JUNOS™ Internet Software
for M-series and T-series Routing Platforms

Interfaces Operations Guide

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Abbreviated Table of Contents

Table of Contents

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About This Guide

This chapter provides a high-level overview of the *JUNOS Internet Software for M-series and T-series Routing Platforms Interfaces Operations Guide:*

Objectives

This manual provides operational information helpful in monitoring router components and isolating potential problems. This manual is not directly related to any particular release of the JUNOS Internet software.

To obtain the most current version of this manual, refer to the product documentation page on the Juniper Networks Web site, which is located at http://www.juniper.net/.

Audience

This manual is designed for Network Operations Center (NOC) personnel who monitor a Juniper Networks router. It assumes that you have a broad understanding of networks in general, the Internet in particular, networking principles, and network configuration. This manual assumes that you are 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), and Simple Network Management Protocol (SNMP).

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

Document Organization

This manual is divided into several parts. Each part describes the most common tasks for monitoring a particular interface, and the individual chapters within a part describe one or more step-by-step procedures for each task.

This manual contains the following parts:

- Preface, "About This Guide" (this chapter), provides a brief description of the contents and organization of this manual and describes how to contact customer support.

- Part 1, "Overview of Interfaces," provides an overview of interfaces supported by Juniper Networks, and the basic strategies for monitoring and troubleshooting an interface.

- Part 2, "Investigate T1 Interfaces," describes steps you use to monitor T1 interfaces and isolate T1 interface problems. Also included is information about the most common T1 interface alarms and errors.

- Part 3, "Investigate T3 Interfaces," describes steps you use to monitor T3 interfaces and isolate T3 interface problems. Also included is information about the most common T3 interface alarms and errors.

- Part 4, "Investigate ATM Interfaces," describes steps you use to monitor ATM interfaces and isolate ATM interface problems. Also included is information about the most common ATM interface alarms and errors.

- Part 5, "Investigate SONET Interfaces," describes steps you use to monitor SONET interfaces and isolate SONET interface problems. Also included is information about the most common SONET interface alarms and errors.

- Part 6, "Investigate Fast Ethernet and Gigabit Ethernet Interfaces," describes steps you use to monitor Fast Ethernet and Gigabit Ethernet interfaces and isolate Fast Ethernet and Gigabit Ethernet interface problems. Also included is information about the most common Fast Ethernet and Gigabit Ethernet interface alarms and errors.

- Part 7, "Investigate Channelized Interfaces," describes steps you use to monitor Multichannel DS-3 interfaces and isolate Multichannel DS-3 interface problems. Also included is information about the most common Multichannel DS-3 interface alarms and errors.

This manual also contains a complete index. For a list and description of glossary terms, see the *JUNOS Comprehensive Index and Glossary*.

Chapter Organization

Most chapters in this manual consist of a checklist at the beginning of the chapter listing the tasks and commands for monitoring the interface. The tasks and commands are then explained in step-by-step procedures.

Each step-by-step procedure consists of some or all of the following parts:

- Purpose—Describes what is affected if this task is not performed or what is accomplished with this task.
- What Is... —Describes a component (usually hardware).
- Step(s) To Take—Lists the steps in the task.
- Action—Describes an action to perform in order to complete the step.
- Sample Output—Presents sample output relevant to the procedure.
- What It Means—Describes or summarizes what is presented in the sample output.
- Symptom/Indications—Describes a problem with the software or hardware.
- See Also—Lists other topics related to this task.
- Alternative Actions—Describes other commands or ways of doing the task.
- Syntax—Describes the full syntax of the command or configuration statement. For an explanation of how to read the syntax statements, see "Documentation Conventions" on page xx.

Documentation Conventions

This section presents general text conventions used for statements, commands, and output. Also included are the details for providing documentation feedback and for contacting technical support.

General Conventions

This manual uses the following text conventions:

- Statements, commands, filenames, directory names, IP addresses, and configuration hierarchy levels are shown in a sans serif font. In the following example, *stub* is a statement name and [edit protocols ospf area *area-id*] is a configuration hierarchy level:

  To configure a stub area, include the stub statement at the [edit protocols ospf area *area-id*] hierarchy level:

- In examples, text that you type literally is shown in bold. In the following example, you type the word *show*:

  [edit protocols ospf area *area-id*]
  cli# **show**
  stub <default-metric *metric*>

- Examples of command output are generally shown in a fixed-width font to preserve the column alignment. For example:

```
user@host> show interfaces terse
Interface       Admin Link Proto Local              Remote
at-1/3/0        up    up
at-1/3/0.0      up    up   inet  1.0.0.1            --> 1.0.0.2
                          iso
fxp0            up    up
fxp0.0          up    up   inet  192.168.5.59/24
```

Conventions for Software Commands and Statements

When describing the JUNOS software, this manual uses the following type and presentation conventions:

- Statement or command names that you type literally are shown nonitalicized. In the following example, the statement name is *area*:

  You configure all these routers by including the following area statement at the [edit protocols ospf] hierarchy level:

- Options, which are variable terms for which you substitute appropriate values, are shown in italics. In the following example, *area-id* is an option. When you type the area statement, you substitute a value for *area-id*.

  area *area-id*;

- Optional portions of a configuration statement are enclosed in angle brackets. In the following example, the "default-metric *metric*" portion of the statement is optional:

stub <default-metric *metric*>;

- For text strings separated by a pipe (|), you must specify either *string1* or *string2*, but you cannot specify both or neither of them. Parentheses are sometimes used to group the strings.

  string1 | *string2*
  (*string1* | *string2*)

  In the following example, you must specify either broadcast or multicast, but you cannot specify both:

  broadcast | multicast

- For some statements, you can specify a set of values. The set must be enclosed in square brackets. For example:

  community *name* members [*community-ids*]

- The configuration examples in this manual are generally formatted in the way that they appear when you issue a show command. This format includes braces ({ }) and semicolons. When you type configuration statements in the CLI, you do not type the braces and semicolons. However, when you type configuration statements in an ASCII file, you must include the braces and semicolons. For example:

```
[edit]
cli# set routing-options static route default nexthop address retain
[edit]
cli# show
routing-options {
    static {
        route default {
            nexthop address;
            retain;
        }
    }
}
```

- Comments in the configuration examples are shown either preceding the lines that the comments apply to, or more often, they appear on the same line. When comments appear on the same line, they are preceded by a pound sign (#) to indicate where the comment starts. In an actual configuration, comments can only precede a line; they cannot be on the same line as a configuration statement. For example:

```
protocols {
    mpls {
        interface (interface-name | all);# Required to enable MPLS on the
interface
    }
    rsvp {                              # Required for dynamic MPLS only
        interface interface-name;
    }
}
```

- The general syntax descriptions provide no indication of the number of times you can specify a statement, option, or keyword. This information is provided in the text of the statement summary.

List of Technical Publications

Table 1 lists the books included in the *Network Operations Guide* series.

Table 1: Operations Guides

Book	Description
JUNOS Internet Software Operations Guides	
Baseline	Describes the most basic tasks for running a network using Juniper Networks products. Tasks include upgrading and reinstalling JUNOS Internet software, gathering basic system management information, verifying your network topology, and searching log messages.
Interfaces	Describes tasks for monitoring interfaces.
MPLS Applications (Under Development)	Describes tasks for monitoring MPLS applications.
Router Hardware	Describes tasks for monitoring M-series and T-series routers.
Routing and Routing Protocols (Under Development)	Describes tasks for monitoring routing protocols.

Table 2 lists the software and hardware books for Juniper Networks routers and describes the contents of each book.

Table 2: Juniper Networks Technical Documentation

Book	Description
JUNOS Internet Software Configuration Guides	
Feature Guide	Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.
System Basics	Provides an overview of the JUNOS software and describes how to install and upgrade the software. This manual also describes how to configure system management functions and how to configure the chassis, including user accounts, passwords, and redundancy.
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.
Network Interfaces and Class of Service	Provides an overview of the network interface and class-of-service 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, forwarding options, and cflowd.
Routing Protocols	Provides an overview of routing concepts and describes how to configure routing, routing instances, and unicast routing protocols.

Book	Description
Services Interfaces	Provides an overview of the services interfaces functions of the JUNOS software and describes how to configure the services interfaces on the routing platform.
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 Internet Software References	
Network and Services Interfaces Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot network and services interfaces on Juniper Networks M-series and T-series routing platforms.
Protocols, Class of Service, and System Basics Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot most aspects of Juniper Networks M-series and T-series routing platforms.
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.
JUNOScript API Documentation	
JUNOScript API Guide	Describes how to use the JUNOScript application programming interface (API) to monitor and configure Juniper Networks routing platforms.
JUNOScript API Configuration Reference	Provides a reference page for the configuration tags in the JUNOScript API.
JUNOScript API Operational Reference	Provides a reference page for the operational tags in the JUNOScript API.
JUNOS Internet Software Comprehensive Index and Glossary	
Comprehensive Index and Glossary	Provides a complete index of all JUNOS software books and the *JUNOScript API Guide*. Also provides a comprehensive glossary.
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 Physical Interface Cards (PICs). Each platform has its own PIC guide.
JUNOScope Software	
JUNOScope Software 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.
Release Notes	
JUNOS Internet Software Release Notes	Summarize new features and known problems for a particular software release, provide corrections and updates to published JUNOS and JUNOScript 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 the supported PICs, and summarize known problems with the hardware and accompanying software. Each platform has its own release notes.
JUNOScope Software 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.

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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 This Book

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 DS-3
- Multichannel DS-3
- Channelized OC-12
- Channelized OC-12 IQ

T1 Interfaces

T1 is the basic physical layer protocol used by the Digital Signal level 1(DS-1) multiplexing method in North America. A T1 interface operates at a bit rate of 1.544 Mbps and can support 24 DS-0 channels. The supported DS-1 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 (DS-3) 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 DS-3 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 OC-1; in the electrical domain, the basic building block is STS-1. OC-1 operates at 51.840 Mbps. OC-3 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 OC-48 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 3 lists the interface types supported by the JUNOS software and shows the interface name as it appears in a configuration.

Table 3: 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 STM-1 IQ PIC.
coc1	Channelized OC-1 IQ	Configured on the Channelized OC-12 IQ PIC.
coc12	Channelized OC-12 IQ	Configured on the Channelized OC-12 IQ PIC.
cstm1	Channelized STM-1 IQ	Configured on the Channelized STM-1 IQ PIC.
ce1	Channelized E1 IQ	Configured on the Channelized E1 IQ PIC or Channelized STM-1 IQ PIC.
ct1	Channelized T1 IQ	Configured on the Channelized DS-3 IQ PIC or Channelized OC-12 IQ PIC.
ct3	Channelized T3 IQ	Configured on the Channelized DS-3 IQ PIC or Channelized OC-12 IQ PIC.
cp	Collector	Configured on the Monitoring Services II PIC.
ds	DS-0	Configured on the Channelized DS-3 to DS-0 PIC, Channelized E1 PIC, Channelized OC-12 IQ PIC, Channelized DS-3 IQ PIC, Channelized E1 IQ PIC, or Channelized STM-1 IQ PIC.
dsc	Discard	Allows you to identify the ingress point of a denial-of-service (DoS) attack.
e1	E1	Includes the channelized STM-1 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.
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.
ip	IP-over-IP encapsulation tunnel	Allows you to configure a unicast tunnel using IP-IP encapsulation.

Interface Name in Configuration	Interface Type	Description
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	OC-3 IQ	Configured on the Channelized OC-12 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.
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 DS-3 to DS-1 interfaces.
t3	T3	Includes the channelized OC-12 to DS-3 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 DS-3, E1, OC-12, and STM-1. For more information about channelized interfaces, see the *JUNOS Network Interfaces and Class of Service 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 “Interfaces Supported by the JUNOS Software” on page 7 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.

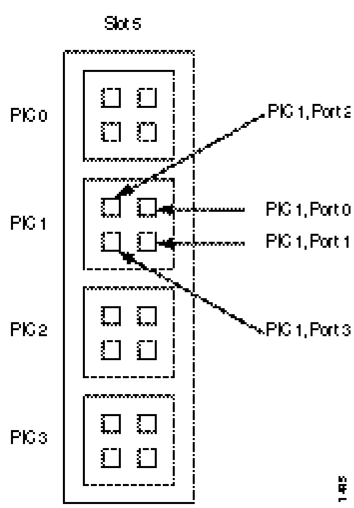
In the virtual part of the name, a period (.) separates the channel and logical unit numbers.

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 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 OC-3 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 OC-48 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 OC-48 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 OC-12 PIC in PIC position 2, the DS-3 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 OC-12 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 DS-3 to DS-0 Interface Naming

You can configure 28 T1 channels for each T3 interface. Each T1 link can have up to eight DS-0 channel groups, and each channel group can hold any combination of DS-0 time slots. To specify the T1 link and DS-0 channel group number in the interface name, use colons (:) as separators. For example, a Channelized DS-3 to DS-0 PIC might have the following physical and virtual interfaces:

```
ds-0/0/0:x:y
```

where x is a T1 link ranging from 0 through 27, and y is a DS-0 channel group ranging from 0 through 7. See the *JUNOS Internet Software Network Interfaces and Class of Service Configuration Guide* for more information about ranges.

Channelized DS-3 to DS-1 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 OC-12 IQ PIC
- coc1-*fpc/pic/port*:*channel*—On a Channelized OC-12 IQ PIC
- ct3-*fpc/pic/port*<:*channel*>—On a Channelized OC-12 IQ PIC or a Channelized DS-3 IQ PIC
- cstm1-*fpc/pic/port*—On a Channelized STM-1 IQ PIC
- cau4-*fpc/pic/port*:*channel*—On a Channelized STM-1 IQ PIC
- ct1-*fpc/pic/port*<:*channel*>—On a Channelized OC-12 IQ PIC or a Channelized DS-3 IQ PIC
- ce1-*fpc/pic/port*<:*channel*>—On a Channelized E1 IQ PIC or a Channelized STM-1 IQ PIC
- e1-*fpc/pic/port*<:*channel*>—E1 channels configured on a Channelized E1 IQ or a Channelized STM-1 IQ PIC
- ds-*fpc/pic/port*<:*channel*>—*Nx*DS-0 channels configured on a Channelized OC-12 IQ PIC, Channelized STM-1 IQ PIC, Channelized DS-3 IQ PIC, or Channelized E1 IQ PIC
- so-*fpc/pic/port*<:*channel*>—SONET/SDH channels configure four OC-3 channels on a Channelized OC-12 IQ PIC, one OC-12 channel on a Channelized OC-12 IQ PIC, or one STM-1 channel on a Channelized STM-1 IQ PIC
- t1-*fpc/pic/port*<:*channel*>—T1 channels configured on a Channelized OC-12 IQPIC or a Channelized DS-3 IQ PIC
- t3-*fpc/pic/port*<:*channel*>—T3 channels configured on a Channelized OC-12 IQ PIC or a Channelized DS-3 IQ PIC

How Interface Configurations Are Displayed

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

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

Interface and Router Clock Sources

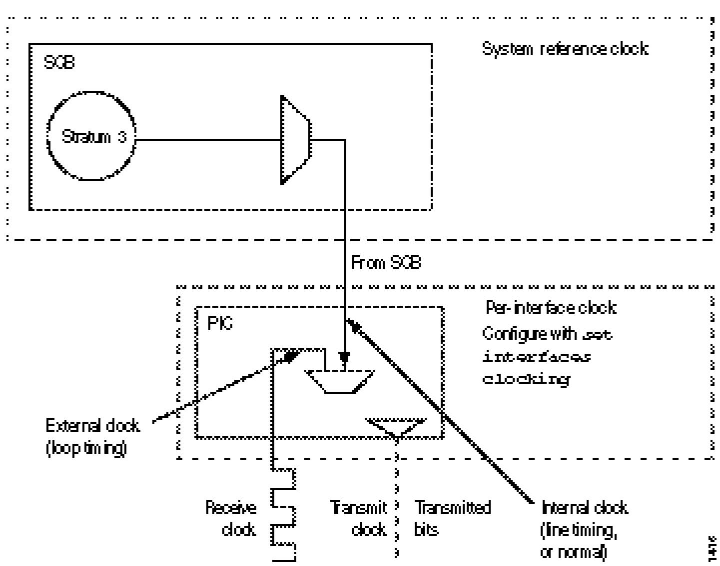
When running a loopback test on T1, T3, ATM, and SONET interfaces, you must configure the *transmit clock*. The transmit clock aligns each outgoing packet transmitted over the router's interfaces. For both the router and interfaces, the clock source can be the router's internal Stratum 3 clock, which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

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

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

Figure 2 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 DS-3
- Multichannel DS-3
- Channelized OC-12
- Channelized OC-12 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 Internet Software: 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 investigation process for each interface is described in three chapters which cover a different aspect of the process.

- 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 help you isolate the source of the problem. The locate alarms and errors chapter explains some of the alarms and errors for the media.

Monitor Interfaces

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.

Steps To Take 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 4 lists and describes the operational mode commands you use to monitor interfaces.

Table 4: 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

Purpose 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.

Steps To Take 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 DS-3 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 5 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 5: 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.

CLI Statement or Command	Interface Type	Description
[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.
[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 DS-3 interfaces	The encapsulation statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces *interface-name*] set no-keepalives	T1, T3, SONET, and Multichannel DS-3 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

Action 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. (See Table 6.)

Table 6: Checklist for Monitoring T1 Interfaces

Monitor T1 Interface Tasks	Command or Action
Monitor T1 Interfaces on page 24	
1. Display the Status of T1 Interfaces on page 24	show interfaces terse t1*
2. Display the Status of a Specific T1 Interface on page 25	show interfaces t1-*fpc/pic/port*
3. Display Extensive Status Information for a Specific T1 Interface on page 25	show interfaces t1-*fpc/pic/port* extensive
4. Monitor Statistics for a T1 Interface on page 27	monitor interface t1-*fpc/pic/port*

Monitor T1 Interfaces

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

Steps To Take To monitor your T1 interfaces, follow these steps:

1. Display the Status of T1 Interfaces on page 24
2. Display the Status of a Specific T1 Interface on page 25
3. Display Extensive Status Information for a Specific T1 Interface on page 25
4. Monitor Statistics for a T1 Interface on page 27

Step 1: Display the Status of T1 Interfaces

Action To display the status of T1 interfaces, use the following JUNOS command-line interface (CLI) operational mode command:

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
```

What It Means This sample output shows the status of both the physical and logical interfaces. See Table 7 for a description of what the output means.

Table 7: Status of T1 Interfaces

Physical Interface	Logical Interface	Status Description
t1-1/0/0 Admin Down Link Up	t1-1/0/0.0 Admin Up Link Down	This interface is administratively disabled and the physical link is healthy (Link Up), but the logical interface is not established. The logical interface is administratively enabled (Admin Up), but is down because the physical link is disabled.
t1-1/0/1 Admin Up Link Down	t1-1/012.0 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.
fe-1/0/3 Admin Up Link Down		The physical interfaces is added to the configuration, but the logical link is not configured.

Step 2: Display the Status of a Specific T1 Interface

Action To display the status of a specific T1 interface when you need to investigate its status further, 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
```

What It Means 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.

Step 3: Display Extensive Status Information for 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
```

What It Means 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 43 for an explanation of T1 alarms.

Step 4: 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'
```

What It Means 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 8 lists additional problem situations and actions to help you further diagnose a problem.

Table 8: 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 4
Use Loopback Testing for T1 Interfaces

This chapter describes using loopback testing to isolate T1 interface problems. (See Table 9.)

Table 9: Checklist for Using Loopback Testing for T1 Interfaces

T1 Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a T1 Interface on page 31	
1. Create a Loopback on page 31	
a. Create a Physical Loopback on page 31	Connect a T1 loopback plug.
b. Configure a Local Loopback on page 32	[edit interfaces *interface-name* t1-options] set loopback local show commit
2. Set Clocking to Internal on page 33	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the T1 Interface Is Up on page 33	show interfaces t1-*fpc/pic/port*
4. Clear T1 Interface Statistics on page 35	clear interfaces statistics t1-*fpc/pic/port*
5. Force the Link Layer To Stay Up on page 35	
a. Configure Encapsulation to Cisco-HDLC on page 35	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 36	[edit interfaces *interface-name*] set no-keepalives show commit
6. Verify the Status of the Logical Interface on page 37	show interfaces t1-*fpc/pic/port* show interfaces t1-*fpc/pic/port* terse
7. Ping the T1 Interface on page 38	ping interface t1-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
8. Check for T1 Interface Error Statistics on page 39	show interfaces t1-*fpc/pic/port* extensive

T1 Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 41	
1. Create a Loop from the Router to the Network on page 41	[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 42	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a T1 Interface" on page 31.

Diagnose a Suspected Hardware Problem with a T1 Interface

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

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

1. Create a Loopback on page 31
2. Set Clocking to Internal on page 33
3. Verify That the T1 Interface Is Up on page 33
4. Clear T1 Interface Statistics on page 35
5. Force the Link Layer To Stay Up on page 35
6. Verify the Status of the Logical Interface on page 37
7. Ping the T1 Interface on page 38
8. Check for T1 Interface Error Statistics on page 39

Step 1: 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.

What It Means 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

What It Means 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.

Step 2: 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

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

Step 3: 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
```

What It Means 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
```

What It Means 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.

Step 4: 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>
```

What It Means This command clears the interface statistics counters for interface t1-1/1/0 only.

Step 5: 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.

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

1. Configure Encapsulation to Cisco-HDLC on page 35

2. Configure No-Keepalives on page 36

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

What It Means 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

What It Means 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.

Step 6: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following two JUNOS CLI operational mode commands:

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
```

What It Means 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
```

What It Means 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.

Step 7: 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
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 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
```

What It Means 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).

Step 8: 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
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 41
2. Create a Loop to the Router from Various Points in the Network on page 42

Step 1: 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
   ```

What It Means This command loops any traffic from the network back into the network.

Step 2: 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 T1 Interface" on page 31. 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. (See Table 10.)

Table 10: Checklist for T1 Alarms and Errors

T1 Alarms and Errors Tasks	Command or Action
Display T1 Alarms and Errors on page 44	show interfaces t1-*fpc/pic/port* extensive
Locate Most Common T1 Alarms and Errors on page 46	
1. Locate Loss of Signal and Loss of Frame Alarms on page 46	Check the connection between the router port and the first T1 network element.
2. Locate Alarm Indication Signal Alarms on page 47	Check the T1 network element connected to the T1 interface.
3. Locate an Incoming Yellow Alarm on page 47	Check the cable between the T1 interface and the directly connected T1 network element.

Display T1 Alarms and Errors

Action To display T1 alarms and errors, use the following JUNOS command-line interface (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
```

What It Means 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 11 lists the T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 11: 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

Steps To Take To locate common alarms and errors, follow these steps:

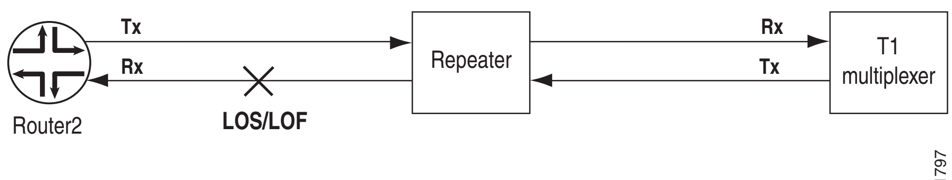
1. Locate Loss of Signal and Loss of Frame Alarms on page 46
2. Locate Alarm Indication Signal Alarms on page 47
3. Locate an Incoming Yellow Alarm on page 47

Step 1: Locate Loss of Signal and Loss of Frame Alarms

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

Action 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, 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...]
```

What It Means The sample output shows that Router2 (Rx) detected a cumulative LOS and LOF alarm for 32 seconds.

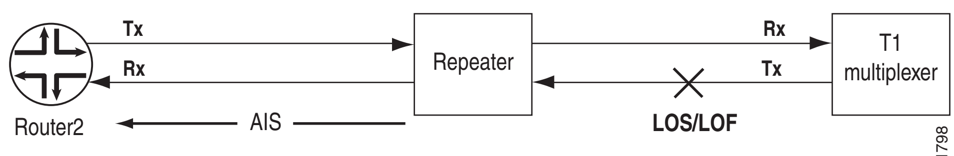
Step 2: Locate Alarm Indication Signal Alarms

Purpose 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.

Action 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 Router2 (the Juniper Networks router). Figure 4 illustrates the location of an AIS alarm in a T1 network.

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



What It Means In Figure 4, 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 Router2.

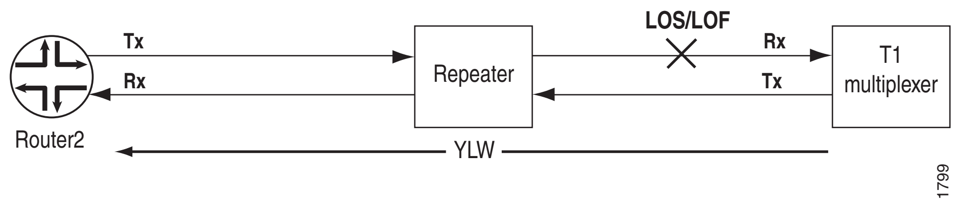
Step 3: Locate an Incoming Yellow Alarm

Purpose 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.

Action 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 Router2. Figure 5 illustrates the location of a yellow alarm in a T1 network.

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



What It Means In Figure 5, the T1 multiplexer detects an LOS or LOF alarm on its connection from Router2 and sends a yellow (YLW) alarm to Router2.

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. (See Table 12.)

Table 12: Checklist for Monitoring T3 Interfaces

T3 Interface Monitor Tasks	Command or Action
Monitor T3 Interfaces on page 52	
1. Display the Status of T3 Interfaces on page 52	show interfaces terse t3*
2. Display the Status of a Specific T3 Interface on page 53	show interfaces t3-*fpc/pic/port*
3. Display Extensive Status Information for a Specific T3 Interface on page 53	show interfaces t3-*fpc/pic/port* extensive
4. Monitor Statistics for a T3 Interface on page 55	monitor interface t3-*fpc/pic/port*

Monitor T3 Interfaces

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

Steps To Take To monitor T3 interfaces, follow these steps:

Step 1: Display the Status of T3 Interfaces

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

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
```

What It Means The sample output shows the status of both the physical and logical interfaces. See Table 13 for a description of what the output means.

Table 13: 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.
fe-1/0/3 Admin Up Link Down		This interface does not have a logical link configured.

Step 2: Display the Status of a Specific T3 Interface

Action 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:

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
```

What It Means 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.

Step 3: Display Extensive Status Information for a Specific T3 Interface

Action To display extensive status information about a specific T3 interface, 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:         - 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
```

What It Means 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 71 for an explanation of T3 alarms.

Step 4: Monitor Statistics for a T3 Interface

Action To monitor statistics for a T3 interface, use the following JUNOS CLI operational mode command:

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'
```

What It Means 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 14 presents problem situations and actions to help you further understand the problem.

Table 14: 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. (See Table 15.)

Table 15: Checklist for Using Loopback Testing for T3 Interfaces

T3 Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a T3 Interface on page 58	
1. Create a Loopback on page 58	
a. Create a Physical Loopback on page 58	Connect the transmit port to the receive port.
b. Configure a Local Loopback on page 59	[edit interfaces *interface-name* t3-options] set loopback local show commit
2. Set Clocking to Internal on page 60	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the T3 Interface Is Up on page 60	show interfaces t3-*fpc/pic/port*
4. Clear T3 Interface Statistics on page 62	clear interfaces statistics t3-*fpc/pic/port*
5. Force the Link Layer To Stay Up on page 62	
a. Configure Encapsulation to Cisco-HDLC on page 62	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 63	[edit interfaces *interface-name*] set no-keepalives show commit
6. Verify the Status of the Logical Interface on page 64	show interfaces t3-*fpc/pic/port* show interfaces *t3-fpc/pic/port* terse
7. Ping the T3 Interface on page 65	ping interface t3-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
8. Check for T3 Interface Error Statistics on page 66	show interfaces t3-*fpc/pic/port* extensive

T3 Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 68	
1. Create a Loop from the Router to the Network on page 68	[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 69	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a T3 Interface" on page 58.

Diagnose a Suspected Hardware Problem with a T3 Interface

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

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

1. Create a Loopback on page 58
2. Set Clocking to Internal on page 60
3. Verify That the T3 Interface Is Up on page 60
4. Clear T3 Interface Statistics on page 62
5. Force the Link Layer To Stay Up on page 62
6. Verify the Status of the Logical Interface on page 64
7. Ping the T3 Interface on page 65
8. Check for T3 Interface Error Statistics on page 66

Step 1: 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.

What It Means 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

What It Means 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.

Step 2: 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

What It Means The clock source for the interface is set to the internal Stratum 3 clock.

Step 3: 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
```

What It Means 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
```

What It Means 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.

Step 4: 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>
```

What It Means This command clears the interface statistics counters for interface t3-4/0/2 only.

Step 5: 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.

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

1. Configure Encapsulation to Cisco-HDLC on page 62
2. Configure No-Keepalives on page 63

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
```

What It Means 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
```

What It Means 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.

Step 6: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following two JUNOS CLI operational mode commands:

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

What It Means 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
```

What It Means 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.

Step 7: 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
```

What It Means 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).

Step 8: 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
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 68
2. Create a Loop to the Router from Various Points in the Network on page 69

Step 1: 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* **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

What It Means This command loops any traffic from the network back into the network.

Step 2: Create a Loop to the Router from Various Points in the Network

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

Action To verify the connection from the router to a loopback in the network, follow Steps 2 through 8 in "Diagnose a Suspected Hardware Problem with a T3 Interface" on page 58.

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. (See Table 16.)

Table 16: Checklist of Common T3 Alarms and Errors

T3 Alarms and Errors Tasks	Command or Action
Display T3 Alarms and Errors on page 72	show interfaces t3-*fpc/pic/port* extensive
Locate Most Common T3 Alarms and Errors on page 74	
1. Locate Loss of Signal and Loss of Frame Alarms on page 74	Check the connection between the router port and the first T3 network element.
2. Locate Alarm Indication Signal Alarms on page 75	Check the T3 network element connected to the T3 interface.
3. Locate an Incoming Yellow Alarm on page 75	Check the cable between the T3 interface and the directly connected T3 network element.
4. Locate IDLE on a T3 Interface on page 76	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. DS-3 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

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

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...]
```

What It Means 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 17 lists the T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 17: 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

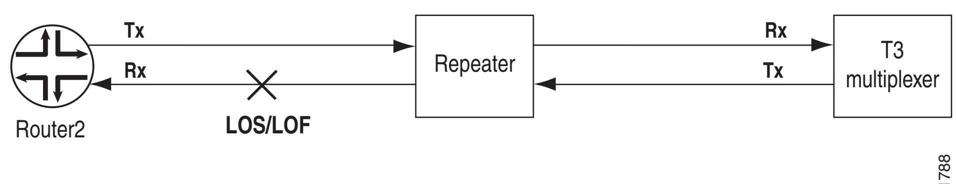
The following alarms and errors are described in this chapter:

Step 1: Locate Loss of Signal and Loss of Frame Alarms

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

Action 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, the X indicates that there is a connection problem between Router2 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...]
```

What It Means The sample output shows that Router2 (Rx) detected a cumulative LOS and LOF for 273 seconds. The defect was declared twice during that time.

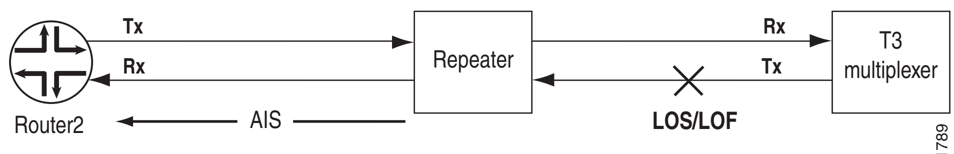
Step 2: Locate Alarm Indication Signal Alarms

Purpose 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.

Action 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 Router2 (the Juniper Networks router). Figure 7 illustrates the location of an AIS alarm in a T3 network.

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



What It Means In Figure 7, 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 Router2.

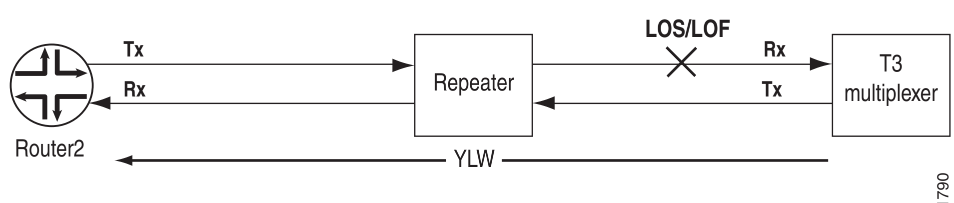
Step 3: Locate an Incoming Yellow Alarm

Purpose 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.

Action 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 Router2. Figure 8 illustrates the location of a yellow alarm in a T3 network.

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



What It Means The T3 multiplexer detects an LOS or LOF on its connection from Router2 and sends a yellow (YLW) alarm to Router2.

Step 4: Locate IDLE on a T3 Interface

Purpose The T3 (DS-3) IDLE signal is a validly framed DS-3 signal with a payload consisting of a repeated 1100 signal. IDLE indicates that the line has not been provisioned for service.

Action 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
```

NOTE: For detailed definitions of the T3 (DS-3) error events (BPV, EXZ, LCV, PCV, and CCV) and performance parameters (LES, PES, PSES, CES, CSES, SEFS, and UAS), see RFC 2496.

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. (See Table 18.)

Table 18: Checklist for Determining ATM Interface Type

Determine ATM Interface Type Tasks	Command or Action
Determine the ATM Interface Type and Configuration on page 80	
1. Determine the ATM Interface Type on page 80	show chassis hardware
2. Check that the ATM Configuration Is Correct on page 81	
a. Check the Configuration of an ATM1 Interface on page 81	show configuration interfaces at-*fpc/ pic/ port*
b. Check the Configuration of an ATM2 IQ Interface on page 82	show configuration interfaces at-*fpc/ pic/ port*
Examples of Incorrect Configurations of ATM Options on page 83	
1. Check the Configuration of the VCI on an ATM1 Interface on page 83	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 84	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 86	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.

Steps To Take 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. 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 80
2. Check that the ATM Configuration Is Correct on page 81

Step 1: Determine the ATM Interface Type

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

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
```

What It Means 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.

Step 2: 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 and Class of Service Configuration Guide* for more information on the options supported for ATM1 and ATM2 IQ interfaces.

Steps To Take To check the configuration of an ATM interface, follow these steps:

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;
}
```

What It Means 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 and Class of Service 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...]
```

What It Means 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 and Class of Service 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:

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;
    }
}
```

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-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
```

What It Means 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
```

What It Means 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
```

What It Means 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. (See Table 19.)

Table 19: Checklist for Monitoring ATM Interfaces

ATM Interface Monitor Tasks	Command or Action
Monitor ATM Interfaces on page 90	show interfaces terse at*
Monitor ATM1 Interfaces on page 91	
1. Display the Status of a Specific ATM1 Interface on page 91	show interfaces at-*fpc/pic/port*
2. Display Extensive Status Information for a Specific ATM1 Interface on page 92	show interfaces at-*fpc/pic/port* extensive
3. Monitor Statistics for an ATM1 Interface on page 94	monitor interface at-*fpc/pic/port*
Monitor ATM2 IQ Interfaces on page 96	
1. Display the Status of a Specific ATM2 IQ Interface on page 96	show interfaces terse at-*fpc/pic/port* show interfaces at-*fpc/pic/port*
2. Display Extensive Information for a Specific ATM2 Interface on page 98	show interfaces at-*fpc/pic/port* extensive
3. Monitor Statistics for an ATM2 Interface on page 103	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 79 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
```

What It Means The sample output lists only the ATM interfaces and shows the status of both the physical and logical interfaces. See Table 20 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 79 for information on how to determine the ATM interface type.

Table 20: 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

Steps To Take

To monitor an ATM1 interface, follow these steps:

Step 1: Display the Status of a Specific ATM1 Interface

Action

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

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

Sample Output

The following sample output is for an ATM1 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
```

What It Means

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 92 to display more extensive information about the ATM interface and the physical interface that is down.

Step 2: Display Extensive Status Information for a Specific ATM1 Interface

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

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:
```

What It Means The sample output is for an OC-3 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 119 for an explanation of ATM alarms.

Step 3: Monitor Statistics for an ATM1 Interface

Action To monitor statistics for an ATM1 interface, use the following JUNOS CLI operational mode command:

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'
```

What It Means 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

Steps To Take

To monitor an ATM2 interface, follow these steps:

1. Display the Status of a Specific ATM2 IQ Interface on page 96
2. Display Extensive Information for a Specific ATM2 Interface on page 98
3. Monitor Statistics for an ATM2 Interface on page 103

Step 1: Display the Status of a Specific ATM2 IQ Interface

Action

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

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
```

What It Means 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 98 to display more extensive information about the ATM interface and the physical interface that is down.

Step 2: Display Extensive Information for a Specific ATM2 Interface

Action To display extensive status information about a specific ATM2 interface, use the following JUNOS CLI operational mode command:

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
```

What It Means The sample output is for an OC-12 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 119 for an explanation of ATM alarms.

Step 3: Monitor Statistics for an ATM2 Interface

Action To monitor statistics for an ATM2 interface, use the following JUNOS CLI operational mode command:

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]
```

What It Means 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. (See Table 21.)

Table 21: Checklist for Using Loopback Testing for ATM Interfaces

ATM Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface on page 106	
1. Create a Loopback on page 106	
a. Create a Physical Loopback on page 106	Connect the transmit port to the receive port.
b. Configure a Local Loopback on page 107	[edit interfaces *interface-name* (sonet-options | t3-options)] set loopback local show commit
2. Set Clocking to Internal on page 108	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the ATM Interface Is Up on page 109	show interfaces at-*fpc/port/pic*
4. Clear ATM Interface Statistics on page 111	clear interfaces statistics at-*fpc/port/pic*
5. Ping the ATM Interface on page 112	ping interface at-*fpc/port/pic local-IP-address* bypass-routing count 1000 rapid
6. Check for ATM Interface Error Statistics on page 112	show interfaces at-*fpc/port/pic* extensive
Diagnose a Suspected Circuit Problem on page 116	
1. Create a Loop from the Router to the Network on page 116	[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 117	Perform Steps 2 through 6 from “Diagnose a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface” on page 106.

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

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

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

1. Create a Loopback on page 106

2. Set Clocking to Internal on page 108

3. Verify That the ATM Interface Is Up on page 109

4. Clear ATM Interface Statistics on page 111

5. Ping the ATM Interface on page 112

6. Check for ATM Interface Error Statistics on page 112

Step 1: 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.

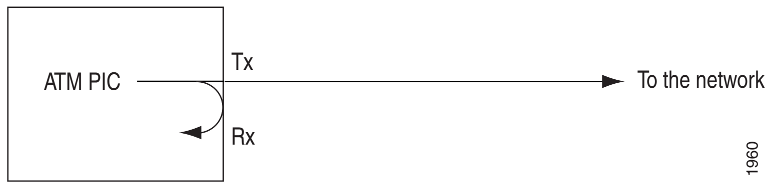
NOTE: Make sure you use single-mode fiber for a single-mode port and multimode fiber for a multimode port for SONET media.

What It Means 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 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

What It Means 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.

Step 2: 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
   ```

What It Means The clock source for the interface is set to the internal Stratum 3 clock.

Step 3: 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 OC-3 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 OC-3 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
```

What It Means 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 22.

Table 22: 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 OC-3 or OC-12 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 OC-3 or OC-12 ATM interface)	Verify that the Tx power of the optics is within range of the PIC optical specification.

Step 4: 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>
```

What It Means This command clears the interface statistics counters for interface at-4/0/2 only.

Step 5: Ping the ATM Interface

Action After you have put the port in a local loopback, run the ping test using the following JUNOS CLI operational mode command:

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
```

What It Means 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).

Step 6: 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 OC-3 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
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 116

2. Create a Loop to the Router from Various Points in the Network on page 117

Step 1: 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 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
```

What It Means This command loops any traffic from the network back into the network.

Step 2: 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 106. 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. (See Table 23.)

Table 23: List of Common ATM Alarms and Errors

ATM Alarms and Errors Task	Command or Action
Display ATM1 and ATM2 Alarms and Errors on page 120	show interfaces at-*fpc*/*pic*/*port* extensive See "Locate SONET Alarms and Errors" on page 151. See "Locate T3 Alarms and Errors" on page 71.

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 OC-3 or OC-12 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 “Determine ATM Interface Type” on page 79.

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
```

What It Means Sample output 1 shows the error statistics for an OC-3 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 151 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
```

What It Means Sample output 2 shows the error statistics for a T3 ATM interface. See "Locate T3 Alarms and Errors" on page 71 for information on T3 alarms.

Table 24 describes the input and output errors that appear in the extensive output for an ATM interface.

Table 24: 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.	
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, such as the Cisco Discovery Protocol (CDP).
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 25 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 25: 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. (See Table 26.)

Table 26: Checklist for Monitoring SONET Interfaces

Monitor SONET Interface Tasks	Command or Action
Monitor SONET Interfaces on page 130	
1. Display the Status of SONET Interfaces on page 130	show interfaces terse so*
2. Display the Status of a Specific SONET Interface on page 131	show interfaces so-*fpc/ pic/ port*
3. Display Extensive Status Information for a Specific SONET Interface on page 132	show interfaces so-*fpc/ pic/ port* extensive
4. Monitor Statistics for a SONET Interface on page 134	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.

Steps To Take To monitor your SONET interface, follow these steps:

1. Display the Status of SONET Interfaces on page 130
2. Display the Status of a Specific SONET Interface on page 131
3. Display Extensive Status Information for a Specific SONET Interface on page 132
4. Monitor Statistics for a SONET Interface on page 134

Step 1: Display the Status of SONET Interfaces

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

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

Sample Output

```
user@host> show interfaces terse so*
Interface       Admin Link Proto Local                 Remote
so-1/0/0        up    up
so-1/0/0.0      up    up   inet  192.168.8.192     --> 192.168.2.250
                           iso
[...Output truncated...]
so-1/1/1        down  up
so-1/1/1.0      up    down inet  192.168.8.113/30
                           iso
                           mpls
[...Output truncated]
so-3/0/1        up    up
so-3/0/1.0      up    down inet  192.168.2.125/30
[...Output truncated...]

so-5/3/0        up    down
so-5/3/0.0      up    down inet  10.39.1.1/16
[...Output truncated...]
```

What It Means 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 27.

Table 27: 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	s0-1/1/1.0 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.

Step 2: Display the Status of a Specific SONET Interface

Action 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:

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
```

What It Means 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 132 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
```

What It Means 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 134 to monitor statistics for the SONET interface and the logical interface that is down.

Step 3: Display Extensive Status Information for a Specific SONET Interface

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

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...]
```

What It Means

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 151 for an explanation of SONET alarms.

Step 4: Monitor Statistics for a SONET Interface

Action To monitor statistics for a SONET interface, use the following JUNOS CLI operational mode command:

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'
```

What It Means 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 28 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 28: 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, such as the Cisco Discovery Protocol (CDP).
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.
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. (See Table 29.)

Table 29: Checklist for Using Loopback Testing for SONET Interfaces

SONET Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a SONET Interface on page 138	
1. Create a Loopback on page 138	
a. Create a Physical Loopback on page 139	Connect the transmit port to the receive port.
b. Configure a Local Loopback on page 139	[edit interfaces *interface-name* sonet-options] set loopback local show commit
2. Set Clocking to Internal on page 140	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the SONET Interface Is Up on page 141	show interfaces so-*fpc*/*pic*/*port*
4. Clear SONET Interface Statistics on page 142	clear interfaces statistics so-*fpc*/*pic*/*port*
5. Check That the Received and Transmitted Path Trace Are the Same on page 143	show interfaces so-*fpc*/*pic*/*port* extensive
6. Force the Link Layer to Stay Up on page 143	
a. Configure Encapsulation to Cisco-HDLC on page 144	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 144	[edit interfaces *interface-name*] set no-keepalives show commit
7. Verify the Status of the Logical Interface on page 145	show interfaces so-*fpc*/*pic*/*port* show interfaces so-*fpc*/*pic*/*port* terse
8. Ping the SONET Interface on page 147	ping interface so-*fpc*/*pic*/*port* *local-IP-address* bypass-routing count 1000 rapid
9. Check for SONET Interface Error Statistics on page 147	show interfaces so-*fpc*/*pic*/*port* extensive

SONET Interface Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 149	
1. Create a Loop from the Router to the Network on page 149	[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 150	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a SONET Interface” on page 138.

Diagnose a Suspected Hardware Problem with a SONET Interface

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

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

1. Create a Loopback on page 138
2. Set Clocking to Internal on page 140
3. Verify That the SONET Interface Is Up on page 141
4. Clear SONET Interface Statistics on page 142
5. Check That the Received and Transmitted Path Trace Are the Same on page 143
6. Force the Link Layer to Stay Up on page 143
7. Verify the Status of the Logical Interface on page 145
8. Ping the SONET Interface on page 147
9. Check for SONET Interface Error Statistics on page 147

Step 1: 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 OC-192, you must use the appropriate attentuation.)

What It Means 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
   ```

What It Means 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.

Step 2: 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# set clocking internal
   ```

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
   ```

What It Means The clock source for the interface is set to the internal Stratum 3 clock.

Step 3: 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
```

What It Means 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 143.

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
```

What It Means 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 30 lists problem situations and actions for a physical link that is down.

Table 30: 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.

Step 4: 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>

What It Means This command clears the interface statistics counters for interface so-4/0/2 only.

Step 5: 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...]
```

What It Means 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 143.

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.

Step 6: 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.

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

1. Configure Encapsulation to Cisco-HDLC on page 144
2. Configure No-Keepalives on page 144

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
   ```

What It Means 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

What It Means 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.

Step 7: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following two JUNOS CLI operational mode commands:

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
```

What It Means 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
```

What It Means 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.

Step 8: Ping the SONET Interface

Action To ping the local interface and verify the loopback connection, use the following JUNOS CLI operational mode command:

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

Sample Output

```
user@host# ping interface so-2/2/0 10.0.2.1 bypass-routing count 1000 rapid
PING 10.0.2.1 (10.0.2.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.0.2.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.374/0.446/9.744/0.754 ms
```

What It Means 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).

Step 9: 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...]
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 149
2. Create a Loop to the Router from Various Points in the Network on page 150

Step 1: 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
```

What It Means This command loops any traffic from the network back into the network.

Step 2: 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 138. 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. (See Table 31.) For a useful reference for details on SONET interfaces, refer to the Telcordia/Bellcore Standard GR-253 CORE, available from www.telcordia.com.

Table 31: List of Common SONET Alarms and Errors

SONET Alarm and Error Tasks	Command or Action
Display SONET Alarms and Errors on page 152	show interfaces so-*fpc/pic/port* extensive
Locate Most Common SONET Alarms and Errors on page 155	
1. Locate Loss of Signal Alarms on page 156	Check the connection between the router port and the first SONET network element.
2. Locate Alarm Indication Signal Alarms on page 157	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 159	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 161	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 163	Check the following: ■ Optical fiber ■ Optical transmitter and receiver ■ Clocking ■ Attenuation in the optical signal
6. Locate Payload Label Mismatch Path Alarms on page 164	Check the received and transmitted C2 byte.
7. Locate Loss of Pointer Path Alarms on page 166	Check that both sides of the connection are configured for concatenate or nonconcatenate mode.
8. Locate Unequipped Payload Alarms on page 167	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 168	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

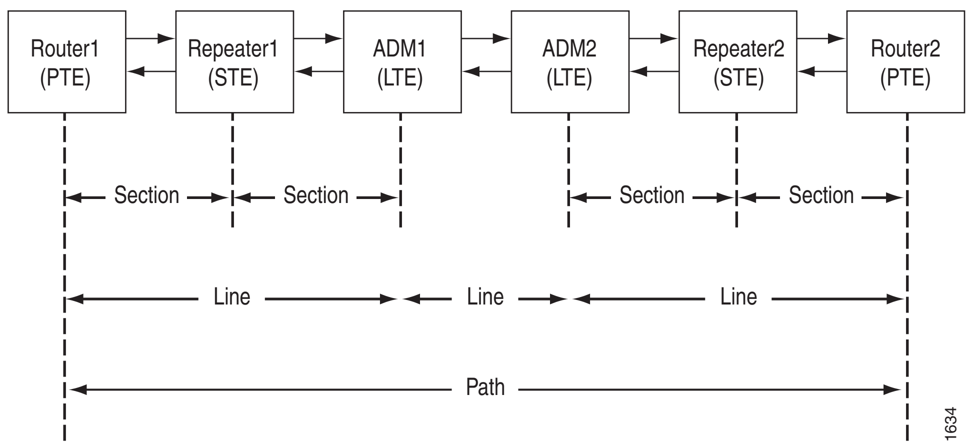
```
user@host> show interfaces so-1/1/1 extensive
[...Output truncated...]
  Active alarms  : None
  Active defects : None
  SONET PHY:           Seconds        Count  State
    PLL Lock                 0            0  OK
    PHY Light                0            0  OK
  SONET section:
    BIP-B1                   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...]
```

What It Means 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 shows an example of a SONET network with the section, line, and path areas delimited. Figure 11 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, Repeater1 (STE) regenerates the SONET signal between itself and ADM1, and the section between itself and Router1 (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:

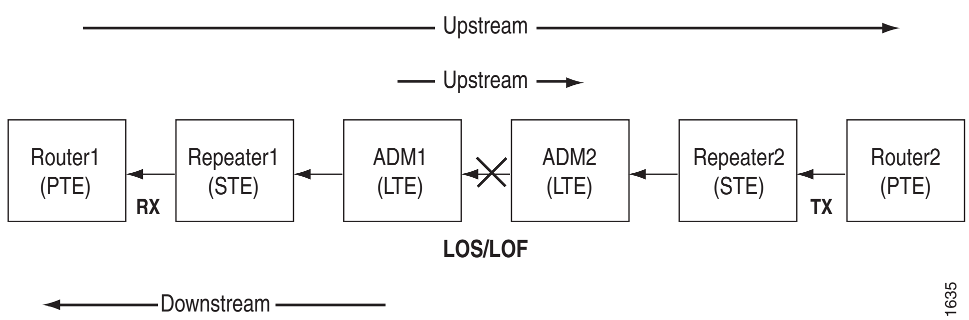
- The main role of a PTE is to read the path overhead bytes. However, it also reads the line overhead bytes and the section overhead bytes. Therefore the PTE also plays the role of an LTE and an STE.
- The main role of an LTE is to read the line overhead bytes. However, it also reads the section overhead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

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 the failure occurs in the section between ADM1 and ADM2. The signal is transmitted from Router2 in the direction of Router1(from right to left). In this example, Router1, Repeater1, and ADM1 are downstream from the failure. ADM2, Repeater2, and Router2 are upstream from the failure.

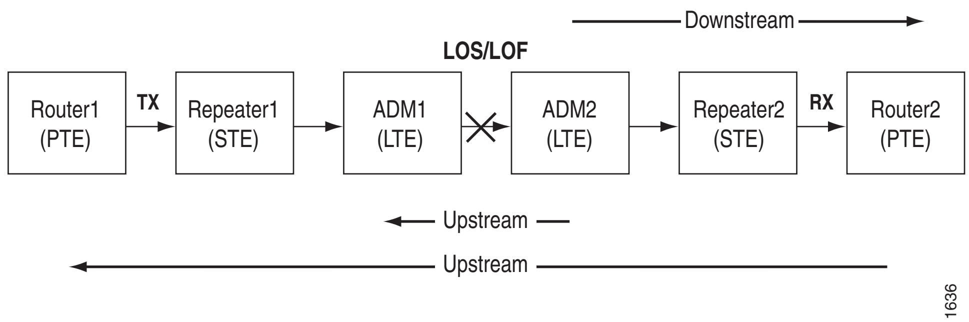
Figure 12: Example of an Upstream or Downstream Failure



The failure sends an alarm from ADM1 to Router1 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, the failure is also between ADM1 and ADM2. However, the signal is transmitted from Router1 in the direction of Router2 (from left to right). Router2, Repeater2, and ADM2 are downstream from the failure. ADM1, Repeater1, and Router1 are upstream from the failure.

Figure 13: Another Example of an Upstream or Downstream Failure



This failure sends an alarm from ADM2 to Router2 in the direction of the signal transmission (downstream). Alarms are also sent from ADM2 to ADM1 and from Router2 to Router1 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

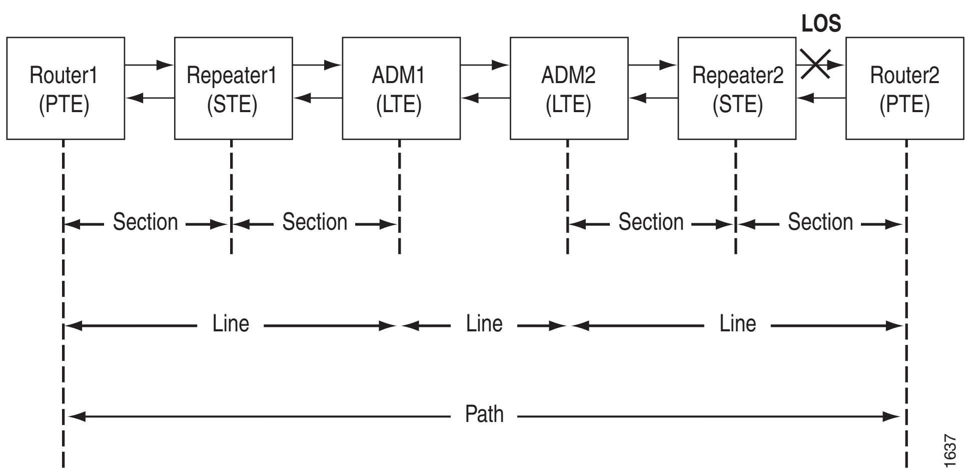
The following alarms and errors are described in this section:

Locate Loss of Signal Alarms

Purpose 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.

Action 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, the X indicates that there is a connection problem between Repeater2 and Router2.

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 s0-1/1/1 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...]
```

What It Means The sample output shows that Router2 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:

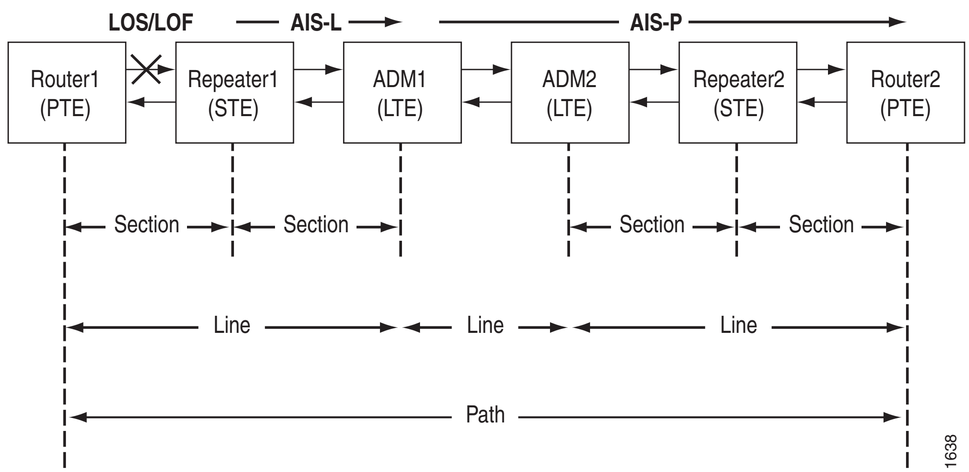
- Alarm indication signal path (AIS-P) is sent by an LTE to a downstream PTE when an LOS or LOF is detected on a upstream SONET section.
- Alarm indication signal line (AIS-L) is sent by an STE to a downstream LTE when an LOS or LOF is detected on an incoming SONET section.

Example of a Router Receiving Only an AIS-P Alarm

In Figure 15, the X indicates that the LOS or LOF occurs in the section between Router1 and Repeater1.

All diagnostics are from the perspective of Router2 (the Juniper Networks router).

Figure 15: Example of a Router Receiving Only an AIS-P Alarm



What It Means In Figure 15, the progression of events occurring after the failure is as follows:

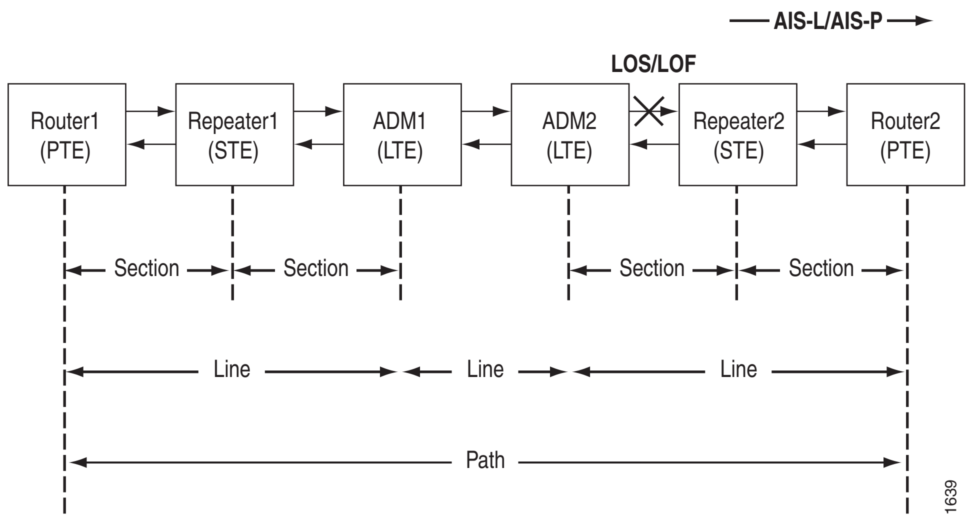
1. Repeater1 detects an LOS or LOF on an incoming SONET section.
2. Repeater1 sends an AIS-L downstream to ADM1 (LTE).
3. ADM1 sends an AIS-P to Router2 (PTE).
4. The only alarm that Router2 receives is the AIS-P alarm from ADM1.

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

In Figure 16, the X indicates that the LOS or LOF occurs in the section between ADM2 and Repeater2.

All diagnostics are from the perspective of Router2 (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, the progression of events occurring after the failure is as follows:

1. Repeater2 detects an LOS or LOF on the incoming section.
2. Repeater2 sends an AIS-L and AIS-P downstream to Router2.
3. Router2 receives both an AIS-L and an AIS-P from Repeater2.

Locate Remote Defect Indication Alarms

Purpose A remote defect indication (RDI) is sent upstream to signal an error condition. There are two types of RDI alarms:

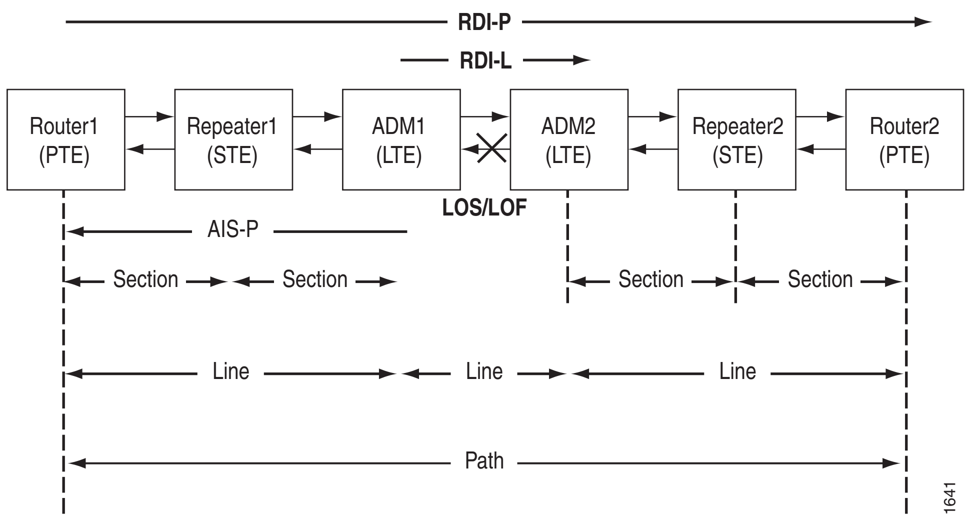
- Remote defect indication line (RDI-L) is sent upstream to a peer LTE when an alarm indication signal line (AIS-L) or low-level defects are detected.
- Remote defect indication path (RDI-P) is sent upstream to a peer PTE when a defect in the signal, typically an AIS-P, is detected.

Example of a Router Receiving Only an RDI-P Alarm

In Figure 17, the X indicates that the LOS or LOF occurs in the section between ADM1 and ADM2.

All diagnostics are from the perspective of Router2 (the Juniper Networks router).

Figure 17: Example of a Router Receiving Only an RDI-P Alarm



What It Means In Figure 17, the progression of events occurring after the failure is as follows:

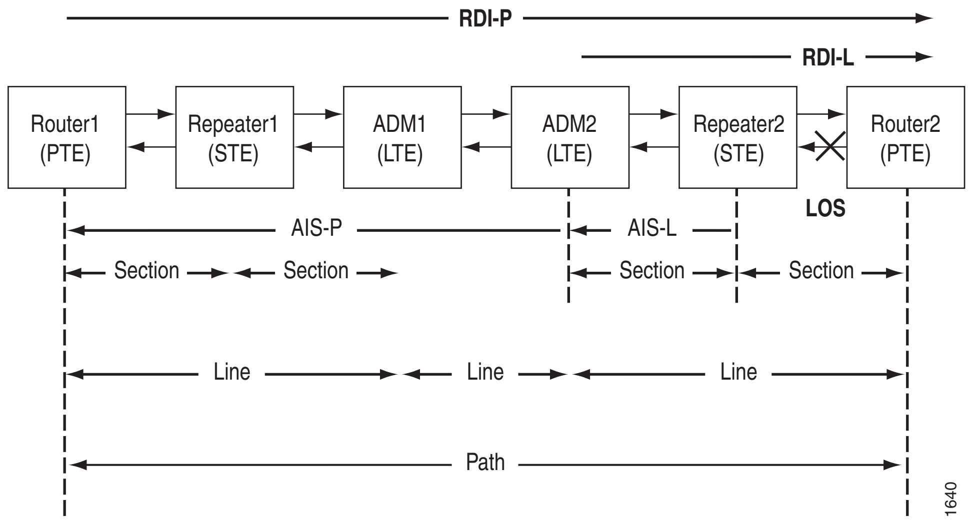
1. ADM1 detects an LOS or LOF on an incoming SONET section.
2. ADM1 sends an RDI-L to ADM2.
3. ADM1 sends an AIS-P downstream to Router1.
4. Router1 sends an RDI-P upstream to Router2.
5. Router2 only receives an RDI-P alarm.

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

In Figure 18, the X indicates that the LOS occurs in the section between Repeater2 and Router2.

All diagnostics are from the perspective of Router2 (the Juniper Networks router).

Figure 18: Example of a Router Receiving Both an RDI-L and RDI-P Alarm



What It Means In Figure 18, the progression of events occurring after the failure is as follows:

1. Repeater2 detects an LOS on an incoming section.
2. Repeater2 sends an AIS-L downstream to ADM2.
3. ADM2 sends an RDI-L upstream to Router2.
4. ADM2 sends an AIS-P downstream to Router1.
5. Router1 sends an RDI-P upstream to Router2.
6. Router2 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:

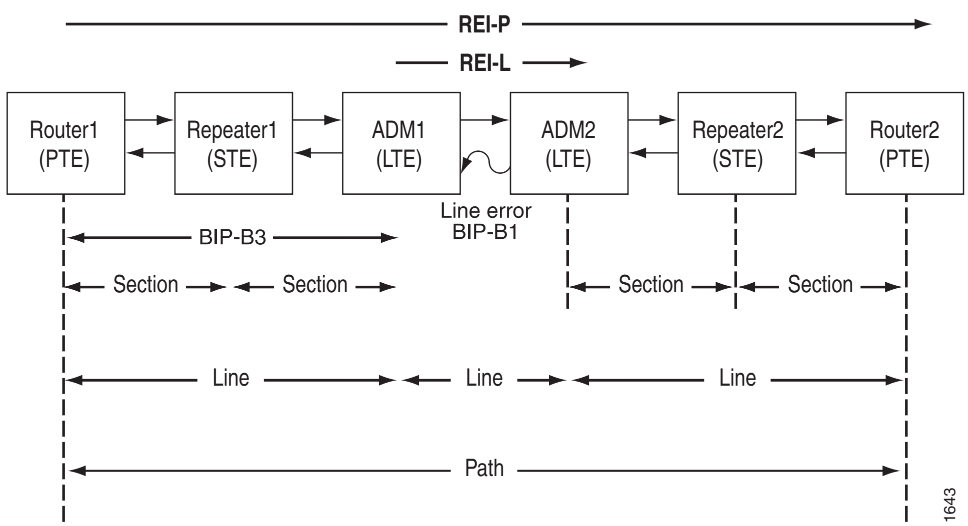
- Remote error indication line (REI-L) is sent to the upstream LTE when errors are detected in the B2 byte.
- Remote error indication path (REI-P) is sent to the upstream PTE when errors are detected in the B3 byte.

Example of Only an REI-P Counter Incrementing

In Figure 19, the wavy line indicates that there is a line error in the section between ADM1 and ADM2.

All diagnostics are from the perspective of Router2 (the Juniper Networks router).

Figure 19: Example of a Router Receiving Only an REI-P Counter Incrementing



What It Means In Figure 19, the progression of events occurring after the failure is as follows:

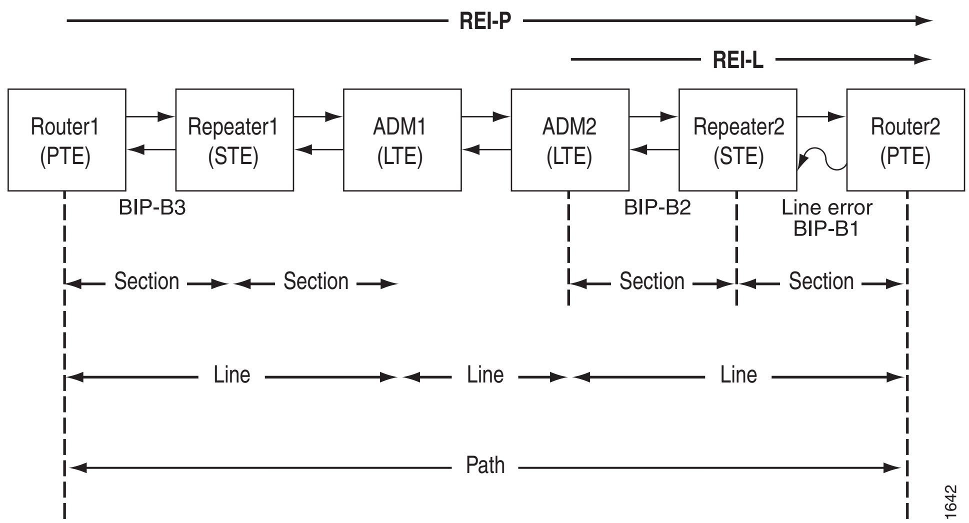
1. ADM1 detects parity errors in the B1 byte.
2. ADM1 sends an REI-L upstream to ADM2.
3. Router1 detects parity errors in the B3 byte.
4. Router1 sends an REI-P upstream to Router2.
5. Router2 only sees an REI-P incrementing counter.

Example of Both REI-L and REI-P Counters Incrementing

In Figure 20, the wavy line indicates that there is a line error in the section between Repeater2 and Router2.

All diagnostics are from the perspective of Router2 (the Juniper Networks router).

Figure 20: Example of a Router Receiving Both An REI-L and REI-P Counter Incrementing



What It Means In Figure 20, the progression of events occurring after the failure is as follows:

1. Repeater2 detects some parity errors in the B1 byte from a corrupted SONET frame.
2. ADM2 detects parity errors in the B2 byte.
3. ADM2 sends an REI-L upstream to Router2.
4. Router1 detects parity errors in the B3 byte.
5. Router1 sends back an REI-P upstream to Router2.
6. Router2 sees incrementing REI-L and REI-P errors.

Locate Bit Error Rate Alarms

Purpose 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.

Action 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
```

What It Means 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

Locate Payload Label Mismatch Path Alarms

Purpose 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.

Action 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
```

What It Means 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 32 shows the synchronous transport signal (STS) path signal label assignments as described in Issue 3 (Sept. 2000) of the GR-253 CORE.

Table 32: STS Path Signal Label Assignments

Code (Hex)	Content of the STS SPE
00	Unequipped
01	Equipped - Nonspecific Payload
02	VT-Structured STS-1 SPE a
03	Locked VT Mode a
04	Asynchronous Mapping for DS-3
12	Asynchronous Mapping for DS-4NA
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

Purpose 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.

Action 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...]
```

What It Means 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

Purpose 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.

Action 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...]
```

What It Means 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

Purpose 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.

Action 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...]
```

What It Means 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 33 on page 170.) For example:

- On the M20 and M40 Internet router OC-48-SM-IR PIC and the M160 Internet router OC-192 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 OC-3 and OC-12 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 33 shows the location of the onboard clock on the various system boards of Juniper Networks routers.

Table 33: 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)
OC-48-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. (See Table 34.)

Table 34: Checklist for Enabling SONET Payload Scrambling

SONET Payload Scrambling Tasks	Command or Action
Understand SONET Payload Scrambling on page 172	
1. Check SONET HDLC Payload Scrambling on page 173	show configuration interfaces | *interface-name* show interfaces *interface-name*
2. Configure SONET HDLC Payload Scrambling on page 174	[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 $1 + x^6 + x^7$ algorithm to scramble the section overhead of the SONET frame. It does not scramble the first row of the section overhead.

- Cell payload scrambling is optional and is defined in ITU-T I.432, section 4.5.3. This mode randomizes the bits in the payload portion of an ATM cell to make sure that the beginning of each new cell is recognized. It leaves the 5-byte header unscrambled.

Synchronous Transport System (STS) stream scrambling must be enabled on every SONET device and is the default for SONET interfaces.

Cell payload scrambling or SONET High-level Data Link Control (HDLC) scrambling can be enabled or disabled, and on Juniper routers is enabled by default to provide better link stability. Both sides of a connection must either use scrambling or not use it.

NOTE: HDLC payload scrambling conflicts with traffic shaping configured using leaky bucket properties. If you configure leaky bucket properties, you must disable payload scrambling because the software rejects configurations that have both features enabled. For more information, see the *JUNOS Network Interfaces and Class of Service Configuration Guide.*

On a Channelized OC-12 interface, the SONET payload-scrambler statement is ignored. To configure scrambling on the DS-3 channels on the interface, include the t3-options payload-scrambler statement in the configuration for each DS-3 channel.

Steps To Take This chapter describes the following tasks:

1. Check SONET HDLC Payload Scrambling on page 173

2. Configure SONET HDLC Payload Scrambling on page 174

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
```

What It Means 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 174.

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. (See Table 35.)

Table 35: Checklist for Checking the SONET Frame Checksum

SONET Frame Checksum Tasks	Command or Action
Understand the SONET Frame Checksum on page 176	
Check the SONET Frame Checksum on page 176	
1. Examine Output for Framing Errors on page 176	show interfaces *interface-name* extensive
2. Check the FCS Configuration on page 178	show configuration interfaces | *interface-name* show interfaces *interface-name*
Configure a SONET Frame Checksum on page 180	
1. Return to the Default 16-Bit Checksum on page 180	[edit] edit interfaces *so-fpc/pic/port* sonet-options delete fcs 32 show commit
2. Configure a 16-Bit Checksum on page 180	[edit] edit interfaces *so-fpc/pic/port* sonet-options set fcs 16 show commit
3. Configure a 32-Bit Checksum on page 181	[edit] edit interfaces *so-fpc/pic/port* sonet-options set (fcs 32 | rfc-2615) show commit

Understand the SONET Frame Checksum

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.

Steps To Take This chapter describes the following tasks:

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.

Steps To Take To check the SONET frame checksum, follow these steps:

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
```

What It Means The sample output shows that Router1 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 interfaces** *interface-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
```

What It Means 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.

What It Means Sample output 2 shows that FCS 32 is configured. To change the FCS configuration, see “Return to the Default 16-Bit Checksum” on page 180, “Configure a 16-Bit Checksum” on page 180, or “Configure a 32-Bit Checksum” on page 181.

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:

- Return to the Default 16-Bit Checksum on page 180
- Configure a 16-Bit Checksum on page 180
- Configure a 32-Bit Checksum on page 181

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

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;
```

4. Commit the configuration:

    user@host# **commit**

NOTE: On a Channelized OC-12 interface, the sonet-options fcs statement is not supported. To configure FCS on each DS-3 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. (See Table 36.)

Table 36: Checklist for Monitoring Fast Ethernet and Gigabit Ethernet Interfaces

Monitor Fast Ethernet and Gigabit Ethernet Interface Tasks	Command or Action
Monitor Fast Ethernet and Gigabit Ethernet Interfaces on page 186	
1. Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces on page 186	show interfaces terse (fe* | ge*)
2. Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface on page 188	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 189	show interfaces (fe-*fpc/ pic/ port* | ge-*fpc/ pic/ port*) extensive
4. Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface on page 192	monitor interface (fe-*fpc/ pic/ port* | ge-*fpc/ pic/ port*)
5. Fiber-Optic Ethernet Interface Specifications on page 193	

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.

Steps To Take To monitor your Fast Ethernet and Gigabit Ethernet interfaces, follow these steps:

1. Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces on page 186

2. Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface on page 188

3. Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface on page 189

4. Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface on page 192

Step 1: Display the Status of Fast Ethernet and Gigabit Ethernet Interfaces

Action To display the status of Fast Ethernet or Gigabit Ethernet interfaces, use the following JUNOS command-line interface (CLI) operational mode command:

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
```

What It Means 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 37.

Table 37: 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.
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.

Physical Interface	Logical Interface	Status Description
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
```

What It Means

This sample output lists only the Gigabit Ethernet interfaces. It shows the status of both the physical and logical interfaces. See Table 38 for a description of what the output means.

Table 38: 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.
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.

Step 2: Display the Status of a Specific Fast Ethernet or Gigabit Ethernet Interface

Action 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:

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
```

What It Means 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 189, to display more extensive information about the Fast Ethernet interface and the physical interface that is down.

Step 3: Display Extensive Status Information for a Specific Fast Ethernet or Gigabit Ethernet Interface

Action To display extensive status information about a specific Fast Ethernet or Gigabit Ethernet interface, use the following JUNOS CLI operational mode command:

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
```

What It Means The sample output shows where the errors might be occurring and includes autonegotiation information. See Table 39 for a description of errors to look for.

Table 39: Errors to Look For

Error	Meaning
Policed discards	Discarded frames that were not recognized or were not of interest, for example, Cisco Discovery Protocol (CDP) packets.
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 LINK Alarm and Counters” on page 205 for an explanation of Fast Ethernet and Gigabit Ethernet alarms.

Table 40 lists and describes some MAC statistics errors to look for.

Table 40: 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 41 explains the autonegotiation information of the show interface *interface-name* extensive command output.

Table 41: Autonegotiation Information

Autonegotiation Field Information	Explanation
Negotiation status: Incomplete	The Negotiation status field shows Incomplete when the Ethernet interface has the speed or link mode configured.
Negotiation status: No autonegotiation	The Negotiation status field shows No autonegotiation when the remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation.
Negotiation status: Complete Link partner status: OK	The Negotiation status field shows Complete and the Link partner field shows OK when the Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process completes successfully.
Link partner: Half-duplex	The Link partner field can be Full-duplex or Half-duplex depending on the capability of the attached Ethernet device.
Flow control: Symmetric/asymmetric	The Flow control field displays the types of flow control supported by the remote Ethernet device.

Step 4: Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface

Action To monitor statistics for a Fast Ethernet or Gigabit Ethernet interface, use the following JUNOS CLI operational mode command:

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]
```

What It Means 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 42 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 42 for the optical specifications.

Fiber-Optic Ethernet Interface Specifications

Table 42 shows the specifications for fiber-optic interfaces for Juniper Networks routers.

Table 42: 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
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. (See Table 43.)

Table 43: Checklist for Using Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces

Loopback Testing for Fast Ethernet and Gigabit Ethernet Interface Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface on page 196	
1. Create a Loopback on page 196	
a. Create a Physical Loopback for a Fiber-Optic Interface on page 196	Connect the transmit port to the receive port.
b. Create a Loopback Plug for an RJ-45 Ethernet Interface on page 197	Cross pin 1 (TX+) and pin 3 (RX+) together, and pin 2 (TX-) and pin 6 (RX-) together.
c. Configure a Local Loopback on page 197	[edit interfaces *interface-name* (fastether-options | gigether-options)] set loopback local show commit
2. Verify That the Fast Ethernet or Gigabit Ethernet Interface Is Up on page 198	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*)
3. Configure a Static Address Resolution Protocol Table Entry on page 200	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 201	clear interfaces statistics fe-*fpc/pic/port |* ge-*fpc/pic/port*
5. Ping the Fast Ethernet or Gigabit Ethernet Interface on page 202	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 202	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*) extensive
Diagnose a Suspected Circuit Problem on page 204	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface” on page 196.

Diagnose a Suspected Hardware Problem with a Fast Ethernet or Gigabit Ethernet Interface

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

Steps To Take To diagnose a suspected hardware problem with the Ethernet interface, follow these steps:

Step 1: 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.

What It Means 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.

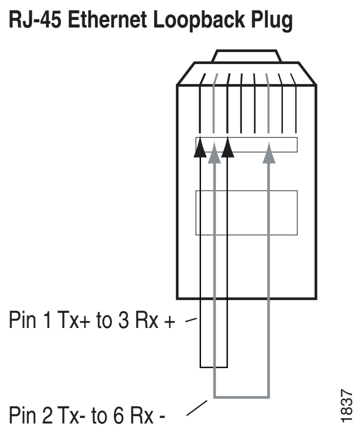
Create a Loopback Plug for an RJ-45 Ethernet Interface

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 illustrates how to create a loopback plug for an RJ-45 Ethernet interface.

Figure 21: RJ-45 Ethernet Loopback Plug



What It Means 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 local**

3. Verify the configuration:

   user@host# **show**

   For example:

   [edit interfaces fe-1/0/0 fastether-options]
   user@host# **show**
   loopback local;

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.

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

Step 2: 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/pic/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
```

What It Means 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
```

What It Means The sample output shows that the physical link is down and there are active alarms and defects.

Table 44 presents problem situations and actions for a physical link that is down.

Table 44: 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.)

Step 3: 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
```

What It Means The sample output is for Steps 1 through 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.

Step 4: 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>
```

What It Means This command clears the interface statistics counters for the Gigabit Ethernet interface only.

Step 5: 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
```

What It Means As the packet is looped over the link, you receive a series of TTL exceeded messages. These messages are received because the ping packets are looped repeatedly between the router and the physical loopback until the IP TTL expires.

Step 6: 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
```

What It Means 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 196. 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. (See Table 45.) The LINK alarm is the only Fast Ethernet or Gigabit Ethernet alarm encountered when isolating line problems on a Juniper Networks router.

Table 45: Checklist for Locating Fast Ethernet and Gigabit Ethernet Alarms and Counters

Fast Ethernet and Gigabit Ethernet Alarm and Counter Tasks	Command or Action
Display the Fast Ethernet or Gigabit Ethernet Interface LINK Alarm on page 206	show interfaces (fe-*fpc/pic/port* | ge-*fpc/pic/port*) extensive
Fast Ethernet and Gigabit Ethernet Counters on page 208	

Display the Fast Ethernet or Gigabit Ethernet Interface LINK Alarm

Action To display the Fast Ethernet or Gigabit Ethernet LINK alarm, use the following JUNOS command-line interface (CLI) operational mode command:

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
```

What It Means 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 195 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

Table 46 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 46: 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, such as the Cisco Discovery Protocol (CDP).
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.
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, the PIC is probably 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.

Counter	Description	Reason for Increment
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 DS-3 Interfaces

This chapter describes how to monitor Channelized DS-3 interfaces and begin the process of isolating Channelized DS-3 interface problems when they occur. (See Table 47.)

Table 47: Checklist for Monitoring Channelized DS-3 Interfaces

Monitor Channelized DS-3 Interfaces Tasks	Command or Action
Monitor Channelized DS-3 Interfaces on page 214	
1. Display the Status of Channelized DS-3 Interfaces on page 214	show interfaces terse t1*
2. Display the Status of a Specific Channelized DS-3 Interface on page 216	show interfaces t1-*fpc*/*pic*/*port*:*channel*
3. Display Extensive Status Information for a Specific Channelized DS-3 Interface on page 219	show interfaces t1-*fpc*/*pic*/*port*:*channel* extensive
4. Monitor Statistics for a Channelized DS-3 Interface on page 224	monitor interfaces t1-*fpc*/*pic*/*port*:*channel*

Monitor Channelized DS-3 Interfaces

Purpose By monitoring Channelized DS-3 interfaces, you begin the process of isolating Channelized DS-3 interface problems when they occur.

Steps To Take To monitor your Channelized DS-3 interfaces, follow these steps:

1. Display the Status of Channelized DS-3 Interfaces on page 214

2. Display the Status of a Specific Channelized DS-3 Interface on page 216

3. Display Extensive Status Information for a Specific Channelized DS-3 Interface on page 219

4. Monitor Statistics for a Channelized DS-3 Interface on page 224

Step 1: Display the Status of Channelized DS-3 Interfaces

Action To display the status of Channelized DS-3 interfaces, use the following JUNOS command-line interface (CLI) operational mode command:

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
```

What It Means

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.

Step 2: Display the Status of a Specific Channelized DS-3 Interface

Action To display the status of a specific Channelized DS-3 interface, use the following JUNOS CLI operational mode command:

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
```

What It Means

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 DS-1 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.

Step 3: Display Extensive Status Information for a Specific Channelized DS-3 Interface

Action To display the status of Channelized DS-3 interfaces, use the following JUNOS CLI operational mode command:

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, O.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, O.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
```

What It Means 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:

- DS-1 alarms
- DS-1 defects
- T1 media

Both sample output 1 and 2 show no DS-1 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 151.

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.

Step 4: Monitor Statistics for a Channelized DS-3 Interface

Action To display the status of Channelized DS-3 interfaces, use the following JUNOS CLI operational mode command:

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'
```

What It Means

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 DS-3 Interfaces

This chapter describes using loopback testing to isolate Channelized DS-3 interface problems. (See Table 48.)

Table 48: Checklist for Using Loopback Testing for Channelized DS-3 Interfaces

Channelized DS-3 Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a Channelized DS-3 Interface on page 229	
1. Create a Loopback on page 229	
a. Create a Physical Loopback on page 229	Connect the TX port to the RX port.
b. Configure a Local Loopback on page 229	[edit interfaces *interface name* (t3-options | t1-options)] set loopback local show commit
2. Verify That the Interface Is Up on page 231	show interfaces t1-*fpc/pic/port:channel* show interfaces t3-*fpc/pic/port:channel*
3. Clear Interface Statistics on page 232	clear interfaces statistics t1-*fpc/pic/port:channel*
4. Force the Link Layer to Stay Up on page 232	
a. Configure Encapsulation to Cisco-HDLC on page 232	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 234	[edit interfaces *interface-name*] set no-keepalives show commit
5. Verify the Status of the Logical Interface on page 235	show interfaces t1-*fpc/pic/port:channel*
6. Ping the Channelized Interface on page 235	ping interface t1-*fpc/pic/port:channel local-IP-address* bypass-routing count 1000 rapid
7. Check for Interface Error Statistics on page 236	show interfaces t1-*fpc/pic/port:channel* extensive

Channelized DS-3 Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 238	
1. Create a Loop from the Router to the Network on page 238	[edit interfaces t1-*fpc/pic/port:channel* t1-options] set loopback remote show commit
2. Create a Loop to the Router from Various Points in the Network on page 239	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Channelized DS-3 Interface” on page 229.

Diagnose a Suspected Hardware Problem with a Channelized DS-3 Interface

Steps To Take To diagnose a suspected hardware problem with a Channelized DS-3 interface, follow these steps:

1. Create a Loopback on page 229
2. Verify That the Interface Is Up on page 231
3. Clear Interface Statistics on page 232
4. Force the Link Layer to Stay Up on page 232
5. Verify the Status of the Logical Interface on page 235
6. Ping the Channelized Interface on page 235
7. Check for Interface Error Statistics on page 236

Step 1: 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 DS-3 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.

What It Means 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 DS-3 port for a Channelized DS-3 to DS-1 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

What It Means 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.

Step 2: Verify That the Interface Is Up

Purpose Display the status of a Channelized DS-1 or DS-3 interface to determine whether the physical link is up or down.

Action To verify that the status of the Channelized DS-1 or DS-3 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 DS-3 to DS-1 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
```

What It Means The sample output shows that the physical link is up and there are no DS-1 or DS-3 alarms or defects. You should not see any DS-1 or DS-3 alarms. You can check any interface on the Channelized DS-3 port. See "Locate Channelized DS-3 Alarms and Errors on page 241" for more information on Channelized DS-3 alarms and errors.

Step 3: Clear Interface Statistics

Purpose You must reset the Channelized DS-3 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>
```

What It Means This command clears the interface statistics counters for the Channelized or T1 interface only.

Step 4: 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.

Steps To Take Force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 232

2. Configure No-Keepalives on page 234

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
```

What It Means 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 DS-3 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
```

What It Means 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.

Step 5: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following JUNOS CLI operational mode command:

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
```

What It Means The sample output shows that the channelized interface has the physical and logical links up.

Step 6: 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
```

What It Means This command sends 1000 ping packets out of the channelized interface under the Channelized DS-3 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).

Step 7: 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, O.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
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 238
2. Create a Loop to the Router from Various Points in the Network on page 239

Step 1: 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**

What It Means This command loops any traffic from the network back into the network.

Step 2: 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 DS-3 Interface" on page 229. 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 DS-3 Alarms and Errors

This chapter describes the most common Channelized DS-3 alarms and errors when investigating line problems on a Juniper Networks router. (See Table 49.)

Table 49: Checklist for Channelized DS-3 Alarms and Errors

Channelized DS-3 Alarms and Errors Tasks	Command or Action
Display Alarms and Errors for Channelized DS-3 Interfaces on page 242	show interfaces t1-*fpc/ pic/ port:channel* extensive

Display Alarms and Errors for Channelized DS-3 Interfaces

Action To display channelized DS-3 alarms and errors, use the following JUNOS command-line interface (CLI) operational mode command:

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, O.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
```

What It Means

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 50 shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 50: 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 43 for more details on T1 alarms and statistics.

Chapter 24
Monitor Multichannel DS-3 Interfaces

This chapter describes how to monitor Multichannel DS-3 interfaces and begin the process of isolating Multichannel DS-3 interface problems when they occur. (See Table 51.)

Table 51: Checklist for Monitoring Multichannel DS-3 Interfaces

Monitor Multichannel DS-3 Interface Tasks	Command or Action
Monitor Multichannel DS-3 Interfaces on page 248	
1. Display the Status of Channelized Interfaces on page 248	show interfaces terse ds* show interfaces terse t1*
2. Display the Status of a Specific Channelized Interface on page 249	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 250	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 253	monitor interfaces ds-*fpc/pic/port:channel:channel* monitor interfaces t1-*fpc/pic/port:channel*

Monitor Multichannel DS-3 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 DS-3 to DS-0 interfaces or channelized DS-3 to DS-1 interfaces, you can begin to isolate Multichannel DS-3 problems when they occur.

Steps To Take To monitor Multichannel DS-3 interfaces, follow these steps:

1. Display the Status of Channelized Interfaces on page 248

2. Display the Status of a Specific Channelized Interface on page 249

3. Display Extensive Status Information for a Specific T3 Interface on page 250

4. Monitor Statistics for a Channelized Interface on page 253

Step 1: Display the Status of Channelized Interfaces

Action To display the status of channelized DS-3 to DS-0 interfaces or channelized DS-3 to DS-1 interfaces, use one of the following JUNOS command-line interface (CLI) operational mode commands:

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

Sample Output The following sample output is for a channelized DS-3 to DS-0 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 DS-3 to DS-1 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
```

What It Means 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.

Step 2: Display the Status of a Specific Channelized Interface

Action To display the status of a specific channelized DS-3 to DS-0 interface or channelized DS-3 to DS-1 interface, use one of the following CLI operational mode commands:

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 DS-3 to DS-0 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 DS-3 to DS-1 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
```

What It Means 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.

Step 3: Display Extensive Status Information for a Specific T3 Interface

Action To display extensive status information about a specific channelized DS-3 to DS-0 interface or channelized DS-3 to DS-1 interface, use one of the following CLI operational mode commands:

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 DS-3 to DS-0 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, O.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 DS-3 to DS-1 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
```

What It Means The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the DS-1 or DS-3 interface and diagnose the media accordingly. See “Locate Multichannel DS-3 Alarms and Errors” on page 273 for an explanation of Multichannel DS-3 alarms.

Step 4: Monitor Statistics for a Channelized Interface

Action To monitor statistics for a channelized DS-3 to DS-0 interface or channelized DS-3 to DS-1 interface, use one of the following CLI operational mode commands:

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 DS-3 to DS-0 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 DS-3 to DS-1 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'
```

What It Means 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 52 lists additional problem situations and actions to help you further understand an interface problem.

Table 52: 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 DS-3 Interfaces

This chapter describes using loopback testing to isolate Multichannel DS-3 interface problems. (See Table 53.)

Table 53: Checklist for Using Loopback Testing for Multichannel DS-3 Interfaces

Multichannel DS-3 Interfaces Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a Multichannel DS-3 Interface on page 259	
1. Create a Loopback on page 259	
a. Create a Physical Loopback on page 259	Connect the TX port to the RX port.
b. Configure a Local Loopback on page 259	[edit interfaces *interface name* (t3-options | t1-options)] set loopback local show commit
2. Verify That the Interface Is Up on page 261	show interfaces (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*)
3. Clear Interface Statistics on page 262	clear interfaces statistics (t1-*fpc/pic/port:channel* | ds-*fpc/pic/port:channel:channel*)
4. Force the Link Layer to Stay Up on page 262	
a. Configure Encapsulation to Cisco-HDLC on page 263	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 263	[edit interfaces *interface-name*] set no-keepalives show commit
5. Verify the Status of the Logical Interface on page 264	show interfaces (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*)
6. Ping the Channelized Interface on page 265	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 266	show interfaces (ds-*fpc/pic/port:channel:channel* | t1-*fpc/pic/port:channel*) extensive

Multichannel DS-3 Interfaces Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 270	
1. Create a Loop from the Router to the Network on page 270	
a. Loop the Entire T3 Interface towards the Network on page 270	[edit interfaces *interface-name* t3-options] set loopback remote show commit
b. Loop a Particular T1 Channel towards the Network on page 271	[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 272	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Multichannel DS-3 Interface” on page 259.

Diagnose a Suspected Hardware Problem with a Multichannel DS-3 Interface

Steps To Take To diagnose a suspected hardware problem with a Multichannel DS-3 interface, follow these steps:

Step 1: 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 DS-3 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.

What It Means 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 DS-3 port for a channelized DS-3 to DS-0 interface:

[edit interfaces ds-2/1/0:**0**:**0** t3-options]

NOTE: In order to configure T3 options on the Multichannel DS-3, 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 DS-3 port for a channelized DS-3 to DS-1 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

What It Means 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.

Step 2: Verify That the Interface Is Up

Purpose Display the status of a DS-1 or DS-3 interface to determine whether the physical link is up or down.

Action To verify that the status of the Multichannel DS-3 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 DS-3 to DS-0 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 DS-3 to DS-1interface:

```
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
```

What It Means The sample output shows that the physical link is up and there are no DS-1 or DS-3 alarms or defects. You should not see any DS-1or DS-3 alarms. You can check any interface on the Multichannel DS-3 port.

Step 3: Clear Interface Statistics

Purpose You must reset the Multichannel DS-3 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 ds-1/1/0:0:0
user@host>

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

What It Means This command clears the interface statistics counters for the Multichannel or T1 interface only.

Step 4: 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.

Steps To Take Force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 263
2. Configure No-Keepalives on page 263

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

What It Means 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 DS-3 or DS-0 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

What It Means 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.

Step 5: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following JUNOS CLI operational mode command:

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 DS-3 to DS-0 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 DS-3 to DS-1interface:

```
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
```

What It Means The sample output shows that both channelized interfaces have the physical and logical links up.

Step 6: 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
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 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
```

What It Means This command sends 1000 ping packets out of the channelized interface under the Multichannel DS-3 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).

Step 7: 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 DS-3 to DS-0 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, O.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 DS-3 to DS-1 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, O.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
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 270
2. Create a Loop to the Router from Various Points in the Network on page 272

Step 1: Create a Loop from the Router to the Network

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

- Loop the Entire T3 Interface towards the Network on page 270
- Loop a Particular T1 Channel towards the Network on page 271

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
```

What It Means 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 DS-3 port for a channelized DS-3 to DS-0 interface (for example, ds-2/1/1:0:0)
- T1 channel 0 on the Multichannel DS-3 port for a channelized DS-3 to DS-1 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:

```
[edit]
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
```

What It Means 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 DS-3 port for a channelized DS-3 to DS-3 interface (for example, ds-2/1/1:2:0)
- Particular T1 channel on the Multichannel DS-3 port for a channelized DS-3 to DS-1 interface (for example, t1-2/1/1:3)

Step 2: Create a Loop to the Router from Various Points in the Network

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

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Step 2 through Step 7 in "Diagnose a Suspected Hardware Problem with a Multichannel DS-3 Interface" on page 259. 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 DS-3 Alarms and Errors

This chapter describes the most common Multichannel DS-3 alarms and errors encountered when investigating line problems on a Juniper Networks router. (See Table 54.)

Table 54: Checklist for DS-3 Alarms

Multichannel DS-3 Alarms and Errors Tasks	Command or Action
Display Alarms and Errors for Channelized DS-3 to DS-1 Interfaces on page 274	show interfaces t1-*fpc/ pic/ port:channel* extensive
Display Alarms and Errors for Channelized DS-3 to DS-0 Interfaces on page 277	show interfaces ds-*fpc/ pic/ port:channel:channel* extensive

Display Alarms and Errors for Channelized DS-3 to DS-1 Interfaces

Action To display channelized DS-3 to DS-1 alarms and errors, use the following JUNOS command-line interface (CLI) operational mode command:

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
```

What It Means 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 55 shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 55: 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 43 for more details on T1 alarms and statistics.

Display Alarms and Errors for Channelized DS-3 to DS-0 Interfaces

Action To display T3 alarms and errors for channelized DS-3 to DS-0 interfaces, use the following JUNOS CLI operational mode command:

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
```

What It Means

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. DS-3 is the term for the electrical signal found at the metallic interface for this circuit where most of the testing is performed.

Table 55 shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 56: 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 71 for more details on T3 alarms and statistics.

Chapter 27
Monitor Channelized OC-12 Interfaces

This chapter describes how to monitor Channelized OC-12 interfaces and begin the process of isolating Channelized OC-12 interface problems when they occur. (See Table 57.)

Table 57: Checklist for Monitoring Channelized OC-12 Interfaces

Monitor Channelized OC-12 Interfaces Tasks	Command or Action
Monitor Channelized OC-12 Interfaces on page 282	
1. Display the Status of Channelized OC-12 Interfaces on page 282	show interfaces terse t3-*interface-name**
2. Display the Status of a Specific Channelized OC-12 Interface on page 283	show interfaces terse t3-*fpc/pic/port:channel*
3. Display Extensive Status Information for a Specific Channelized OC-12 Interface on page 283	show interfaces t3-*fpc/pic/port:channel* extensive
4. Monitor Statistics for a Channelized OC-12 Interface on page 286	monitor interfaces t3-*fpc/pic/port:channel*
Monitor Channelized OC-12 IQ Interfaces on page 287	
1. Display the Status of a Channelized OC-12 IQ Interface on page 287	show interfaces terse coc* show interfaces controller show interfaces terse
2. Display the Status of the Controller Channelized OC-12 IQ Interface on page 291	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*
3. Display the Status of a Specific Channel of a Channelized OC-12 IQ Interface on page 293	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 OC-12 IQ Interface on page 295	show interfaces *interface-type-interface-name* extensive
5. Monitor Statistics for a Channelized OC-12 IQ Interface on page 298	monitor interfaces *interface-type-fpc/pic/port:channel*

Monitor Channelized OC-12 Interfaces

Purpose By monitoring Channelized OC-12 interfaces, you begin the process of isolating Channelized OC-12 interface problems when they occur.

Steps To Take To monitor your Channelized OC-12 interfaces, follow these steps:

Step 1: Display the Status of Channelized OC-12 Interfaces

Action To display the status of Channelized OC-12 interfaces, use the following JUNOS command-line interface (CLI) operational mode command:

user@host> **show interfaces terse t3-***interface-name**

Sample Output 1 The following sample output is for a Channelized OC-12 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
```

What It Means The sample output shows the status of both the physical and logical interfaces. In this example, all of the Channelized OC-12 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 OC-12 SONET link, or a Physical Interface Card (PIC) problem. For more information on monitoring SONET interfaces, see "Monitor Channelized OC-12 Interfaces" on page 281.

Step 2: Display the Status of a Specific Channelized OC-12 Interface

Action To display the status of specific Channelized OC-12 interface, use the following JUNOS CLI operational mode command:

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
```

What It Means. 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 OC-12 SONET link or PIC problem. For more information on monitoring SONET interfaces, see "Monitor Channelized OC-12 Interfaces" on page 281.

Step 3: Display Extensive Status Information for a Specific Channelized OC-12 Interface

Action To display extensive status information for a Channelized OC-12 interface, use the following JUNOS CLI operational mode command:

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

Sample Output

```
user@host> show interfaces t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 118, Generation: 122
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
  Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2004-05-21 15:23:34 UTC (01:59:02 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                    0 bps
   Output bytes  :                   0                    0 bps
   Input  packets:                   0                    0 pps
   Output packets:                   0                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
```

```
DS3   alarms   : None
SONET alarms   : None
DS3   defects  : None
SONET defects  : None
DS3 media:            Seconds        Count  State
  AIS                       0            0  OK
  LOF                       0            0  OK
  LOS                       0            0  OK
  IDLE                      0            0  OK
  YELLOW                    0            0  OK
  BPV                       0            0
  EXZ                       0            0
  LCV                       0            0
  PCV                       0            0
  CCV                       0            0
  LES                       0
  PES                       0
  PSES                      0
  CES                       0
  CSES                      0
  SEFS                      0
  UAS                       0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 3
  Idle cycle flag: flags, Start end flag: shared
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
Interface transmit queues:
                 B/W  WRR       Packets        Bytes
  Queue0           0    0
    Transmitted:                      0            0
    Drops:                            0            0
    Errors:                           0
  Queue1           0    0
    Transmitted:                      0            0
    Drops:                            0            0
    Errors:                           0
  Queue2           0    0
    Transmitted:                      0            0
    Drops:                            0            0
    Errors:                           0
  Queue3           0    0
    Transmitted:                      0            0
    Drops:                            0            0
    Errors:                           0
SONET PHY:            Seconds        Count  State
  PLL Lock                  0            0  OK
  PHY Light                 0            0  OK
SONET section:
  BIP-B1                    1           22
  SEF                       0            0  OK
  LOS                       0            0  OK
  LOF                       0            0  OK
  ES-S                      1
  SES-S                     0
  SEFS-S                    0
SONET line:
```

```
    BIP-B2                    1          307
    REI-L                     0            0
    RDI-L                     3            1  OK
    AIS-L                     0            0  OK
    BERR-SF                   0            0  OK
    BERR-SD                   0            0  OK
    ES-L                      1
    SES-L                     0
    UAS-L                     0
    ES-LFE                    3
    SES-LFE                   3
    UAS-LFE                   0
  SONET path:
    BIP-B3                    1           35
    REI-P                     1            7
    LOP-P                     0            0  OK
    AIS-P                     0            0  OK
    RDI-P                     0            0  OK
    UNEQ-P                    0            0  OK
    PLM-P                     1            1  OK
    ES-P                      1
    SES-P                     0
    UAS-P                     0
    ES-PFE                    1
    SES-PFE                   0
    UAS-PFE                   0
  Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
    Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
  Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00
  Received path trace: t3-0/1/0:0
    74 33 2d 30 2f 31 2f 30 3a 30 00 00 00 00 0d 0a   t3-0/1/0:0......
  Transmitted path trace: t3-0/3/0:0
    74 33 2d 30 2f 33 2f 30 3a 30 00 00 00 00 00 00   t3-0/3/0:0......
  Packet Forwarding Engine configuration:
    Destination slot: 0, PLP byte: 1 (0x00)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %        bytes
    0 best-effort            95     42499200  95            0      low    none
    3 network-control         5      2236800   5            0      low    none
```

What It Means 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 DS-3 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 49. For more information about diagnosing a SONET layer problem, see "Investigate SONET Interfaces" on page 127.

Step 4: Monitor Statistics for a Channelized OC-12 Interface

Action To monitor statistics for a Channelized OC-12 interface, use the following JUNOS CLI operational mode command:

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
```

What It Means 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 OC-12 IQ Interfaces

Purpose By monitoring Channelized OC-12 intelligent queuing (IQ) interfaces, you begin the process of isolating Channelized OC-12 IQ interface problems when they occur.

Steps To Take To monitor your Channelized OC-12 IQ interface, follow these steps:

1. Display the Status of a Channelized OC-12 IQ Interface on page 287
2. Display the Status of the Controller Channelized OC-12 IQ Interface on page 291
3. Display the Status of a Specific Channel of a Channelized OC-12 IQ Interface on page 293
4. Display Extensive Status Information for a Channelized OC-12 IQ Interface on page 295
5. Monitor Statistics for a Channelized OC-12 IQ Interface on page 298

Step 1: Display the Status of a Channelized OC-12 IQ Interface

Action To display the status of Channelized OC-12 IQ interfaces, use one or all of the following JUNOS CLI operational mode commands:

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
```

What It Means

The sample output shows the status of both the physical and logical interfaces. In this example, all of the channelized OC-12 IQ interfaces are up.

Sample output 1 shows the channelized interfaces that are configured, but not the channels for those channelized interfaces.

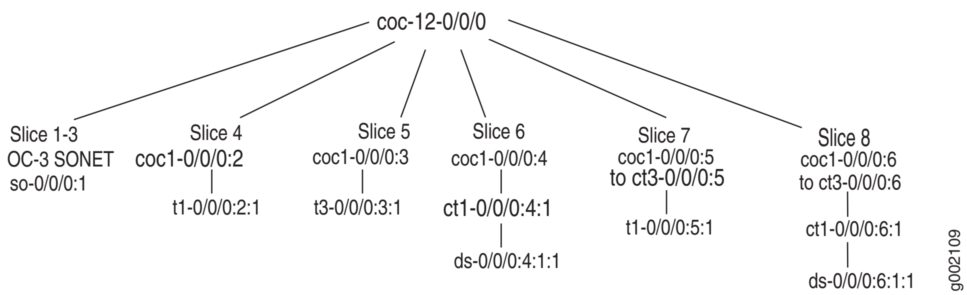
Sample output 2 shows the channels for the channelized interfaces that are configured and the hierarchy, but not the interface address information. At the top, the hierarchy includes the controller interface coc12-0/0/0.

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, DS-0, or OC-12 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 OC-12 IQ interface used for all show commands in this section is shown in Figure 22.

Figure 22: Sample Configuration of Channelized OC-12 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 COC-1 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 COC-1 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 COC-1 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 COC-1 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 OC-12 IQ interface configured into eight channels or slices as shown in Figure 22 on page 289. 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 DS-0 interfaces
- Channels 7 is for T1 interfaces
- Channel 8 is for DS-0 interfaces

Step 2: Display the Status of the Controller Channelized OC-12 IQ Interface

Action To display the status of the controller OC-12 IQ interface, use one or all of the following JUNOS CLI operational mode commands, depending on the level of channelization:

user@host> **show interfaces** *interface-type-fpc/pic/port*
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 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

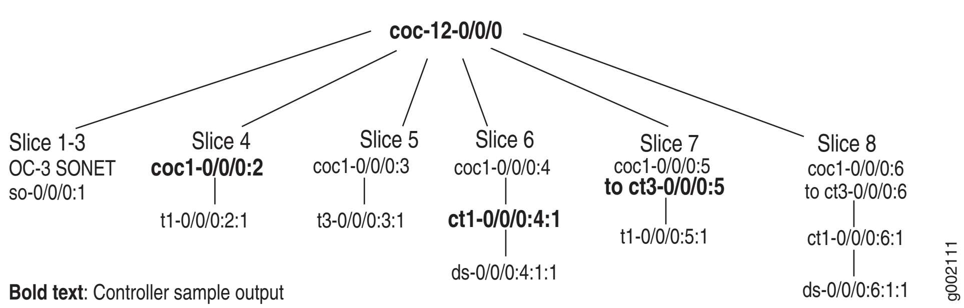
```
user@host> show interfaces ct1-0/0/0:4:1
Physical interface: ct1-0/0/0:4:1, Enabled, Physical link is Up
  Interface index: 230, SNMP ifIndex: 167
  Link-level type: Controller, Clocking: Internal, Speed: T1, Loopback: None,
  Framing: ESF, Parent: coc1-0/0/0:4 Interface index 229
  Device flags   : 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
```

What It Means

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.

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.

Step 3: Display the Status of a Specific Channel of a Channelized OC-12 IQ Interface

Action To display the status of a specific channel of an OC-12 IQ interface, use the following JUNOS CLI operational mode command:

```
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
```

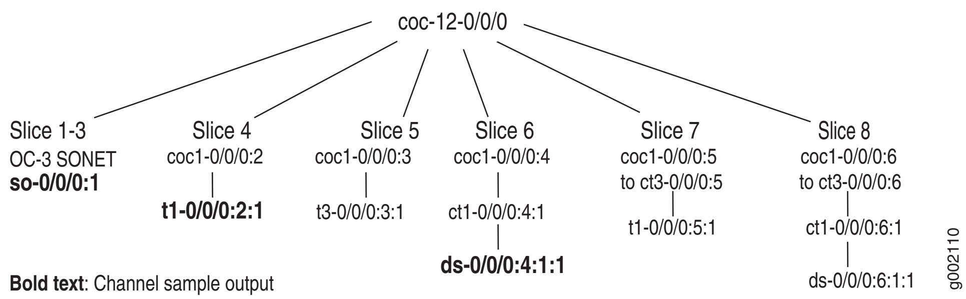
What It Means

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 OC-3 SONET interface. Sample output 2 shows a T1 interface that is the result of a partitioned OC-1 interface, and sample output 3 shows a DS-0 interface that is the result of an OC-1 interface partitioned into a T1 interface, which is further partitioned into the DS-0 interface.

Figure 24 shows a visual representation of the different channel levels.

Figure 24: Specific Channels of a Channelized OC-12 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, DS-0, or OC-12 SONET link or PIC problem. For more information on monitoring these types of interfaces, see the respective sections in this guide.

Step 4: Display Extensive Status Information for a Channelized OC-12 IQ Interface

Action To display extensive status information for a Channelized OC-12 IQ interface, use the following JUNOS CLI operational mode command:

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 OC-12 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
```

What It Means 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.

Step 5: Monitor Statistics for a Channelized OC-12 IQ Interface

Action To monitor statistics for a Channelized OC-12 interface, use the following JUNOS CLI operational mode command:

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
```

What It Means 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 OC-12 Interfaces

This chapter describes using loopback testing to isolate Channelized OC-12 and Channelized OC-12 IQ interface problems. (See Table 58.) The procedure for both types of Channelized OC-12 interfaces is the same. The naming convention for the Channelized OC-12 IQ interface varies depending on the type of interface. For a list of interface types associated with the Channelized OC-12 IQ interface, see “Channelized Intelligent Queuing Interface Naming” on page 14.

Table 58: Checklist for Using Loopback Testing for Channelized OC-12 and Channelized OC-12 IQ Interfaces

Channelized OC-12 or Channelized OC-12 IQ Loopback Testing Tasks	Command or Action
Diagnose a Suspected Hardware Problem with a Channelized OC-12 or Channelized OC-12 IQ Interface on page 303	
1. Create a Loopback on page 303	
a. Create a Physical Loopback on page 303	Connect the TX port to the RX port.
b. Configure a Local Loopback on page 304	[edit interfaces t3-*fpc/ pic/ port:channel* t3 options] set loopback local show commit
2. Verify That the Interface Is Up on page 305	show interfaces t3-*fpc/ pic/ port:channel* extensive
3. Clear Interface Statistics on page 307	clear interfaces statistics t3-*fpc/ pic/ port:channel*
4. Force the Link Layer to Stay Up on page 308	
a. Configure Encapsulation to Cisco-HDLC on page 308	[edit interfaces t3-*fpc/ pic/ port:channel*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 309	[edit interfaces t3-*fpc/ pic/ port:channel*] set no-keepalives show commit
5. Verify the Status of the Logical Interface on page 310	show interfaces t3-*fpc/ pic/ port:channel*
6. Ping the Channelized Interface on page 311	ping interface t3-*fpc/ pic/ port:channel local-IP-address* bypass-routing count 1000 rapid
7. Check for Interface Error Statistics on page 312	show interfaces t3-*fpc/ pic/ port:channel* extensive

Channelized OC-12 or Channelized OC-12 IQ Loopback Testing Tasks	Command or Action
Diagnose a Suspected Circuit Problem on page 315	
1. Loop the Entire T3 Interface towards the Network on page 315	[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 316	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a Channelized OC-12 or Channelized OC-12 IQ Interface" on page 303.

Diagnose a Suspected Hardware Problem with a Channelized OC-12 or Channelized OC-12 IQ Interface

Steps To Take To diagnose a suspected hardware problem with a Channelized OC-12 or Channelized OC-12 IQ interface, follow these steps:

Step 1: 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 OC-12 or Channelized OC-12 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 OC-12 IQ interface, see “Channelized Intelligent Queuing Interface Naming” on page 14.

Create a Physical Loopback

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

What It Means 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 OC-12 IQ interface, see “Channelized Intelligent Queuing Interface Naming” on page 14.

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 DS-3 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

What It Means 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.

Step 2: Verify That the Interface Is Up

Purpose Display the status of a Channelized OC-12 or Channelized OC-12 IQ interface to determine whether the physical link is up or down.

Action To verify that the status of the Channelized OC-12 or Channelized OC-12 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 OC-12 IQ interface, see "Channelized Intelligent Queuing Interface Naming" on page 14.

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
```

What It Means The sample output shows that the physical link is up and there are no OC-12 alarms or defects. You should not see any OC-12 alarms. If there are SONET layer errors, see “Investigate SONET Interfaces” on page 127, for information on diagnosing SONET interface problems.

Step 3: Clear Interface Statistics

Purpose You must reset the Channelized OC-12 or Channelized OC-12 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>
```

What It Means This command clears the interface statistics counters for the Channelized OC-12 interface only.

Step 4: 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.

Steps To Take Force the link layer to stay up, follow these steps:

1. Configure Encapsulation to Cisco-HDLC on page 308
2. Configure No-Keepalives on page 309

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
   ```

What It Means 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 OC-12 or Channelized OC-12 IQ interface, follow these steps:.

NOTE: For a list of interface types associated with the Channelized OC-12 IQ interface, see “Channelized Intelligent Queuing Interface Naming” on page 14.

---

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

What It Means 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.

Step 5: Verify the Status of the Logical Interface

Action To verify the status of the logical interface, use the following JUNOS CLI operational mode command:

user@host> **show interfaces t3-***fpc/pic/port:channel*.

NOTE: For a list of interface types associated with the Channelized OC-12 IQ interface, see "Channelized Intelligent Queuing Interface Naming" on page 14.

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
```

What It Means 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 127, for information on diagnosing SONET interface problems.

Step 6: 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 OC-12 IQ interface, see “Channelized Intelligent Queuing Interface Naming” on page 14.

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
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 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
```

What It Means 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).

Step 7: 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 OC-12 IQ interface, see "Channelized Intelligent Queuing Interface Naming" on page 14.

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
```

What It Means 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.

Steps To Take To diagnose a suspected circuit problem, follow these steps:

1. Loop the Entire T3 Interface towards the Network on page 315
2. Create a Loop to the Router from Various Points in the Network on page 316

Step 1: 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 OC-12 IQ interface, see “Channelized Intelligent Queuing Interface Naming” on page 14.

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**

What It Means The loopback remote command loops any traffic from the network back into the network.

Step 2: 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 OC-12 or Channelized OC-12 IQ Interface" on page 303. 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 OC-12 Alarms and Errors

This chapter describes the most common Channelized OC-12 alarms and errors encountered when investigating line problems on a Juniper Networks router. (See Table 59.)

Table 59: Checklist for Channelized OC-12 Alarms and Errors

Channelized OC-12 Alarms and Errors	Command or Action
Display Channelized OC-12 Alarms and Errors on page 318	show interfaces t3-*fpc/pic/port:channel* extensive
Display Channelized OC-12 IQ Alarms and Errors on page 322	show interfaces *interface-type-interface-name* extensive

Display Channelized OC-12 Alarms and Errors

Action To display Channelized OC-12 interface alarms and errors, use the following JUNOS command-line interface (CLI) operational mode command:

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

Sample Output 1

```
user@host> show interfaces  t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 118, Generation: 122
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
  Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2004-05-21 15:23:34 UTC (01:59:02 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  DS3   alarms   : None
  SONET alarms   : None
  DS3   defects  : None
  SONET defects  : None
  DS3 media:            Seconds        Count  State
    AIS                       0            0  OK
    LOF                       0            0  OK
    LOS                       0            0  OK
    IDLE                      0            0  OK
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                       0            0
    CCV                       0            0
    LES                       0
    PES                       0
    PSES                      0
    CES                       0
    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
```

What It Means 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 49. For more information about diagnosing a SONET layer problem, see "Investigate SONET Interfaces" on page 127.

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. DS-3 is the term for the electrical signal found at the metallic interface for this circuit where most of the testing is performed.

Table 60 shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 60: 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 71 for more details on T3 alarms and statistics.

Display Channelized OC-12 IQ Alarms and Errors

Action To display Channelized OC-12 IQ interface alarms and errors, use the following JUNOS CLI operational mode command:

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 OC-12 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
```

What It Means 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 21, "Investigate T3 Interfaces" on page 49, or "Investigate SONET Interfaces" on page 127.

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.

Part 8
Appendix

Command-Line Interface Overview

This chapter provides an overview of the JUNOS software command-line interface (CLI). For more detailed information about using the JUNOS software CLI, see the *JUNOS System Basics Configuration Guide* and the *JUNOS Protocols, Class of Service and System Basics Command Reference*.

The CLI is the interface to the software that you use whenever you access the router—whether from the console or through a remote network connection. The CLI, which automatically starts after the router finishes booting, provides commands that you use to perform various tasks, including configuring the JUNOS software, and monitoring and troubleshooting the software, network connectivity, and the router hardware.

The CLI has two modes:

CLI Operational Mode

In operational mode you enter commands to monitor and troubleshoot the software, network connectivity, and the router by entering commands. When you log in to the router and the CLI starts, you are at the top level of the CLI operational mode. At this level, there are several broad groups of CLI commands (see Table 61).

Table 61: CLI Operational Mode Top-Level Commands

Command	Description
clear	Clear statistics and protocol database information. Syntax: clear (arp | bgp | chassis | firewall | igmp | interfaces | isis | ldp | log | mpls | msdp | multicast | ospf | pim | rip | route | rsvp | snmp | system | vrrp)
configure	Enter CLI configuration mode. Alternative commands: configure exclusive | configure private
file	Perform file manipulation operations, such as copy, delete, list, rename, and show. Syntax: file (compare | copy | delete | list | rename | show)
help	Provide help information. Syntax: help (reference | topic)
monitor	Monitor a log file or interface traffic in real time. Syntax: monitor (start | stop | interface | list | traffic)
mtrace	Display trace information about a multicast path from a source to a receiver. Syntax: mtrace (from-source | to-gateway | monitor)
ping	Try to connect to a remote target.
pipe	Filter the output of an operational mode or configuration mode command. Syntax: | (compare | count | display <detail | inheritance | xml> | except pattern | find pattern | hold | match pattern | no-more | resolve <full-names> | save *filename* | trim columns)
quit	Exit from the CLI to a UNIX shell.
request	Make system-level requests, such as stop or reboot the router, load software packages, and back up the router's file systems. Syntax: request system (reboot | halt | software | snapshot)
restart	Restart the router software processes. Syntax: restart (fpc | interface-control | mib-process | routing | sampling | sfm | snmp | soft)
set	Set CLI properties, the router's date and time, and the craft interface display text. Syntax: set (chassis | cli | date)
show	Show information about all aspects of the software, including interfaces and routing protocols. Syntax: (aps | arp | as-path | bgp | chassis | cli | configuration | connections | dvmrp | firewall | host | igmp | interfaces | isis | ldp | log | mpls | msdpl | multicast | ntp | ospf | pfe | pim | policy | ripl | route | rsvp | sap | snmp | system | task | ted | version | vrrp)
ssh	Open a secure shell to another host.
start	Start a software process. Syntax: start shell
telnet	Start a telnet session to another host.
test	Run various diagnostic debugging commands. Syntax: test (configuration | interface | msdp | policy)
traceroute	Trace the route to a remote host.

Use the CLI Operational Mode

This section describes how to use the CLI operational mode. You can do the following:

Enter the CLI Operational Mode

To enter the JUNOS software CLI, use the following command:

```
% cli
```

You are in the CLI when you see the > prompt, which is preceded by a string that defaults to the name of the user and the name of the router. For example:

```
user@host>
```

Get Help on Commands at a Hierarchy Level

The CLI provides context-sensitive help at every level of the command hierarchy. The help information tells you which commands are available at the current level in the hierarchy and provides a brief description of each.

To get help while in the CLI, type ?. You do not need to press Enter after typing the question mark. You have the following options:

- If you type the question mark at the command-line prompt, the CLI lists the available commands and options.
- If you type the question mark after entering the complete name of a command or command option, the CLI lists the available commands and options, then redisplays the command names and options that you typed.
- If you type the question mark in the middle of a command name, the CLI lists possible command completions that match the letters you have entered so far, then redisplays the letters that you typed.

Get Help about Commands

To get help about operational mode CLI commands, you can do the following:

- List Top-Level Operational Mode CLI Commands on page 330
- List CLI Commands that Start with a Particular Letter on page 330
- List All Available Commands of a Particular Type on page 331

List Top-Level Operational Mode CLI Commands

To list all available commands at the top level of the CLI operational mode, use the following command (see Table 61):

user@host> **?**

```
Possible completions:
  clear                     Clear information in the system
  configure                 Manipulate software configuration information
  file                      Perform file operations
  help                      Provide help information
  mtrace                    Trace mtrace packets from source to receiver.
  monitor                   Real-time debugging
  ping                      Ping a remote target
  quit                      Exit the management session
  request                   Make system-level requests
  restart                   Restart a software process
  set                       Set CLI properties, date, time, craft display text
  show                      Show information about the system
  ssh                       Open a secure shell to another host
  start                     Start a software process
  telnet                    Telnet to another host
  test                      Diagnostic debugging commands
  traceroute                Trace the route to a remote host
user@host>
```

List CLI Commands that Start with a Particular Letter

To list all commands that start with the letter **c**, use the following CLI command:

user@host> **c?**

```
Possible completions:
  clear                     Clear information in the system
  configure                 Manipulate software configuration information
user@host> c
```

List All Available Commands of a Particular Type

To list all available clear commands, use the following CLI command:

user@host> **clear ?**

```
Possible completions:
  arp                   Clear address-resolution information
  bgp                   Clear BGP information
  chassis               Clear chassis information
  firewall              Clear firewall counters
  igmp                  Clear IGMP information
  interfaces            Clear interface information
  ilmi                  Clear ILMI statistics information
  isis                  Clear IS-IS information
  ldp                   Clear LDP information
  log                   Clear contents of a log file
  mpls                  Clear MPLS information
  msdp                  Clear MSDP information
  multicast             Clear Multicast information
  ospf                  Clear OSPF information
  pim                   Clear PIM information
  rip                   Clear RIP information
  route                 Clear routing table information
  rsvp                  Clear RSVP information
  snmp                  Clear SNMP information
  system                Clear system status
  vrrp                  Clear VRRP statistics information
user@host> clear
```

Have the CLI Complete Commands

You do not always have to remember or type the full command or option name for the CLI to recognize it. To display all possible command or option completions, type the partial command followed by a question mark.

To complete a command or option that you have partially typed, press the Tab key or the spacebar. If the partially typed letters begin a string that uniquely identifies a command, the complete command name appears. Otherwise, a beep indicates that you have entered an ambiguous command, and the possible completions are displayed.

Command completion also applies to other strings, such as filenames and usernames. To display all possible values, type a partial string followed by a question mark. However, to complete these strings, press the Tab key; pressing the space bar does not work.

Use CLI Command Completion

To complete the show interfaces command, do the following:

user@host> **show in<Spacebar>**terfaces **<Enter>**

```
Physical interface: at-0/1/0, Enabled, Physical link is Up
  Interface index: 11, SNMP ifIndex: 65
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode
  Speed: OC12, Loopback: None, Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags     : 0x01
[...Output truncated...]
```

To display a list of all log files whose names start with the string "messages," and then display the contents of one of the files, do the following:

user@host> **show log mes?**

```
Possible completions:
  <filename>                Log file to display
  messages                  Size: 1417052, Last changed: Mar  3 00:33
  messages.0.gz             Size: 145575, Last changed: Mar  3 00:00
  messages.1.gz             Size: 134253, Last changed: Mar  2 23:00
  messages.10.gz            Size: 137022, Last changed: Mar  2 14:00
  messages.2.gr             Size: 137112, Last changed: Mar  2 22:00
  messages.3.gz             Size: 121633, Last changed: Mar  2 21:00
  messages.4.gz             Size: 135715, Last changed: Mar  2 20:00
  messages.5.gz             Size: 137504, Last changed: Mar  2 19:00
  messages.6.gz             Size: 134591, Last changed: Mar  2 18:00
  messages.7.gz             Size: 132670, Last changed: Mar  2 17:00
  messages.8.gz             Size: 136596, Last changed: Mar  2 16:00
  messages.9.gz             Size: 136210, Last changed: Mar  2 15:00

user@host> show log mes<Tab>sages.4<Tab>.gz<Enter>
Jan 15 21:00:00 myhost newsyslog[1381]: logfile turned over
[...Output truncated...]
```

Display CLI Command History

You can display a list of recent commands that you issued. To display the command history, use the show cli history command:

user@host> **show cli history**

```
03-03 01:00:50 -- show cli history
03-03 01:01:12 -- show interfaces terse
03-03 01:01:22 -- show interfaces lo0
03-03 01:01:44 -- show bgp next-hop-database
03-03 01:01:51 -- show cli history
```

By default, this command displays the last 100 commands issued in the CLI. Specify a number with the command to display that number of recent commands. For example:

user@host> **show cli history 3**

```
01:01:44 -- show bgp next-hop-database
01:01:51 -- show cli history
01:02:51 -- show cli history 3
```

CLI Configuration Mode

In configuration mode, you configure the JUNOS software by creating a hierarchy of configuration statements by using the CLI or by creating a text (ASCII) file that contains the statement hierarchy. (The statement hierarchy is identical in both the CLI and text configuration file.) You can configure all properties of the JUNOS software, including interfaces, general routing information, routing protocols, and user access, as well as several system hardware properties. When you have finished entering the configuration statements, you commit them, which activates the configuration on the router.

Table 62 explains each CLI configuration mode command. The commands are organized alphabetically.

Table 62: CLI Configuration Mode Commands

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>activate</td><td>Remove the inactive: tag from a statement, effectively reading the statement or identifier to the configuration. Statements or identifiers that have been activated take effect when you next issue the commit command.

Syntax: activate (statement | identifier)</td></tr>
<tr><td>annotate</td><td>Add comments to a configuration. You can add comments only at the current hierarchy level.

Syntax: annotate statement "comment-string"</td></tr>
<tr><td>commit</td><td>Commit the set of changes to the database and cause the changes to take operational effect.

Syntax: commit << at <<i>string</i>>> <and-quit> <check> <confirmed <<i>minutes</i>>> <synchronize></td></tr>
<tr><td>copy</td><td>Make a copy of an existing statement in the configuration.

Syntax: copy existing-statement to new-statement</td></tr>
<tr><td>deactivate</td><td>Add the inactive: tag to a statement, effectively commenting out the statement or identifier from the configuration. Statements or identifiers marked as inactive do not take effect when you issue the commit command.

Syntax: deactivate (statement | identifier)</td></tr>
<tr><td>delete</td><td>Delete a statement or identifier. All subordinate statements and identifiers contained within the specified statement path are deleted with it.

Syntax: delete <<i>statement-path</i>> <<i>identifier</i>></td></tr>
<tr><td>edit</td><td>Move inside the specified statement hierarchy. If the statement does not exist, it is created.

Syntax: edit statement-path</td></tr>
<tr><td>exit</td><td>Exit the current level of the statement hierarchy, returning to the level prior to the last edit command, or exit from configuration mode. The quit and exit commands are synonyms.

Syntax: exit <<i>configuration-mode</i>></td></tr>
<tr><td>help</td><td>Display help about available configuration statements.

Syntax: help (apropos | topic | reference) <<i>string</i>></td></tr>
<tr><td>insert</td><td>Insert an identifier into an existing hierarchy.

Syntax: insert <<i>statement-path</i>> <i>identifier1</i> (before | after) <i>identifier2</i></td></tr>
<tr><td>load</td><td>Load a configuration from an ASCII configuration file or from terminal input. Your current location in the configuration hierarchy is ignored when the load operation occurs.

Syntax: load (replace | merge | override) (filename | terminal)</td></tr>
</table>

Command	Description
quit	Exit the current level of the statement hierarchy, returning to the level prior to the last edit command, or exit from configuration mode. The quit and exit commands are synonyms. Syntax: quit <*configuration-mode*>
rename	Rename an existing configuration statement or identifier. Syntax: rename <*statement-path*> *identifier1* to *identifier2*
rollback	Return to a previously committed configuration. The software saves the last 10 committed configurations, including the rollback number, date, time, and name of the user who issued the commit configuration command. The currently operational JUNOS software configuration is stored in the file juniper.conf, and the last three committed configurations are stored in the files juniper.conf.1, juniper.conf.2, and juniper.conf.3. These four files are located in the directory /config, which is on the router's flash drive. The remaining six previous committed configurations, the files juniper.conf.4 through juniper.conf.9, are stored in the directory /var/db/config, which is on the router's hard disk. Syntax: rollback <*number*>
run	Run a top-level CLI command without exiting from configuration mode. Syntax: run *command*
save	Save the configuration to an ASCII file. The contents of the current level of the statement hierarchy (and below) are saved, along with the statement hierarchy containing it. This allows a section of the configuration to be saved, while fully specifying the statement hierarchy. Syntax: save *filename*
set	Create a statement hierarchy and set identifier values. This is similar to edit except that your current level in the hierarchy does not change. Syntax: set <*statement-path*> *identifier*
show	Display the current configuration. Syntax: show <*statement-path*> <*identifier*>
status	Display the users currently editing the configuration.
top	Return to the top level of configuration command mode, which is indicated by the [edit] banner. Syntax: top <*configuration-command*>
up	Move up one level in the statement hierarchy. Syntax: up <*number*> <*configuration-command*>
update	Update a private database.

Configuration Statements and Identifiers

You configure all router properties by including statements in the configuration. A statement consists of a keyword, which is fixed text, and, optionally, an identifier. An identifier is an identifying name that you define, such as the name of an interface, or a username, which allows you and the CLI to discriminate among a collection of statements.

The following list shows the statements available at the top level of the configuration mode (that is, the trunk of the hierarchy tree). Table 63 on page 336 describes each statement.

```
user@host# set ?
Possible completions:
> accounting-options    Accounting data configuration
+ apply-groups          Groups from which to inherit configuration data
> chassis               Chassis configuration
> class-of-service      Class-of-service configuration
> firewall              Define a firewall configuration
> forwarding-options    Configure options to control packet sampling
> groups                Configuration groups
> interfaces            Interface configuration
> policy-options        Routing policy option configuration
> protocols             Routing protocol configuration
> routing-instances     Routing instance configuration
> routing-options       Protocol-independent routing option configuration
> snmp                  Simple Network Management Protocol
> system                System parameters
```

An angle bracket (>) before the statement name indicates that it is a container statement and you can define other statements at levels below it.

If there is no angle bracket (>) before the statement name, the statement is a leaf statement; you cannot define other statements at hierarchy levels below it.

A plus sign (+) before the statement name indicates that it can contain a set of values. To specify a set, include the values in brackets. For example:

```
[edit]
user@host# set policy-options community my-as1-transit members [65535:10
65535:11]
```

In some statements, you can include an identifier. For some identifiers, such as interface names, you must specify the identifier in a precise format. For example, the interface name so-0/0/0 refers to a SONET/SDH interface that is on the Flexible PIC Concentrator (FPC) in slot 0, in the first Physical Interface Card (PIC) location, and in the first port on the PIC. For other identifiers, such as interface descriptive text, policy, and firewall term names, you can specify any name, including special characters, spaces, and tabs.

You must enclose in quotation marks (double quotes) identifiers and any strings that include the following characters: space tab ( ) [ ] { } ! @ # $ % ^ & | ' = ?

Table 63 describes each top-level CLI configuration mode statement.

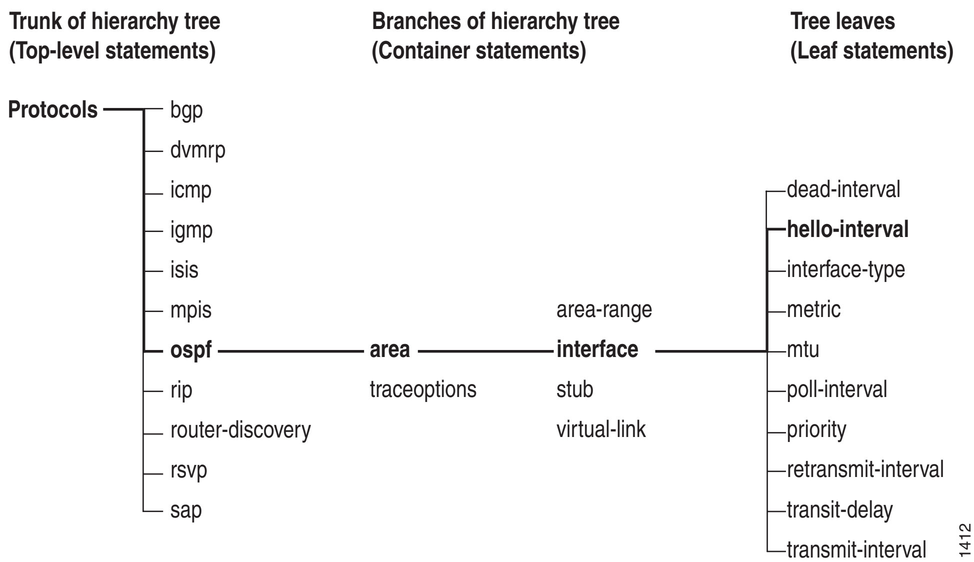
Table 63: Configuration Mode Top-Level Statements

Statement	Description
accounting-options	Configure accounting statistics data collection for interfaces and firewall filters. For information about the statements in this hierarchy, see the *JUNOS Network Management Configuration Guide*.
chassis	Configure properties of the router chassis, including the clock source, conditions that activate alarms, and SONET/SDH framing and concatenation properties. For information about the statements in this hierarchy, see the *JUNOS Network Interfaces and Class of Service Configuration Guide*.
class-of-service	Configure class-of-service parameters. For information about the statements in this hierarchy, see the *JUNOS Network Interfaces and Class of Service Configuration Guide*.
firewall	Define filters that select packets based on their contents. For information about the statements in this hierarchy, see the *JUNOS Policy Framework Configuration Guide*.
forwarding-options	Define forwarding options, including traffic sampling options. For information about the statements in this hierarchy, see the *JUNOS Network Interfaces and Class of Service Configuration Guide*.
groups	Configure configuration groups.
interfaces	Configure interface information, such as encapsulation, interfaces, virtual channel identifiers (VCIs), and data-link channel identifiers (DLCIs). For information about the statements in this hierarchy, see the *JUNOS Network Interfaces and Class of Service Configuration Guide*.
policy-options	Define routing policies, which allow you to filter and set properties in incoming and outgoing routes. For information about the statements in this hierarchy, see the *JUNOS Routing Protocols Configuration Guide*.
protocols	Configure routing protocols, including Border Gateway Protocol (BGP), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), Routing Information Protocol (RIP), Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP), and Resource Reservation Protocol (RSVP). For information about the statements in this hierarchy, see the chapters that discuss how to configure the individual routing protocols in the *JUNOS Routing Protocols Configuration Guide* and the *JUNOS MPLS Applications Configuration Guide*.
routing-instances	Configure multiple routing instances. For information about the statements in this hierarchy, see the *JUNOS Routing Protocols Configuration Guide*.
routing-options	Configure protocol-independent routing options, such as static routes, autonomous system (AS) numbers, confederation members, and global tracing (debugging) operations to log. For information about the statements in this hierarchy, see the *JUNOS Routing Protocols Configuration Guide*.
snmp	Configure Simple Network Management Protocol (SNMP) community strings, interfaces, traps, and notifications. For information about the statements in this hierarchy, see the *JUNOS Network Management Configuration Guide*.
system	Configure systemwide properties, including the hostname, domain name, Domain Name System (DNS) server, user logins and permissions, mappings between hostnames and addresses, and software processes.

Configuration Statement Hierarchy

The JUNOS software configuration consists of a hierarchy of *statements*. There are two types of statements: *container statements*, which are statements that contain other statements, and *leaf statements*, which do not contain other statements (see Figure 25). All of the container and leaf statements together form the *configuration hierarchy*.

Figure 25: Configuration Mode Hierarchy of Statements



Each statement at the top level of the configuration hierarchy resides at the trunk (or root level) of a hierarchy tree. The top-level statements are container statements, containing other statements that form the tree branches. The leaf statements are the leaves of the hierarchy tree. An individual hierarchy of statements, which starts at the trunk of the hierarchy tree, is called a *statement path*. Figure 25 illustrates the hierarchy tree, showing a statement path for the portion of the protocol configuration hierarchy that configures the hello interval on an interface in an OSPF area.

The protocols statement is a top-level statement at the trunk of the configuration tree. The ospf, area, and interface statements are all subordinate container statements of a higher statement (they are branches of the hierarchy tree), and the hello-interval statement is a leaf on the tree, which, in this case, contains a data value: the length of the hello interval in seconds.

The CLI represents the statement path shown in Figure 25 on page 337as [protocols ospf area *area-number* interface *interface-name*], and displays the configuration as follows:

```
protocols {
    ospf {
        area 0.0.0.0 {
            interface so-0/0/0 {
                hello-interval 5;
            }
            interface so-0/0/1 {
                hello-interval 5;
            }
        }
    }
}
```

The CLI indents each level in the hierarchy to indicate each statement's relative position in the hierarchy and generally sets off each level with braces, using an open brace at the beginning of each hierarchy level and a closing brace at the end. If the statement at a hierarchy level is empty, the braces are not printed. Each leaf statement ends with a semicolon. If the hierarchy does not extend as far as a leaf statement, the last statement in the hierarchy ends with a semicolon.

The CLI uses this indented representation when it displays the current system configuration, and you use this format when creating ASCII files that contain the software configuration. However, the format of ASCII configuration files is not as strict as the CLI output of the configuration. Although the braces and semicolons are required, the indentation and use of new lines, as shown above, are not required in ASCII configuration files.

Use the CLI Configuration Mode

This section describes how to use the CLI configuration mode. You can do the following:

Enter Configuration Mode

If many users enter configuration mode at the same time, everyone can make configuration changes and commit all changes. If one user enters configuration mode when another user is also in configuration mode, a message indicates who the user is and what portion of the configuration that user is viewing or editing. To enter configuration mode, use the following CLI command:

user@host> **configure**

```
Entering configuration mode
Current configuration users:
    root terminal p3 (pid 1088) on since 1999-05-13 01:03:27 EDT
        [edit interfaces so-3/0/0 unit 0 family inet]
The configuration has been changed but not committed
```

- If, when you enter configuration mode, the configuration contains changes that have not been committed, a message appears:

  user@host> **configure**

  ```
  Entering configuration mode
  The configuration has been changed but not committed
  ```

- If, while in configuration mode, you try to make a change while the configuration is locked by another user, a message indicates that the configuration database is locked, who the user is, and what portion of the configuration the user is viewing or editing:

  user@host# **set system host-name ipswitch**

  ```
  error: configuration database locked by:
      user2 terminal d0 (pid 1828) on since 19:47:58 EDT, idle 00:02:11
          exclusive [edit protocols]
  ```

- If you enter configuration mode with the configure exclusive command, you lock the candidate configuration for as long as you remain in configuration mode, allowing you to make changes without interference from other users. If another user is also in configuration mode and has the configuration locked, a message indicates who the user is and what portion of the configuration the user is viewing or editing:

  user@host> **configure exclusive**

  ```
  Entering configuration mode
  Users currently editing the configuration:
      root terminal p3 (pid 1088) on since 2000-10-30 19:47:58 EDT, idle
  00:00:44
      exclusive [edit interfaces so-3/0/0 unit 0 family inet]
  ```

Exit Configuration Mode

To exit configuration mode, use the exit configuration-mode configuration mode command from any level or use the exit command from the top level. If you try to exit from configuration mode using the exit command and the configuration contains changes that have not been committed, you see a message and prompt:

[edit]
user@host# **exit**

```
The configuration has been changed but not committed
Exit with uncommitted changes? [yes,no] (yes) <Enter>
Exiting configuration mode
user@host>
```

To exit with uncommitted changes without having to respond to a prompt, use the exit configuration-mode command.

Move among Levels of the Hierarchy

The CLI commands in Table 64 help you navigate the levels of the configuration statement hierarchy.

Table 64: CLI Configuration Mode Navigation Commands

Command	Description
edit	To move down through an existing configuration command hierarchy, or to create a hierarchy and move down to that level, use the edit configuration mode command, specifying the hierarchy level at which you want to be.
exit	To move up the hierarchy, use the exit configuration mode command. This command is, in effect, the opposite of the edit command.
up	To move up the hierarchy one level at a time, use the up configuration mode command.
top	To move directly to the top level, use the top configuration mode command.

Display the Current Configuration

You can display the following information about the current configuration:

- Display the Configuration at the Current Hierarchy Level on page 341
- Display the Last Committed Current Configuration on page 341
- Display Users Currently Editing the Configuration on page 341

Display the Configuration at the Current Hierarchy Level

To display the configuration at the current hierarchy level or at the specified level, use the show configuration mode command.

user@host> **show** <*statement-path*>

The configuration statements appear in a fixed order. The CLI indents each level in the hierarchy to indicate each statement's relative position in the hierarchy and generally sets off each level with braces, using an open brace at the beginning of each hierarchy level and a closing brace at the end. If the statement at a hierarchy level is empty, the braces are not printed. Each leaf statement ends with a semicolon. If the hierarchy does not extend as far as a leaf statement, the last statement in the hierarchy ends with a semicolon. Interfaces appear alphabetically by type, and then in numerical order by slot number, PIC number, and port number.

Display the Last Committed Current Configuration

You also can use the CLI operational mode show configuration command to display the last committed current configuration, which is the configuration currently running on the router:

user@host> **show configuration**

Display Users Currently Editing the Configuration

To display the users currently editing the configuration, use the status configuration mode command:

user@host# **status**

```
Current configuration users:
  user terminal p0 (pid 518) on since 2002-03-12 18:24:27 PST
      [edit protocols]
```

The system displays who is editing the configuration (user), how the user is logged in (terminal p0), the date and time the user logged in (2002-03-12 18:24:27 PST), and what level of the hierarchy the user is editing ([edit protocols]).

Modify the Configuration

To configure the router or to modify an existing router configuration, you add statements to the configuration. For each statement hierarchy, you create the hierarchy starting with a statement at the top level and continuing with statements that move progressively lower in the hierarchy.

To modify the hierarchy, you use two configuration mode commands:

- set—Creates a statement hierarchy and sets identifier values. After you issue a set command, you remain at the same level in the hierarchy. The set command has the following syntax:

  set <*statement-path*> *statement* <*identifier*>

  statement-path is the hierarchy to the configuration statement and the statement itself. If you have already moved to the statement's hierarchy level, you omit this. *statement* is the configuration statement itself. *identifier* is a string that identifies an instance of a statement.

- edit—Moves to a particular hierarchy level. If that hierarchy level does not exist, the edit command creates it and then moves to it. The edit command has the following syntax:

  edit <*statement-path*> *statement* <*identifier*>

Remove a Statement

To delete a statement or identifier, use the delete configuration mode command. Deleting a statement or an identifier effectively "unconfigures" the functionality associated with that statement or identifier, returning that functionality to its default condition. When you delete a statement, the statement and all its subordinate statements and identifiers are removed from the configuration.

delete <*statement-path*> <*identifier*>

To delete the entire hierarchy starting at the current hierarchy level, do not specify a statement or an identifier in the delete command:

[edit]
user@host# **delete**

```
Delete everything under this level? [yes, no] (no) ?
    Possible completions:
        no          Don't delete everything under this level
        yes         Delete everything under this level
Delete everything under this level? [yes, no] (no)
```

Run Operational Mode CLI Commands from Configuration Mode

To display the output of an operational mode show or other command while configuring the software, you can execute a single operational mode command by issuing the run configuration mode command and specifying the operational mode command:

```
[edit]
user@host# run operational-mode-command
```

Display Configuration Mode Command History

To display a list of the recent commands you issued while in configuration mode, use the run show cli history command. By default, this command displays the last 100 commands issued in the CLI.

```
user@host# run show cli history

12:40:08 -- show
12:40:17 -- edit protocols
12:40:27 -- set isis
12:40:29 -- edit isis
12:40:40 -- run show cli history
```

Commit a Configuration

To commit a configuration, you can do the following:

- Save Configuration Changes and Activate the Configuration on page 343
- Save Configuration Changes, Activate the Configuration, and Exit Configuration Mode on page 344

Save Configuration Changes and Activate the Configuration

To save software configuration changes to the configuration database and activate the configuration on the router, use the commit configuration mode command:

```
user@host# commit

commit complete
```

The configuration is checked for syntax errors. If the syntax is correct, the configuration is activated and becomes the current, operational router configuration. If the configuration contains syntax errors, a message indicates the location of the error and the configuration is not activated. You must correct the error before recommitting the configuration.

Save Configuration Changes, Activate the Configuration, and Exit Configuration Mode

To save software configuration changes, activate the configuration on the router, and exit configuration mode, use the commit and-quit configuration mode command. This command succeeds only if the configuration contains no errors.

[edit]
user@host# **commit and-quit**

```
commit complete
exiting configuration mode
user@host>
```

Save a Configuration to a File

To save the configuration to a text (ASCII) file so that you can edit it with a text editor of your choice, use the save configuration mode command. By default, the configuration is saved to that file in your home directory, which is on the flash disk.

[edit]
user@host# **save** *filename*

Return to a Previously Committed Configuration

To return to a previously committed configuration, you can do the following:

- Return to the Most Recent Committed Configuration on page 344
- Activate the Configuration You Loaded on page 345
- Return to a Configuration Prior to the Most Recently Committed One on page 345
- Display Previous Configurations on page 345

Return to the Most Recent Committed Configuration

To return to the most recently committed configuration and load it into configuration mode without activating it, use the rollback configuration mode command:

[edit]
user@host# **rollback**

```
load complete
```

Activate the Configuration You Loaded

To activate the configuration that you loaded, use the commit command:

```
[edit]
user@host# rollback
load complete
[edit]
user@host# commit
```

Return to a Configuration Prior to the Most Recently Committed One

To return to a configuration prior to the most recently committed one, include the number in the rollback command. *number* can be a number in the range 0 through 9. The most recently saved configuration is number 0 (which is the default configuration to which the system returns), and the oldest saved configuration is number 9.

```
[edit]
user@host# rollback number
load complete
```

Display Previous Configurations

To display previous configurations, including the rollback number, date, time, the name of the user who committed changes, and the method of commit, use the rollback ? command.

```
[edit]
user@host# rollback ?

Possible completions:
<[Enter]> Execute this command
<number> Numeric argument
0 2001-02-27 12:52:10 PST by abc via cli
1 2001-02-26 14:47:42 PST by cde via cli
2 2001-02-14 21:55:45 PST by fgh via cli
3 2001-02-10 16:11:30 PST by hij via cli
4 2001-02-10 16:02:35 PST by klm via cli
|   Pipe through a command
[edit]
```

Get Help about Statements

In configuration mode, you can use the help command to display help based on a text string contained in a statement name. This command displays help for statements at the current hierarchy level and below.

user@host# **help** *string*

You can also display help based on a text string contained in a statement name using the help topic and help reference commands. The help topic command displays usage guidelines for the statement, whereas the help reference command displays summary information about the statement.

user@host# **help topic** *string*
user@host# **help reference** *string*

If you do not type an option for a statement that requires one, a message indicates the type of information expected. In this example, you need to type an area number to complete the command:

```
[edit]
user@host# set protocols ospf area<Enter>

syntax error, expecting <identifier>.
```

In this example, you need to type a value for the hello interval to complete the command:

```
[edit]
user@host# set protocols ospf area 45 interface so-0/0/0
            hello-interval<Enter>

syntax error, expecting <data>
```

If you have omitted a required statement at a particular hierarchy level, when you attempt to move from that hierarchy level or when you issue the show command in configuration mode, a message indicates which statement is missing. For example:

```
[edit protocols pim interface so-0/0/0]
user@host# top
Warning: missing mandatory statement: 'mode'
[edit]
user@host# show
protocols {
    pim {
      interface so-0/0/0 {
        priority 4;
        version 2;
        # Warning: missing mandatory statement(s): 'mode'
      }
    }
}
```

Part 9
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