |
| 6. Ping the Channelized Interface on page 230 | <code>ping interface t1-fpc/pic/port:channel local-IP-address</code> <code>bypass-routing count 1000 rapid</code> |
| 7. Check for Interface Error Statistics on page 230 | <code>show interfaces t1-fpc/pic/port:channel extensive</code> |
| “Diagnose a Suspected Circuit Problem” on page 232 | |
| 8. “Create a Loop from the Router to the Network” on page 232 | <code>[edit interfaces t1-fpc/pic/port:channel t1-options]</code> <code>set loopback remote</code> <code>show</code> <code>commit</code> |
| 9. Create a Loop to the Router from Various Points in the Network on page 233 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 224. |

Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface

Problem To diagnose a suspected hardware problem with a Channelized DS3 interface, follow these steps:

Solution

- Create a Loopback on page 225
- Verify That the Interface Is Up on page 226
- Clear Interface Statistics on page 227
- Force the Link Layer to Stay Up on page 227
- Verify the Status of the Logical Interface on page 229

- Ping the Channelized Interface on page 230
- Check for Interface Error Statistics on page 230

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the Channelized DS3 port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback on page 225
2. Configure a Local Loopback on page 225

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port.

Meaning When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback, follow these steps:

1. In configuration mode, go to the following hierarchy level, depending on whether you are configuring a full T3 or T1 interface:

```
[edit]
user@host# edit interfaces interface-name (t3-options | t1-options)
```

2. Configure the local loopback:

```
[edit interfaces interface-name (t3-options | t1-options)]
user@host# set loopback local
```

The following is an example of the name for a T1 channel on a Channelized DS3 port for a Channelized DS3 to DS1 interface:

```
[edit interfaces t1-2/1/1:0 t1-options]
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# show
loopback local;
```

4. Commit the configuration:

```
user@host# commit
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# commit
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Verify That the Interface Is Up

Purpose Display the status of a Channelized DS1 or DS3 interface to determine whether the physical link is up or down.

Action To verify that the status of the Channelized DS1 or DS3 interface is up, use one of the following Junos OS command-line interface (CLI) operational mode commands:

```
user@host> show interfaces t1-fpc/pic/port:channel
user@host> show interfaces t3-fpc/pic/port:channel
```

Sample Output The following sample output is for a channelized DS3 to DS1 interface:

```
user@host# show interfaces t1-2/1/0:20
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 39 (00:00:06 ago), Output: 0 (never)
  CoS queues     : 4 supported
  Last flapped   : 2004-05-20 21:46:27 UTC (00:14:28 ago)
  Input rate     : 16 bps (0 pps)
  Output rate    : 160 bps (0 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
  Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.10.1.1, Local: 10.10.1.2
```

Meaning The sample output shows that the physical link is up and there are no DS1 or DS3 alarms or defects. You should not see any DS1 or DS3 alarms. You can check any interface on

the Channelized DS3 port. See ““Checklist for Channelized DS3 Alarms and Errors” on page 235” for more information on Channelized DS3 alarms and errors.

Clear Interface Statistics

| | |
|----------------------|--|
| Purpose | You must reset the Channelized DS3 interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current efforts to diagnose the problem. |
| Action | To clear all statistics for the interface, use the following Junos OS CLI operational mode command: user@host> clear interfaces statistics t1-fpc/pic/port:channel |
| Sample Output | user@host> clear interfaces statistics t1-2/1/0:20 user@host> |
| Meaning | This command clears the interface statistics counters for the Channelized or T1 interface only. |

Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. If you have the Point-to-Point protocol (PPP) configured, you need to change the encapsulation to Cisco High-Level Data Link Control (HDLC) and reconfigure the keepalives in order to force the link layer to stay up.

Force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 227
2. Configure No-Keepalives on page 228

Configure Encapsulation to Cisco-HDLC

Action To set the encapsulation on a T1 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure Cisco-HDLC:

```
[edit interfaces interface-name]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# show
```

```
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# commit
commit complete
```

5. Check the interface configuration

```
user@host# run show interfaces t1-2/1/0:20

Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
Interface index: 210, SNMP ifIndex: 173
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: Local, FCS: 16,
Mode: C/Bit parity, Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 39 (00:00:06 ago), Output: 0 (never)
CoS queues     : 4 supported
Last flapped   : 2004-05-20 21:46:27 UTC (00:14:28 ago)
Input rate     : 16 bps (0 pps)
Output rate    : 160 bps (0 pps)
DS1  alarms    : None
DS3  alarms    : None
DS1  defects   : None
DS3  defects   : None
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.1.1, Local: 10.10.1.2
```

Meaning This command sets the interface encapsulation to the Cisco HDLC transport protocol. You must configure the interface with Cisco HDLC to ensure that the logical interface remains up in preparation for the ping test.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a channelized DS3 interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure no-keepalives:

```
[edit interfaces interface-name]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/0:20]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-2/1/0:20]
user@host# commit
commit complete
```

Meaning By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Verify the Status of the Logical Interface

Purpose To verify the status of the logical interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces t1-fpc/pic/port:channel`

Sample Output 1

```
user@host# show interfaces t1-2/1/0:20
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 39 (00:00:06 ago), Output: 0 (never)
  CoS queues     : 4 supported
  Last flapped   : 2004-05-20 21:46:27 UTC (00:14:28 ago)
  Input rate     : 16 bps (0 pps)
  Output rate    : 160 bps (0 pps)
  DS1 alarms    : None
  DS3 alarms    : None
  DS1 defects   : None
  DS3 defects   : None
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.10.1.1, Local: 10.10.1.2
```

Meaning The sample output shows that the channelized interface has the physical and logical links up.

Ping the Channelized Interface

Purpose Use the ping command to verify the loopback connection.

Action To ping the local interface, use the following Junos OS CLI operational mode commands:

```
user@host> ping interface t1-fpc/pic/port:channel local-IP-address bypass-routing count
1000 rapid
```

[illegible]

| | |
|----------------|---|
| Meaning | This command sends 1000 ping packets out of the channelized interface under the Channelized DS3 port to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net , or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States). |
|----------------|---|

Check for Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with JTAC.

Action To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces t1-fpc/pic/port:channel extensive
```

```

Sample Output user@host# show interfaces t1-2/1/0:20 extensive
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173, Generation: 93
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
  Device flags      : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags       : No-Keepalives
  Hold-times       : Up 0 ms, Down 0 ms
  CoS queues       : 4 supported
  Last flapped     : 2004-05-20 21:46:27 UTC (00:26:47 ago)
  Statistics last cleared: 2004-05-20 22:12:03 UTC (00:01:11 ago)
  Traffic statistics:

```



```

Input bytes :          88680          27640 bps
Output bytes :          88680          27640 bps
Input packets:          1010           39 pps
Output packets:          1010           39 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0, L3 incompletes:
0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms :None
DS3 alarms :None
DS1 defects :None
DS3 defects :None
T1 media:
Seconds      Count  State
SEF          0        0 OK
BEE          0        0 OK
AIS          0        0 OK
LOF          0        0 OK
LOS          0        0 OK
YELLOW       0        0 OK
BPV          0        0
EXZ          0        0
LCV          0        0
PCV          0        0
CS           0        0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS          0
DS3 media:
Seconds      Count  State
PLL Lock     0        0 OK
Reframing    0        0 OK
AIS          0        0 OK
LOF          0        0 OK
LOS          0        0 OK
IDLE         0        0 OK
YELLOW       0        0 OK
BPV          0        0
EXZ          0        0
LCV          0        0
PCV          0        0
CCV          0        0
LES          0
PES          0
PSES         0
CES          0
CSES         0
SEFS         0
UAS          0
Interface transmit queues:
      B/W  WRR  Packets  Bytes  Drops  Errors
Queue0  95  95      0      0      0      0
Queue1   5   5    1010    88680    0      0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled, Idle
cycle flag: flags,

```

```

Start end flag: shared
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 2, PLP byte: 2 (0x14)
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort            95      1459200  95      0      low  none
3 network-control        5       76800   5       0      low  none
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213) (Generation 14)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Generation: 24, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.1.1, Local: 10.10.1.2, Broadcast: Unspecified,
Generation: 24

```

Meaning Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Purpose When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 232
2. Create a Loop to the Router from Various Points in the Network on page 233

Create a Loop from the Router to the Network

Purpose Creating a loop from a particular T1 interface to the network allows the transport-layer engineer to test the T1 interface from various points in the network and isolate the problem.

Action To create a loop from a particular T1 interface to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:


```
[edit]
user@host# edit interfaces t1-fpc/pic/port:channel t1-options
```
2. Configure the loopback:


```
[edit interfaces interface-name t1-options]
user@host# set loopback remote
```
3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/1:0:0 t1-options]
```

```
user@host# show
```

```
loopback remote;
```

4. Commit the configuration:

```
user@host# commit
```

Meaning This command loops any traffic from the network back into the network.

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 7 in “Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 224. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

Locate Channelized DS3 Alarms and Errors

This chapter describes the most common Channelized DS3 alarms and errors when investigating line problems on a Juniper Networks router.

- Checklist for Channelized DS3 Alarms and Errors on page 235
- Display Alarms and Errors for Channelized DS3 Interfaces on page 235

Checklist for Channelized DS3 Alarms and Errors

Purpose Table 52 on page 235 provides links and commands for the most common Channelized DS3 alarms and error when investigating line problems on a Juniper Networks router.

Table 52: Checklist for Channelized DS3 Alarms and Errors

| Tasks | Command or Action |
|--|--|
| “Display Alarms and Errors for Channelized DS3 Interfaces” on page 235 | <code>show interfaces t1-fpc/pic/port:channel extensive</code> |

Display Alarms and Errors for Channelized DS3 Interfaces

Purpose To display channelized DS3 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces t1-fpc/pic/port:channel extensive`

Sample Output 1

```
user@host> show interfaces t1-1/2/0:5 extensive
Physical interface: t1-1/2/0:5, Enabled, Physical link is Up
  Interface index: 181, SNMP ifIndex: 210, Generation: 96
  Description: T1 to Tombstone - Circuit # 123456789
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 6910 (last seen 00:00:21 ago)
```

```

Output: 6886 (last sent 00:00:04 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mp1s:
Not-configured
CHAP state: Not-configured
CoS queues      : 4 supported
Last flapped    : 2004-05-11 16:01:30 EDT (5d 02:53 ago)
Statistics last cleared: 2004-05-11 23:43:42 EDT (4d 19:10 ago)
Traffic statistics:
Input bytes  :          551301316          4432 bps
Output bytes :          4091306894          2696 bps
Input packets:           5231609           6 pps
Output packets:          4867661           3 pps
Input errors:
Errors: 47, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
398, L3 incompletes: 0, L2 channel errors: 0,
L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets      Dropped packets

0 best-effort          4820512          4804578          24909

1 expedited-fo              0              0              0

2 assured-forw            0              0              0

3 network-cont          63083          63083              0

DS1 alarms :None
DS1 defects :None
TI media:      Seconds      Count  State
SEF           5      4 OK
BEE          246     127 OK
AIS           0      0 OK
LOF           0      0 OK
LOS           0      0 OK
YELLOW        0      0 OK
BPV           0          0
EXZ           0          0
LCV          246        538
PCV           0          0
CS            0          0
LES           0
ES            0
SES           8
SEFS          12
BES           0
UAS           0

HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 1514, Runt threshold: 0
Timeslots      : All active
Line encoding: B8ZS, Byte encoding: Nx64K
Buildout       : 0 to 132 feet
Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
BERT time period: 10 seconds, Elapsed: 0 seconds
Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:

```

```

Destination slot: 1, PLP byte: 4 (0x01)
Logical interface t1-1/2/0:5.0 (Index 86) (SNMP ifIndex 238) (Generation 111)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 117, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 68.71.141.32/30, Local: 68.71.141.33, Broadcast: 68.71.141.35,
Generation: 169

```

Sample Output 2

```

user@host> show interfaces t1-1/2/0:19 extensive
Physical interface: t1-1/2/0:19, Enabled, Physical link is Down
Interface index: 148, SNMP ifIndex: 224, Generation: 110
Description: T1 to Rock City - Circuit # 987654321
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,
Parent: ct3-1/2/0 Interface index 173
Device flags   : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times    : Up 0 ms, Down 0 ms
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 0 (last seen: never)
  Output: 0 (last sent: never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpl:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : 2004-05-14 15:56:43 EDT (2d 03:01 ago)
Statistics last cleared: 2004-04-09 13:30:02 EDT (5w2d 05:28 ago)
Traffic statistics:
  Input bytes   :                89198                0 bps
  Output bytes  :                90532                0 bps
  Input packets:                6371                0 pps
  Output packets:               6448                0 pps
Input errors:
  Errors: 271124, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed
discards: 266254, L3 incompletes: 0,
  L2 channel errors: 2, L2 mismatch timeouts: 2, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 32, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:

```

| | Queued packets | Transmitted packets | Dropped packets |
|----------------|----------------|---------------------|-----------------|
| 0 best-effort | 0 | 0 | 0 |
| 1 expedited-fo | 0 | 0 | 0 |
| 2 assured-forw | 0 | 0 | 0 |
| 3 network-cont | 6448 | 6448 | 0 |

```

DS1 alarms : AIS, LOF
DS1 defects : AIS, LOF
T1 media:
SEF          Seconds      Count  State
BEE          53           47     OK
AIS          3201537      15 Defect Active
LOF          3202041      16 Defect Active
LOS          0           0      OK

```

```

YELLOW                1023435          0 OK
BPV                    0                0
EXZ                    0                0
LCV                    53              72
PCV                    0                0
CS                     0                0
LES                   3202041
ES                    3202041
SES                   3202060
SEFS                  3202102
BES                    0
UAS                   3202160
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots       : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout        : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x04)
Logical interface t1-1/2/0:19.0 (Index 91) (SNMP ifIndex 256) (Generation 115)

  Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP

Protocol inet, MTU: 1500, Generation: 121, Route table: 0
  Flags: Protocol-Down
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 68.71.141.136/30, Local: 68.71.141.137, Broadcast:
    68.71.141.139, Generation: 179

```

Meaning The sample output shows the active alarms and active defects. Sample output 1 shows no active alarms or defects.

Sample output 2 shows that the physical and logical links are down, with active alarms and defects. When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T1 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell).

Table 53 on page 239 shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 53: T1 Media Alarms and Error Definitions

| T1 Media Alarm or Error | Definitions |
|-------------------------|--------------------------------------|
| AIS | Alarm indication signal (blue alarm) |
| BEE | Block error event |
| BES | Bursty errored seconds |
| BPV | Bipolar violation |
| CS | Controlled slip |
| ES | Errored seconds |
| EXZ | Excessive zeros |
| LCV | Line code violation |
| LES | Line errored seconds |
| LOF | Loss of frame |
| LOS | Loss of signal |
| PCV | Path code violation |
| SEF | Severely errored frame |
| SEFS | Severely errored frame seconds |
| SES | Severely errored seconds |
| UAS | Unavailable seconds |
| YLW | Yellow alarm |

See “Checklist for T1 Alarms and Errors” on page 39 for more details on T1 alarms and statistics.

Monitor Multichannel DS3 Interfaces

This chapter describes how to monitor Multichannel DS3 interfaces and begin the process of isolating Multichannel DS3 interface problems when they occur. (See .)

- Checklist for Monitoring Multichannel DS3 Interfaces on page 241
- Monitor Multichannel DS3 Interfaces on page 241

Checklist for Monitoring Multichannel DS3 Interfaces

Purpose Table 54 on page 241 provides links and commands for monitoring Multichannel DS3 interfaces and begin the process of isolating Multichannel DS3 interface problems when they occur.

Table 54: Checklist for Monitoring Multichannel DS3 Interfaces

| Tasks | Command or Action |
|---|--|
| “Monitor Multichannel DS3 Interfaces” on page 241 | |
| 1. Display the Status of Channelized Interfaces on page 242 | <code>show interfaces terse ds*</code> <code>show interfaces terse t1*</code> |
| 2. Display the Status of a Specific Channelized Interface on page 242 | <code>show interfaces ds-fpc/pic/port:channel:channel</code> <code>show interfaces t1-fpc/pic/port:channel</code> |
| 3. Display Extensive Status Information for a Specific T3 Interface on page 243 | <code>show interfaces ds-fpc/pic/port:channel:channel extensive</code> <code>show interfaces t1-fpc/pic/port:channel extensive</code> |
| 4. Monitor Statistics for a Channelized Interface on page 247 | <code>monitor interfaces ds-fpc/pic/port:channel:channel</code> <code>monitor interfaces t1-fpc/pic/port:channel</code> |

Monitor Multichannel DS3 Interfaces

Purpose Channelized interfaces enable you to configure a number of individual channels that subdivide the bandwidth of a larger interface and minimize the number of Physical Interface Cards (PICs) that an installation requires. By monitoring channelized DS3 to DS0 interfaces or channelized DS3 to DS1 interfaces, you can begin to isolate Multichannel DS3 problems when they occur.

To monitor Multichannel DS3 interfaces, follow these steps:

1. Display the Status of Channelized Interfaces on page 242
2. Display the Status of a Specific Channelized Interface on page 242
3. Display Extensive Status Information for a Specific T3 Interface on page 243
4. Monitor Statistics for a Channelized Interface on page 247

Display the Status of Channelized Interfaces

Purpose To display the status of channelized DS3 to DS0 interfaces or channelized DS3 to DS1 interfaces, use one of the following Junos OS command-line interface (CLI) operational mode commands:

Action `user@host> show interfaces terse ds*`
`user@host> show interfaces terse t1*`

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces terse ds*
Interface      Admin Link Proto Local Remote
ds-2/1/0:5:1   up    up
ds-2/1/0:5:1.0 up    up   inet 192.168.140.197/30
```

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> show interfaces terse t1*
[...Output truncated...]
t1-2/1/0:16    up    down
t1-2/1/0:16.0  up    down inet 192.168.118.61/30
t1-2/1/0:17    up    up
t1-2/1/0:17.0  up    up   inet 192.168.118.49/30
t1-2/1/0:18    up    up
t1-2/1/0:18.0  up    up   inet 192.168.36.21/30
t1-2/1/0:19    up    up
t1-2/1/0:19.0  up    up   inet 192.168.118.97/30
```

Meaning The sample output shows the status of both the physical and logical interfaces. In both sample outputs, all links are up except for the first interface in the T1 sample output. The first interface, **t1-2/1/0:16**, has both the physical and logical links down.

Display the Status of a Specific Channelized Interface

Purpose To display the status of a specific channelized DS3 to DS0 interface or channelized DS3 to DS1 interface, use one of the following CLI operational mode commands:

Action `user@host> show interfaces ds-fpc/pic/port:channel:channel`
`user@host> show interfaces t1-fpc/pic/port:channel`

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces ds-2/1/0:5:1
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
```

```

Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 1 (00:00:06 ago), Output: 1 (00:00:06 ago)
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
Interface index: 50, SNMP ifIndex: 59
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
Mode: M23, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
Input rate : 741512 bps (224 pps)
Output rate : 1266528 bps (224 pps)
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.118.96/30, Local: 192.168.118.97

```

Meaning The first line of the sample output shows the status of the link. If this line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets.

Display Extensive Status Information for a Specific T3 Interface

Purpose To display extensive status information about a specific channelized DS3 to DS0 interface or channelized DS3 to DS1 interface, use one of the following CLI operational mode commands:

Action `user@host> show interfaces ds-fpc/pic/port:channel:channel extensive`
`user@host> show interfaces t1-fpc/pic/port:channel extensive`

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```

user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)
    Output: 2 (last sent 00:00:05 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
  Traffic statistics:
    Input bytes :           524           304 bps
    Output bytes :           528           304 bps
    Input packets:             8             0 pps
    Output packets:            8             0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes:
  0,
    L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1 alarms :None
  DS3 alarms :None
  DS1 defects :None
  DS3 defects :None
  T1 media:
    Seconds      Count  State
    SEF          0       0 OK
    BEE          0       0 OK
    AIS          0       0 OK
    LOF          0       0 OK
    LOS          0       0 OK
    YELLOW       0       0 OK
    BPV          0       0
    EXZ          0       0
    LCV          0       0
    PCV          0       0
    CS           0       0
    LES         0
    ES           0
    SES         0
    SEFS        0
    BES         0
    UAS         0
  DS3 media:
    Seconds      Count  State
    PLL Lock     0       0 OK
    Reframing    0       0 OK
    AIS          0       0 OK
    LOF          0       0 OK
    LOS          0       0 OK
    IDLE         0       0 OK
    YELLOW       0       0 OK
    BPV          0       0
    EXZ          0       0
    LCV          0       0
    PCV          0       0

```

```

LES                                0
PES                                0
PSES                               0
SEFS                               0
UAS                                0
Interface transmit queues:
      B/W  WRR  Packets      Bytes      Drops      Errors
Queue0   95  95       4       336         0         0
Queue1    5   5       1        22         0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : 1
  Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0x2f)
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      bytes
0 best-effort             0         0      0         0      low  none
1 expedited-forwarding    0         0      0         0      low  none
2 assured-forwarding      0         0      0         0      low  none
3 network-control         0         0      0         0      low  none
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 20 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197,
Broadcast: Unspecified,
Generation: 22

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
Interface index: 50, SNMP ifIndex: 59, Generation: 49
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
Mode: M23, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags   : Keepalives
Hold-times   : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 117 (last seen 00:00:08 ago)
  Output: 121 (last sent 00:00:01 ago)
Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
Traffic statistics:
Input bytes :          22459734          236888 bps
Output bytes :        162288645        1322208 bps
Input packets:          201233           214 pps
Output packets:         236341           227 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:

```

```

0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM
errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1 alarms :None
  DS3 alarms :None
  DS1 defects :None
  DS3 defects :None
  T1 media:
    Seconds      Count  State
    SEF          0      0 OK
    BEE          0      0 OK
    AIS          0      0 OK
    LOF          0      0 OK
    LOS          0      0 OK
    YELLOW       0      0 OK
    BPV          0      0
    EXZ          0      0
    LCV          0      0
    PCV          0      0
    CS           0      0
    LES          0
    ES           0
    SES          0
    SEFS         0
    BES          0
    UAS          0
  DS3 media:
    Seconds      Count  State
    PLL Lock     0      0 OK
    Reframing    0      0 OK
    AIS          0      0 OK
    LOF          0      0 OK
    LOS          0      0 OK
    IDLE         0      0 OK
    YELLOW       0      0 OK
    BPV          0      0
    EXZ          0      0
    LCV          0      0
    PCV          0      0
    LES          0
    PES          0
    PSES         0
    SEFS         0
    UAS          0
  Interface transmit queues:
    B/W  WRR      Packets      Bytes      Drops      Errors
  Queue0  95  95      234494      162020375      0      0
  Queue1   5   5        164        5808      0      0
  HDLC configuration:
    Giant threshold: 1514, Runt threshold: 3
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
  DS3 BERT configuration:
    BERT time period: 0 seconds, Elapsed: 0 seconds
    Algorithm: Unknown (0), Induced Error rate: 10e-0
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
  PFE configuration:
    Destination slot: 2, PLP byte: 2 (0xab)
    CoS transmit queue      Bandwidth      Buffer      Priority      Limit

```



```

                                %          bps  %          bytes
0 best-effort                   0          0  0          0      low  none
1 expedited-forwarding         0          0  0          0      low  none
2 assured-forwarding           0          0  0          0      low  none
3 network-control               0          0  0          0      low  none
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.118.96/30, Local: 192.168.118.97,
Broadcast: Unspecified, Generation: 44

```

Meaning The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the DS1 or DS3 interface and diagnose the media accordingly. See “Checklist for Locating Multichannel DS3 Alarms and Errors” on page 265 for an explanation of Multichannel DS3 alarms.

Monitor Statistics for a Channelized Interface

Purpose To monitor statistics for a channelized DS3 to DS0 interface or channelized DS3 to DS1 interface, use one of the following CLI operational mode commands:

Action `user@host> monitor interfaces ds-fpc/pic/port:channel:channel`
`user@host> monitor interfaces t1-fpc/pic/port:channel`

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```

user@host> monitor interface ds-2/1/0:5:1
host      Seconds: 9          Time: 10:36:11          Delay: 0/0/4

Interface: ds-2/1/0:5:1, Enabled, Link is Up
Encapsulation: Cisco-HDLC, Keepalives, Speed: 64kbps
Traffic statistics:
Input bytes:          52502 (80 bps)          [262]
Output bytes:         52608 (88 bps)          [344]
Input packets:        714 (0 pps)            [4]
Output packets:       714 (0 pps)            [5]
Encapsulation statistics:
Input keepalives:     133                    [1]
Output keepalives:    133                    [1]
Error statistics:
Input errors:         0                      [0]
Input drops:         0                      [0]
Input framing errors: 0                      [0]
Input runs:          0                      [0]
Input giants:        0                      [0]
Policed discards:     410                    [1]
L3 incompletes:       0                      [0]
L2 channel errors:    0                      [0]
L2 mismatch timeouts: 0                      [0]
Carrier transitions:  0                      [0]
Output errors:        0                      [0]
Output drops:        0                      [0]
Aged packets:         0Active alarms : N      [0]
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> monitor interface t1-2/1/0:19
host      Seconds: 4      Time: 10:37:53      Delay: 0/0/4

Interface: t1-2/1/0:19, Enabled, Link is Up
Encapsulation: Cisco-HDLC, Keepalives, Speed: T1
Traffic statistics:
  Input bytes:      27046020 (124752 bps)      [32358]
  Output bytes:     186975710 (623840 bps)      [161809]
  Input packets:    233498 (139 pps)           [289]
  Output packets:   273161 (139 pps)           [290]
Encapsulation statistics:
  Input keepalives:      138      [0]
  Output keepalives:     141      [0]
Error statistics:
  Input errors:          0      [0]
  Input drops:          0      [0]
  Input framing errors:  0      [0]
  Input runs:           0      [0]
  Input giants:         0      [0]
  Policed discards:     439      [0]
  L3 incompletes:       0      [0]
  L2 channel errors:    0      [0]
  L2 mismatch timeouts: 0      [0]
  Carrier transitions:  0      [0]
  Output errors:        0      [0]
  Output drops:         0      [0]
  Aged packets:         0Active alarms : N      [0]
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Meaning This command checks for and displays common interface failures, indicates whether loopback is detected, and shows increases in framing errors. Use information from this command to help narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.

Table 55 on page 248 lists additional problem situations and actions to help you further understand an interface problem.

Table 55: Problem Situations and Actions

| Problem Situation | Action |
|--|--|
| Framing errors are increasing. | Check the frame checksum sequence (FCS), scrambling, and subrate configuration. |
| Framing errors are increasing, and the configuration is correct. | Check the cabling to the router and have the carrier verify the integrity of the line. |
| Input errors are increasing. | Check the cabling to the router and have the carrier verify the integrity of the line. |



.....

NOTE: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

.....

Use Loopback Testing for Multichannel DS3 Interfaces

This chapter describes using loopback testing to isolate Multichannel DS3 interface problems.

- Checklist for Using Loopback Testing for Multichannel DS3 Interfaces on page 251
- Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface on page 253
- Create a Loopback on page 253
- Verify That the Interface Is Up on page 254
- Clear Interface Statistics on page 255
- Force the Link Layer to Stay Up on page 256
- Verify the Status of the Logical Interface on page 257
- Ping the Channelized Interface on page 258
- Check for Interface Error Statistics on page 259
- Diagnose a Suspected Circuit Problem on page 262
- Create a Loop from the Router to the Network on page 263
- Create a Loop to the Router from Various Points in the Network on page 264

Checklist for Using Loopback Testing for Multichannel DS3 Interfaces

Purpose Table 56 on page 251 provides links and commands for using loopback testing to isolate Multichannel DS3 interface problems.

Table 56: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces

| Tasks | Command or Action |
|---|-------------------------------------|
| “Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 253 | |
| 1. Create a Loopback on page 253 | |
| a. Create a Physical Loopback on page 253 | Connect the TX port to the RX port. |

Table 56: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces (*continued*)

| Tasks | Command or Action |
|---|--|
| b. Configure a Local Loopback on page 253 | [edit interfaces <i>interface name</i> (t3-options t1-options)] set loopback local show commit |
| 2. Verify That the Interface Is Up on page 254 | show interfaces (ds- <i>fpc/pic/port:channel:channel</i> t1- <i>fpc/pic/port:channel</i>) |
| 3. Clear Interface Statistics on page 255 | clear interfaces statistics (t1- <i>fpc/pic/port:channel</i> ds- <i>fpc/pic/port:channel:channel</i>) |
| 4. Force the Link Layer to Stay Up on page 256 | |
| a. Configure Encapsulation to Cisco-HDLC on page 256 | [edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc show commit |
| b. Configure No-Keepalives on page 257 | [edit interfaces <i>interface-name</i>] set no-keepalives show commit |
| 5. Verify the Status of the Logical Interface on page 257 | show interfaces (ds- <i>fpc/pic/port:channel:channel</i> t1- <i>fpc/pic/port:channel</i>) |
| 6. Ping the Channelized Interface on page 258 | ping interface (ds- <i>fpc/pic/port:channel:channel</i> t1- <i>fpc/pic/port:channel</i>) <i>local-IP-address</i> bypass-routing count 1000 rapid |
| 7. Check for Interface Error Statistics on page 259 | show interfaces (ds- <i>fpc/pic/port:channel:channel</i> t1- <i>fpc/pic/port:channel</i>) extensive |
| “Diagnose a Suspected Circuit Problem” on page 262 | |
| 1. Create a Loop from the Router to the Network on page 263 | |
| a. Loop the Entire T3 Interface towards the Network on page 263 | [edit interfaces <i>interface-name</i> t3-options] set loopback remote show commit |
| b. Loop a Particular T1 Channel towards the Network on page 264 | [edit interfaces <i>interface-name</i> t1-options] set loopback remote show commit |
| 2. Create a Loop to the Router from Various Points in the Network on page 264 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 253. |

Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface

Problem To diagnose a suspected hardware problem with a Multichannel DS3 interface, follow these steps:

- Solution**
- Create a Loopback on page 253
 - Verify That the Interface Is Up on page 254
 - Clear Interface Statistics on page 255
 - Force the Link Layer to Stay Up on page 256
 - Verify the Status of the Logical Interface on page 257
 - Ping the Channelized Interface on page 258
 - Check for Interface Error Statistics on page 259

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the Multichannel DS3 port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback on page 253
2. Configure a Local Loopback on page 253

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port.

Meaning When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback, follow these steps:

1. In configuration mode, go to the following hierarchy level, depending on whether you are configuring a full T3 or T1 interface:

```
[edit]
user@host# edit interfaces interface-name (t3-options | t1-options)
```

2. Configure the local loopback:

```
[edit interfaces interface-name (t3-options | t1-options)]
user@host# set loopback local
```

The following is an example of the name for a T1 channel 0, group 0, on a Multichannel DS3 port for a channelized DS3 to DS0 interface:

```
[edit interfaces ds-2/1/0:0:0 t3-options]
```



NOTE: In order to configure T3 options on the Multichannel DS3, you configure the first logical interfaces: `ds-2/1/0:0:0 t3-options`.

The following is an example of the name for a T1 channel on a Multichannel DS3 port for a channelized DS3 to DS1 interface:

```
[edit interfaces t1-2/1/1:0 t1-options]
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# show
loopback local;
```

4. Commit the configuration:

```
user@host# commit
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# commit
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Verify That the Interface Is Up

Purpose Display the status of a DS1 or DS3 interface to determine whether the physical link is up or down.

Action To verify that the status of the Multichannel DS3 interface is up, use one of the following Junos OS command-line interface (CLI) operational mode commands:

```
user@host> show interfaces (ds-fpc/pic/port:channel:channel | t1- fpc/pic/port:channel )
```

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces ds-2/1/0:5:1
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
```



```

Interface index: 36, SNMP ifIndex: 133
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
16, Mode: M23,
Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 1 (00:00:06 ago), Output: 1 (00:00:06 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
DS1  alarms    : None
DS3  alarms    : None
DS1  defects   : None
DS3  defects   : None
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 192.168.140.196/30, Local: 192.168.140.197

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
  Input rate     : 741512 bps (224 pps)
  Output rate    : 1266528 bps (224 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 192.168.140.196/30, Local: 192.168.140.197

```

Meaning The sample output shows that the physical link is up and there are no DS1 or DS3 alarms or defects. You should not see any DS1 or DS3 alarms. You can check any interface on the Multichannel DS3 port.

Clear Interface Statistics

Purpose You must reset the Multichannel DS3 interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current efforts to diagnose the problem.

Action To clear all statistics for the interface, use the following Junos OS CLI operational mode command:

```
user@host> clear interfaces statistics (ds-fpc/pic/port:channel:channel |
t1-fpc/pic/port:channel)
```

Sample Output

```
user@host> clear interfaces statistics DS1/1/0:0:0
user@host>
user@host> clear interfaces statistics t1-1/1/0:0
user@host>
```

Meaning This command clears the interface statistics counters for the Multichannel or T1 interface only.

Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. You need to force the link layer to stay up by making some configuration changes to the encapsulation and keepalives.

Force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 256
2. Configure No-Keepalives on page 257

Configure Encapsulation to Cisco-HDLC

Action To set the encapsulation on a T1 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure Cisco-HDLC:

```
[edit interfaces interface-name ]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# commit
```

commit complete

Meaning This command sets the interface encapsulation to the Cisco High-Level Data-Link Control (HDLC) transport protocol.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a channelized DS3 or DS0 interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name
```

2. Configure no-keepalives:

```
[edit interfaces interface-name]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# commit
commit complete
```

Meaning By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Verify the Status of the Logical Interface

Purpose To verify the status of the logical interface, use the following Junos OS CLI operational mode command:

Action user@host> show interfaces (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*)

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces ds-2/1/0:5:1
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
```

```
16, Mode: M23,
Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 1 (00:00:06 ago), Output: 1 (00:00:06 ago)
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.10.196/30, Local: 10.10.10.197
```

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
Interface index: 50, SNMP ifIndex: 59
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
Mode: M23, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
Input rate : 741512 bps (224 pps)
Output rate : 1266528 bps (224 pps)
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.10.196/30, Local: 10.10.10.197
```

Meaning The sample output shows that both channelized interfaces have the physical and logical links up.

Ping the Channelized Interface

Purpose Use the **ping** command to verify the loopback connection.

Action To ping the local interface, use the following Junos OS CLI operational mode commands:

```
user@host> ping interface ds-fpc/pic/port:channel:channel | t1-fpc/pic/port:channel
local-IP-address bypass-routing count 1000 rapid
```

Sample Output

```

user@host> ping interface t1-2/1/0:7 192.168.126.29 bypass-routing count 1000 rapid
PING 192.168.126.29 (192.168.126.29 ): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 192.168.126.29 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 6.068/7.475/74.080/3.696 ms

```

Meaning This command sends 1000 ping packets out of the channelized interface under the Multichannel DS3 port to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with JTAC.

Action To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```

user@host> show interfaces (ds-fpc/pic/port:channel:channel | t1-fpc/pic/port:channel)
extensive

```

Sample Output The following sample output is for a channelized DS3 to DS0 interface:

```

user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)
    Output: 2 (last sent 00:00:05 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
  Traffic statistics:
    Input bytes :          524          304 bps
    Output bytes :          528          304 bps
    Input packets:           8           0 pps
    Output packets:          8           0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes:
    0,

```

```

L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1  alarms   : None
DS3  alarms   : None
DS1  defects  : None
DS3  defects  : None
T1  media:
      Seconds      Count  State
SEF          0         0  OK
BEE          0         0  OK
AIS          0         0  OK
LOF          0         0  OK
LOS          0         0  OK
YELLOW       0         0  OK
BPV          0         0
EXZ          0         0
LCV          0         0
PCV          0         0
CS           0         0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS          0
DS3  media:
      Seconds      Count  State
PLL Lock     0         0  OK
Reframing    0         0  OK
AIS          0         0  OK
LOF          0         0  OK
LOS          0         0  OK
IDLE         0         0  OK
YELLOW       0         0  OK
BPV          0         0
EXZ          0         0
LCV          0         0
PCV          0         0
LES          0
PES          0
PSES         0
SEFS         0
UAS          0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0   95  95         4        336         0         0
Queue1    5   5         1         22         0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : 1
  Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0x2f)
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      bytes
0 best-effort             0         0    0         0      low   none

```

```

1 expedited-forwarding 0 0 0 0 low none
2 assured-forwarding 0 0 0 0 low none
3 network-control 0 0 0 0 low none
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

```

```

Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 20 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
Unspecified,
Generation: 22

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
Interface index: 50, SNMP ifIndex: 59, Generation: 49
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
Mode: M23, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Hold-times : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
Input : 117 (last seen 00:00:08 ago)
Output: 121 (last sent 00:00:01 ago)
Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
Traffic statistics:
Input bytes : 22459734 236888 bps
Output bytes : 162288645 1322208 bps
Input packets: 201233 214 pps
Output packets: 236341 227 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:
0,
L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
T1 media:
Seconds Count State
SEF 0 0 OK
BEE 0 0 OK
AIS 0 0 OK
LOF 0 0 OK
LOS 0 0 OK
YELLOW 0 0 OK
BPV 0 0
EXZ 0 0
LCV 0 0
PCV 0 0
CS 0 0
LES 0
ES 0
SES 0

```

```

SEFS                                0
BES                                0
UAS                                0
DS3 media:                        Seconds      Count   State
PLL Lock                          0         0   OK
Reframing                        0         0   OK
AIS                              0         0   OK
LOF                              0         0   OK
LOS                              0         0   OK
IDLE                             0         0   OK
YELLOW                           0         0   OK
BPV                              0         0
EXZ                              0         0
LCV                              0         0
PCV                              0         0
LES                              0
PES                              0
PSES                             0
SEFS                             0
UAS                              0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0   95  95      234494    162020375      0         0
Queue1    5   5         164         5808      0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0xab)
  CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                           %      bps      %      bytes
0 best-effort             0         0   0         0      low     none
1 expedited-forwarding    0         0   0         0      low     none
2 assured-forwarding      0         0   0         0      low     none
3 network-control         0         0   0         0      low     none
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
Unspecified, Generation: 44

```

Meaning Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Problem When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a

loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

Solution To diagnose a suspected circuit problem, follow these steps:

- Create a Loop from the Router to the Network on page 263
- Create a Loop to the Router from Various Points in the Network on page 264

Create a Loop from the Router to the Network

To create a loop from the router to the network, follow these steps:

1. Loop the Entire T3 Interface towards the Network on page 263
2. Loop a Particular T1 Channel towards the Network on page 264

Loop the Entire T3 Interface towards the Network

Purpose Creating a loop from the entire T3 interface to the network allows the transport-layer engineer to test the router from various points in the network and isolate the problem.

Action To create a loop from the entire T3 interface to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name t3-options
```

2. Configure the loopback:

```
[edit interfaces interface-name t3-options]
user@host# set loopback remote
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-2/1/1:0 t3-options]
user@host# show
loopback remote;
```

4. Commit the configuration:

```
user@host# commit
```

Meaning The `loopback remote` command loops any traffic from the network back into the network.

The interface name is one of the following:

- T1 channel 0, channel group 0, on the Multichannel DS3 port for a channelized DS3 to DS0 interface (for example, `ds-2/1/1:0:0`)
- T1 channel 0 on the Multichannel DS3 port for a channelized DS3 to DS1 interface (for example, `t1-2/1/1:0`)

Loop a Particular T1 Channel towards the Network

Purpose Creating a loop from a particular T1 interface to the network allows the transport-layer engineer to test the T1 interface from various points in the network and isolate the problem.

Action To create a loop from a particular T1 interface to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
user@host# edit interfaces interface-name t1-options
```

2. Configure the loopback:

```
[edit interfaces interface-name t1-options]  
user@host# set loopback remote
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces ds-2/1/1:0:0 t1-options]  
user@host# show  
loopback remote;
```

4. Commit the configuration:

```
user@host# commit
```

Meaning This command loops any traffic from the network back into the network. The interface name is one of the following:

- Channel group 0 for the particular T1 channel on the Multichannel DS3 port for a channelized DS3 to DS3 interface (for example, **ds-2/1/1:2:0**)
- Particular T1 channel on the Multichannel DS3 port for a channelized DS3 to DS1 interface (for example, **t1-2/1/1:3**)

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Step 2 through Step 7 in “Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 253. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

Locate Multichannel DS3 Alarms and Errors

This chapter describes the most common Multichannel DS3 alarms and errors encountered when investigating line problems on a Juniper Networks router.

- Checklist for Locating Multichannel DS3 Alarms and Errors on page 265
- Display Alarms and Errors for Channelized DS3 to DS1 Interfaces on page 265
- Display Alarms and Errors for Channelized DS3 to DS0 Interfaces on page 268

Checklist for Locating Multichannel DS3 Alarms and Errors

Purpose Table 57 on page 265 provides links and commands for the most common Multichannel DS3 alarms and errors encountered when investigating line problems on a Juniper Networks router.

Table 57: Checklist for DS3 Alarms

| Tasks | Command or Action |
|---|--|
| “Display Alarms and Errors for Channelized DS3 to DS1 Interfaces” on page 265 | <code>show interfaces t1-fpc/pic/port:channel extensive</code> |
| “Display Alarms and Errors for Channelized DS3 to DS0 Interfaces” on page 268 | <code>show interfaces ds-fpc/pic/port:channel:channel extensive</code> |

Display Alarms and Errors for Channelized DS3 to DS1 Interfaces

Purpose To display channelized DS3 to DS1 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces t1-fpc/pic/port:channel extensive`

Sample Output

```
user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59, Generation: 49
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
```

```

Interface flags: Point-To-Point SNMP-Traps
Link flags      : Keepalives
Hold-times      : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 117 (last seen 00:00:08 ago)
  Output: 121 (last sent 00:00:01 ago)
Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
Traffic statistics:
  Input bytes :          22459734          236888 bps
  Output bytes :         162288645         1322208 bps
  Input packets:          201233          214 pps
  Output packets:         236341          227 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:
0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms :None
DS3 alarms :None
DS1 defects :None
DS3 defects :None
T1 media:
  Seconds      Count  State
SEF            0        0 OK
BEE            0        0 OK
AIS            0        0 OK
LOF            0        0 OK
LOS            0        0 OK
YELLOW         0        0 OK
BPV            0        0
EXZ            0        0
LCV            0        0
PCV            0        0
CS             0        0
LES            0
ES             0
SES            0
SEFS           0
BES            0
UAS            0
DS3 media:
  Seconds      Count  State
PLL Lock       0        0 OK
Reframing      0        0 OK
AIS            0        0 OK
LOF            0        0 OK
LOS            0        0 OK
IDLE           0        0 OK
YELLOW         0        0 OK
BPV            0        0
EXZ            0        0
LCV            0        0
PCV            0        0
LES            0
PES            0
PSES           0
SEFS           0
UAS            0
Interface transmit queues:
  B/W  WRR      Packets      Bytes      Drops      Errors

```

```

Queue0      95  95      234494  162020375      0      0
Queue1      5   5       164      5808      0      0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0xab)
  CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                           %      bps      %      bytes
0 best-effort             0      0      0      0      low      none
1 expedited-forwarding    0      0      0      0      low      none
2 assured-forwarding      0      0      0      0      low      none
3 network-control         0      0      0      0      low      none
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
Unspecified, Generation: 44

```

Meaning The sample output shows that there are no active alarms and active defects. When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T1 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell).

Table 58 on page 267 shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 58: T1 Media Alarms and Error Definitions

| T1 Media Alarm or Error | Definitions |
|-------------------------|--------------------------------------|
| AIS | Alarm indication signal (blue alarm) |
| BEE | Block error event |
| BES | Bursty errored seconds |
| BPV | Bipolar violation |
| CS | Controlled slip |

Table 58: T1 Media Alarms and Error Definitions (continued)

| T1 Media Alarm or Error | Definitions |
|-------------------------|--------------------------------|
| ES | Errored seconds |
| EXZ | Excessive zeros |
| LCV | Line code violation |
| LES | Line errored seconds |
| LOF | Loss of frame |
| LOS | Loss of signal |
| PCV | Path code violation |
| SEF | Severely errored frame |
| SEFS | Severely errored frame seconds |
| SES | Severely errored seconds |
| UAS | Unavailable seconds |
| YLW | Yellow alarm |

See “Checklist for T1 Alarms and Errors” on page 39 for more details on T1 alarms and statistics.

Display Alarms and Errors for Channelized DS3 to DS0 Interfaces

Purpose To display T3 alarms and errors for channelized DS3 to DS0 interfaces, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces ds-fpc/pic/port:channel:channel extensive`

Sample Output

```

user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)

```

```

Output: 2 (last sent 00:00:05 ago)
Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
Traffic statistics:
Input bytes :          524          304 bps
Output bytes :          528          304 bps
Input packets:           8           0 pps
Output packets:          8           0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes:
0,
L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
T1 media:
Seconds      Count  State
SEF          0        0 OK
BEE          0        0 OK
AIS          0        0 OK
LOF          0        0 OK
LOS          0        0 OK
YELLOW       0        0 OK
BPV          0        0
EXZ          0        0
LCV          0        0
PCV          0        0
CS           0        0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS          0
DS3 media:
Seconds      Count  State
PLL Lock     0        0 OK
Reframing    0        0 OK
AIS          0        0 OK
LOF          0        0 OK
LOS          0        0 OK
IDLE         0        0 OK
YELLOW       0        0 OK
BPV          0        0
EXZ          0        0
LCV          0        0
PCV          0        0
LES          0
PES          0
PSES         0
SEFS         0
UAS          0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0  95  95         4        336         0         0
Queue1   5   5         1         22         0         0
HDLC configuration:
Giant threshold: 1514, Runt threshold: 3
Timeslots      : 1
Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:

```

```

BERT time period: 0 seconds, Elapsed: 0 seconds
Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
BERT time period: 0 seconds, Elapsed: 0 seconds
Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
Destination slot: 2, PLP byte: 2 (0x2f)
CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                        %          bps      %          bytes
0 best-effort            0            0    0            0      low  none
1 expedited-forwarding   0            0    0            0      low  none
2 assured-forwarding     0            0    0            0      low  none
3 network-control        0            0    0            0      low  none
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 20 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.118.96/30, Local: 192.168.118.97, Broadcast:
Unspecified,
Generation: 22

```

Meaning The sample output shows that there are no active alarms and active defects. When a major error (such as an AIS) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T3 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell).



NOTE: T3 is a general term used to refer to the transmission of 44.736-Mbps digital circuits over any media. T3 can be transported over copper, fiber, or radio. DS3 is the term for the electrical signal found at the metallic interface for this circuit where most of the testing is performed.

Table 58 on page 267 shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 59: T3 Interface Error Counter Definitions

| T3 Alarm or Error | Definition |
|-------------------|-------------------------|
| AIS | Alarm indication signal |
| EXZ | Excessive zeros |
| FERF | Far-end failures |

Table 59: T3 Interface Error Counter Definitions (*continued*)

| T3 Alarm or Error | Definition |
|-------------------|---|
| IDLE | Idle code detected |
| LCV | Line code violation |
| LOS | Loss of signal |
| LOF | Loss of frame |
| YLW | Remote defect indication (yellow alarm) |
| PLL | Phase locked loop |

See “Checklist of Common T3 Alarms and Errors” on page 65 for more details on T3 alarms and statistics.

CHAPTER 27

Monitor Channelized OC12 Interfaces

This chapter describes how to monitor Channelized OC12 interfaces and begin the process of isolating Channelized OC12 interface problems when they occur.

- Checklist for Monitoring Channelized OC12 Interfaces on page 273
- Monitor Channelized OC12 Interfaces on page 274
- Monitor Channelized OC12 IQ Interfaces on page 279

Checklist for Monitoring Channelized OC12 Interfaces

Purpose Table 60 on page 273 provides links and commands for monitoring Channelized OC12 interfaces and begin the process of isolating Channelized OC12 interface problems when they occur.

Table 60: Checklist for Monitoring Channelized OC12 Interfaces

| Tasks | Command or Action |
|---|--|
| “Monitor Channelized OC12 Interfaces” on page 274 | |
| 1. Display the Status of Channelized OC12 Interfaces on page 274 | <code>show interfaces terse t3-interface-name*</code> |
| 2. Display the Status of a Specific Channelized OC12 Interface on page 275 | <code>show interfaces terse t3-fpc/pic/port:channel</code> |
| 3. Display Extensive Status Information for a Specific Channelized OC12 Interface on page 275 | <code>show interfaces t3-fpc/pic/port:channel extensive</code> |
| 4. Monitor Statistics for a Channelized OC12 Interface on page 278 | <code>monitor interfaces t3-fpc/pic/port:channel</code> |
| “Monitor Channelized OC12 IQ Interfaces” on page 279 | |
| 1. Display the Status of a Channelized OC12 IQ Interface on page 279 | <code>show interfaces terse coc*</code> <code>show interfaces controller</code> <code>show interfaces terse</code> |
| 2. Display the Status of the Controller Channelized OC12 IQ Interface on page 283 | <code>show interfaces interface-type-fpc/pic/port</code> <code>show interfaces interface-type-fpc/pic/port</code> <code>show interfaces interface-type-fpc/pic/port:channel</code> <code>show interfaces interface-type-fpc/pic/port:channel:channel</code> <code>show interfaces interface-type-fpc/pic/port:channel:channel:channel</code> |

Table 60: Checklist for Monitoring Channelized OC12 Interfaces
(continued)

| Tasks | Command or Action |
|--|---|
| 3. Display the Status of a Specific Channel of a Channelized OC12 IQ Interface on page 285 | <code>show interfaces <i>interface-type-fpc/pic/port:channel</i></code> <code>show interfaces <i>interface-type-fpc/pic/port:channel:channel</i></code> <code>show interfaces</code> <code><i>interface-type-fpc/pic/port:channel:channel:channel</i></code> |
| 4. Display Extensive Status Information for a Channelized OC12 IQ Interface on page 287 | <code>show interfaces <i>interface-type-interface-name</i> extensive</code> |
| 5. Monitor Statistics for a Channelized OC12 IQ Interface on page 290 | <code>monitor interfaces <i>interface-type-fpc/pic/port:channel</i></code> |

Monitor Channelized OC12 Interfaces

Purpose By monitoring Channelized OC12 interfaces, you begin the process of isolating Channelized OC12 interface problems when they occur.

To monitor your Channelized OC12 interfaces, follow these steps:

1. Display the Status of Channelized OC12 Interfaces on page 274
2. Display the Status of a Specific Channelized OC12 Interface on page 275
3. Display Extensive Status Information for a Specific Channelized OC12 Interface on page 275
4. Monitor Statistics for a Channelized OC12 Interface on page 278

Display the Status of Channelized OC12 Interfaces

Purpose To display the status of Channelized OC12 interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interfaces terse t3-interface-name*`

Sample Output 1 The following sample output is for a Channelized OC12 interface:

```

user@host> show interfaces terse t3-0/3/0:*
Interface           Admin Link Proto Local Remote
t3-0/3/0:0          up    up
t3-0/3/0:1          up    up
t3-0/3/0:2          up    up
t3-0/3/0:3          up    up
t3-0/3/0:4          up    up
t3-0/3/0:5          up    up
t3-0/3/0:6          up    up
t3-0/3/0:7          up    up
t3-0/3/0:8          up    up
t3-0/3/0:9          up    up
t3-0/3/0:10         up    up
t3-0/3/0:11         up    down

```

Meaning The sample output shows the status of both the physical and logical interfaces. In this example, all of the Channelized OC12 interfaces are up except the channel interface **t3-0/3/0:11**.

When only one or some individual T3 channels are down, you must troubleshoot the T3 channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the T3 channels are down, you must work with this as a T3 or OC12 SONET link, or a Physical Interface Card (PIC) problem. For more information on monitoring SONET interfaces, see “Checklist for Monitoring Channelized OC12 Interfaces” on page 273.

Display the Status of a Specific Channelized OC12 Interface

Purpose To display the status of specific Channelized OC12 interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces terse t3-fpc/pic/port:channel`

Sample Output

```
user@host> show interfaces terse t3-0/3/0:0
Interface           Admin Link Proto Local           Remote
t3-0/3/0:0           up    up

user@host> show interfaces terse t3-0/3/0:11
Interface           Admin Link Proto Local           Remote
t3-0/3/0:11          up    down
```

Meaning The first line of the output shows the status of the link. If this line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets.

When only one or some individual T3 channels are down, you must troubleshoot the T3 channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the T3 channels are down, you must work with this as an OC12 SONET link or PIC problem. For more information on monitoring SONET interfaces, see “Checklist for Monitoring Channelized OC12 Interfaces” on page 273.

Display Extensive Status Information for a Specific Channelized OC12 Interface

Purpose To display extensive status information for a Channelized OC12 interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interface t3-fpc/pic/port:channel extensive`

Sample Output

```
user@host> show interfaces t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 118, Generation: 122
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
  Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  CoS queues    : 4 supported
  Last flapped  : 2004-05-21 15:23:34 UTC (01:59:02 ago)
```

```

Statistics last cleared: Never
Traffic statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
HS link CRC errors: 0, SRAM errors: 0
Output errors:
Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
DS3 alarms : None
SONET alarms : None
DS3 defects : None
SONET defects : None
DS3 media:
Seconds Count State
AIS 0 0 OK
LOF 0 0 OK
LOS 0 0 OK
IDLE 0 0 OK
YELLOW 0 0 OK
BPV 0 0
EXZ 0 0
LCV 0 0
PCV 0 0
CCV 0 0
LES 0
PES 0
PSES 0
CES 0
CSES 0
SEFS 0
UAS 0
HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 4484, Runt threshold: 3
Idle cycle flag: flags, Start end flag: shared
DSU configuration:
Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
BERT time period: 10 seconds, Elapsed: 0 seconds
Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
Interface transmit queues:
B/W WRR Packets Bytes
Queue0 0 0
Transmitted: 0 0
Drops: 0 0
Errors: 0
Queue1 0 0
Transmitted: 0 0
Drops: 0 0
Errors: 0
Queue2 0 0
Transmitted: 0 0
Drops: 0 0
Errors: 0
Queue3 0 0

```

```

Transmitted:                0          0
Drops:                      0          0
Errors:                     0
SONET PHY:                  Seconds    Count    State
  PLL Lock                   0          0    OK
  PHY Light                   0          0    OK
SONET section:
  BIP-B1                     1          22
  SEF                        0          0    OK
  LOS                        0          0    OK
  LOF                        0          0    OK
  ES-S                       1
  SES-S                      0
  SEFS-S                     0
SONET line:
  BIP-B2                     1          307
  REI-L                      0          0
  RDI-L                      3          1    OK
  AIS-L                      0          0    OK
  BERR-SF                    0          0    OK
  BERR-SD                    0          0    OK
  ES-L                       1
  SES-L                      0
  UAS-L                      0
  ES-LFE                     3
  SES-LFE                    3
  UAS-LFE                    0
SONET path:
  BIP-B3                     1          35
  REI-P                      1          7
  LOP-P                      0          0    OK
  AIS-P                      0          0    OK
  RDI-P                      0          0    OK
  UNEQ-P                     0          0    OK
  PLM-P                      1          1    OK
  ES-P                       1
  SES-P                      0
  UAS-P                      0
  ES-PFE                     1
  SES-PFE                    0
  UAS-PFE                    0
Received SONET overhead:
  F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
  Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
  F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
  Z4      : 0x00
Received path trace: t3-0/1/0:0
  74 33 2d 30 2f 31 2f 30 3a 30 00 00 00 00 0d 0a  t3-0/1/0:0:.....
Transmitted path trace: t3-0/3/0:0
  74 33 2d 30 2f 33 2f 30 3a 30 00 00 00 00 00 00  t3-0/3/0:0:.....
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x00)
CoS transmit queue          Bandwidth          Buffer Priority Limit
                             %          bps          %          bytes
0 best-effort                95      42499200 95          0          low    none
3 network-control            5       2236800  5          0          low    none

```

Meaning The sample output shows where the errors might be occurring, either with the T3 media or the SONET layer. In this example, there are no SONET or DS3 alarms or defects. However, if errors occur, you must troubleshoot the T3 media or the SONET layer.

Monitor Statistics for a Channelized OC12 Interface

Purpose To monitor statistics for a Channelized OC12 interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interfaces t3-fpc/pic/port:channel`

Sample Output

```

user@host> monitor interfaces t3-0/3/0:11
host          Seconds: 12          Time: 17:27:15          Delay: 32/0/32

Interface: t3-0/3/0:11, Enabled, Link is Down
Encapsulation: Cisco-HDLC, Keepalives, Speed: T3
Traffic statistics:
  Input bytes:          109846 (176 bps)          [44]
  Output bytes:         110308 (176 bps)          [44]
  Input packets:        1687 (1 pps)              [2]
  Output packets:       1693 (1 pps)              [2]
Encapsulation statistics:
  Input keepalives:      8                        [2]
  Output keepalives:     7                        [2]
Error statistics:
  Input errors:          0                        [0]
  Input drops:           0                        [0]
  Input framing errors:  1066                     [0]
  Input runs:            0                        [0]
  Input giants:          0                        [0]
  Policed discards:      0                        [0]
  L3 incompletes:        0                        [0]
  L2 channel errors:     3                        [0]
  L2 mismatch timeouts:  0                        [0]
  Carrier transitions:    7                        [0]
  Output errors:         0      Output drops:     [0]
Interface warnings:
  o Loopback detected while not in test mode

```

Meaning The sample output shows common interface failures, indicates whether loopback is detected, and shows increases in framing errors. Use information from this command to help narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.



CAUTION: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

Monitor Channelized OC12 IQ Interfaces

Purpose By monitoring Channelized OC12 intelligent queuing (IQ) interfaces, you begin the process of isolating Channelized OC12 IQ interface problems when they occur.

To monitor your Channelized OC12 IQ interface, follow these steps:

1. Display the Status of a Channelized OC12 IQ Interface on page 279
2. Display the Status of the Controller Channelized OC12 IQ Interface on page 283
3. Display the Status of a Specific Channel of a Channelized OC12 IQ Interface on page 285
4. Display Extensive Status Information for a Channelized OC12 IQ Interface on page 287
5. Monitor Statistics for a Channelized OC12 IQ Interface on page 290

Display the Status of a Channelized OC12 IQ Interface

Purpose To display the status of Channelized OC12 IQ interfaces, use one or all of the following Junos OS CLI operational mode commands:

Action user@host> show interfaces terse coc*
user@host> show interfaces controller
user@host> show interfaces terse

Sample Output 1

```
user@host> show interfaces terse coc*
Interface                Admin Link Proto Local Remote
coc12-0/0/0              up    up
coc1-0/0/0:2             up    up
coc1-0/0/0:3             up    up
coc1-0/0/0:4             up    up
coc1-0/0/0:5             up    up
coc1-0/0/0:6             up    up
```

Sample Output 2

```
user@host> show interfaces controller
Controller                Admin Link
coc12-0/0/0              up    up
  so-0/0/0:1             up    up
  coc1-0/0/0:2            up    up
    t1-0/0/0:2:1          up    up
    t1-0/0/0:2:2          up    up
    t1-0/0/0:2:3          up    up
    t1-0/0/0:2:4          up    up
    t1-0/0/0:2:5          up    up
    t1-0/0/0:2:6          up    up
    t1-0/0/0:2:7          up    up
    t1-0/0/0:2:8          up    up
    t1-0/0/0:2:9          up    up
    t1-0/0/0:2:10         up    up
    t1-0/0/0:2:11         up    up
    t1-0/0/0:2:12         up    up
    t1-0/0/0:2:13         up    up
    t1-0/0/0:2:14         up    up
    t1-0/0/0:2:15         up    up
    t1-0/0/0:2:16         up    up
    t1-0/0/0:2:17         up    up
    t1-0/0/0:2:18         up    up
    t1-0/0/0:2:19         up    up
```

```

t1-0/0/0:2:20      up    up
t1-0/0/0:2:21      up    up
t1-0/0/0:2:22      up    up
t1-0/0/0:2:23      up    up
t1-0/0/0:2:24      up    up
t1-0/0/0:2:25      up    up
t1-0/0/0:2:26      up    up
t1-0/0/0:2:27      up    up
t1-0/0/0:2:28      up    up
coc1-0/0/0:3        up    up
t3-0/0/0:3          up    up
coc1-0/0/0:4        up    up
  ct1-0/0/0:4:1      up    up
    ds-0/0/0:4:1:1    up    up
coc1-0/0/0:5        up    up
t3-0/0/0:5          up    up
  t1-0/0/0:5:1       up    up
coc1-0/0/0:6        up    up
t3-0/0/0:6          up    up
  ct1-0/0/0:6:1      up    up
    ds-0/0/0:6:1:1    up    up

```

Sample Output 3 user@host> show interfaces terse

| Interface | Admin | Link | Proto | Local | Remote |
|--------------------------|-------|------|-------|----------------|--------|
| coc12-0/0/0 | up | up | | | |
| so-0/0/0:1 | up | up | | | |
| so-0/0/0:1.0 | up | up | inet | 20.20.20.1/30 | |
| coc1-0/0/0:2 | up | up | | | |
| t1-0/0/0:2:1 | up | up | | | |
| t1-0/0/0:2:1.0 | up | up | inet | 20.20.20.5/30 | |
| t1-0/0/0:2:2 | up | up | | | |
| [...Output Truncated...] | | | | | |
| t1-0/0/0:2:27 | up | up | | | |
| t1-0/0/0:2:28 | up | up | | | |
| coc1-0/0/0:3 | up | up | | | |
| t3-0/0/0:3 | up | up | | | |
| coc1-0/0/0:4 | up | up | | | |
| ct1-0/0/0:4:1 | up | up | | | |
| ds-0/0/0:4:1:1 | up | up | | | |
| ds-0/0/0:4:1:1.0 | up | up | inet | 20.20.20.13/30 | |
| coc1-0/0/0:5 | up | up | | | |
| ct3-0/0/0:5 | up | up | | | |
| t1-0/0/0:5:1 | up | up | | | |
| t1-0/0/0:5:1.0 | up | up | inet | 20.20.20.17/30 | |
| coc1-0/0/0:6 | up | up | | | |
| ct3-0/0/0:6 | up | up | | | |
| ct1-0/0/0:6:1 | up | up | | | |
| ds-0/0/0:6:1:1 | up | up | | | |
| ds-0/0/0:6:1:1.0 | up | up | inet | 20.20.20.21/30 | |

Meaning The sample output shows the status of both the physical and logical interfaces. In this example, all of the channelized OC12 IQ interfaces are up.

Sample output 1 shows the channelized interfaces that are configured, but not the channels for those channelized interfaces.

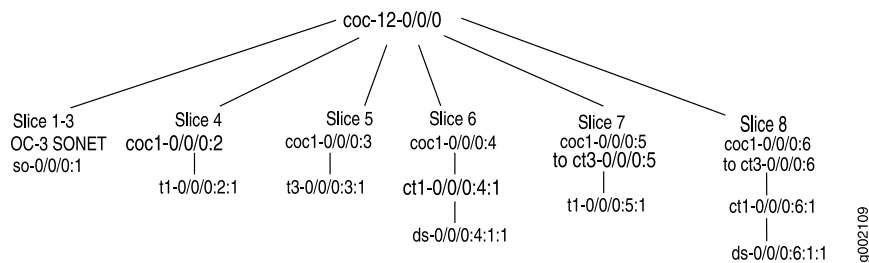
Sample output 2 shows the channels for the channelized interfaces that are configured and the hierarchy, but not the interface address information. At the top, the hierarchy includes the controller interface **coc12-0/0/0**.

Sample output 3 shows all channelized interfaces and their configured channels and the address information.

When only one or some individual channels are down, you must troubleshoot the channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the channels are down, you must work with this as a T1, T3, DS0, or OC12 SONET link or PIC problem. For more information on monitoring these types of interfaces, see the respective sections in this guide.

The interface configuration of the OC12 IQ interface used for all **show** commands in this section is shown in Figure 22 on page 281.

Figure 22: Sample Configuration of Channelized OC12 IQ Interface



In addition, the configuration is shown in the following output:

```

interfaces {
  coc12-0/0/0 {
    partition 1 oc-slice 1-3 interface-type so;
    partition 2 oc-slice 4 interface-type coc1;
    partition 3 oc-slice 5 interface-type coc1;
    partition 4 oc-slice 6 interface-type coc1;
    partition 5 oc-slice 7 interface-type coc1;
    partition 6 oc-slice 8 interface-type coc1;
  }
  so-0/0/0:1 {
    description "oc-slice 1-3 of coc12-0/0/0. COC12 > OC3.";
    unit 0 {
      family inet {
        address 20.20.20.2/30;
      }
    }
  }
  coc1-0/0/0:2 {
    description "oc-slice 4 of coc12-0/0/0. COC12 to COC1 VT-mapped to T1s.";
    partition 1-28 interface-type t1;
  }
  t1-0/0/0:2:1 {
    unit 0 {
      family inet {
        address 20.20.20.6/30;
      }
    }
  }
  coc1-0/0/0:3 {
    description " oc-slice 5 of coc12-0/0/0. COC12 to COC1 converted to a T3.";
  }
}

```

```
        no-partition interface-type t3;
    }
    t3-0/0/0:3:1 {
        unit 0 {
            family inet {
                address 20.20.20.10/30;
            }
        }
    }
    coc1-0/0/0:4 {
        description " oc-slice 6 of coc12-0/0/0. CT1 to NxDS-Os.";
        partition 1 interface-type ct1;
    }
    ct1-0/0/0:4:1 {
        partition 1 timeslots 1-10 interface-type ds;
    }
    ds-0/0/0:4:1:1 {
        unit 0 {
            family inet {
                address 20.20.20.14/30;
            }
        }
    }
    coc1-0/0/0:5 {
        description " oc-slice 7 of coc12-0/0/0. COC12 to COC1 converted to a CT3 to T1s.";
        no-partition interface-type ct3;
    }
    ct3-0/0/0:5 {
        partition 1 interface-type t1;
    }
    t1-0/0/0:5:1 {
        unit 0 {
            family inet {
                address 20.20.20.18/30;
            }
        }
    }
    coc1-0/0/0:6 {
        description " oc-slice 8 of coc12-0/0/0. COC12 to COC1 converted to a CT3 to CT1 to
        NxDS-Os.";
        no-partition interface-type ct3;
    }
    ct3-0/0/0:6 {
        partition 1 interface-type ct1;
    }
    ct1-0/0/0:6:1 {
        partition 1 timeslots 1 interface-type ds;
    }
    ds-0/0/0:6:1:1 {
        unit 0 {
            family inet {
                address 20.20.20.22/30;
            }
        }
    }
}
```

The above configuration shows the OC12 IQ interface configured into eight channels or slices as shown in Figure 22 on page 281. A summary of the channels follows:

- Channels 1 through 3 are for SONET interfaces
- Channel 4 is for T1 interfaces
- Channel 5 is for T3 interfaces
- Channel 6 is for DS0 interfaces
- Channels 7 is for T1 interfaces
- Channel 8 is for DS0 interfaces

Display the Status of the Controller Channelized OC12 IQ Interface

Purpose To display the status of the controller OC12 IQ interface, use one or all of the following Junos OS CLI operational mode commands, depending on the level of channelization:

Action

```
user@host> show interfaces interface-type-fpc/pic/port
user@host> show interfaces interface-type-fpc/pic /port:channel:channel
user@host> show interfaces interface-type-fpc/pic/port:channel:channel:channel
```

Sample Output 1

```
user@host> show interfaces coc12-0/0/0
Physical interface: coc12-0/0/0, Enabled, Physical link is Up
Interface index: 195, SNMP ifIndex: 82
Link-level type: Controller , Clocking: Internal, SONET mode, Speed: OC12,
Loopback: None, Parent: None
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : None
CoS queues : 4 supported
Last flapped : 2004-05-26 21:37:18 UTC (00:44:19 ago)
SONET alarms : None
SONET defects : None
```

Sample Output 2

```
user@host> show interfaces coc1-0/0/0:2
Physical interface: coc1-0/0/0:2, Enabled, Physical link is Up
Interface index: 198, SNMP ifIndex: 88
Link-level type: Controller , Clocking: Internal, SONET mode, Speed: 51840kbps,
Loopback: None, Parent: coc12-0/0/0 Interface index 195
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : None
CoS queues : 4 supported
Last flapped : 2004-05-26 22:19:18 UTC (00:07:06 ago)
SONET alarms : None
SONET defects : None
```

Sample Output 3

```
user@host> show interfaces ct3-0/0/0:5
Physical interface: ct3-0/0/0:5, Enabled, Physical link is Up
Interface index: 233, SNMP ifIndex: 169
Link-level type: Controller , Clocking: Internal, Speed: T3, Loopback: None,
Mode: C/Bit parity, Parent: coc1-0/0/0:5 Interface index 232
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : None
CoS queues : 4 supported
```

```

Last flapped   : Never
Active alarms  : None
Active defects : None
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0

```

Sample Output 4

```

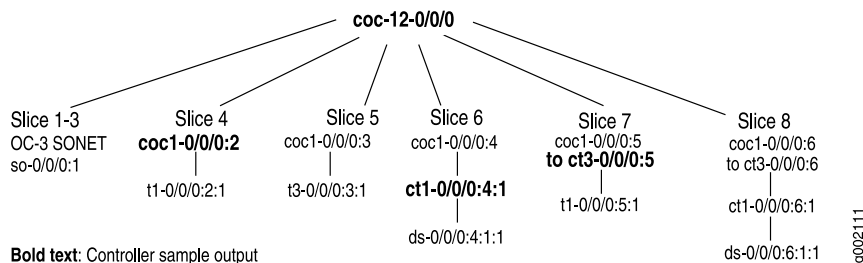
user@host> show interfaces ct1-0/0/0:4:1
Physical interface: ct1-0/0/0:4:1, Enabled, Physical link is Up
Interface index: 230, SNMP ifIndex: 167
Link-level type: Controller , Clocking: Internal, Speed: T1, Loopback: None,
Framing: ESF, Parent: coc1-0/0/0:4 Interface index 229
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : None
CoS queues     : 4 supported
Last flapped   : Never
DS1 alarms     : None
DS1 defects    : None
SONET alarms   : None
SONET defects   : None

```

Meaning The first line of the output shows the status of the link. If this line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets.

The controller interface is partitioned into other interface types and appears at the top of a specific level of channelization. For a visual representation of the controller interface at different levels of channelization, see Figure 23 on page 284.

Figure 23: Controller Interfaces at Different Levels of Channelization



Each of the four examples of controller output is for a different level of channelization.

Sample output 1 for interface **coc12-0/0/0** shows **Parent: None**, which indicates the top-most level of channelization.

Sample output 2 for interface **coc1-0/0/0:2** shows **Parent: coc12-0/0/0**, which indicates that this interface is one level down from the top-most level, and is the OC1 controller for a first level of channelization.

Sample output 3 for interface **ct3-0/0/0:5** shows **Parent: coc1-0/0/0:5**, which indicates that this interface is at the second level of channelization, and is a CT3 controller.

Sample output 4 for interface **ct1-0/0/0:4:1** shows **Parent: coc1-0/0/0:4:1**, which indicates that this interface is at the third level of channelization, and is a CT1 controller.

Display the Status of a Specific Channel of a Channelized OC12 IQ Interface

Purpose To display the status of a specific channel of an OC12 IQ interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces interface-type-fpc/pic/port:channel`
`user@host> show interfaces interface-type-fpc/pic/port:channel:channel`
`user@host> show interfaces interface-type-fpc/pic/port:channel:channel:channel`

Sample Output 1 `user@host> show interfaces so-0/0/0:1`

```
Physical interface: so-0/0/0:1, Enabled, Physical link is Up
  Interface index: 197, SNMP ifIndex: 131
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 16, Payload scrambler: Enabled,
  Parent: coc12-0/0/0 Interface index 195
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 17 (00:00:01 ago), Output: 17 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues    : 4 supported
  Last flapped   : 2004-05-26 22:19:18 UTC (00:02:59 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : None
  SONET defects  : None
  Logical interface so-0/0/0:1.0 (Index 70) (SNMP ifIndex 132)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 4470
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 20.20.20.0/30, Local: 20.20.20.1, Broadcast: 20.20.20.3
```

Sample Output 2 `user@host> show interfaces tl-0/0/0:2:1`

```
Physical interface: tl-0/0/0:2:1, Enabled, Physical link is Up
  Interface index: 199, SNMP ifIndex: 133
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Framing: ESF,
  Parent: coc1-0/0/0:2 Interface index 198
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 44 (00:00:07 ago), Output: 46 (00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues    : 4 supported
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1 alarms    : None
  DS1 defects    : None
  SONET alarms   : None
```

```

SONET defects : None
Logical interface t1-0/0/0:2:1.0 (Index 71) (SNMP ifIndex 134)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 20.20.20.4/30, Local: 20.20.20.5, Broadcast: 20.20.20.7

```

Sample Output 3

```

user@host> show interfaces ds-0/0/0:4:1:1
Physical interface: ds-0/0/0:4:1:1, Enabled, Physical link is Up
  Interface index: 231, SNMP ifIndex: 168
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps,
  Loopback: None, FCS: 16, Parent: ct1-0/0/0:4:1 Interface index 230
  Device flags : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 58 (00:00:06 ago), Output: 59 (00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues : 4 supported
  Last flapped : Never
  Input rate : 48 bps (0 pps)
  Output rate : 48 bps (0 pps)
  DSO BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
  Logical interface ds-0/0/0:4:1:1.0 (Index 75) (SNMP ifIndex 173)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 1500
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 20.20.20.12/30, Local: 20.20.20.13, Broadcast: 20.20.20.15

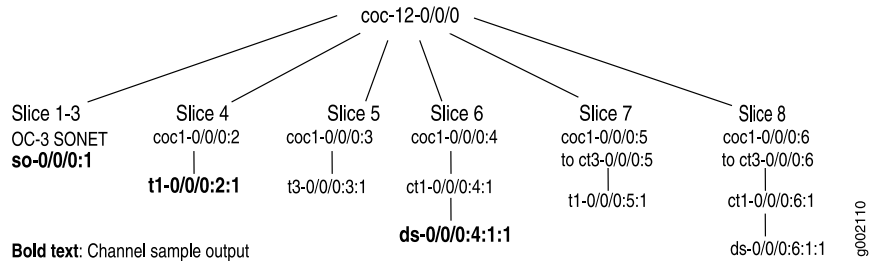
```

Meaning The first line of the output shows the status of the link. If this line shows that the physical link is up, the physical link is healthy and can pass packets. If this line shows that the physical link is down, the physical link is unhealthy and cannot pass packets. All four examples of output show the link is up and can pass packets.

Sample output 1 shows an OC3 SONET interface. Sample output 2 shows a T1 interface that is the result of a partitioned OC1 interface, and sample output 3 shows a DS0 interface that is the result of an OC1 interface partitioned into a T1 interface, which is further partitioned into the DS0 interface.

Figure 24 on page 287 shows a visual representation of the different channel levels.

Figure 24: Specific Channels of a Channelized OC12 IQ Interface



When only one or some individual channels are down, you must troubleshoot the channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the channels are down, you must work with this as a T1, T3, DS0, or OC12 SONET link or PIC problem. For more information on monitoring these types of interfaces, see the respective sections in this guide.

Display Extensive Status Information for a Channelized OC12 IQ Interface

Purpose To display extensive status information for a Channelized OC12 IQ interface, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces interface-type-interface-name extensive`

Sample Output 1 The following sample output is for a controller interface:

```

user@host> show interfaces coc12-0/0/0 extensive
Physical interface: coc12-0/0/0, Enabled, Physical link is Up
Interface index: 138, SNMP ifIndex: 82, Generation: 21
Link-level type: Controller, Clocking: Internal, SONET mode, Speed: OC12,
Loopback: None, Parent: None
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : None
Hold-times     : Up 0 ms, Down 0 ms
CoS queues     : 4 supported
Last flapped   : 2004-05-18 21:25:45 UTC (2d 00:04 ago)
Statistics last cleared: Never
SONET alarms :None
SONET defects :None
SONET PHY:
Seconds      Count  State
  PLL Lock         0      0  OK
  PHY Light         0      0  OK
SONET section:
Seconds      Count  State
  BIP-B1          0      0
  SEF              77      1  OK
  LOS              77      1  OK
  LOF              77      1  OK
  ES-S             77
  SES-S            77
  SEFS-S           77
SONET line:
Seconds      Count  State
  BIP-B2          0      0
  REI-L           82584 1274876
  RDI-L            5      1  OK
  AIS-L            0      0  OK
  BERR-SF          77      1  OK
  
```

```

BERR-SD                2                1 OK
ES-L                   77
SES-L                  77
UAS-L                   67
ES-LFE                 82589
SES-LFE                 5
UAS-LFE                 0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00

```

Sample Output 2 The following sample output is for a channel on a Channelized OC12 IQ interface:

```

user@host> show interfaces tl-0/0/0:2:1 extensive
Physical interface: tl-0/0/0:2:1, Enabled, Physical link is Up
Interface index: 186, SNMP ifIndex: 133, Generation: 69
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Framing: ESF,
Parent: coc1-0/0/0:2 Interface index 185
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 444 (last seen 00:00:05 ago)
  Output: 442 (last sent 00:00:09 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : Never
Statistics last cleared: Never
Traffic statistics:
Input bytes  :                10948                0 bps
Output bytes :                11792                0 bps
Input packets:                 892                0 pps
Output packets:                940                0 pps
Input errors:
  Errors: 2, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
  Policed discards: 2, L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets  Dropped packets

  0 best-effort                3                3                0
  1 expedited-fo                0                0                0
  2 assured-forw                0                0                0
  3 network-cont            937            937                0

DS1 alarms :None
DS1 defects :None
T1 media:      Seconds      Count  State

```

```

SEF                1                1 OK
BEE                2                2 OK
AIS                0                0 OK
LOF                108              1 OK
LOS                0                0 OK
YELLOW             0                0 OK
BPV                0                0
EXZ                0                0
LCV                1                1
PCV                0                0
CS                0                0
LES                108
ES                 108
SES                108
SEFS               108
BES                0
UAS                116
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
SONET alarms :None
SONET defects :None
SONET vt:
  BIP-BIP2         0                0
  REI-V            25              25
  LOP-V            93              1 OK
  AIS-V            0                0 OK
  RDI-V            0                0 OK
  UNEQ-V           0                0 OK
  PLM-V            93              1 OK
  ES-V             93
  SES-V            93
  UAS-V            83
  ES-VFE           25
  SES-VFE           25
  UAS-VFE           0
Received SONET overhead:
  V5               : 0x02, V5(cmp) : 0x02
Transmitted SONET overhead:
  V5               : 0x02
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 4 (0x00)
Logical interface t1-0/0/0:2:1.0 (Index 70) (SNMP ifIndex 134)
(Generation 15)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 24, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 20.20.20.4/30, Local: 20.20.20.5, Broadcast: 20.20.20.7,
    Generation: 29

```

Meaning The sample output shows where the errors might be occurring: either with the channel media or the SONET layer. In this example, there are no errors. However, if errors occur, you must troubleshoot the channel media or the SONET layer. For more information, see the sections of this guide that correspond to the media with which you are working.

Monitor Statistics for a Channelized OC12 IQ Interface

Purpose To monitor statistics for a Channelized OC12 interface, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interfaces interface-type-fpc/pic/port:channel`

Sample Output

```

user@host> monitor interfaces so-0/0/0:1.0
host          Seconds: 10          Time: 00:23:13          Delay: 0/0/32

Interface: so-0/0/0:1.0, Enabled, Link is Up
Flags: Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
  Input bytes:          431244          [0]
  Output bytes:         432268          [0]
  Input packets:        35933           [0]
  Output packets:       36019           [0]
Remote statistics:
  Input bytes:          0 (0 bps)       [0]
  Output bytes:         0 (0 bps)       [0]
  Input packets:        0 (1 pps)       [0]
  Output packets:       0 (0 pps)       [0]
Traffic statistics:
  Input bytes:          431244          [0]
  Output bytes:         432268          [0]
  Input packets:        35933           [0]
  Output packets:       36019           [0]
Protocol: inet, MTU: 4470

user@host> monitor interfaces t1-0/0/0:2:1.0
host          Seconds: 1          Time: 00:32:07          Delay: 0/0/26

Interface: t1-0/0/0:2:1.0, Enabled, Link is Up
Flags: Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
  Input bytes:          432028          [0]
  Output bytes:         433076          [0]
  Input packets:        35954           [0]
  Output packets:       36041           [0]
Remote statistics:
  Input bytes:          0 (0 bps)       [0]
  Output bytes:         0 (0 bps)       [0]
  Input packets:        0 (0 pps)       [0]
  Output packets:       0 (0 pps)       [0]
Traffic statistics:
  Input bytes:          432028          [0]
  Output bytes:         433076          [0]
  Input packets:        35954           [0]
  Output packets:       36041           [0]
Protocol: inet, MTU: 1500

user@host> monitor interfaces ds-0/0/0:4:1.0

```

```

host          Seconds: 3          Time: 00:36:59          Delay: 0/0/0

Interface: ds-0/0/0:4:1:1.0, Enabled, Link is Up
Flags: Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
  Input bytes:          432836          [0]
  Output bytes:         433882          [0]
  Input packets:        36065          [0]
  Output packets:       36152          [0]
Remote statistics:
  Input bytes:          0 (0 bps)       [0]
  Output bytes:         0 (0 bps)       [0]
  Input packets:        0 (0 pps)       [0]
  Output packets:       0 (0 pps)       [0]
Traffic statistics:
  Input bytes:          432836          [0]
  Output bytes:         433882          [0]
  Input packets:        36065          [0]
  Output packets:       36152          [0]
Protocol: inet, MTU: 1500

```

Meaning The sample output shows common interface failures, indicates whether loopback is detected, and shows increases in framing errors. Use information from this command to help narrow down possible causes of an interface problem.



NOTE: If you are accessing the router from the console connection, make sure you set the CLI terminal type using the `set cli terminal` command.



CAUTION: We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

Use Loopback Testing for Channelized OC12 Interfaces

This chapter describes using loopback testing to isolate Channelized OC12 and Channelized OC12 IQ interface problems. The procedure for both types of Channelized OC12 interfaces is the same. The naming convention for the Channelized OC12 IQ interface varies depending on the type of interface. For a list of interface types associated with the Channelized OC12 IQ interface, see the [Junos OS Network Interfaces Configuration Guide](#).

- Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces on page 293
- Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface on page 294
- Create a Loopback on page 295
- Verify That the Interface Is Up on page 296
- Clear Interface Statistics on page 299
- Force the Link Layer to Stay Up on page 299
- Verify the Status of the Logical Interface on page 301
- Ping the Channelized Interface on page 302
- Check for Interface Error Statistics on page 302
- Diagnose a Suspected Circuit Problem on page 305

Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces

Purpose Table 61 on page 293 provides links and commands for using loopback testing to isolate Channelized OC12 and Channelized OC12 IQ interface problems. The naming convention for the Channelized OC12 IQ interface varies depending on the type of interface.

Table 61: Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces

| Tasks | Command or Action |
|--|-------------------|
| “Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface” on page 294 | |
| 1. Create a Loopback on page 295 | |

Table 61: Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces (*continued*)

| Tasks | Command or Action |
|---|--|
| a. Create a Physical Loopback on page 295 | Connect the TX port to the RX port. |
| b. Configure a Local Loopback on page 295 | <code>[edit interfaces t3-fpc/pic/port:channel t3 options] set loopback local show commit</code> |
| 2. Verify That the Interface Is Up on page 296 | <code>show interfaces t3-fpc/pic/port:channel extensive</code> |
| 3. Clear Interface Statistics on page 299 | <code>clear interfaces statistics t3-fpc/pic/port:channel</code> |
| 4. Force the Link Layer to Stay Up on page 299 | |
| a. Configure Encapsulation to Cisco-HDLC on page 299 | <code>[edit interfaces t3-fpc/pic/port:channel] set encapsulation cisco-hdlc show commit</code> |
| b. Configure No-Keepalives on page 300 | <code>[edit interfaces t3-fpc/pic/port:channel] set no-keepalives show commit</code> |
| 5. Verify the Status of the Logical Interface on page 301 | <code>show interfaces t3-fpc/pic/port:channel</code> |
| 6. Ping the Channelized Interface on page 302 | <code>ping interface t3-fpc/pic/port:channel local-IP-address bypass-routing count 1000 rapid</code> |
| 7. Check for Interface Error Statistics on page 302 | <code>show interfaces t3-fpc/pic/port:channel extensive</code> |
| “Diagnose a Suspected Circuit Problem” on page 305 | |
| 1. Loop the Entire T3 Interface Towards the Network on page 305 | <code>[edit interfaces t3-fpc/pic/port:channel t3-options] set loopback remote show commit</code> |
| 2. Create a Loop to the Router from Various Points in the Network on page 306 | Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface” on page 294. |

Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface

Problem To diagnose a suspected hardware problem with a Channelized OC12 or Channelized OC12 IQ interface, follow these steps:

- Solution**
- Create a Loopback on page 295
 - Verify That the Interface Is Up on page 296
 - Clear Interface Statistics on page 299
 - Force the Link Layer to Stay Up on page 299
 - Verify the Status of the Logical Interface on page 301
 - Ping the Channelized Interface on page 302
 - Check for Interface Error Statistics on page 302

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the Channelized OC12 or Channelized OC12 IQ port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos OS Network Interfaces Configuration Guide*.

1. Create a Physical Loopback on page 295
2. Configure a Local Loopback on page 295

Create a Physical Loopback

Action To create a physical loopback at the port, connect the transmit port to the receive port.

Meaning When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

Configure a Local Loopback

Action To configure a local loopback, follow these steps:



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel t3-options
```

2. Configure the local loopback:

```
[edit interfaces t3-fpc/pic/port:channel t3-options]
user@host# set loopback local
```

The following is an example of the name for a T3 channel on a channelized DS3 interface:

```
[edit interfaces t3-2/1/0:2 t3-options]
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-2/1/0:2 t3-options]
user@host# show
loopback local;
```

4. Commit the configuration:

```
user@host# commit
```

For example:

```
[edit interfaces t3-2/1/1:2 t3-options]
user@host# commit
commit complete
```

Meaning When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.



NOTE: Remember to delete the loopback statement after completing the test.

Verify That the Interface Is Up

Purpose Display the status of a Channelized OC12 or Channelized OC12 IQ interface to determine whether the physical link is up or down.

Action To verify that the status of the Channelized OC12 or Channelized OC12 IQ interface is up, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces t3-fpc/pic/port:channel extensive.
```



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see *Junos Network Interfaces Configuration Guide*.

```

Sample Output user@host> show interfaces t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 118, Generation: 122
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
  Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2004-05-21 15:23:34 UTC (00:05:00 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes   :                0                0 bps
    Output bytes  :                0                0 bps
    Input packets :                0                0 pps
    Output packets:                0                0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  DS3 alarms :None
  SONET alarms :None
  DS3 defects :None
  SONET defects :None
  DS3 media:
    Seconds      Count  State
    AIS          0       0 OK
    LOF          0       0 OK
    LOS          0       0 OK
    IDLE         0       0 OK
    YELLOW       0       0 OK
    BPV          0       0
    EXZ          0       0
    LCV          0       0
    PCV          0       0
    CCV          0       0
    LES          0
    PES          0
    PSES         0
    CES          0
    CSES         0
    SEFS         0
    UAS          0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 4484, Runt threshold: 3
    Idle cycle flag: flags, Start end flag: shared
  DSU configuration:
    Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
    FEAC loopback: Inactive, Response: Disabled, Count: 0
  DS-3 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
  Interface transmit queues:
    B/W  WRR      Packets      Bytes
  Queue0      0    0
    Transmitted:                0          0

```

```

        Drops:                                0            0
        Errors:                                0
Queue1      0      0
        Transmitted:                          0            0
        Drops:                                0            0
        Errors:                                0
Queue2      0      0
        Transmitted:                          0            0
        Drops:                                0            0
        Errors:                                0
Queue3      0      0
        Transmitted:                          0            0
        Drops:                                0            0
        Errors:                                0
SONET PHY:      Seconds      Count      State
  PLL Lock      0            0      OK
  PHY Light      0            0      OK
SONET section:
  BIP-B1          1            22
  SEF              0            0      OK
  LOS              0            0      OK
  LOF              0            0      OK
  ES-S            1
  SES-S           0
  SEFS-S          0
SONET line:
  BIP-B2          1            307
  REI-L           0            0
  RDI-L           3            1      OK
  AIS-L           0            0      OK
  BERR-SF         0            0      OK
  BERR-SD         0            0      OK
  ES-L            1
  SES-L           0
  UAS-L           0
  ES-LFE          3
  SES-LFE         3
  UAS-LFE         0
SONET path:
  BIP-B3          1            35
  REI-P           1            7
  LOP-P           0            0      OK
  AIS-P           0            0      OK
  RDI-P           0            0      OK
  UNEQ-P          0            0      OK
  PLM-P           1            1      OK
  ES-P            1
  SES-P           0
  UAS-P           0
  ES-PFE          1
  SES-PFE         0
  UAS-PFE         0
Received SONET overhead:
  F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
  Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
  F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
  Z4      : 0x00
Received path trace: t3-0/1/0:0

```

```

74 33 2d 30 2f 31 2f 30 3a 30 00 00 00 0d 0a t3-0/1/0:0.....
Transmitted path trace: t3-0/3/0:0
74 33 2d 30 2f 33 2f 30 3a 30 00 00 00 00 00 t3-0/3/0:0.....
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort            95      42499200 95      0      low  none
3 network-control        5      2236800  5      0      low  none

```

Meaning The sample output shows that the physical link is up and there are no OC12 alarms or defects. You should not see any OC12 alarms.

- Related Documentation**
- Checklist for Monitoring SONET Interfaces on page 123
 - Checklist for Using Loopback Testing for SONET Interfaces on page 131
 - List of Common SONET Alarms and Errors on page 145

Clear Interface Statistics

Purpose You must reset the Channelized OC12 or Channelized OC12 IQ interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input or output errors and packet statistics do not interfere with the current efforts to diagnose the problem.

Action To clear all statistics for the interface, use the following Junos OS CLI operational mode command:

```
user@host> clear interfaces statistics t3-fpc/pic/port:channel.
```

Sample Output

```
user@host> clear interfaces statistics t3-1/1/0:0
user@host>
```

Meaning This command clears the interface statistics counters for the Channelized OC12 interface only.

Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. You need to force the link layer to stay up by making some configuration changes to the encapsulation and keepalives.

Force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 299
2. Configure No-Keepalives on page 300

Configure Encapsulation to Cisco-HDLC

Action To set the encapsulation on a T3 physical interface, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel
```

2. Configure Cisco-HDLC:

```
[edit interfaces t3-fpc/pic /port:channel ]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# commit
commit complete
```

Meaning This command sets the interface encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol.

Configure No-Keepalives

Action To disable the sending of link-layer keepalives on a Channelized OC12 or Channelized OC12 IQ interface, follow these steps:



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see *Junos Network Interfaces Configuration Guide*.

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel
```

2. Configure no-keepalives:

```
[edit interfaces t3-fpc/pic/port:channel]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-0/1/1:8]
```

```
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# commit
commit complete
```

Meaning By setting no-keepalives, the link layer is forced to stay up. If the setting remains at keepalive, the router will recognize that the same link-layer keepalives are being looped back and will bring the link layer down.

Verify the Status of the Logical Interface

Purpose To verify the status of the logical interface, use the following Junos OS CLI operational mode command:

Action user@host> show interfaces t3-fpc/pic/port:channel.



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see *Junos Network Interfaces Configuration Guide*.

Sample Output

```
user@host> show interfaces t3-0/3/0:11
Physical interface: t3-0/3/0:11, Enabled, Physical link is Up
  Interface index: 204, SNMP ifIndex: 129
  Link-level type: Cisco-HDLC, MTU: 4474, SONET mode, Speed: T3, Loopback: Local,

  SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  CoS queues     : 4 supported
  Last flapped   : 2004-05-21 15:23:34 UTC (01:34:24 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS3 alarms    : None
  SONET alarms   : None
  DS3 defects    : None
  SONET defects  : None
  DS-3 BERT configuration:
    BERT time period: 0 seconds, Elapsed: 0 seconds
    Algorithm: Unknown (0), Induced error rate: 10e-0
  Logical interface t3-0/3/0:11.0 (Index 71) (SNMP ifIndex 130)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 4470
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.0.0.0/30, Local: 10.0.0.1, Broadcast: 10.0.0.3
```

Meaning The sample output shows that the channelized interface has the physical and logical links up. There are no alarms or defects.

Related Documentation

- Checklist for Monitoring SONET Interfaces on page 123
- Checklist for Using Loopback Testing for SONET Interfaces on page 131
- List of Common SONET Alarms and Errors on page 145

Ping the Channelized Interface

Purpose Use the `ping` command to verify the loopback connection.

Action To ping the local interface, use the following Junos OS CLI operational mode command:

```
user@host> ping interface t3-fpc/pic/port:channel local-IP-address bypass-routing
count 1000 rapid.
```



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

[illegible]

Meaning This command sends 1000 ping packets out of the channelized interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for Interface Error Statistics

Purpose Persistent interface error statistics indicate that you need to open a case with JTAC.

Action To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces t3-fpc/pic/port:channel extensive.
```




NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

Sample Output

```

user@host> show interfaces t3-0/3/0:11 extensive
Physical interface: t3-0/3/0:11, Enabled, Physical link is Up
  Interface index: 204, SNMP ifIndex: 129, Generation: 133
  Link-level type: Cisco-HDLC, MTU: 4474, SONET mode, Speed: T3, Loopback: Local,

  SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  CoS queues    : 4 supported
  Last flapped  : 2004-05-21 15:23:34 UTC (01:36:27 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes  :                109318                0 bps
    Output bytes :                109318                0 bps
    Input packets:                 1669                0 pps
    Output packets:                 1669                0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0
  DS3 alarms :None
  SONET alarms :None
  DS3 defects :None
  SONET defects :None
  DS3 media:
    Seconds      Count  State
    AIS          0       0 OK
    LOF          0       0 OK
    LOS          0       0 OK
    IDLE         0       0 OK
    YELLOW       0       0 OK
    BPV          0       0
    EXZ          0       0
    LCV          0       0
    PCV          0       0
    CCV          0       0
    LES          0
    PES          0
    PSES        0
    CES          0
    CSES        0
    SEFS        0
    UAS          0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 4484, Runt threshold: 3
    Idle cycle flag: flags, Start end flag: shared
  DSU configuration:
    Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled

```

FEAC loopback: Inactive, Response: Disabled, Count: 0

DS-3 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds

Algorithm: Unknown (0), Induced error rate: 10e-0

Interface transmit queues:

| | B/W | WRR | Packets | Bytes |
|--------------|-----|-----|---------|--------|
| Queue0 | 0 | 0 | | |
| Transmitted: | | | 0 | 0 |
| Drops: | | | 0 | 0 |
| Errors: | | | 0 | |
| Queue1 | 0 | 0 | | |
| Transmitted: | | | 0 | 0 |
| Drops: | | | 0 | 0 |
| Errors: | | | 0 | |
| Queue2 | 0 | 0 | | |
| Transmitted: | | | 0 | 0 |
| Drops: | | | 0 | 0 |
| Errors: | | | 0 | |
| Queue3 | 0 | 0 | | |
| Transmitted: | | | 1669 | 109318 |
| Drops: | | | 0 | 0 |
| Errors: | | | 0 | |

| SONET PHY: | Seconds | Count | State |
|------------|---------|-------|-------|
| PLL Lock | 0 | 0 | OK |
| PHY Light | 0 | 0 | OK |

SONET section:

| | | | |
|--------|---|----|----|
| BIP-B1 | 1 | 22 | |
| SEF | 0 | 0 | OK |
| LOS | 0 | 0 | OK |
| LOF | 0 | 0 | OK |
| ES-S | 1 | | |
| SES-S | 0 | | |
| SEFS-S | 0 | | |

SONET line:

| | | | |
|---------|---|-----|----|
| BIP-B2 | 1 | 307 | |
| REI-L | 0 | 0 | |
| RDI-L | 3 | 1 | OK |
| AIS-L | 0 | 0 | OK |
| BERR-SF | 0 | 0 | OK |
| BERR-SD | 0 | 0 | OK |
| ES-L | 1 | | |
| SES-L | 0 | | |
| UAS-L | 0 | | |
| ES-LFE | 3 | | |
| SES-LFE | 3 | | |
| UAS-LFE | 0 | | |

SONET path:

| | | | |
|---------|---|----|----|
| BIP-B3 | 1 | 37 | |
| REI-P | 1 | 23 | |
| LOP-P | 0 | 0 | OK |
| AIS-P | 0 | 0 | OK |
| RDI-P | 0 | 0 | OK |
| UNEQ-P | 0 | 0 | OK |
| PLM-P | 1 | 1 | OK |
| ES-P | 1 | | |
| SES-P | 0 | | |
| UAS-P | 0 | | |
| ES-PFE | 1 | | |
| SES-PFE | 0 | | |
| UAS-PFE | 0 | | |

Received SONET overhead:

```

F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
Received path trace: t3-0/1/0:11
74 33 2d 30 2f 31 2f 30 3a 31 31 00 00 00 0d 0a  t3-0/1/0:11.....
Transmitted path trace: t3-0/3/0:11
74 33 2d 30 2f 33 2f 30 3a 31 31 00 00 00 00 00  t3-0/3/0:11.....
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x02)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort            95      42499200 95      0      low  none
3 network-control        5      2236800  5      0      low  none
Logical interface t3-0/3/0:11.0 (Index 71) (SNMP ifIndex 130) (Generation 22)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Generation: 31, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.0.0.0/30, Local: 10.0.0.1, Broadcast: 10.0.0.3, Generation:
43

```

Meaning Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Diagnose a Suspected Circuit Problem

Purpose When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. Loop the Entire T3 Interface Towards the Network on page 305
2. Create a Loop to the Router from Various Points in the Network on page 306

Loop the Entire T3 Interface Towards the Network

Purpose Creating a loop from the entire T3 interface to the network allows the transport-layer engineer to test the router from various points in the network and isolate the problem..



NOTE: For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

Action To create a loop from the entire T3 interface to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]  
user@host# edit interfaces t3-fpc/pic/port:channel t3-options
```
2. Configure the loopback:

```
[edit interfaces t3-fpc/pic/port:channel t3-options]  
user@host# set loopback remote
```
3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-2/1/1:0 t3-options]  
user@host# show  
loopback remote;
```
4. Commit the configuration:

```
user@host# commit
```

Meaning The **loopback remote** command loops any traffic from the network back into the network.

Create a Loop to the Router from Various Points in the Network

Purpose The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 7 in “Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface” on page 294. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

Locate Channelized OC12 Alarms and Errors

This chapter describes the most common Channelized OC12 alarms and errors encountered when investigating line problems on a Juniper Networks router.

- Checklist for Channelized OC12 Alarms and Errors on page 307
- Display Channelized OC12 Alarms and Errors on page 307
- Display Channelized OC12 IQ Alarms and Errors on page 311

Checklist for Channelized OC12 Alarms and Errors

Purpose Table 62 on page 307 provides links and commands for the most common Channelized OC12 alarms and errors encountered when investigating line problems on a Juniper Networks router.

Table 62: Checklist for Channelized OC12 Alarms and Errors

| Tasks | Command or Action |
|---|--|
| “Display Channelized OC12 Alarms and Errors” on page 307 | <code>show interfaces t3-fpc/pic/port:channel extensive</code> |
| “Display Channelized OC12 IQ Alarms and Errors” on page 311 | <code>show interfaces interface-type-interface-name extensive</code> |

Display Channelized OC12 Alarms and Errors

Purpose To display Channelized OC12 interface alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

Action `user@host> show interface t3-fpc/pic/port:channel extensive`

Sample Output 1

```
user@host> show interfaces t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 118, Generation: 122
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
  Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags      : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags       : Keepalives
  Hold-times       : Up 0 ms, Down 0 ms
```

```

CoS queues      : 4 supported
Last flapped   : 2004-05-21 15:23:34 UTC (01:59:02 ago)
Statistics last cleared: Never
Traffic statistics:
Input bytes :                0                0 bps
Output bytes :                0                0 bps
Input packets:                0                0 pps
Output packets:                0                0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
DS3 alarms :None
SONET alarms :None
DS3 defects :None
SONET defects :None
DS3 media:
Seconds      Count  State
AIS          0      0 OK
LOF          0      0 OK
LOS          0      0 OK
IDLE         0      0 OK
YELLOW       0      0 OK
BPV          0      0
EXZ          0      0
LCV          0      0
PCV          0      0
CCV          0      0
LES          0
PES          0
PSES         0
CES          0
CES          0
SEFS         0
UAS          0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 3
  Idle cycle flag: flags, Start end flag: shared
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
Interface transmit queues:
B/W  WRR      Packets      Bytes
Queue0    0    0
  Transmitted:    0      0
  Drops:          0      0
  Errors:         0
Queue1    0    0
  Transmitted:    0      0
  Drops:          0      0
  Errors:         0
Queue2    0    0
  Transmitted:    0      0
  Drops:          0      0

```

```

Errors:
Queue3      0    0
Transmitted: 0      0
Drops:      0      0
Errors:      0
SONET PHY:
  PLL Lock      Seconds    Count  State
  PHY Light      0          0  OK
SONET section:
  BIP-B1          1          22
  SEF              0          0  OK
  LOS              0          0  OK
  LOF              0          0  OK
  ES-S            1
  SES-S           0
  SEFS-S          0
SONET line:
  BIP-B2          1          307
  REI-L           0          0
  RDI-L           3          1  OK
  AIS-L           0          0  OK
  BERR-SF         0          0  OK
  BERR-SD         0          0  OK
  ES-L            1
  SES-L           0
  UAS-L           0
  ES-LFE          3
  SES-LFE         3
  UAS-LFE         0
SONET path:
  BIP-B3          1          35
  REI-P           1          7
  LOP-P           0          0  OK
  AIS-P           0          0  OK
  RDI-P           0          0  OK
  UNEQ-P          0          0  OK
  PLM-P           1          1  OK
  ES-P            1
  SES-P           0
  UAS-P           0
  ES-PFE          1
  SES-PFE         0
  UAS-PFE         0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
Received path trace: t3-0/1/0:0
74 33 2d 30 2f 31 2f 30 3a 30 00 00 00 0d 0a  t3-0/1/0:0:.....
Transmitted path trace: t3-0/3/0:0
74 33 2d 30 2f 33 2f 30 3a 30 00 00 00 00 00  t3-0/3/0:0:.....
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes

```

```

0 best-effort          95      42499200  95          0      low  none
3 network-control      5       2236800   5          0      low  none

```

Meaning The sample output shows that there are no active alarms or active defects, either with the T3 media or the SONET layer. If alarms or errors occur, you must troubleshoot the T3 media or the SONET layer. For more information on diagnosing a T3 media problem or a SONET layer problem, see the topics in the Related Topics section.

When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T3 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell).



NOTE: T3 is a general term used to refer to the transmission of 44.736-Mbps digital circuits over any media. T3 can be transported over copper, fiber, or radio. DS3 is the term for the electrical signal found at the metallic interface for this circuit where most of the testing is performed.

Table 63 on page 310 shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 63: T3 Interface Error Counter Definitions

| T3 Alarm or Error | Definition |
|-------------------|---|
| AIS | Alarm indication signal |
| EXZ | Excessive zeros |
| FERF | Far-end failures |
| IDLE | Idle code detected |
| LCV | Line code violation |
| LOS | Loss of signal |
| LOF | Loss of frame |
| YLW | Remote defect indication (yellow alarm) |
| PLL | Phase locked loop |

For more details on T3 alarms and statistics, see “Checklist of Common T3 Alarms and Errors” on page 65.

Related Documentation

For more information on diagnosing a T3 media problem, see:

- Checklist for Monitoring T1 Interfaces on page 21
- Checklist for Using Loopback Testing for T3 Interfaces on page 53
- Checklist of Common T3 Alarms and Errors on page 65

For more information about diagnosing a SONET layer problem, see

- Checklist for Monitoring SONET Interfaces on page 123
- Checklist for Using Loopback Testing for SONET Interfaces on page 131
- List of Common SONET Alarms and Errors on page 145

Display Channelized OC12 IQ Alarms and Errors

Purpose To display Channelized OC12 IQ interface alarms and errors, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces interface-type-interface-name extensive`

Sample Output 1 The following sample output is for a controller interface:

```
user@host> show interfaces coc12-0/0/0 extensive
Physical interface: coc12-0/0/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 82, Generation: 21
  Link-level type: Controller, Clocking: Internal, SONET mode, Speed: OC12,
  Loopback: None, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2004-05-18 21:25:45 UTC (2d 00:04 ago)
  Statistics last cleared: Never
  SONET alarms  : None
  SONET defects : None
  SONET PHY:
    Seconds      Count  State
    PLL Lock     0       0 OK
    PHY Light     0       0 OK
  SONET section:
    BIP-B1        0       0
    SEF           77       1 OK
    LOS           77       1 OK
    LOF           77       1 OK
    ES-S          77
    SES-S         77
    SEFS-S        77
  SONET line:
    BIP-B2        0       0
    REI-L         82584    1274876
    RDI-L         5        1 OK
    AIS-L         0        0 OK
```

```

BERR-SF          77          1 OK
BERR-SD          2          1 OK
ES-L            77
SES-L           77
UAS-L           67
ES-LFE          82589
SES-LFE          5
UAS-LFE          0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00

```

Sample Output 2 The following sample output is for a T1 channel on a Channelized OC12 IQ interface:

```

user@host> show interfaces t1-0/0/0:2:1 extensive
Physical interface: t1-0/0/0:2:1, Enabled, Physical link is Up
Interface index: 186, SNMP ifIndex: 133, Generation: 69
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Framing: ESF,
Parent: coc1-0/0/0:2 Interface index 185
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 444 (last seen 00:00:05 ago)
  Output: 442 (last sent 00:00:09 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mp1s:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : Never
Statistics last cleared: Never
Traffic statistics:
Input bytes  :          10948          0 bps
Output bytes :          11792          0 bps
Input packets:           892          0 pps
Output packets:          940          0 pps
Input errors:
  Errors: 2, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
  Policed discards: 2, L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets  Dropped packets

  0 best-effort          3              3              0

  1 expedited-fo         0              0              0

  2 assured-forw         0              0              0

  3 network-cont       937             937              0

DS1 alarms : None
DS1 defects : None

```

| T1 media: | Seconds | Count | State |
|-----------|---------|-------|-------|
| SEF | 1 | 1 | OK |
| BEE | 2 | 2 | OK |
| AIS | 0 | 0 | OK |
| LOF | 108 | 1 | OK |
| LOS | 0 | 0 | OK |
| YELLOW | 0 | 0 | OK |
| BPV | 0 | 0 | |
| EXZ | 0 | 0 | |
| LCV | 1 | 1 | |
| PCV | 0 | 0 | |
| CS | 0 | 0 | |
| LES | 108 | | |
| ES | 108 | | |
| SES | 108 | | |
| SEFS | 108 | | |
| BES | 0 | | |
| UAS | 116 | | |

HDLC configuration:

- Policing bucket: Disabled
- Shaping bucket : Disabled
- Giant threshold: 1514, Runt threshold: 0
- Timeslots : All active
- Line encoding: B8ZS, Byte encoding: Nx64K
- Buildout : 0 to 132 feet
- Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared

DS1 BERT configuration:

- BERT time period: 10 seconds, Elapsed: 0 seconds
- Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)

SONET alarms :None

SONET defects :None

SONET vt:

| | | |
|----------|----|------|
| BIP-BIP2 | 0 | 0 |
| REI-V | 25 | 25 |
| LOP-V | 93 | 1 OK |
| AIS-V | 0 | 0 OK |
| RDI-V | 0 | 0 OK |
| UNEQ-V | 0 | 0 OK |
| PLM-V | 93 | 1 OK |
| ES-V | 93 | |
| SES-V | 93 | |
| UAS-V | 83 | |
| ES-VFE | 25 | |
| SES-VFE | 25 | |
| UAS-VFE | 0 | |

Received SONET overhead:

- V5 : 0x02, V5(cmp) : 0x02

Transmitted SONET overhead:

- V5 : 0x02

Packet Forwarding Engine configuration:

- Destination slot: 0, PLP byte: 4 (0x00)

Logical interface t1-0/0/0:2:1.0 (Index 70) (SNMP ifIndex 134)

(Generation 15)

- Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
- Protocol inet, MTU: 1500, Generation: 24, Route table: 0
- Flags: None
- Addresses, Flags: Is-Preferred Is-Primary
- Destination: 20.20.20.4/30, Local: 20.20.20.5, Broadcast: 20.20.20.7, Generation: 29

Meaning The sample output shows that there are no active alarms or active defects. If alarms or errors occur, you must troubleshoot the channel media or the SONET layer. For more information, see the topics that correspond to the media with which you are working.

When a major error (such as an AIS) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

- Related Documentation**
- Checklist for Monitoring T1 Interfaces on page 21
 - Checklist for Monitoring T3 Interfaces on page 47
 - Checklist for Monitoring SONET Interfaces on page 123

PART 9

Index

- Index on page 317

Index

A

- add/drop multiplexer *See* ADM
- address entries8
- Address Resolution Protocol *See* ARP
- address statement.....9
- ADM.....147
- AIS alarms
 - T1 interfaces43
 - T3 interfaces68
- AIS-P alarms
 - figure.....151
- alarms
 - AIS, locating.....151
 - AIS-L, locating152
 - AIS-P, locating151
 - ATM interfaces, checklist.....113
 - Channelized DS3 interfaces, checklist235
 - Channelized OC12 interfaces, checklist307
 - Channelized OC12 IQ interfaces, checklist
.....307
 - Fast Ethernet interfaces, checklist.....201
 - Gigabit Ethernet interfaces, checklist.....201
 - LINK, displaying.....201
 - LOS, locating150
 - Multichannel DS3 interfaces, checklist265
 - SONET interfaces, checklist.....145
 - SONET network, figure.....149
 - T1 interfaces, checklist.....39
 - T3 interfaces, checklist.....65
 - yellow, locating.....43
- ARP configuration steps.....195
- ATM cells.....165
- ATM interfaces.....83
 - active alarms and defects, table.....119
 - alarms and errors
 - checklist.....113
 - See* SONET interfaces, alarms and
errors.....113
 - circuit problems.....109
 - clear interfaces statistics command.....105
 - clocking, setting.....102
 - configuring local.....101
 - edit interfaces command.....102
 - edit interfaces sonet-options
command.....101, 110
 - edit interfaces t3-options command.....101, 110
 - error statistics.....106
 - extensive status85
 - input and output errors, table.....117
 - loopback
 - creating physical.....101
 - monitor checklist83
 - overview.....4
 - physical link
 - down, table.....105
 - status103
 - ping interface command.....105
 - set clocking internal command.....102
 - set loopback local command.....102
 - set loopback remote command.....110
 - show chassis hardware command75
 - show interfaces command.....103
 - show interfaces extensive command.....106, 113
 - show interfaces terse command.....84
 - statistics
 - checking errors.....106
 - resetting.....105
 - status
 - description, table84
 - extensive.....85
 - verifying.....103
 - transmit clock13
 - type, determining.....73
- ATM1 interfaces.....78
 - configuration, checking.....75
 - errors87
 - monitor checklist83
 - monitor interface command.....87
 - physical link down.....85
 - pic-type statement.....76
 - set cli terminal command.....88

| | |
|---|---------------|
| show chassis hardware command | 75 |
| show configuration interfaces command..... | 75 |
| show interfaces command..... | 85 |
| show interfaces extensive command..... | 85 |
| statistics, monitoring..... | 87 |
| status | |
| displaying for specific..... | 85 |
| extensive..... | 85 |
| ATM2 IQ interfaces..... | 79 |
| configuration checking | 76 |
| errors..... | 96 |
| maximum-vcs statement..... | 76 |
| monitor checklist | 83 |
| monitor interface command..... | 96 |
| overview..... | 5 |
| physical link up..... | 91 |
| promiscuous mode..... | 80 |
| set cli terminal command..... | 97 |
| show chassis hardware command..... | 75 |
| show configuration interfaces command..... | 76 |
| show interfaces command..... | 89 |
| show interfaces extensive command..... | 91 |
| show interfaces terse command..... | 89 |
| status | |
| displaying for specific..... | 89 |
| extensive..... | 91 |
| autonegotiation, table..... | 185 |
| C | |
| cables | |
| damaged or dirty..... | 105, 136, 194 |
| mismatch..... | 105, 136, 194 |
| multimode fiber..... | 187 |
| single-mode fiber..... | 101, 133, 187 |
| CCC, protocol family | 9 |
| cell-payload scrambling..... | 166 |
| channel, Channelized OC12 IQ interfaces | 285 |
| channelization levels, controller interface | 284 |
| Channelized DS3 interfaces | |
| alarms and errors..... | 235 |
| circuit problem | 232 |
| clear interfaces statistics command..... | 227 |
| edit interfaces command..... | 227, 228 |
| edit interfaces t1-options command | 225, 232 |
| edit interfaces t3-options command..... | 225 |
| encapsulation, configuring..... | 227 |
| errors | 218 |
| link layer, forcing up..... | 227 |
| local loopback, configuring..... | 225 |
| logical interface | 229 |
| loopback, configuring | |
| from specific T1 interface..... | 232 |
| monitor interface command | 219 |
| monitor, checklist..... | 209 |
| no keepalives, configuring..... | 228 |
| notification messages..... | 238 |
| physical link status..... | 211, 226 |
| physical loopback, creating | 225 |
| ping interface command..... | 230 |
| set encapsulation command..... | 227 |
| set loopback local command..... | 225 |
| set loopback remote command..... | 232 |
| set no-keepalives command..... | 228 |
| show interfaces command..... | 211, 226, 229 |
| show interfaces extensive | |
| command..... | 213, 230, 235 |
| show interfaces terse command..... | 210 |
| statistics | |
| checking error..... | 230 |
| monitoring | 218 |
| resetting..... | 227 |
| status | |
| displaying | 210, 226 |
| displaying specific | 211, 213 |
| extensive | 213 |
| logical interface, verifying..... | 229 |
| t1-options statement..... | 225, 232 |
| t3-options statement..... | 225 |
| channelized DS3 to DS0 interfaces | |
| alarms and errors | 268 |
| clear interfaces statistics command..... | 256 |
| logical interface | 257 |
| monitor interfaces command | 247 |
| ping interface command..... | 258 |
| show interfaces command..... | 254, 257 |
| show interfaces extensive | |
| command..... | 259, 268 |
| channelized DS3 to DS1 interfaces | |
| alarms and errors | 265 |
| show interfaces command..... | 226, 255, 257 |
| show interfaces extensive command..... | 265 |
| channelized interfaces..... | 241 |
| Channelized DS3, status, displaying..... | 210 |
| errors..... | 218, 247, 278 |
| Multichannel DS3, status, displaying..... | 242 |
| naming | |
| DS3 to DS0..... | 12 |
| DS3 to DS1..... | 12 |

- notification messages.....267
- OC12 IQ status, displaying.....279
- OC12 status, displaying.....274
- overview.....6
- physical link down275
- statistics monitoring247
- status.....226, 254, 296
 - extensive.....213, 243, 287
- Channelized OC12 interfaces
 - alarms310
 - alarms and errors307
 - checklist for alarms.....307
 - circuit problem305
 - clear interfaces statistics command.....299
 - defects.....310
 - edit interfaces command300
 - edit interfaces t3-options command306
 - encapsulation, configuring299
 - errors.....278, 310
 - link layer, forcing up299
 - local loopback, configuring295
 - logical interface301
 - loopback, configuring
 - for entire T3 interface305
 - monitor
 - checklist.....273
 - statistics.....278
 - monitor interface command.....290
 - no keepalives, configuring300
 - physical link status.....275, 296
 - physical loopback, creating295
 - ping interface command302
 - set cli terminal command.....278
 - set encapsulation command300
 - set loopback local command296
 - set loopback remote command306
 - set no-keepalives command300
 - show command296
 - show interfaces coc1 command.....283
 - show interfaces coc12 command.....283
 - show interfaces command.....275, 296
 - show interfaces ct1 command.....284
 - show interfaces ct3 command.....283
 - show interfaces extensive
 - command.....275, 302, 307
 - show interfaces terse command.....274
- statistics
 - checking error302
 - monitoring278
 - resetting299
- status
 - displaying296
 - displaying for specific.....275
 - extensive.....275
 - logical interface, verifying301
 - t3-options statement295, 306
- Channelized OC12 IQ interfaces
 - alarms and errors311
 - checklist for alarms307
 - circuit problem305
 - configuration.....281
 - figure281
 - controller interface.....280
 - channelization levels.....284
 - status, displaying.....283, 284
 - edit interfaces command.....300
 - edit interfaces t3-options command.....306
 - encapsulation, configuring299
 - errors.....290
 - hierarchy.....280
 - individual channels down.....281
 - link layer, forcing up.....299
 - local loopback, configuring295
 - logical interface301
 - loopback, configuring
 - for entire T3 interface.....305
 - monitor checklist273
 - no keepalives, configuring.....300
 - physical link status.....280, 296
 - physical loopback, creating295
 - ping interface command302
 - set encapsulation command.....300
 - set loopback local command.....296
 - set loopback remote command.....306
 - set no-keepalives command.....300
 - show command296
 - show interfaces command283, 285, 296
 - show interfaces controller command.....279
 - show interfaces extensive302
 - show interfaces extensive command.....311
 - show interfaces terse coc command.....279
 - show interfaces terse command.....280
 - specific
 - channel, displaying status.....285
 - figure.....287

| | |
|---|----------|
| statistics | |
| checking error..... | 302 |
| monitoring | 290 |
| resetting..... | 299 |
| status | |
| displaying..... | 296 |
| displaying for specific..... | 285 |
| extensive..... | 287 |
| logical interface, verifying..... | 301 |
| t3-options statement..... | 306 |
| checklist for alarms | |
| ATM interfaces..... | 113 |
| Channelized DS3 alarms | 235 |
| Channelized OC12 interfaces | 307 |
| Channelized OC12 IQ interfaces | 307 |
| Fast Ethernet interfaces | 201 |
| Gigabit Ethernet interfaces | 201 |
| Multichannel DS3 alarms..... | 265 |
| SONET interfaces..... | 145 |
| T1 interfaces..... | 39 |
| T3 interfaces..... | 65 |
| checklist for monitoring | |
| ATM1 interfaces | 83 |
| ATM2 IQ interfaces..... | 83 |
| Channelized DS3 interfaces | 209 |
| Channelized OC12 interfaces | 273 |
| Channelized OC12 IQ interfaces | 273 |
| Fast Ethernet interfaces..... | 179 |
| Gigabit Ethernet interfaces..... | 179 |
| Multichannel DS3 interfaces | 241 |
| SONET interfaces | 123 |
| T1 interfaces..... | 21 |
| T3 interfaces..... | 47 |
| checklist for payload scrambling, SONET | 165 |
| checklist for SONET frame checksum | 169 |
| checksum, SONET frame..... | 169 |
| circuit cross-connect CCC, protocol family See CCC, | |
| protocol family | |
| circuit problems | |
| ATM interfaces | 109 |
| Channelized DS3 interfaces..... | 232 |
| Channelized OC12 interfaces | 305 |
| Channelized OC12 IQ interfaces..... | 305 |
| Fast Ethernet interfaces | 199 |
| Gigabit Ethernet interfaces | 199 |
| SONET interfaces | 142 |
| T1 interfaces | 37 |
| T3 interfaces | 63 |
| Cisco-HDLC, configuring encapsulation | |
| SONET interfaces..... | 138 |
| T1 interfaces..... | 32 |
| T3 interfaces | 58 |
| clear interfaces statistics command | |
| ATM interfaces..... | 105 |
| Channelized DS3 interfaces..... | 227 |
| channelized DS3 to DS0 interfaces | 256 |
| Channelized OC12 interfaces..... | 299 |
| Fast Ethernet interfaces..... | 186 |
| Fast Ethernet statistics..... | 196 |
| SONET interfaces..... | 128, 137 |
| T1 interfaces..... | 32 |
| T3 interfaces..... | 58 |
| clock | |
| location of onboard, table | 163 |
| clock sources | |
| figure | 14 |
| clocking..... | 102 |
| ATM interfaces..... | 102 |
| SONET interfaces | 134 |
| T1 interfaces..... | 30 |
| T3 interfaces | 56 |
| clocking statement, usage guidelines..... | 14 |
| commands for router management, | |
| interfaces..... | 16, 17 |
| configuration, interfaces | |
| ATM interfaces, incorrect..... | 77 |
| Channelized OC12 IQ | 281 |
| checking | |
| ATM1 interfaces | 75 |
| ATM2 IQ interfaces | 76 |
| connections, verifying..... | 110 |
| connectors, network, and interface names | 10 |
| controller interface | |
| Channelized OC12 IQ interfaces | 280, 283 |
| levels of channelization, figure | 284 |
| show interfaces command..... | 283 |
| counters..... | 196 |
| craft interface, LED alarms..... | 118 |
| cumulative statistics | |
| Ethernet interfaces..... | 186 |
| SONET interfaces..... | 128 |
| customer support..... | xxxiii |
| contacting JTAC..... | xxxiii |
| D | |
| data integrity..... | 165 |
| delete fcs 32 command | 174 |

descriptors, configuring8
documentation
 comments on.....xxxii
downstream, SONET alarms and errors,
 defining.....148
DS0 interface.....286

E

edit interfaces command.....13, 17
 ATM interfaces102
 Channelized DS3 interfaces227, 228
 Channelized OC12 interfaces300
 Channelized OC12 IQ interfaces300
 Fast Ethernet interfaces195
 Gigabit Ethernet interfaces195
 Multichannel DS3 interfaces256, 257
 SONET interfaces134, 138, 174
 T1 interfaces30, 32, 33
 T3 interfaces56, 58, 59
edit interfaces fastether-options command192
edit interfaces gigether-options command.....192
edit interfaces sonet-options command
 ATM interfaces.....101, 110
 SONET interfaces.....134, 143, 168
edit interfaces t1-options command
 Channelized DS3 interfaces225, 232
 Multichannel DS3 interfaces253, 264
 T1 interfaces29, 37
edit interfaces t3-options command
 ATM interfaces101, 110
 Channelized DS3 interfaces225
 Channelized OC12 interfaces295, 306
 Channelized OC12 IQ interfaces.....295, 306
 Multichannel DS3 interfaces253, 263
 T3 interfaces55, 63
encapsulation
 SONET interfaces138
 T1 interfaces.....32
 T3 interfaces.....58
error statistics
 ATM interfaces.....106
 Fast Ethernet interfaces197
 Gigabit Ethernet interfaces.....197
 OC3 ATM interfaces.....116
 SONET interfaces141
 T1 interfaces35
 T3 ATM interfaces.....117
 T3 interfaces61

errors

ATM2 IQ interfaces.....96
Channelized DS3 interfaces218
channelized interfaces247
Channelized OC12 interfaces278
Channelized OC12 IQ interfaces290
Ethernet interfaces.....187
Fast Ethernet interfaces, table184
Gigabit Ethernet interfaces, table184
SONET interfaces.....127
T1 interfaces.....39
T3 interfaces.....50, 61

Ethernet interfaces

autonegotiation, table.....185
RJ-45191
specifications, table.....187

F

family

descriptors8
statement.....9

Fast Ethernet interfaces

alarms, LINK.....201
autonegotiation, table.....185
circuit problems.....186, 199
clear interfaces statistics command.....196
counters201, 203
edit interfaces command195
LINK alarms, checklist201
local loopback, configuring192
monitor checklist.....179
monitor interface command186
monitoring.....186
overview.....5
physical loopback.....191
ping interface command.....196
set arp command195
set cli terminal command186
set loopback local command192
show interfaces command182, 193, 197
show interfaces extensive command.....183, 201
show interfaces terse command180
static ARP entry, configuring195

| | |
|--|-----|
| statistics | |
| checking error | 197 |
| monitoring..... | 197 |
| resetting..... | 196 |
| status | |
| description, table..... | 180 |
| displaying..... | 180 |
| errors, table..... | 184 |
| verifying..... | 193 |
| fiber-optic | |
| connection..... | 187 |
| Ethernet interface specifications, table..... | 187 |
| interface, physical loopback..... | 191 |
| Flexible PIC Concentrator FPC See FPC | |
| Forwarding Module SFM See SFM | |
| FPC | 164 |
| frame checksum, SONET interfaces | 169 |
| frame error control, SONET interfaces overview | 170 |
| frames, SONET | 148 |
| framing errors | |
| SONET interfaces..... | 128 |
| T3 interfaces..... | 51 |

G

| | |
|--|----------|
| Gigabit Ethernet interfaces | |
| alarms, LINK..... | 201 |
| autonegotiation, table..... | 185 |
| circuit problems..... | 199 |
| counters..... | 201, 203 |
| edit interfaces command..... | 195 |
| LINK alarms, checklist | 201 |
| local loopback, configuring..... | 192 |
| loopback plug, creating..... | 191 |
| monitor checklist..... | 179 |
| monitor interface command..... | 186 |
| monitoring..... | 186 |
| overview..... | 5 |
| physical loopback, creating | 191 |
| ping interface command..... | 196 |
| set arp command | 195 |
| set cli terminal command..... | 186 |
| set loopback local command..... | 192 |
| show interfaces command..... | 182, 193 |
| show interfaces extensive command..... | 183, 201 |
| show interfaces terse command..... | 180, 181 |
| static ARP entry, configuring | 195 |

| | |
|--------------------------|-----|
| statistics | |
| checking error..... | 197 |
| monitoring..... | 197 |
| resetting..... | 196 |
| status | |
| description, table..... | 181 |
| displaying..... | 180 |
| displaying specific..... | 182 |
| errors, table..... | 184 |
| extensive..... | 183 |
| verifying..... | 193 |
| GR-253 CORE..... | 145 |

H

| | |
|--------------------------------------|-----|
| HDLC | |
| configuring encapsulation | |
| SONET interfaces | 138 |
| T1 interfaces | 32 |
| T3 interfaces | 58 |
| payload scrambling | |
| SONET interfaces, checking | 166 |
| hierarchy | |
| Channelized OC12 IQ interfaces | 280 |
| SONET..... | 148 |

I

| | |
|---|--------|
| IDLE signal, T3 interfaces | 69 |
| input keepalives, SONET interfaces..... | 128 |
| interface names | |
| examples..... | 11 |
| logical part..... | 10 |
| physical part..... | 10 |
| separators..... | 10 |
| interfaces | |
| alarms | 18 |
| descriptors | 8 |
| displaying order in configurations..... | 13 |
| investigation process | 16, 18 |
| locating alarms..... | 18 |
| loopback test commands, table..... | 17 |
| monitoring commands, table..... | 16 |
| monitoring, general steps..... | 16 |
| names and naming..... | 9, 12 |
| slot, PIC, and port locations..... | 11 |
| supported by Junos OS, table..... | 6 |
| interfaces statement..... | 9 |
| International Organization for Standardization, | |
| protocol family See ISO, protocol family | |
| Internet Protocol, version 4 See IPv4 | |

- Internet Protocol, version 6 *See* IPv6
- investigation process.....3
 - interfaces.....16, 18
- IPv49
- IPv69
- ISO, protocol family9
- J**
- Junos OS, supported interfaces, table6
- K**
- keepalives, disabling138
- L**
- line overhead bytes148
- line-terminating equipment *See* LTE
- lines, SONET148
- link layer, forcing up
 - SONET interfaces.....138
 - T1 interfaces32
 - T3 interfaces58
- link stability.....167
- LOF alarms
 - T3 interfaces
 - alarms and errors.....67
- logical interfaces
 - descriptors.....8
 - SONET interfaces, status.....139, 140
 - T3 interfaces, status.....60
- logical part, interface name10
- loopback test, checklists
 - ATM1 interfaces99
 - ATM2 IQ interfaces.....99
 - Channelized DS3 interfaces.....223
 - Fast Ethernet interfaces.....189
 - Gigabit Ethernet interfaces.....189
 - Multichannel DS3 interfaces.....251
 - SONET interfaces.....131
 - T1 interfaces.....27
 - T3 interfaces.....53
- loopback, configuring local.....101
 - ATM interfaces101
 - ATM interfaces, figure101
 - Channelized DS3 interfaces.....225
 - Channelized OC12 interfaces295
 - Channelized OC12 IQ interfaces.....295
 - Fast Ethernet interfaces192
 - Gigabit Ethernet interfaces.....192
 - Multichannel DS3 interfaces.....253
 - T1 interfaces29
 - T3 interfaces55
- loopback, creating physical
 - ATM interfaces101
 - Channelized DS3 interfaces.....225
 - Channelized OC12 interfaces295
 - Channelized OC12 IQ interfaces.....295
 - Fast Ethernet interfaces191
 - Gigabit Ethernet interfaces191
 - Multichannel DS3 interfaces.....253
 - T1 interfaces29
 - T3 interfaces55
- loopback, plug.....191
- LOS alarms
 - SONET interfaces.....150
 - T3 interfaces67
- LTE.....147
- M**
- manuals
 - comments on.....xxxii
- maximum-vcs statement.....75
 - ATM2 IQ interfaces76
- MCS164
- Miscellaneous Control Subsystem *See* MCS
- monitor interface command
 - ATM1 interface.....87
 - ATM2 IQ interfaces.....96
 - Channelized DS3 interfaces219
 - channelized DS3 to DS0 interfaces.....247
 - Channelized OC12 interfaces.....278
 - Channelized OC12 IQ interfaces290
 - Fast Ethernet interfaces186
 - Gigabit Ethernet interfaces.....186
 - SONET interfaces.....127
 - T1 interfaces.....24
 - T3 interfaces.....50
- Multichannel DS3 interfaces
 - alarms and errors.....265, 268
 - checklist for alarms.....265
 - clear interface statistics command.....256
 - edit interfaces command.....256, 257
 - edit interfaces t1-options command253, 264
 - edit interfaces t3-options command.....253, 263
 - encapsulation, configuring.....256
 - errors.....247
 - link layer, forcing up.....256
 - local loopback, configuring.....253

| | |
|--|---------------------------------|
| loopback, configuring | |
| for entire T3 interface..... | 263 |
| from specific T1 interface..... | 264 |
| monitor | |
| channelized..... | 247 |
| checklist..... | 241 |
| monitor interfaces command..... | 247 |
| no keepalives, configuring..... | 257 |
| physical link status..... | 242, 248, 254 |
| physical loopback, creating | 253 |
| ping interface command..... | 258 |
| problems, table..... | 248 |
| set cli terminal command..... | 248 |
| set encapsulation command..... | 256 |
| set loopback local command..... | 253 |
| set loopback remote command..... | 263, 264 |
| set no-keepalives command..... | 257 |
| show command..... | 254 |
| show interfaces command..... | 254, 255 |
| show interfaces extensive | |
| command..... | 259, 268 |
| statistics | |
| checking error..... | 259 |
| monitoring..... | 247 |
| resetting..... | 255 |
| status | |
| displaying..... | 242, 254 |
| displaying specific..... | 242 |
| extensive..... | 243 |
| logical interface, verifying..... | 257 |
| t1-options statement..... | 253, 264 |
| t3-options statement..... | 253, 263 |
| Multilink Frame Relay See MLFR | |
| Multilink PPP See MLPPP | |
| multimode fiber cable..... | 187 |
| Multiprotocol Label Switching See MPLS | |
| N | |
| naming | |
| channelized interfaces | 12 |
| interfaces..... | 9, 12 |
| network..... | 37, 63, 109, 142, 232, 262, 305 |
| network connectors, and interface names..... | 10 |
| no-keepalives, configuring | |
| SONET interfaces | 139 |
| T1 interfaces | 33 |
| T3 interfaces | 59 |
| notification messages, logging for..... | 238, 267 |
| O | |
| OC1 interface..... | 286 |
| OC3 ATM interface | |
| extensive output..... | 106 |
| status..... | 104 |
| OC3 SONET interface..... | 286 |
| onboard clock..... | 163 |
| optical attenuation..... | 105, 136, 194 |
| output keepalives, SONET interfaces..... | 128 |
| P | |
| path area, SONET interfaces..... | 148 |
| path overhead bytes | 148 |
| path-terminating equipment See PTE | |
| payload | |
| scrambling | |
| checking | 166 |
| configuring | 167 |
| SONET interfaces | 165 |
| status..... | 167 |
| SONET interfaces..... | 148 |
| physical interfaces, descriptors..... | 8 |
| physical link down | |
| ATM interfaces, table..... | 105 |
| ATM1 interfaces | 85 |
| Channelized DS3 interfaces..... | 213 |
| channelized interfaces..... | 243, 275 |
| Fast Ethernet interfaces, table..... | 194 |
| Gigabit Ethernet interfaces, table..... | 194 |
| Multichannel DS3 interfaces, table | 248 |
| SONET interfaces..... | 125, 136 |
| table..... | 136 |
| T1 interfaces..... | 23 |
| table..... | 25 |
| T3 interfaces..... | 49 |
| table..... | 51 |
| physical link up | |
| ATM2 IQ interfaces | 91 |
| Channelized DS3 interfaces..... | 213 |
| channelized interfaces..... | 243 |
| Channelized OC12 IQ interfaces..... | 280 |
| Fast Ethernet interfaces..... | 182, 193 |
| Gigabit Ethernet interfaces..... | 182, 193 |
| SONET interfaces | 135 |
| T1 interfaces..... | 23 |
| T3 interfaces..... | 49, 57 |
| physical loopback | |
| ATM interfaces..... | 101 |
| Channelized DS3 interfaces | 225 |

- channelized interfaces253, 295
- Fast Ethernet interfaces.....191
- Gigabit Ethernet interfaces.....191
- SONET interfaces133
- T1 interfaces.....29
- T3 interfaces.....55
- physical part, interface name10
- pic-type statement
 - ATM1 interfaces76
- ping interface command
 - ATM interfaces.....105
 - Channelized DS3 interfaces230
 - channelized interfaces258, 302
 - Fast Ethernet interfaces.....196
 - Gigabit Ethernet interfaces196
 - SONET interfaces140
 - T1 interfaces.....35
 - T3 interfaces.....61
- problems
 - ATM interfaces, table.....105
 - channelized interfaces, table.....248
 - T1 interfaces, table.....25, 248
- promiscuous mode, ATM2 IQ interfaces.....80
- properties, for physical interfaces.....8
- protocol families, supported.....9
- PTE.....147
- R**
- red alarm bell.....118
- repeaters.....147
- RJ-45 Ethernet interface.....191
- routers, path-terminating equipment.....147
- S**
- SBR163
- SCB163
- SCG164
- scrambling, SONET payload.....165
- section overhead
 - bytes.....148
- section-terminating equipment See STE
- separators, in interface names10
- set arp command
 - Fast Ethernet interfaces195
 - Gigabit Ethernet interfaces.....195
- set cli terminal command
 - ATM1 interfaces88
 - ATM2 IQ interfaces97
 - Channelized OC12 interfaces278
 - Fast Ethernet interfaces186
 - Gigabit Ethernet interfaces186
 - Multichannel DS3 interfaces248
 - SONET interfaces128
 - T1 interfaces25
 - T3 interfaces51
- set clocking internal command
 - ATM interfaces102
 - SONET interfaces135
 - T1 interfaces30
 - T3 interfaces56
- set encapsulation command
 - Channelized DS3 interfaces227
 - Channelized OC12 interfaces300
 - Channelized OC12 IQ interfaces300
 - Multichannel DS3 interfaces256
 - SONET interfaces138
 - T1 interfaces32
 - T3 interfaces58
- set fcs 16 command.....174
- set fcs 32 command175
- set loopback local command
 - ATM interfaces102
 - Channelized DS3 interfaces225
 - Channelized OC12 interfaces296
 - Channelized OC12 IQ interfaces296
 - Fast Ethernet interfaces192
 - Gigabit Ethernet interfaces192
 - Multichannel DS3 interfaces253
 - SONET interfaces.....134
 - T1 interfaces29
 - T3 interfaces55
- set loopback remote command
 - ATM interfaces110
 - Channelized DS3 interfaces232
 - Channelized OC12 interfaces306
 - Channelized OC12 IQ interfaces306
 - Multichannel DS3 interfaces263, 264
 - SONET interfaces143
 - T1 interfaces37
 - T3 interfaces63
- set no-keepalives command
 - Channelized DS3 interfaces228
 - Channelized OC12 interfaces300
 - Channelized OC12 IQ interfaces300
 - Multichannel DS3 interfaces257
 - SONET interfaces139
 - T1 interfaces33
 - T3 interfaces59

| | |
|---|--------------------|
| set payload-scrambler command | 168, 174, 175 |
| set rfc-2615 command | 175 |
| SFM | 163 |
| show chassis hardware command..... | 75 |
| show command | 254, 296 |
| show configuration command | 166 |
| show configuration interfaces command | |
| ATM1 interfaces | 75, 77 |
| ATM2 IQ interfaces | 76, 78 |
| SONET interfaces | 166 |
| show interfaces coc1 command | 283 |
| show interfaces coc12 command | 283 |
| show interfaces command..... | 60, 166, 195 |
| ATM interfaces..... | 103 |
| ATM1 interfaces | 85 |
| ATM2 IQ interfaces | 89 |
| Channelized DS3 interfaces | 211, 226, 229 |
| channelized DS3 to DS0 interfaces | 254, 257 |
| Channelized OC12 interfaces | 275, 296, 301 |
| Channelized OC12 IQ interfaces | |
| | 283, 285, 296, 301 |
| controller interface | 283 |
| DS3 to DS1 interfaces | 226, 255 |
| Fast Ethernet interfaces | 182, 193, 197 |
| Gigabit Ethernet interfaces | 182, 193 |
| SONET interfaces..... | 124, 135, 139, 166 |
| T1 interfaces..... | 23, 31, 34 |
| T3 interfaces..... | 49, 57 |
| show interfaces controller command | 279 |
| show interfaces ct1 command | 284 |
| show interfaces ct3 command | 283 |
| show interfaces extensive command..... | 39, 137 |
| ATM interfaces..... | 106, 113 |
| ATM1 interfaces..... | 85 |
| ATM2 IQ interfaces..... | 91 |
| Channelized DS3 interfaces..... | 213, 230, 235 |
| channelized DS3 to DS0 interfaces..... | 259, 268 |
| channelized DS3 to DS1 interfaces..... | 265 |
| Channelized OC12 interfaces..... | 275, 302, 307 |
| Channelized OC12 IQ interfaces..... | 302, 311 |
| Fast Ethernet interfaces..... | 183, 201 |
| Gigabit Ethernet interfaces..... | 183 |
| SONET interfaces..... | 126, 141, 146, 150 |
| T1 interfaces..... | 23, 35 |
| T3 interfaces..... | 49, 61 |
| show interfaces terse coc command | 279 |
| show interfaces terse command | |
| ATM interfaces..... | 84 |
| ATM1 interfaces | 78 |
| ATM2 IQ interfaces | 79, 89 |
| Channelized DS3 interfaces | 210 |
| Channelized OC12 interfaces | 274 |
| Channelized OC12 IQ interfaces | 280 |
| Fast Ethernet interfaces | 180 |
| Gigabit Ethernet interfaces..... | 180, 181 |
| SONET interfaces..... | 124, 139 |
| T1 interfaces..... | 22, 34 |
| T3 interfaces..... | 48, 60 |
| signal transmission..... | 149 |
| Single Board Router See SBR | |
| single-mode fiber cable..... | 101, 133, 187 |
| SONET clock generatorSys See SCG | |
| SONET frames..... | 148 |
| line overhead bytes..... | 148 |
| path overhead bytes..... | 148 |
| section overhead bytes..... | 148 |
| SONET interfaces..... | 175 |
| alarms and errors | |
| AIS-P alarms..... | 151 |
| displaying..... | 146 |
| LOS alarms | 150 |
| path signal label assignments, table..... | 159 |
| PLM-P alarms..... | 157 |
| RDI-L alarms..... | 154 |
| RDI-P alarms..... | 153 |
| REI-L alarms..... | 155 |
| REI-P alarms..... | 154 |
| alarms and errors checklist..... | 145 |
| circuit problems..... | 142 |
| clear interfaces statistics command..... | 137 |
| clocking | |
| setting..... | 134 |
| delete fcs 32 command..... | 174 |
| displaying for specific..... | 124 |
| edit interfaces command..... | 134, 138, 174 |
| edit interfaces sonet-options | |
| command..... | 134, 143, 168 |
| encapsulation, configuring..... | 138 |
| error statistics..... | 141 |
| frame..... | 148 |
| checksum checklist | 169 |
| error control..... | 170 |
| further investigation..... | 124 |
| HDLC payload scrambling..... | 166 |
| line area..... | 148 |
| link layer, forcing up..... | 138 |
| logical interface, status..... | 139 |

| | |
|---|-------------------------|
| loopback | |
| configuring local..... | 134 |
| creating physical..... | 133 |
| monitor checklist..... | 123 |
| no keepalives | |
| configuring..... | 138 |
| setting..... | 139 |
| overview..... | 5 |
| path area..... | 148 |
| payload scrambling | |
| checklist | 165 |
| configuring..... | 167 |
| conflicts..... | 165 |
| described | 165 |
| levels | 165 |
| status..... | 167 |
| physical link down, table | 136 |
| ping interface command | 140 |
| section area..... | 148 |
| set cli terminal command..... | 128 |
| set clocking internal command..... | 135 |
| set encapsulation command..... | 138 |
| set fcs 16 command | 174 |
| set fcs 32 command | 175 |
| set loopback local command | 134 |
| set loopback remote command..... | 143 |
| set no keepalives command | 139 |
| set payload-scrambler command..... | 168 |
| show configuration interfaces command | 166 |
| show interfaces | |
| command..... | 124, 126, 127, 135, 166 |
| show interfaces extensive | |
| command..... | 126, 146, 158 |
| show interfaces terse command..... | 124, 139 |
| statistics | |
| checking errors..... | 141 |
| monitoring..... | 127 |
| resetting..... | 137 |
| status | |
| description table..... | 124 |
| displaying..... | 124 |
| extensive..... | 125 |
| verifying..... | 135 |
| transmit clock..... | 13 |
| transmitted path trace, checking..... | 137 |
| SONET network..... | 147 |
| line area..... | 148 |
| network, figure..... | 148 |
| section area..... | 148 |
| span..... | 148 |
| system hierarchy..... | 148 |
| sonet-options statement..... | 134, 168, 174, 175 |
| span and SONET line..... | 148 |
| span, and SONET line..... | 148 |
| specifications for fiber-optic, table..... | 187 |
| SSB | 163 |
| static address resolution protocol..... | 194 |
| statistic error | |
| Fast Ethernet interfaces..... | 197 |
| statistics | |
| ATM interfaces, resetting..... | 105 |
| ATM1 interfaces | 87 |
| channelized interfaces | 218, 247 |
| Channelized OC12 interfaces..... | 278 |
| Channelized OC12 IQ interfaces..... | 290 |
| cumulative for SONET interfaces..... | 128 |
| errors | |
| ATM interfaces | 106 |
| SONET interfaces..... | 141 |
| T1 interfaces..... | 35 |
| T3 interfaces..... | 61 |
| Fast Ethernet interfaces | 186 |
| resetting..... | 196 |
| Gigabit Ethernet interfaces | 186 |
| resetting..... | 196 |
| SONET interfaces, resetting..... | 137 |
| T1 interfaces | |
| checking | 35 |
| monitoring..... | 24 |
| resetting..... | 32 |
| T3 interfaces | |
| checking..... | 61 |
| monitoring..... | 50 |
| resetting..... | 58 |
| status | |
| ATM interfaces..... | 103 |
| Channelized DS3 interfaces | 210, 226 |
| channelized interfaces..... | 254, 296 |
| Channelized OC12 interfaces | 274 |
| Channelized OC12 IQ interfaces | 279 |
| controller interface | 284 |
| Fast Ethernet interfaces..... | 180, 193 |
| Gigabit Ethernet interfaces..... | 180, 193 |
| Multichannel DS3 interfaces | 242 |
| SONET interfaces..... | 124, 135 |
| T1 interfaces..... | 22, 57 |
| T3 interfaces..... | 48 |

| | |
|--|-----|
| status description, table | |
| ATM interfaces..... | 84 |
| Fast Ethernet interfaces..... | 180 |
| Gigabit Ethernet interfaces..... | 181 |
| SONET interfaces..... | 124 |
| T1 interfaces..... | 22 |
| T3 interfaces..... | 48 |
| status extensive | |
| ATM1 interfaces | 85 |
| ATM2 IQ interfaces | 91 |
| Channelized DS3 interfaces | 213 |
| channelized interfaces | 243 |
| Channelized OC12 interfaces | 275 |
| Channelized OC12 IQ interfaces | 287 |
| Fast Ethernet interfaces..... | 183 |
| Gigabit Ethernet interfaces | 183 |
| SONET interfaces | 125 |
| T1 interfaces..... | 23 |
| T3 interfaces | 49 |
| status for specific interface | |
| ATM..... | 85 |
| Channelized OC12 | 275 |
| Channelized OC12 IQ | 285 |
| Fast Ethernet..... | 182 |
| Gigabit Ethernet | 182 |
| SONET | 124 |
| T1 | 23 |
| T3..... | 49 |
| STE..... | 147 |
| steps and commands, overview..... | 15 |
| STS | |
| path signal label assignments, figure..... | 159 |
| path signal label assignments, table | 159 |
| support, technical See technical support | |
| supported processes..... | 9 |
| System and Switch Board See SSB | |
| system board, location of, table | 163 |
| System Control Board See SCB | |
| system hierarchy, SONET interfaces..... | 148 |

T

T1 interfaces

| | |
|-------------------------------|-------------------|
| alarms and errors | |
| AIS alarms..... | 43 |
| definitions, table..... | 41 |
| displaying..... | 39 |
| yellow alarms | 43 |
| circuit problems..... | 37 |
| clear statistics command..... | 32, 227, 256, 299 |

| | |
|---|--------------------|
| configuring local..... | 29 |
| edit interfaces command..... | 30, 32, 33 |
| edit interfaces t1-options command..... | 29, 37 |
| encapsulation, configuring | 32 |
| error statistics..... | 35 |
| further investigation..... | 23 |
| HDLC, configuring encapsulation..... | 32 |
| link layer, forcing up..... | 32 |
| logical interface, status..... | 34 |
| loopback | |
| creating physical..... | 29 |
| loopback, creating physical | 29 |
| monitor checklist..... | 21 |
| no keepalives, configuring..... | 33 |
| overview | 4 |
| ping command..... | 35 |
| ping interface command..... | 35 |
| set cli terminal command..... | 25 |
| set clocking internal command..... | 30 |
| set encapsulation command..... | 32 |
| set loopback local command..... | 29 |
| set loopback remote command..... | 37 |
| set no-keepalives command..... | 33 |
| show interfaces command..... | 23, 31, 34 |
| show interfaces extensive command..... | 35, 39 |
| show interfaces terse command..... | 22, 34 |
| statistics | |
| checking error..... | 35 |
| monitoring..... | 24 |
| resetting..... | 32 |
| status | |
| description, table..... | 22 |
| displaying all..... | 22 |
| displaying specific | 23 |
| extensive..... | 23 |
| supported standards..... | 4 |
| transmit clocks..... | 13 |
| T1 media alarms, table..... | 239, 267 |
| t1-options statement | 225, 232, 253, 264 |
| T3 ATM interfaces | |
| extensive output..... | 108 |
| physical link down..... | 104 |
| physical link up..... | 103 |
| T3 interfaces | |
| alarms and errors | |
| AIS alarms..... | 68 |
| checklist..... | 65 |
| displaying..... | 66 |
| IDLE signals..... | 69 |

- LOS alarms.....67
 - yellow alarms.....69
 - circuit problems.....63
 - clocking, setting.....56
 - edit interfaces command.....56, 58, 59
 - edit interfaces t3-options command.....55, 63
 - encapsulation, configuring.....58
 - error statistics61
 - further investigation48
 - HDLC, configuring encapsulation.....58
 - link layer, forcing up.....58
 - logical interface, status.....60
 - loopback
 - configuring local.....55
 - creating physical.....55
 - monitor checklist.....47
 - monitor interface command.....50
 - no keepalives, configuring.....59
 - overview.....4
 - physical link status.....57
 - ping interface command.....61
 - set cli terminal command.....51
 - set clocking internal command.....56
 - set encapsulation command.....58
 - set loopback local command.....55
 - set loopback remote command.....63
 - set no-keepalives command.....59
 - show interfaces command.....49, 57, 60
 - show interfaces extensive command.....61, 66
 - show interfaces terse command.....48, 60
 - statistics
 - checking error.....61
 - monitoring.....50
 - resetting.....58
 - status
 - description, table.....48
 - displaying48
 - displaying all.....48
 - displaying specific.....48
 - extensive.....49
 - verifying.....57
 - supported standards.....4
 - transmit clocks.....13
- t3-options statement
.....225, 232, 253, 263, 264, 295, 306
- TCC, protocol family9
- technical support
- contacting JTAC.....xxxiii
 - telcordia/bellcore standard GR-253 CORE.....145
- TNP, protocol family9
- translational cross-connect TCC, protocol family
See TCC, protocol family
- transmit light level.....187
- Trivial Network Protocol, protocol family See TNP,
protocol family
- tunnel statement.....9
- U**
- unit statement.....9
- upstream or downstream failure, figure149
- upstream, SONET alarms and errors, defining.....148
- V**
- VCI, configuration
 - ATM1 interfaces.....77
 - ATM2 IQ interfaces.....78
- virtual channel identifier VCI, configuration See VCI,
configuration
- virtual channel identifier, configuration See VCI,
configuration
- Y**
- yellow alarm bell.....118
- yellow alarms
 - T1 interfaces43
 - T3 interfaces69

