JUNOS® Internet Software

Interfaces Operations Guide

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

Part Number: 530-017618-01, Revision 1
Published: 2009-07-17

Writing: Merisha Wazna
Editing: Sonia Saruba
Illustration: Nathaniel Woodward
Cover Design: Edmonds Design
Thanks to Siew Ng and his team of engineers, especially Stephen McCarthy, Au Nguy, John Wang, and Robert Kim for their help with the first edition of this book. Thanks to John Wang and Sunny Schoch for their help with the second edition of this book.

Revision History
29 January 2003—First Edition
30 May 2004—Second Edition
12 January 2007—Revision 1

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

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

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About This Guide

This preface provides the following guidelines for using the *JUNOS™ Internet Software Interfaces Network Operations Guide*:

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 Internet software.

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 CLI User Guide*—Describes how to use the JUNOS 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 Baseline Network Operations Guide*
- *JUNOS 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 Software 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 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.xsl;
         }
      }
   }
   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.xsl; }
   ```

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:

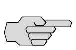
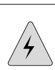
   ```
   [edit system scripts]
   user@host# load merge relative /var/tmp/ex-script-snippet.conf
   load complete
   ```

For more information about the load command, see the *JUNOS 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 xxxiii lists the books included in the *Network Operations Guide* series. Table 4 on page xxxiv lists the manuals and release notes supporting JUNOS software for J-series and SRX-series platforms. All documents are available at http://www.juniper.net/techpubs/.

Table 5 on page xxxv 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
JUNOS Software for Supported Routing Platforms	
Access Privilege	Explains how to configure access privileges in user classes by using permission flags and regular expressions. Lists the permission flags along with their associated command-line interface (CLI) operational mode commands and configuration statements.
Broadband Subscriber Management Solutions	Describes residential subscriber management and how you can deploy solutions that include multisubscriber IP address assignment, service provisioning, authentication, authorization, accounting, and dynamic request services in your network
Class of Service	Provides an overview of the class-of-service (CoS) functions of the JUNOS software and describes how to configure CoS features, including configuring multiple forwarding classes for transmitting packets, defining which packets are placed into each output queue, scheduling the transmission service level for each queue, and managing congestion through the random early detection (RED) algorithm.
CLI User Guide	Describes how to use the JUNOS command-line interface (CLI) to configure, monitor, and manage Juniper Networks routing platforms. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Feature Guide	Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.
High Availability	Provides an overview of hardware and software resources that ensure a high level of continuous routing platform operation and describes how to configure high availability (HA) features such as nonstop active routing (NSR) and graceful Routing Engine switchover (GRES).
MPLS Applications	Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols.
Multicast Protocols	Provides an overview of multicast concepts and describes how to configure multicast routing protocols.

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

Book	Description
Multiplay Solutions	Describes how you can deploy IPTV and voice over IP (VoIP) services in your network.
MX-series Layer 2 Configuration Guide	Provides an overview of the Layer 2 functions of the MX-series routers, including configuring bridging domains, MAC address and VLAN learning and forwarding, and spanning-tree protocols. It also details the routing instance types used by Layer 2 applications. All of this material was formerly covered in the *JUNOS Routing Protocols Configuration Guide*.
MX-series Layer 2 Solutions Guide	Describes common configuration scenarios for the Layer 2 features supported on the MX-series routers, including basic bridged VLANs with normalized VLAN tags, aggregated Ethernet links, bridge domains, Multiple Spanning Tree Protocol (MSTP), and integrated routing and bridging (IRB).
Network Interfaces	Provides an overview of the network interface functions of the JUNOS software and describes how to configure the network interfaces on the routing platform.
Network Management	Provides an overview of network management concepts and describes how to configure various network management features, such as SNMP and accounting options.
Policy Framework	Provides an overview of policy concepts and describes how to configure routing policy, firewall filters, and forwarding options.
Protected System Domain	Provides an overview of the JCS 1200 platform and the concept of Protected System Domains (PSDs). The JCS 1200 platform, which contains up to six redundant pairs of Routing Engines running JUNOS software, is connected to a T320 router or to a T640 or T1600 routing node. To configure a PSD, you assign any number of Flexible PIC concentrators (FPCs) in the T-series routing platform to a pair of Routing Engines on the JCS 1200 platform. Each PSD has the same capabilities and functionality as a physical router, with its own control plane, forwarding plane, and administration.
Routing Protocols	Provides an overview of routing concepts and describes how to configure routing instances, and unicast routing protocols.
Secure Configuration Guide for Common Criteria and JUNOS-FIPS	Provides an overview of secure Common Criteria and JUNOS-FIPS protocols for the JUNOS software and describes how to install and configure secure Common Criteria and JUNOS-FIPS on a routing platform.
Services Interfaces	Provides an overview of the services interfaces functions of the JUNOS software and describes how to configure the services interfaces on the router.
Software Installation and Upgrade Guide	Describes the JUNOS software components and packaging and explains how to initially configure, reinstall, and upgrade the JUNOS system software. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.

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

Book	Description
Subscriber Access	Provides an overview of the subscriber access features of the JUNOS software and describes how to configure subscriber access support on the router, including dynamic profiles, class of service, AAA, and access methods.
System Basics	Describes Juniper Networks routing platforms and explains how to configure basic system parameters, supported protocols and software processes, authentication, and a variety of utilities for managing your router on the network.
VPNs	Provides an overview and describes how to configure Layer 2 and Layer 3 virtual private networks (VPNs), virtual private LAN service (VPLS), and Layer 2 circuits. Provides configuration examples.
JUNOS References	
Hierarchy and RFC Reference	Describes the JUNOS configuration mode commands. Provides a hierarchy reference that displays each level of a configuration hierarchy, and includes all possible configuration statements that can be used at that level. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Interfaces Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot interfaces.
Routing Protocols and Policies Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot routing policies and protocols, including firewall filters.
System Basics and Services Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot system basics, including commands for real-time monitoring and route (or path) tracing, system software management, and chassis management. Also describes commands for monitoring and troubleshooting services such as class of service (CoS), IP Security (IPsec), stateful firewalls, flow collection, and flow monitoring.
System Log Messages Reference	Describes how to access and interpret system log messages generated by JUNOS software modules and provides a reference page for each message.
J-Web User Guide	
J-Web Interface User Guide	Describes how to use the J-Web graphical user interface (GUI) to configure, monitor, and manage Juniper Networks routing platforms.
JUNOS API and Scripting Documentation	
JUNOScript API Guide	Describes how to use the JUNOScript application programming interface (API) to monitor and configure Juniper Networks routing platforms.
JUNOS XML API Configuration Reference	Provides reference pages for the configuration tag elements in the JUNOS XML API.

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

Book	Description
JUNOS XML API Operational Reference	Provides reference pages for the operational tag elements in the JUNOS XML API.
NETCONF API Guide	Describes how to use the NETCONF API to monitor and configure Juniper Networks routing platforms.
JUNOS Configuration and Diagnostic Automation Guide	Describes how to use the commit script and self-diagnosis features of the JUNOS software. This guide explains how to enforce custom configuration rules defined in scripts, how to use commit script macros to provide simplified aliases for frequently used configuration statements, and how to configure diagnostic event policies.
Hardware Documentation	
Hardware Guide	Describes how to install, maintain, and troubleshoot routing platforms and components. Each platform has its own hardware guide.
PIC Guide	Describes the routing platform's Physical Interface Cards (PICs). Each platform has its own PIC guide.
DPC Guide	Describes the Dense Port Concentrators (DPCs) for all MX-series routers.
JUNOScope Documentation	
JUNOScope Software User Guide	Describes the JUNOScope 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	
Advanced Insight Solutions Guide	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	
JUNOS Release Notes	Summarize new features and known problems for a particular software release, provide corrections and updates to published JUNOS, JUNOScript, and NETCONF manuals, provide information that might have been omitted from the manuals, and describe upgrade and downgrade procedures.
Hardware Release Notes	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.
JUNOScope Release Notes	Contain corrections and updates to the published JUNOScope manual, provide information that might have been omitted from the manual, and describe upgrade and downgrade procedures.

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

Book	Description
AIS Release Notes	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.
AIS AI-Scripts Release Notes	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 Software Network Operations Guides

Book	Description
Baseline	Describes the most basic tasks for running a network using Juniper Networks products. Tasks include upgrading and reinstalling JUNOS software, gathering basic system management information, verifying your network topology, and searching log messages.
Interfaces	Describes tasks for monitoring interfaces. Tasks include using loopback testing and locating alarms.
MPLS	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.
MPLS Log Reference	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.
MPLS Fast Reroute	Describes operational information helpful in monitoring and troubleshooting an MPLS network configured with fast reroute (FRR) and load balancing.
Hardware	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 software, 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 Software for J-series Services Routers and SRX-series Services Gateways Documentation

Book	Description
J-series and SRX-series Platforms	
JUNOS Software Interfaces and Routing Configuration Guide	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.
JUNOS Software Security Configuration Guide	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).
JUNOS Software Administration Guide	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.
JUNOS Software CLI Reference	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.
Network and Security Manager: Configuring J Series Services Routers and SRX Series Services Gateways Guide	Explains how to configure, manage, and monitor J-series Services Routers and SRX-series services gateways through NSM.
JUNOS Release Notes	Summarize new features and known problems for a particular release of JUNOS software, including JUNOS software 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 software.
J-series Only	
JUNOS Software Design and Implementation Guide	Provides guidelines and examples for designing and implementing IPsec VPNs, firewalls, and routing on J-series Services Routers running JUNOS software.
J Series Services Routers Quick Start	Explains how to quickly set up a J-series Services Router. This document contains router declarations of conformity.
JUNOS Software with Enhanced Services J-series Services Router Hardware Guide	Provides an overview, basic instructions, and specifications for J-series Services Routers. This guide explains how to prepare a site, unpack and install the router, replace router hardware, and establish basic router connectivity. This guide contains hardware descriptions and specifications.
JUNOS Software Migration Guide	Provides instructions for migrating an SSG device running ScreenOS software to JUNOS software or upgrading a J-series device to a later version of the JUNOS software.

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

Book	Description
WXC Integrated Services Module Installation and Configuration Guide	Explains how to install and initially configure a WXC Integrated Services Module in a J-series Services Router for application acceleration.

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

Book	Description
Interdomain Multicast Routing	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.
JUNOS Cookbook	Provides detailed examples of common JUNOS software configuration tasks, such as basic router configuration and file management, security and access control, logging, routing policy, firewalls, routing protocols, MPLS, and VPNs.
MPLS-Enabled Applications	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.
OSPF and IS-IS: Choosing an IGP for Large-Scale Networks	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.
Routing Policy and Protocols for Multivendor IP Networks	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.
The Complete IS-IS Protocol	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 name
- Document part number
- Page number
- Software release version (not required for Network Operations Guides [NOGs])

Requesting Technical Support

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

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

Self-Help Online Tools and Resources

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

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

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

Opening a Case with JTAC

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

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

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

Part 1
Overview of Interfaces

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 Software 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 TI.107, TI.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 software 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 TI.107, TI.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 Software

The JUNOS software 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 software. Table 6 on page 6 lists the interface types supported by the JUNOS software and shows the interface name as it appears in a configuration.

Table 6: Interface Types Supported by the JUNOS Software

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.
es	Encryption	Allows you to configure a security association (SA) name with a logical interface.

Table 6: Interface Types Supported by the JUNOS Software *(continued)*

Interface Name in Configuration	Interface Type	Description
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/pic/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.
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.

Table 6: Interface Types Supported by the JUNOS Software *(continued)*

Interface Name in Configuration	Interface Type	Description
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-*fpc/pic/port*.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 [Unresolved xref] 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.

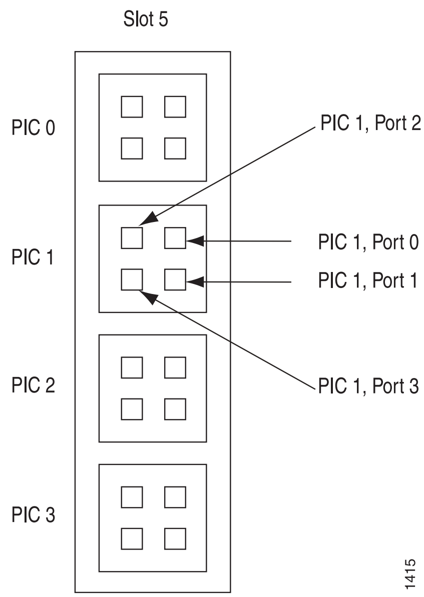
In the virtual part of the name, a period (.) separates the channel and logical unit numbers.

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 IQPIC 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

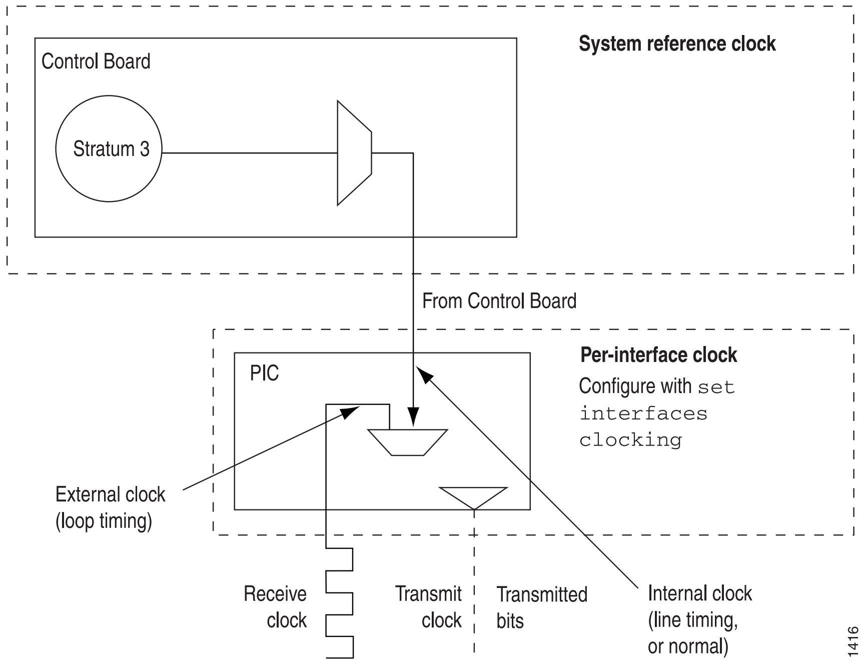
When running a loopback test onT1, T3, ATM, and SONET interfaces, you must configure the *transmit clock*. The transmit clock aligns each outgoing packet transmitted over the router's interfaces. For both the router and interfaces, the clock source can be the router's internal Stratum 3 clock, which 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

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 *interface-name* For example: show interfaces terse t1*	Displays summary information about the named interfaces.
show interfaces *interface-name* For example: show interfaces t1-*x/x/x*	Displays static status information about a specific interface.
show interfaces *interface-name*extensive For example: show interfaces t1-*x/x/x* extensive	Displays very detailed interface information about a specific interface.
monitor interface *interface-name* 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
[edit interfaces *interface-name interface-* options] set loopback (local | remote)	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.
show	All interfaces	Verify the configuration before you commit it.
commit	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.
[edit interfaces *interface-name*] set clocking internal	T1, T3, ATM, and SONET interfaces	The clocking statement at this hierarchy level configures the clock source of the interface to internal.
show interfaces *interface-name*	Used for all interfaces	Display static status information about a specific interface.

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

CLI Statement or Command	Interface Type	Description
[edit interfaces *interface-name* unit *logical-unit-number* family inet *address* address] arp *ip-address* mac *mac-address*	Fast Ethernet and Gigabit Ethernet interfaces	The arp statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses.
show arp no-resolve	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).
clear interfaces statistics *interface-name*	All interfaces	Reset the statistics for an interface to zero.
[edit interfaces *interface-name*] set encapsulation cisco-hdlc	T1, T3, SONET, and Multichannel DS3 interfaces	The encapsulation statement at thishierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces *interface-name*] set no-keepalives	T1, T3, SONET, and Multichannel DS3 interfaces	The no-keepalives statement at this level disables the sending of keepalives on the physical interface.
show interfaces *interface-name* terse	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
ping interface t1- *x/x/x local-IP-address* bypass-routing count 1000 rapid	All interfaces	Check the reachability of network hosts by sending ICMP ECHO_REQUEST messages to elicit ICMP ECHO_RESPONSE messages from the specified host. Use the bypass-routing option to ping a local system through an interface that has no route through it. The count option sends 1000 ping requests through the system. Type Ctrl+C to interrupt a ping command.
show interfaces *interface-name* extensive	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

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

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-*fpc/pic/port*
3. Display Extensive Status Information for a Specific T1 Interface on page 23	show interfaces t1-*fpc/pic/port* extensive
4. Monitor Statistics for a T1 Interface on page 24	monitor interface t1-*fpc/pic/port*

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

Display the Status of T1 Interfaces

Purpose To display the status of T1 interfaces.

Action Use the following JUNOS 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 AdminDown 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 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)
  DS1   alarms   : LOF, LOS
  DS1   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 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 “Locate 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 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

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 *interface-name* t1-options] set loopback local show commit
2. Set Clocking to Internal on page 30	[edit interfaces *interface-name*] 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	show interfaces t1-*fpc/pic/port*
4. Clear T1 Interface Statistics on page 32	clear interfaces statistics t1-*fpc/pic/port*
5. Force the Link Layer To Stay Up on page 32	
a. Configure Encapsulation to Cisco-HDLC on page 32	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 33	[edit interfaces *interface-name*] set no-keepalives show commit
6. Verify the Status of the Logical Interface on page 34	show interfaces t1-*fpc/pic/port* show interfaces t1-*fpc/pic/port* terse
7. Ping the T1 Interface on page 35	ping interface t1-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
8. Check for T1 Interface Error Statistics on page 35	show interfaces t1-*fpc/pic/port* extensive
"Diagnose a Suspected Circuit Problem" on page 37	
1. Create a Loop from the Router to the Network on page 37	[edit interfaces *interface-name* t1-options] set loopback remote show commit
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

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).

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 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 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 software 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 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)
  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
    Bandwidth: 0
    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

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
```

Meaning The sample output for both commands shows 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 t1-1/1/0.0 is down.

Ping the T1 Interface

Purpose Use the ping command to verify the loopback connection.

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

user@host> **ping interface t1-***fpc/pic/port local-IP-address* **bypass-routing count 1000 rapid**

Sample Output

```
user@host> ping interface t1-1/1/0 1.1.1.1 bypass-routing count 1000 rapid
PING 1.1.1.1 (1.1.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 1.1.1.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.036/2.120/9.809/0.681 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 T1 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 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 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	show interfaces t1-*fpc/pic/port* extensive
"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 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

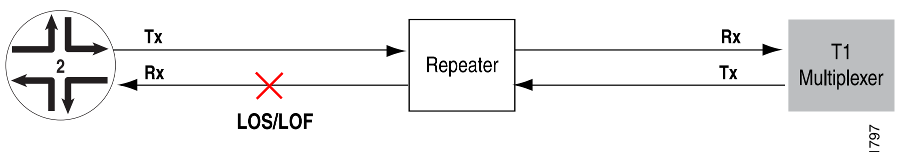
To locate common alarms and errors, follow these steps:

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 t1-1/1/1 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
    ES                         32
    SES                        32
    SEFS                       32
    BES                         0
```

```
    UAS                         32
[...Output truncated...]
```

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

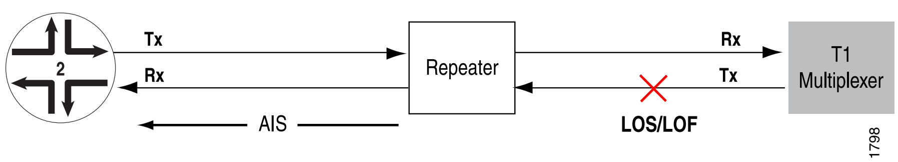
Locate Alarm Indication Signal Alarms

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.

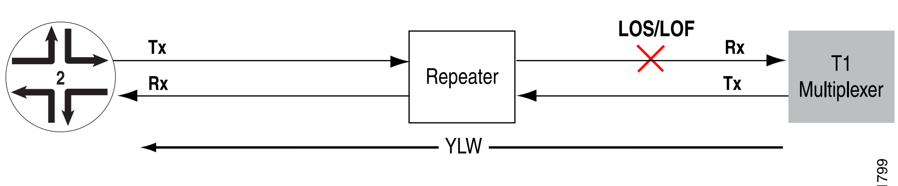
Locate an Incoming Yellow Alarm

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

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

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-*fpc/pic/port*
3. Display Extensive Status Information for a Specific T3 Interface on page 49	show interfaces t3-*fpc/pic/port* extensive
4. Monitor Statistics for a T3 Interface on page 50	monitor interface t3-*fpc/pic/port*

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 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 Admin Down Link Up	t3-1/0/0.0 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 down because the physical link is disabled (Link Down).
t3-1/0/1 Admin Up Link Down	t3-1/0/1.0 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).
t3-1/0/2 Admin Up Link Up	t3-1/0/2.0 Admin Up Link Up	This interface has both the physical and logical links up and running.
t3-1/0/3 Admin Up Link Down		This interface does not have a logical link configured.

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 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 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 “Locate 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 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

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: ChecklAsctiforn Using Loopback Testing for T3 Interfaces

Tasks	Command or Action
[Unresolved xref]	
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 *interface-name* t3-options] set loopback local show commit

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

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

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

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

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

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
```

Meaning The sample output for both commands shows 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 t3-0/2/0 is down.

Ping the T3 Interface

Purpose Use the ping command to verify the loopback connection.

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

user@host> **ping interface t3-** *fpc/pic/port local-IP-address* **bypass-routing count 1000 rapid**

Sample Output

```
user@host# ping interface t3-2/2/0 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 T3 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 CLI operational mode command:

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 :
    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 [Unresolved xref].

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	show interfaces t3-*fpc/pic/port* extensive
"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 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
    CSES                    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:

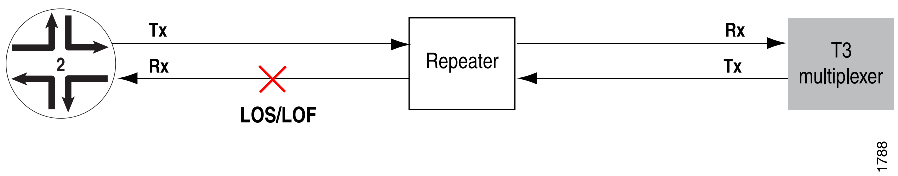
1. Locate Loss of Signal and Loss of Frame Alarms on page 67
2. Locate Alarm Indication Signal Alarms on page 68
3. Locate an Incoming Yellow Alarm on page 69
4. Locate IDLE on a T3 Interface on page 69

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.

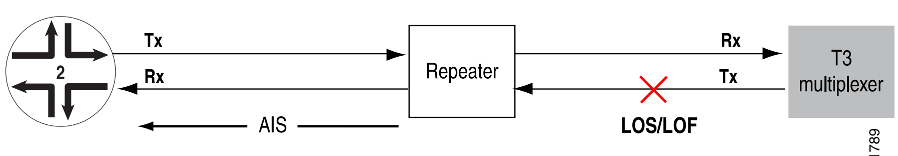
Locate Alarm Indication Signal Alarms

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.

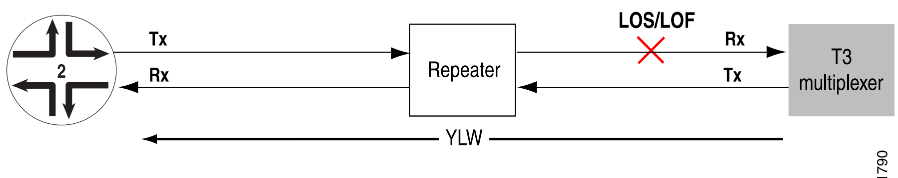
Locate an Incoming Yellow Alarm

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

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

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-*fpc/pic/port*
b. Check the Configuration of an ATM2 IQ Interface on page 76	show configuration interfaces at-*fpc/pic/port*
"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	show configuration interfaces at-*fpc/pic/port* show interfaces terse at-*fpc/pic/port* edit edit interfaces *interface-name* atm-options vpi *vpi-identifier* maximum-vcs *maximum-vcs* show commit show configuration interfaces at-*fpc/pic/port* run show interfaces terse at-*fpc/pic/port*
2. Check the Configuration of the VCI on an ATM2 IQ Interface on page 78	show configuration interfaces at-*fpc/pic/port* show interfaces terse at-*fpc/pic/port* edit edit interfaces *interface-name* atm-options vpi *vpi-identifier* delete maximum-vcs show commit show configuration interfaces at-*fpc/pic/port* run show interfaces terse at-*fpc/pic/port*
3. Check the Configuration of Promiscuous Mode on an ATM2 IQ Interface on page 80	show configuration interfaces at-*fpc/pic/port* show interfaces terse at-*fpc/pic/port* edit set interfaces *interface-name* atm-options pic-type atm 2 show commit show configuration interfaces at-*fpc/pic/port* run show interfaces terse at-*fpc/pic/port*

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 software 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 command-line interface (CLI) operational mode command:

Action user@host> **show chassis hardware**

Sample Output

```
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
```

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 software 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 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 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 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 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

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	show interfaces terse at*
"Monitor ATM1 Interfaces" on page 85	
1. Display the Status of a Specific ATM1 Interface on page 85	show interfaces at-*fpc/pic/port*
2. Display Extensive Status Information for a Specific ATM1 Interface on page 85	show interfaces at-*fpc/pic/port* extensive
3. "Monitor Statistics for an ATM1 Interface" on page 87	monitor interface at-*fpc/pic/port*
"Monitor ATM2 IQ Interfaces" on page 89	
1. Display the Status of a Specific ATM2 IQ Interface on page 89	show interfaces terse at-*fpc/pic/port* show interfaces at-*fpc/pic/port*
2. Display Extensive Information for a Specific ATM2 Interface on page 91	show interfaces at-*fpc/pic/port* extensive
3. Monitor Statistics for an ATM2 Interface on page 96	monitor interface at-*fpc/pic/port*

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 "Determine 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 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 "Determine 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 Admin Up Link Up	at-2/0/0.100 Admin Up Link Up	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 ATM 1 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.
at-2/0/1 Admin Up Link Down	at-2/0/1.10 Admin Up Link Down	The physical link is down on this interface and therefore the logical interface is down also.

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 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 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 "Locate ATM Alarms and Errors" 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 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:                                            Current delta
  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 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 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 "Locate ATM Alarms and Errors" 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 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:                                          Current delta
  Input bytes:                           0 (0 bps)                    [0]
  Output bytes:                       1600 (0 bps)                    [0]
  Input packets:                         0 (0 pps)                    [0]
  Output packets:                       18 (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:                 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

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 100	
a. Create a Physical Loopback on page 101	Connect the transmit port to the receive port.
b. Configure a Local Loopback on page 101	[edit interfaces *interface-name* (sonet-options | t3-options)] set loopback local show commit

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

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

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 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 CLI operational mode command:

user@host> **clear interfaces statistics at-***fpc/pic/port*

Sample Output

user@host> **clear interfaces statistics at-4/0/2**
user@host>

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 CLI operational mode command:

Action

user@host> **ping interface at-***fpc/pic/port-IP-address* **bypass-routing count 1000 rapid**

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
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 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 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

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	show interfaces at-*fpc/pic/port* extensive See "List of Common SONET Alarms and Errors" on page 145. See "Checklist of Common T3 Alarms and Errors" on page 65.

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 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 “Locate 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 "Locate 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 software 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)
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

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

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-*fpc/pic/port*
3. Display Extensive Status Information for a Specific SONET Interface on page 126	show interfaces so-*fpc/pic/port* extensive
4. Monitor Statistics for a SONET Interface on page 127	monitor interface so-*fpc/pic/port*

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 126
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 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 Admin Up Link Up	so-1/0/0.0 Admin Up Link Up	This interface has both the physical and logical links up and running.
so-1/1/1 Admin Down Link Up	so-1/1/1.0 Admin Up Link Down	This interface is administratively disabled. The physical link is healthy (Link Up), but the logical link is not established end to end (Link Down).
so-3/0/1 Admin Up Link Up	so-3/0/1.0 Admin Up Link Down	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).
so-5/3/0 Admin Up Link Down	so-5/3/0.0 Admin Up Link Down	This interface has the physical link down and the logical interface is down also.

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 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 126 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 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 “Locate 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 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:                                          Current Delta
  Input bytes:                 375527568 (0 bps)                       [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	Sum of ATM Adaption Layers (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 software does not handle.

Table 31: SONET Error Statistics *(continued)*

Output Field	Output Field Description
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.
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.

Chapter 14

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

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 132	
1. Create a Loopback on page 133	
a. Create a Physical Loopback on page 133	Connect the transmit port to the receive port.
b. Configure a Local Loopback on page 133	[edit interfaces *interface-name* sonet-options] set loopback local show commit

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

Tasks	Command or Action
2. Set Clocking to Internal on page 134	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the SONET Interface Is Up on page 135	show interfaces so-*fpc/pic/port*
4. Clear SONET Interface Statistics on page 137	clear interfaces statistics so-*fpc/pic/port*
5. Check That the Received and Transmitted Path Trace Are the Same on page 137	show interfaces so-*fpc/pic/port* extensive
6. Force the Link Layer to Stay Up on page 138	
a. Configure Encapsulation to Cisco-HDLC on page 138	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 138	[edit interfaces *interface-name*] set no-keepalives show commit
7. Verify the Status of the Logical Interface on page 139	show interfaces so-*fpc/pic/port* show interfaces so-*fpc/pic/port* terse
8. Ping the SONET Interface on page 140	ping interface so-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
9. Check for SONET Interface Error Statistics on page 141	show interfaces so-*fpc/pic/port* extensive
“Diagnose a Suspected Circuit Problem” on page 142	
1. Create a Loop from the Router to the Network on page 142	[edit interfaces *interface-name* sonet-options] set loopback remote show commit
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 132.

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

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

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 attentuation.)

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 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 CLI operational mode command:

user@host> **clear interfaces statistics so-***fpc/pic/port*

Sample Output

user@host> **clear interfaces statistics so-4/0/2**
user@host>

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 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
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 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...]
```

Meaning 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.

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.

Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, JUNOS software 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 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 1shows 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 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
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 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 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 132. 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 15

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

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	show interfaces so-*fpc/pic/port* extensive
"Locate Most Common SONET Alarms and Errors" on page 150	
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 153	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: ■ Optical fiber ■ Optical transmitter and receiver ■ Clocking ■ Attenuation in the optical signal
6. Locate Payload Label Mismatch Path Alarms on page 158	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 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
```

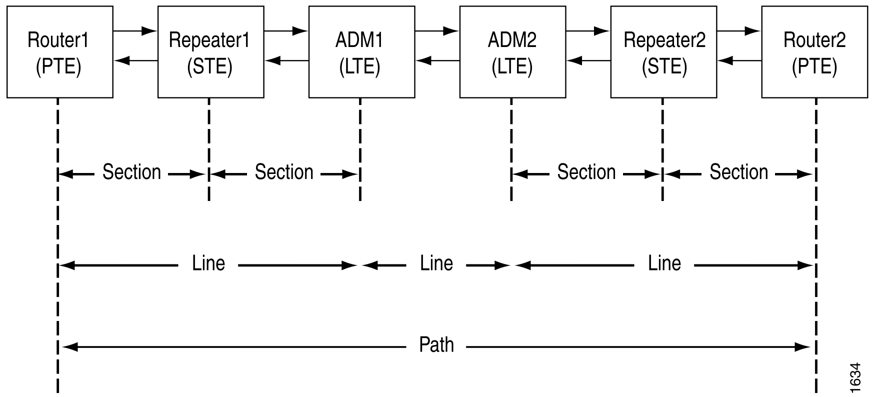
```
    ES-S                   0
    SES-S                  0
    SEFS-S                 0
  SONET line:
    BIP-B2                 0            0
    REI-L                  0            0
    RDI-L                  0            0  OK
    AIS-L                  0            0  OK
    BERR-SF                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 andRouter 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:

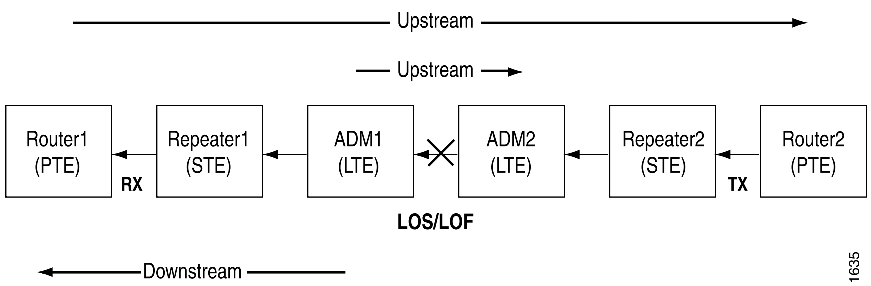
- The main role of a PTE is to read the path overhead bytes. However, it also reads the line overhead bytes and the section overhead bytes. Therefore the PTE also plays the role of an LTE and an STE.
- The main role of an LTE is to read the line overhead bytes. However, it also reads the section overhead 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.

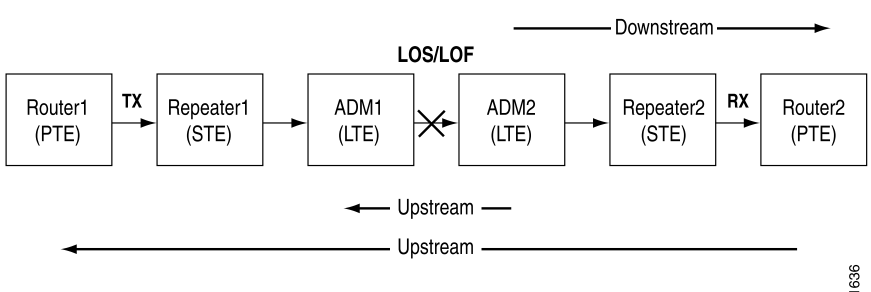
Figure 12: Example of an Upstream or Downstream Failure



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:

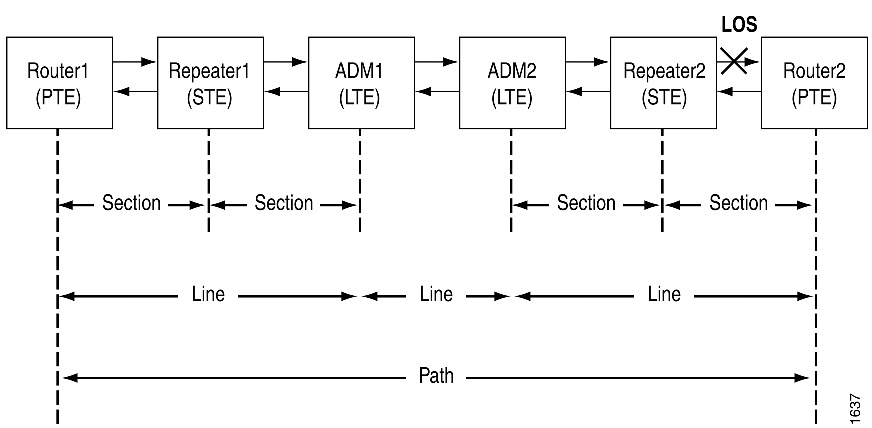
- Locate Loss of Signal Alarms on page 150
- Locate Alarm Indication Signal Alarms on page 151
- Locate Remote Defect Indication Alarms on page 153
- Locate Remote Error Indication Line Errors on page 154
- Locate Bit Error Rate Alarms on page 156
- Locate Payload Label Mismatch Path Alarms on page 158
- 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 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 that Router 2 detected an LOS that lasted 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.

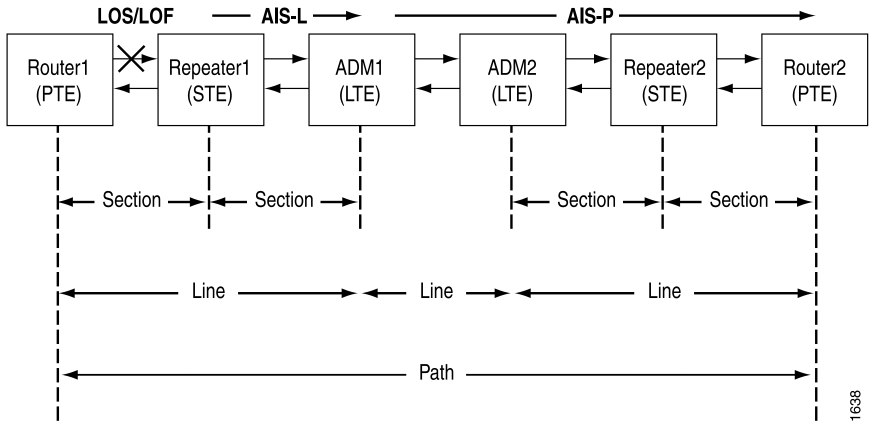
1. Example of a Router Receiving Only an AIS-P Alarm on page 151
2. Example of a Router Receiving Both an AIS-L and AIS-P Alarm on page 152

Example of a Router Receiving Only an AIS-P Alarm

Problem Figure 15 on page 152 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 152, the progression of events occurring after the failure is as follows:

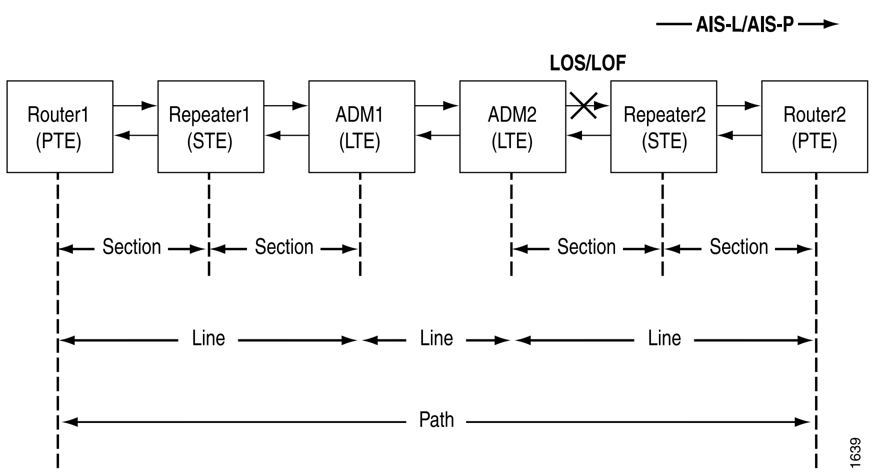
1. Repeater 1 detects an LOS or LOF on an incoming SONET section.
2. Repeater 1 sends an AIS-L downstream to ADM1 (LTE).
3. ADM 1 sends an AIS-P to Router 2 (PTE).
4. The only alarm that Router 2 receives is the AIS-P alarm from ADM 1.

Example of a Router Receiving Both an AIS-L and AIS-P Alarm

Problem Figure 16 on page 152shows a router receiving both an IS-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:

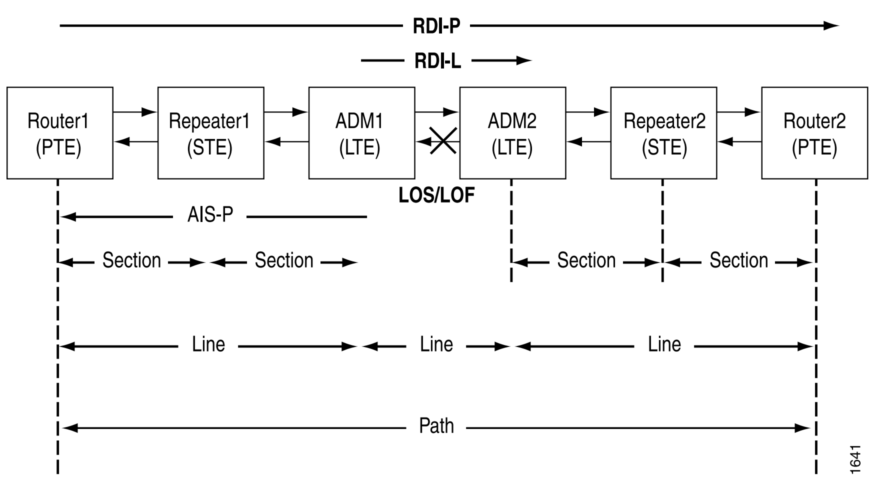
- Remote defect indication line (RDI-L) is sent upstream to a peer LTE when an alarm indication signal line (AIS-L) or low-level defects are detected.
- Remote defect indication path (RDI-P) is sent upstream to a peer PTE when a defect in the signal, typically an AIS-P, is detected.

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.

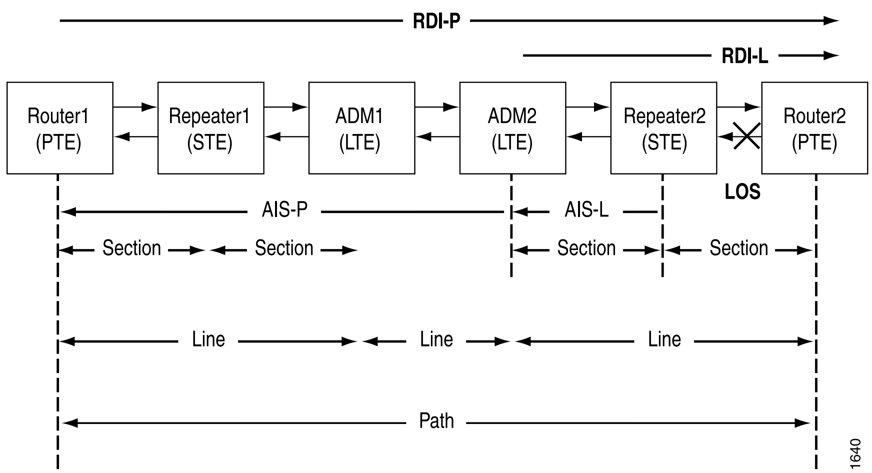
4. Router 1 sends an RDI-P upstream to Router 2.
5. Router 2 only receives an RDI-P alarm.

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.

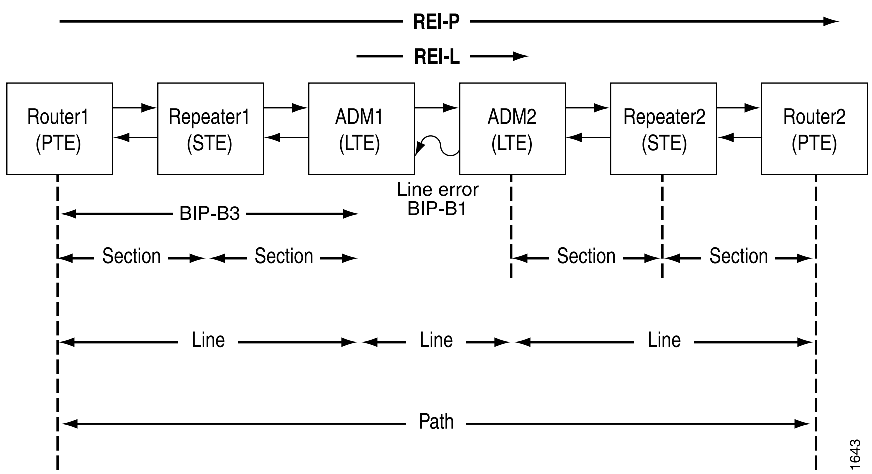
1. Example of Only an REI-P Counter Incrementing on page 155
2. Example of Both REI-L and REI-P Counters Incrementing on page 155

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:

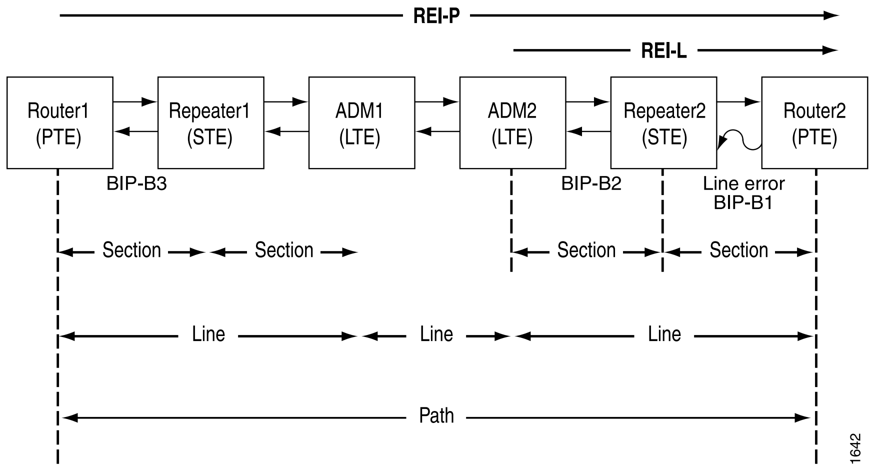
1. ADM 1 detects parity errors in the B1 byte.
2. ADM 1 sends an REI-L upstream to ADM 2.
3. Router 1 detects parity errors in the B3 byte.
4. Router 1 sends an REI-P upstream to Router 2.
5. Router 2 only sees an REI-P incrementing counter.

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 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 : None
  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  OK
    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 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 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:           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                  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 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:            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                  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 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 164.) 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 164 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)
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

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	show configuration interfaces | *interface-name* show interfaces *interface-name*
2. Configure SONET HDLC Payload Scrambling on page 167	[edit] edit interfaces *so-fpc/pic/port* sonet-options set payload-scrambler show commit

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 + x6 + x7 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 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**

Chapter 17

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

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	show interfaces *interface-name* extensive
2. Check the FCS Configuration on page 172	show configuration interfaces | *interface-name* show interfaces *interface-name*
"Configure a SONET Frame Checksum" on page 174	
1. Return to the Default 16-Bit Checksum on page 174	[edit] edit interfaces *so-fpc/pic/port* sonet-options delete fcs 32 show commit
2. Configure a 16-Bit Checksum on page 174	[edit] edit interfaces *so-fpc/pic/port* sonet-options set fcs 16 show commit

Table 38: Checklist for Checking the SONET Frame Checksum *(continued)*

Tasks	Command or Action
3. Configure a 32-Bit Checksum on page 175	[edit] edit interfaces *so-fpc/pic/port* sonet-options set (fcs 32 | rfc-2615) show commit

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 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   ................
HDLC 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 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 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

Chapter 18

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

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	show interfaces terse (fe* | ge*)
2. Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface on page 182	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*)
3. Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface on page 183	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*) extensive
4. Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface on page 186	monitor interface (fe-*fpc/pic/port* | ge-*fpc/pic/port*)
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:

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 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 Admin Up Link Up	fe-2/1/0.0 Admin Up Link Up	This interface has both the physical and logical links up and running.

Table 40: Status of Fast Ethernet Interfaces *(continued)*

Physical Interface	Logical Interface	Status Description
fe-3/0/2 Admin Up Link Down	fe-3/0/2.0 Admin Up Link Down	This interface has the physical link down (Link Down). The logical link is also down as a result.
fe-4/1/0 Admin Down Link Up	fe-4/1/0.0 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 down because the physical link is disabled.
fe-4/1/2 Admin Up Link Down	fe-4/1/2.0 Admin Up Link Down	This interface has both the physical and logical links 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 Admin Down Link Down	ge-2/2/0.0 Admin Up Link Down	This interface is administratively disabled (Admin Down). Both the physical and logical links are down (Link Down).
ge-2/3/0 Admin Up Link Up	ge-2/3/0.0 Admin Up Link Up	This interface has both the physical and logical links up and running.

Table 41: Status of Gigabit Ethernet Interfaces *(continued)*

Physical Interface	Logical Interface	Status Description
ge-3/2/0 Admin Up Link Down	ge-3/2/0.0 Admin Up Link Down	This interface has both the physical link and the logical interface 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 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 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 "Locate the Fast Ethernet and Gigabit Ethernet LINKAlarm 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	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. 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.
Fragment frames	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. 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.

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.

Table 44: Autonegotiation Information *(continued)*

Autonegotiation Field Information	Explanation
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 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:                                          Current Delta
  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 1012) 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

Table 45: Fiber-Optic Ethernet Interface Specifications *(continued)*

Fiber-Optic Ethernet Interface	Length	Wavelength	Average Launch Power	Receiver Saturation	Receiver Sensitivity
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

Chapter 19

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

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	[edit interfaces *interface-name* (fastether-options | gigether-options)] set loopback show commit
2. Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up on page 193	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*)
3. Configure a Static Address Resolution Protocol Table Entry on page 194	show interfaces ge-*fpc/pic/port* [edit interfaces *interface-name* unit *logical-unit-number* family inet address *address]* set arp *ip-address* mac *mac-address* show commit run show arp no-resolve
4. Clear Fast Ethernet or Gigabit Ethernet Interface Statistics on page 196	clear interfaces statistics fe-*fpc/pic/port* | ge-*fpc/pic/port*
5. Ping the Fast Ethernet or Gigabit Ethernet Interface on page 196	ping *remote-IP-address* bypass-routing interface (fe-*fpc/pic/port* | ge-*fpc/pic/port* count 100 rapid
6. Check for Fast Ethernet or Gigabit Ethernet Interface Error Statistics on page 197	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*) extensive
"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).

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.

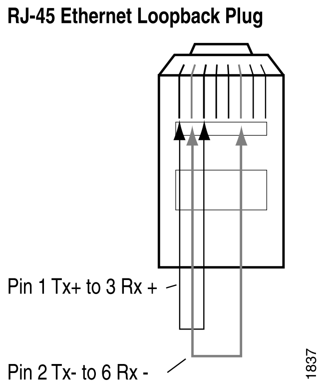
Create a Loopback Plug for an RJ-45 Ethernet Interface

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



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 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 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 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 TLL 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 packed is either lost, or the TLL 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 software 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 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 inferfaces.

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	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*) extensive
"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 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
    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 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 "Use 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 software 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.
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.

Table 49: Major Fast Ethernet and Gigabit Ethernet Counters *(continued)*

Counter	Description	Reason for Increment
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.
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

Chapter 21

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 207
- Monitor Channelized DS3 Interfaces on page 207

Checklist for Monitoring Channelized DS3 Interfaces

Purpose Table 50 on page 207 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 207	
1. Display the Status of Channelized DS3 Interfaces on page 208	show interfaces terse t1*
2. Display the Status of a Specific Channelized DS3 Interface on page 209	show interfaces t1-*fpc/pic/port*:*channel*
3. Display Extensive Status Information for a Specific Channelized DS3 Interface on page 211	show interfaces t1-*fpc/pic/port*:*channel* extensive
4. Monitor Statistics for a Channelized DS3 Interface on page 217	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 208
2. Display the Status of a Specific Channelized DS3 Interface on page 209

3. Display Extensive Status Information for a Specific Channelized DS3 Interface on page 211
4. Monitor Statistics for a Channelized DS3 Interface on page 217

Display the Status of Channelized DS3 Interfaces

Purpose To display the status of Channelized DS3 interfaces, use the following JUNOS 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 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 t1-0/3/3:2.0  (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 t1-1/2/0:1
Physical interface: t1-1/2/0:1, 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 t1-1/2/0:19
  Physical interface: t1-1/2/0:19, 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 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:              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
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 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, mpls:
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 “Locate 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 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:                                    Current delta
  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:                                    Current delta
  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 runts:                           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 t1-1/2/0:19
host      Seconds: 9                  Time: 19:05:23
                                                       Delay: 0/0/68
Interface: t1-1/2/0:19, Enabled, Link is Down
Encapsulation: PPP, Keepalives, Speed: T1
Traffic statistics:                                    Current delta
  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

Purpose Table 51 on page 221 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 222	
1. Create a Loopback on page 223	
a. Create a Physical Loopback on page 223	Connect the TX port to the RX port.
b. Configure a Local Loopback on page 223	[edit interfaces *interface name* (t3-options | t1-options)] set loopback local show commit

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 224	show interfaces t1-*fpc/pic/port:channel* show interfaces t3-*fpc/pic/port:channel*
3. Clear Interface Statistics on page 225	clear interfaces statistics t1-*fpc/pic/port:channel*
4. Force the Link Layer to Stay Up on page 225	
a. Configure Encapsulation to Cisco-HDLC on page 225	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 227	[edit interfaces *interface-name*] set no-keepalives show commit
5. Verify the Status of the Logical Interface on page 227	show interfaces t1-*fpc/pic/port:channel*
6. Ping the Channelized Interface on page 228	ping interface t1-*fpc/pic/port:channel local-IP-address* bypass-routing count 1000 rapid
7. Check for Interface Error Statistics on page 228	show interfaces t1-*fpc/pic/port:channel* extensive
"Diagnose a Suspected Circuit Problem" on page 230	
8. "Create a Loop from the Router to the Network" on page 231	[edit interfaces t1-*fpc/pic/port:channel* t1-options] set loopback remote show commit
9. Create a Loop to the Router from Various Points in the Network on page 231	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface" on page 222.

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 223
- Verify That the Interface Is Up on page 224
- Clear Interface Statistics on page 225
- Force the Link Layer to Stay Up on page 225
- Verify the Status of the Logical Interface on page 227

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).

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 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 " "Locate Channelized DS3 Alarms and Errors" on page 233for 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 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 software 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 225
2. Configure No-Keepalives on page 227

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 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 CLI operational mode commands:

user@host> **ping interface t1**-*fpc/pic/port:channel local-IP-address* **bypass-routing count 1000 rapid**

Sample Output

```
user@host> ping interface t1-2/1/0:20 10.10.1.2 bypass-routing count 1000 rapid
PING 10.10.1.2 (10.10.1.2): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.10.1.2 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.830/3.872/9.965/0.633 ms
```

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 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 231
2. Create a Loop to the Router from Various Points in the Network on page 231

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 222. 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 23

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

Purpose Table 52 on page 233 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 233	show interfaces t1-*fpc/pic/port:channel* extensive

Display Alarms and Errors for Channelized DS3 Interfaces

Purpose To display channelized DS3 alarms and errors, use the following JUNOS 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, 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:             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, mpls:
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 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 237 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 “Locate T1 Alarms and Errors” on page 39 for more details on T1 alarms and statistics.

Chapter 24
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

Purpose Table 54 on page 239 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 239	
1. Display the Status of Channelized Interfaces on page 240	show interfaces terse ds* show interfaces terse t1*
2. Display the Status of a Specific Channelized Interface on page 240	show interfaces ds-*fpc/pic/port:channel:channel* show interfaces t1-*fpc/pic/port:channel*
3. Display Extensive Status Information for a Specific T3 Interface on page 241	show interfaces ds-*fpc/pic/port:channel:channel* extensive show interfaces t1-*fpc/pic/port:channel* extensive
4. Monitor Statistics for a Channelized Interface on page 245	monitor interfaces ds-*fpc/pic/port:channel:channel* monitor interfaces t1-*fpc/pic/port:channel*

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:

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 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: 192.168118.97
```

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 "Locate 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:                                      Current delta
  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 runts:                        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:                                      Current delta
  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 runts:                      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 246 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.

Chapter 25

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

Purpose Table 56 on page 249 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
[Unresolved xref]	
1. Create a Loopback on page 251	
a. Create a Physical Loopback on page 251	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 251	[edit interfaces *interface name* (t3-options | t1-options)] set loopback local show commit
2. Verify That the Interface Is Up on page 252	show interfaces (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*)
3. Clear Interface Statistics on page 254	clear interfaces statistics (t1-*fpc/pic/port:channel* | ds-*fpc/pic/port:channel:channel*)
4. Force the Link Layer to Stay Up on page 254	
a. Configure Encapsulation to Cisco-HDLC on page 254	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 255	[edit interfaces *interface-name*] set no-keepalives show commit
5. Verify the Status of the Logical Interface on page 256	show interfaces (ds- *fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*)
6. Ping the Channelized Interface on page 257	ping interface (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*) *local-IP-address* bypass-routing count 1000 rapid
7. Check for Interface Error Statistics on page 257	show interfaces (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*) extensive
"Diagnose a Suspected Circuit Problem" on page 261	
1. Create a Loop from the Router to the Network on page 261	
a. Loop the Entire T3 Interface towards the Network on page 261	[edit interfaces *interface-name* t3-options] set loopback remote show commit
b. Loop a Particular T1 Channel towards the Network on page 262	[edit interfaces *interface-name* t1-options] set loopback remote show commit
2. Create a Loop to the Router from Various Points in the Network on page 263	Perform Steps 2 through 8 from [Unresolved xref].

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 251
- Verify That the Interface Is Up on page 252
- Clear Interface Statistics on page 254
- Force the Link Layer to Stay Up on page 254
- Verify the Status of the Logical Interface on page 256
- Ping the Channelized Interface on page 257
- Check for Interface Error Statistics on page 257

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 251
2. Configure a Local Loopback on page 251

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 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 DS1interface:

```
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 DS1or 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 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 software 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 254
2. Configure No-Keepalives on page 255

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 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 DS1interface:

```
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 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 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 261
- Create a Loop to the Router from Various Points in the Network on page 263

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 261
2. Loop a Particular T1 Channel towards the Network on page 262

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 [Unresolved xref]. 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 26

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.

for DS3 Alarms

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	show interfaces t1-*fpc/pic/port:channel* extensive
"Display Alarms and Errors for Channelized DS3 to DS0 Interfaces" on page 268	show interfaces ds-*fpc/pic/port:channel:channel* extensive

Display Alarms and Errors for Channelized DS3 to DS1 Interfaces

Purpose To display channelized DS3 to DS1 alarms and errors, use the following JUNOS 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 “Locate 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 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
IDLE	Idle code detected
LCV	Line code violation

Table 59: T3 Interface Error Counter Definitions *(continued)*

T3 Alarm or Error	Definition
LOS	Loss of signal
LOF	Loss of frame
YLW	Remote defect indication (yellow alarm)
PLL	Phase locked loop

See "Locate 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	show interfaces terse t3-*interface-name**
2. Display the Status of a Specific Channelized OC12 Interface on page 275	show interfaces terse t3-*fpc/pic/port:channel*
3. Display Extensive Status Information for a Specific Channelized OC12 Interface on page 275	show interfaces t3-*fpc/pic/port:channel* extensive
4. Monitor Statistics for a Channelized OC12 Interface on page 278	monitor interfaces t3-*fpc/pic/port:channel*
"Monitor Channelized OC12 IQ Interfaces" on page 279	
1. Display the Status of a Channelized OC12 IQ Interface on page 279	show interfaces terse coc* show interfaces controller show interfaces terse
2. Display the Status of the Controller Channelized OC12 IQ Interface on page 283	show interfaces interface-type-*fpc/pic/port* show interfaces *interface-type-fpc/pic/port* show interfaces *interface-type-fpc/pic/port:channel* show interfaces interface-type-*fpc/pic/port:channel:channel* show interfaces interface-type-*fpc/pic/port:channel:channel:channel*

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	show interfaces *interface-type-fpc/pic/port:channel* show interfaces *interface-type-fpc/pic/port:channel:channel* show interfaces *interface-type-fpc/pic/port:channel:channel:channel*
4. Display Extensive Status Information for a Channelized OC12 IQ Interface on page 287	show interfaces *interface-type-interface-name* extensive
5. Monitor Statistics for a Channelized OC12 IQ Interface on page 290	monitor interfaces *interface-type-fpc/pic/port:channel*

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 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 “Monitor 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 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 “Monitor 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 CLI operational mode command:

Action user@host> **show interfacest3-***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. For more information on diagnosing a T3 media problem, see“Investigate T3 Interfaces” on page 45. For more information about diagnosing a SONET layer problem, see [Unresolved xref].

Monitor Statistics for a Channelized OC12 Interface

Purpose To monitor statistics for a Channelized OC12 interface, use the following JUNOS 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:                                    Current delta
  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 runts:                       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:

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 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
    ct3-0/0/0:5                                                      up    up
        t1-0/0/0:5:1                                                 up    up
    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
```

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.

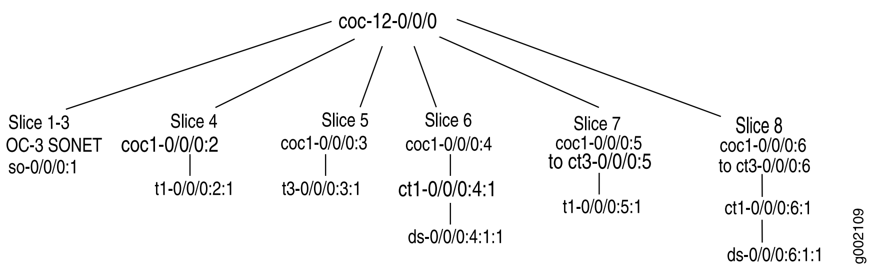
Sample output 2 shows the channels for the channelized interfaces that are configured and the hierarchy, but not the interface address information. At the top, the hierarchy includes the controller interface coc12-0/0/0.

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-0s.";
        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-0s.";
        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 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
```

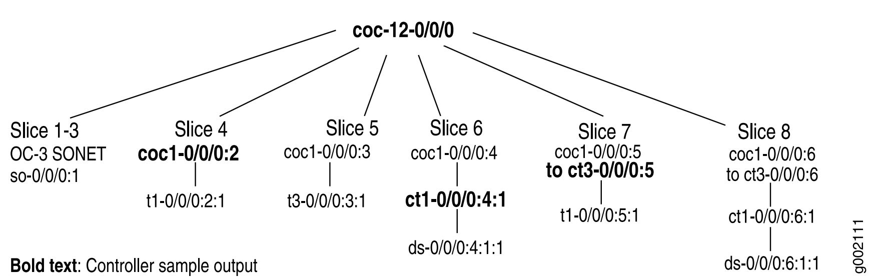
Sample Output 4

```
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 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 t1-0/0/0:2:1
Physical interface: t1-0/0/0:2:1, 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)
  DS0 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
```

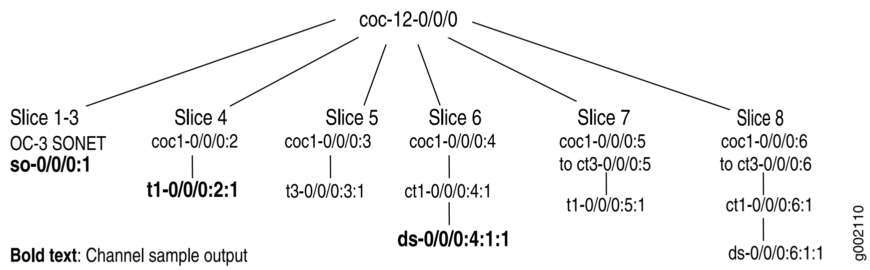
Meaning

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 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 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, 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 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:                                            Current delta
  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:                                            Current delta
  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-0/0/0:4:1:1.0
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:                                          Current delta
  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.

Chapter 28

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 [Unresolved xref].

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	[edit interfaces t3-*fpc/pic/port:channel* t3 options] set loopback local show commit
2. Verify That the Interface Is Up on page 296	show interfaces t3-*fpc/pic/port:channel* extensive
3. Clear Interface Statistics on page 299	clear interfaces statistics t3-*fpc/pic/port:channel*
4. Force the Link Layer to Stay Up on page 299	
a. Configure Encapsulation to Cisco-HDLC on page 299	[edit interfaces t3-*fpc/pic/port:channel*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 300	[edit interfaces t3-*fpc/pic/port:channel*] set no-keepalives show commit
5. Verify the Status of the Logical Interface on page 301	show interfaces t3-*fpc/pic/port:channel*
6. Ping the Channelized Interface on page 302	ping interface t3-*fpc/pic/port:channel local-IP-address* bypass-routing count 1000 rapid
7. Check for Interface Error Statistics on page 302	show interfaces t3-*fpc/pic/port:channel* extensive
"Diagnose a Suspected Circuit Problem" on page 305	
1. Loop the Entire T3 Interface Towards the Network on page 305	[edit interfaces t3-*fpc/pic/port:channel* t3-options] set loopback remote show commit
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

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 [Unresolved xref].

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 [Unresolved xref].

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 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 [Unresolved xref].

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 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 that the physical link is up and there are no OC12 alarms or defects. You should not see any OC12 alarms. If there are SONET layer errors, see "Investigate SONET Interfaces" on page 121, for information on diagnosing SONET interface problems.

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 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 software 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 [Unresolved xref].

---

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 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 [Unresolved xref].

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. If there are SONET layer errors, see “Investigate SONET Interfaces” on page 121, for information on diagnosing SONET interface problems.

Ping the Channelized Interface

Purpose Use the ping command to verify the loopback connection.

Action To ping the local interface, use the following JUNOS 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 [Unresolved xref].

Sample Output

```
user@host> ping interface t3-0/3/0:11 10.0.0.1 bypass-routing count 1000 rapid
PING 10.0.0.1 (10.0.0.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.0.0.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.439/0.694/42.590/2.206 ms
```

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 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 [Unresolved xref].

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 [Unresolved xref].

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.

Chapter 29

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

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	show interfaces t3-*fpc/pic/port:channel* extensive
"Display Channelized OC12 IQ Alarms and Errors" on page 311	show interfaces *interface-type-interface-name* extensive

Display Channelized OC12 Alarms and Errors

Purpose To display Channelized OC12 interface alarms and errors, use the following JUNOS command-line interface (CLI) operational mode command:

Action user@host> **show interfacest3-***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
    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 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, see "Investigate T3 Interfaces" on page 45. For more information about diagnosing a SONET layer problem, see "Investigate SONET Interfaces" on page 121.

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

See "Locate T3 Alarms and Errors" on page 65 for more details on T3 alarms and statistics.

Display Channelized OC12 IQ Alarms and Errors

Purpose To display Channelized OC12 IQ interface alarms and errors, use the following JUNOS 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, 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 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 sections of this guide that correspond to the media with which you are working. For example, see "Investigate T1 Interfaces" on page 19, "Investigate T3 Interfaces" on page 45, or "Investigate SONET Interfaces" on page 121.

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.

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