

Channelized T3 Interfaces



Published: 2012-12-11

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

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

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

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

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

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

Juniper Networks, Junos, Steel-Belted Radius, NetScreen, and ScreenOS are registered trademarks of Juniper Networks, Inc. in the United States and other countries. The Juniper Networks Logo, the Junos logo, and JunosE are trademarks of Juniper Networks, Inc. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners.

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

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

Channelized T3 Interfaces

Copyright © 2012, Juniper Networks, Inc.
All rights reserved.

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

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

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at <http://www.juniper.net/support/eula.html>. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

	About the Documentation	xi
	Documentation and Release Notes	xi
	Supported Platforms	xi
	Using the Examples in This Manual	xi
	Merging a Full Example	xii
	Merging a Snippet	xii
	Documentation Conventions	xiii
	Documentation Feedback	xv
	Requesting Technical Support	xv
	Self-Help Online Tools and Resources	xv
	Opening a Case with JTAC	xvi
Part 1	Overview	
Chapter 1	Channelized T3 Interfaces	3
	Configuring Channelized T3 IQ Interfaces	3
	Configuring T3 IQ Interfaces	3
	Configuring T1 IQ Interfaces	3
	Example: Configuring T1 IQ and IQE Interfaces	4
	Configuring Fractional T1 IQ and IQE Interfaces	4
	Example: Configuring Fractional T1 IQ Interfaces	4
	Configuring an NxDS0 IQ Interface	5
	Example: Configuring an NxDS0 IQ Interface	5
Part 2	Configuration	
Chapter 2	Channelized T3 Interfaces	9
	Configuring Channelized DS3-to-DS0 Interfaces	9
	Configuring Channelized DS3-to-DS1 Interfaces	12
	Configuring the Junos OS to Enable Channelization on DS3/E3 MIC	13
	Configuring the Channelized T3 Loop Timing	15
	Example: Configuring Channelized T3 IQ Interfaces	15
	Examples: Configuring Channelized DS3-to-DS0 Interfaces	16
	Examples: Configuring Channelized DS3-to-DS1 Interfaces	19
Chapter 3	Network Interfaces Configuration Statements and Hierarchy	23
	[edit chassis] Hierarchy Level	23
	[edit interfaces] Hierarchy Level	24
	[edit logical-systems] Hierarchy Level	40

Chapter 4	Statement Summary	45
	bert-algorithm	46
	bert-error-rate	48
	bert-period	50
	byte-encoding	51
	cbit-parity	52
	channelization	52
	ds0-options	53
	fast-aps-switch	54
	fcs	55
	feac-loop-respond	56
	framing (E1, E3, and T1 Interfaces)	57
	idle-cycle-flag	58
	interface-type (Interfaces)	59
	invert-data	60
	long-buildout	61
	loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3)	62
	no-partition	64
	partition	66
	start-end-flag	67
	t1-options	68
	t3-options	69
	timeslots	70
Part 3	Administration	
Chapter 5	Monitoring Commands	75
	show interfaces (Channelized DS3-to-DS0)	76
	show interfaces (Channelized DS3-to-DS1)	87
	show interfaces (Channelized T3 IQ)	90
	show interfaces (T1, E1, or DS)	92
	show interfaces (Channelized T1 IQ)	116
	show interfaces (T3 or E3)	128
Chapter 6	Command Summaries	145
	Channelized OC Interface Operational Commands	145
	Channelized T1 and T3 Interface Operational Mode Commands	146
Part 4	Troubleshooting	
Chapter 7	Interface Diagnostics	149
	Interface Diagnostics	149
	Configuring Loopback Testing	149
	Interface Diagnostics	151
	Starting and Stopping a BERT Test	155
	Example: Configuring Bit Error Rate Testing	155

Chapter 8	Investigate Channelized DS3 Interfaces	157
	Investigating Interface Steps and Commands	157
	Investigating Interface Steps and Commands Overview	157
	Monitoring Interfaces	157
	Performing a Loopback Test on an Interface	158
	Locating Interface Alarms	160
	Monitor Channelized DS3 Interfaces	160
	Checklist for Monitoring Channelized DS3 Interfaces	160
	Monitor Channelized DS3 Interfaces	161
	Display the Status of Channelized DS3 Interfaces	161
	Display the Status of a Specific Channelized DS3 Interface	162
	Display Extensive Status Information for a Specific Channelized DS3 Interface	165
	Monitor Statistics for a Channelized DS3 Interface	170
	Use Loopback Testing For Channelized DS3 Interfaces	173
	Checklist for Using Loopback Testing for Channelized DS3 Interfaces	173
	Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface	174
	Create a Loopback	175
	Create a Physical Loopback	175
	Configure a Local Loopback	175
	Verify That the Interface Is Up	176
	Clear Interface Statistics	177
	Force the Link Layer to Stay Up	177
	Configure Encapsulation to Cisco-HDLC	177
	Configure No-Keepalives	178
	Verify the Status of the Logical Interface	179
	Ping the Channelized Interface	180
	Check for Interface Error Statistics	180
	Diagnose a Suspected Circuit Problem	182
	Create a Loop from the Router to the Network	182
	Create a Loop to the Router from Various Points in the Network	183
	Locate Channelized DS3 Alarms and Errors	183
	Checklist for Channelized DS3 Alarms and Errors	183
	Display Alarms and Errors for Channelized DS3 Interfaces	184
Chapter 9	Investigate Multichannel DS3 Interfaces	189
	Investigating Interface Steps and Commands	189
	Investigating Interface Steps and Commands Overview	189
	Monitoring Interfaces	189
	Performing a Loopback Test on an Interface	190
	Locating Interface Alarms	192
	Monitor Multichannel DS3 Interfaces	192
	Checklist for Monitoring Multichannel DS3 Interfaces	192
	Monitor Multichannel DS3 Interfaces	193
	Display the Status of Channelized Interfaces	193
	Display the Status of a Specific Channelized Interface	194
	Display Extensive Status Information for a Specific T3 Interface	195
	Monitor Statistics for a Channelized Interface	199

Use Loopback Testing for Multichannel DS3 Interfaces	200
Checklist for Using Loopback Testing for Multichannel DS3 Interfaces	201
Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface	202
Create a Loopback	203
Create a Physical Loopback	203
Configure a Local Loopback	203
Verify That the Interface Is Up	204
Clear Interface Statistics	205
Force the Link Layer to Stay Up	206
Configure Encapsulation to Cisco-HDLC	206
Configure No-Keepalives	206
Verify the Status of the Logical Interface	207
Ping the Channelized Interface	208
Check for Interface Error Statistics	209
Diagnose a Suspected Circuit Problem	212
Create a Loop from the Router to the Network	213
Loop the Entire T3 Interface Toward the Network	213
Loop a Particular T1 Channel Toward the Network	214
Create a Loop to the Router from Various Points in the Network	214
Locate Multichannel DS3 Alarms and Errors	215
Checklist for Locating Multichannel DS3 Alarms and Errors	215
Display Alarms and Errors for Channelized DS3 to DS1 Interfaces	215
Display Alarms and Errors for Channelized DS3 to DS0 Interfaces	218

Part 5

Index

Index	225
-----------------	-----

List of Figures

Part 2	Configuration	
Chapter 2	Channelized T3 Interfaces	9
	Figure 1: Sample Channelization of DS3 IQ or IQE PIC	16

List of Tables

	About the Documentation	xi
	Table 1: Notice Icons	xiii
	Table 2: Text and Syntax Conventions	xiii
Part 2	Configuration	
Chapter 2	Channelized T3 Interfaces	9
	Table 3: Ranges for Channelized DS3-to-DS0 Configuration	10
Part 3	Administration	
Chapter 5	Monitoring Commands	75
	Table 4: Channelized DS3 show interfaces Output Fields	76
	Table 5: T1 or E1 show interfaces Output Fields	93
	Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields	116
	Table 7: T3 or E3 show interfaces Output Fields	128
Chapter 6	Command Summaries	145
	Table 8: Channelized OC Interface Operational Mode Commands	145
	Table 9: Channelized T1 and T3 Interface Operational Mode Commands	146
Part 4	Troubleshooting	
Chapter 7	Interface Diagnostics	149
	Table 10: Loopback Modes by Interface Type	150
	Table 11: BERT Capabilities by Interface Type	154
Chapter 8	Investigate Channelized DS3 Interfaces	157
	Table 12: Commands Used to Monitor Interfaces	158
	Table 13: Commands Used to Perform Loopback Testing on Interfaces	159
	Table 14: Checklist for Monitoring Channelized DS3 Interfaces	160
	Table 15: Checklist for Using Loopback Testing for Channelized DS3 Interfaces	173
	Table 16: Checklist for Channelized DS3 Alarms and Errors	184
	Table 17: T1 Media Alarms and Error Definitions	187
Chapter 9	Investigate Multichannel DS3 Interfaces	189
	Table 18: Commands Used to Monitor Interfaces	190
	Table 19: Commands Used to Perform Loopback Testing on Interfaces	191
	Table 20: Checklist for Monitoring Multichannel DS3 Interfaces	192
	Table 21: Problem Situations and Actions	200

Table 22: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces	201
Table 23: Checklist for MultichannelDS3 Alarms and Errors	215
Table 24: T1 Media Alarms and Error Definitions	217
Table 25: T3 Interface Error Counter Definitions	220

About the Documentation

- Documentation and Release Notes on page xi
- Supported Platforms on page xi
- Using the Examples in This Manual on page xi
- Documentation Conventions on page xiii
- Documentation Feedback on page xv
- Requesting Technical Support on page xv

Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

Supported Platforms

For the features described in this document, the following platforms are supported:

- M Series
- MX Series
- T Series
- J Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

For more information about the **load** command, see the CLI User Guide.

Documentation Conventions

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

Table 1: Notice Icons





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

Table 2 on page xiii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric metric>;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast <i>(string1 string2 string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [community-ids]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

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

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

Requesting Technical Support

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

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

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

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

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

Opening a Case with JTAC

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

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

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

PART 1

Overview

- [Channelized T3 Interfaces on page 3](#)

CHAPTER 1

Channelized T3 Interfaces

- [Configuring Channelized T3 IQ Interfaces on page 3](#)

Configuring Channelized T3 IQ Interfaces



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

This section describes how to configure channelized T3 intelligent queuing (IQ) interfaces, discussing the following topics:

- [Configuring T3 IQ Interfaces on page 3](#)
- [Configuring T1 IQ Interfaces on page 3](#)
- [Configuring Fractional T1 IQ and IQE Interfaces on page 4](#)
- [Configuring an NxDS0 IQ Interface on page 5](#)

Configuring T3 IQ Interfaces

To configure a T3 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level:

```
[edit interfaces ct3-fpc/pic/port]
no-partition interface-type t3;
```

This configuration creates interface **t3-fpc/pic/port**.

Configuring T1 IQ Interfaces

On a Channelized DS3 IQ or IQE Physical Interface Card (PIC), you can create up to 112 T1 interfaces. To configure a T1 interface on a Channelized DS3 IQ or IQE PIC, include the **partition** and **interface-type** statements at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level, specifying the **t1** interface type:

```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type t1;
```

This configuration creates interface **t1-fpc/pic/port:channel**.

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized T3 interfaces, the partition number can be from 1 through 28.



NOTE: For channelized T3 interfaces, channel numbering begins with 0 (:0). For channelized T3 IQ and IQE interfaces, channel numbering begins with 1 (:1).

The interface type is the channelized interface type or clear channel you are creating. For channelized T3 interfaces, **type** can be **ct1** or **t1**.

Example: Configuring T1 IQ and IQE Interfaces

Configure the following five T1 interfaces:

```
t1-0/0/0:1
t1-0/0/0:2
t1-0/0/0:3
t1-0/0/0:4
t1-0/0/0:5
```

```
[edit interfaces ct3-0/0/0]
  partition 1-5 interface-type t1;
```

For a full configuration example, see the Junos OS Feature Guides.

Configuring Fractional T1 IQ and IQE Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized DS3 IQ or IQE PIC, perform the following tasks:

1. Configure a T1 IQ interface. For more information, see [“Configuring T1 IQ Interfaces” on page 3](#).

This configuration creates interface **t1-fpc/pic/port:channel**.

2. Configure the number of time slots allocated to the T1 IQ interface by including the **timeslots** statement at the **[edit interfaces t1-fpc/pic/port:channel t1-options]** hierarchy level:

```
[edit interfaces t1-fpc/pic/port t1-options]
  timeslots time-slot-range;
```

For channelized T1 IQ interfaces, the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information about T1 time slots, see [Configuring Fractional T1 Time Slots](#).

Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 1 through 10:

```
[edit interfaces ct3-0/0/0:1]
  partition 1 interface-type t1;
```

```
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-10;
```

For a full configuration example, see the Junos OS Feature Guides.

Configuring an NxDS0 IQ Interface

By default, all the time slots on a channelized T3 interface are used. To configure an NxDS0 IQ interface on a Channelized DS3 IQ or IQE PIC, perform the following tasks:

1. Partition the channelized T3 interface into channelized T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level, specifying the **ct1** interface type:

```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type ct1;
```

This configuration creates interface **ct1-fpc/pic/port:channel**.

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized T1 interfaces, the partition number can be from 1 through 28.

The interface type is the channelized interface type or clear channel you are creating. For channelized T3 interfaces, **type** can be **ct1** or **t1**.



NOTE: For channelized T3 interfaces, channel numbering begins with 0 (:0). For channelized T3 IQ interfaces, channel numbering begins with 1 (:1).

2. Configure the number of time slots allocated to the NxDS0 IQ interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces ct1-fpc/pic/port:channel]** hierarchy level, specifying the **ds** interface type:

```
[edit interfaces ct1-fpc/pic/port:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

For channelized T1 IQ interfaces, the partition number range is from 1 through 28; the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information about T1 time slots, see *Configuring Fractional T1 Time Slots*.

Example: Configuring an NxDS0 IQ Interface

Configure the following two NxDS0 interfaces with 10 time slots and 4 time slots, respectively:

```
ds-0/0/0:1:1
ds-0/0/0:1:2
```

```
[edit interfaces ct3-0/0/0]
partition 1 interface-type ct1;
[edit interfaces ct1-0/0/0:1]
```

```
partition 1 timeslots 1-10 interface-type ds;  
partition 2 timeslots 12-16 interface-type ds;
```

For a full configuration example, see the Junos OS Feature Guides.

PART 2

Configuration

- [Channelized T3 Interfaces on page 9](#)
- [Network Interfaces Configuration Statements and Hierarchy on page 23](#)
- [Statement Summary on page 45](#)

CHAPTER 2

Channelized T3 Interfaces

- [Configuring Channelized DS3-to-DS0 Interfaces on page 9](#)
- [Configuring Channelized DS3-to-DS1 Interfaces on page 12](#)
- [Configuring the Junos OS to Enable Channelization on DS3/E3 MIC on page 13](#)
- [Configuring the Channelized T3 Loop Timing on page 15](#)
- [Example: Configuring Channelized T3 IQ Interfaces on page 15](#)
- [Examples: Configuring Channelized DS3-to-DS0 Interfaces on page 16](#)
- [Examples: Configuring Channelized DS3-to-DS1 Interfaces on page 19](#)

Configuring Channelized DS3-to-DS0 Interfaces

For channelized interfaces, you can configure 28 T1 channels per T3 interface. Each T1 link can have up to eight DS0 channel groups, and each channel group can hold any combination of DS0 time slots. To specify the T1 link and DS0 channel group number in the interface name, use colons (:) as separators. For example, a Multichannel DS3 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 DS0 channel group from 0 through 7. For more information about ranges, see [Table 3 on page 10](#).

You can use any of the values within the range available for *x* and *y*, and you do not have to configure the links sequentially. In addition, the Junos OS applies the interface options you configure according to the following rules:

- To configure the T1 options, you must set channel group *y* to 0; the T1 link *x* can be any value:

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

- To configure the T3 options, you must set the T1 link *x* to 0 and channel group *y* to 0:

`ds-0/0/0:0:0`

- There are no restrictions on configuring the DS0 options.
- If you delete a configuration you previously committed for channel group 0, the options return to default values.

By default, all the time slots are used. To configure the channel groups and time slots for a channelized DS3-to-DS0 interface, include the **channel-group** and **timeslots** statements at the **[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number ]
channel-group group-number;
timeslots time-slot-range;
```



NOTE: If you commit the interface name but do not include the **[edit chassis]** configuration, the channelized DS3-to-DS0 interface behaves like a channelized DS3-to-DS1 interface: none of the DS0 functionality is accessible.

Table 3 on page 10 shows the ranges you can specify for each of the elements in the preceding configuration.

Table 3: Ranges for Channelized DS3-to-DS0 Configuration

Item	Option	Range
FPC slot	slot-number	0 through 7 (see note below)
PIC slot	pic-number	0 through 3
Port	port-number	0 through 1
T1 link	link-number	0 through 27
DS0 channel group	group-number	0 through 7
Time slot	time-slot-range	1 through 24



NOTE: The FPC slot range depends on the router. For a routing matrix, the range is from 0 through 31. For M40, M40e, M160, M320, M120, and other T Series routers, the range is from 0 through 7. For M20 routers, the range is from 0 through 3. For M10 and M10i routers the range is from 0 through 1. For M5 and M7i routers, the only applicable value is 0.

Bandwidth limitations restrict the interface to a maximum of 128 channel groups per T3 port, rather than the theoretical maximum of $8 * 28 = 224$.

There are 24 time slots on a T1 interface. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. You can use each time slot number on only one channel group within the same T1 link.

To configure channelized DS3-to-DS0 interface properties, you can include the **t3-options**, **t1-options**, and **ds0-options** statements. Only a subset of the T3 options are valid for this

configuration, and the **buildout**, **invert-data**, and **line-encoding** statements at the **[edit interfaces *interface-name* t1-options]** hierarchy level are ignored. Likewise, only a subset of the DS0 options are valid for this configuration, and the **bert-algorithm**, **bert-error-rate**, **bert-period**, and **loopback payload** statements at the **[edit interfaces *interface-name* ds0-options]** hierarchy level are ignored. The following configurations list all the valid parameters.



NOTE: The set of options the Junos OS applies to the interface depends on how you specify the interface name. For more information, see [“Examples: Configuring Channelized DS3-to-DS0 Interfaces” on page 16](#).

To specify options for the T3 side of the connection, include the **t3-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
t3-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  (cbit-parity | no-cbit-parity);
  (long-buildout | no-long-buildout);
  loopback (local | payload | remote);
}
```

The statements at the **t3-options** hierarchy are supported only for channel 0; they are ignored if configured on other channels. To specify options for each of the T1 channels, include the **t1-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
t1-options {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  framing (esf | lf);
  idle-cycle-flag (flags | ones);
  invert-data;
  loopback (local | payload | remote);
  start-end-flag (filler | shared);
  timeslots time-slot-number;
}
```

To specify options for each of the DS0 channels, include the **ds0-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  invert-data;
  loopback payload;
```

```
    start-end-flag (filler | shared);  
}
```

For more information about specific parameters, see E1 Interfaces Overview, E3 Interfaces Overview, T1 Interfaces Overview, and T3 Interfaces Overview. For a configuration example, see [“Examples: Configuring Channelized DS3-to-DS0 Interfaces” on page 16](#).

For information about Frame Relay DLCI limitations for channelized interfaces, see Data-Link Connection Identifiers on Channelized Interfaces. For more information about Frame Relay DLCIs, see Configuring Frame Relay DLCIs. For more information about DLCI sparse mode, see the Junos OS System Basics Configuration Guide.

Each T1 link can have up to eight DS0 channel groups, and each channel group can hold any combination of DS0 time slots.

Configuring Channelized DS3-to-DS1 Interfaces

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
```

where *x* is a channel number ranging from 0 through 27.

To configure channelized DS3-to-DS1 interface properties, you can include both the **t1-options** and **t3-options** statements. Only a subset of the T3 options is valid for this configuration, and the **buildout**, **invert-data**, and **line-encoding** statements at the **[edit interfaces *interface-name* t1-options]** hierarchy level are ignored. Likewise, only a subset of the DS0 options are valid for this configuration, and the **bert-algorithm**, **bert-error-rate**, **bert-period**, and **loopback payload** statements at the **[edit interfaces *interface-name* ds0-options]** hierarchy level are ignored. The following configuration lists all the valid parameters.

To specify options for the T3 side of the connection, include the **t3-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
t3-options {  
    bert-algorithm algorithm;  
    bert-error-rate rate;  
    bert-period seconds;  
    (cbit-parity | no-cbit-parity);  
    (feac-loop-respond | no-feac-loop-respond);  
    loopback (local | payload | remote);  
}
```

The statements in the **t3-options** hierarchy are supported only for channel 0; they are ignored if configured on other channels.

To specify options for each of the T1 channels, include the **t1-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
t1-options {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  framing (sf | esf);
  idle-cycle-flag (flags | ones);
  loopback (local | payload | remote);
  start-end-flag (filler | shared);
  timeslots time-slot-number;
}
```

For T1 channels on a channelized T3 interface, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of channels 1 through 11. The clock source configured for channel 0 applies to all channels on the channelized T3 interface. The individual T1 channels use a gapped 45-MHz clock as the transmit clock. When you configure the clock source for a channelized interface—**ds-fpc/pic/port :0**, for example—you must also include the **channel-group** statement at the **[edit chassis]** hierarchy level, and specify channel group 0. For more information, see *Clock Sources on Channelized Interfaces*.

For information about Frame Relay DLCI limitations for channelized interfaces, see *Data-Link Connection Identifiers on Channelized Interfaces*. For more information about Frame Relay DLCIs, see *Configuring Frame Relay DLCIs*. For more information about DLCI sparse mode, see the *Junos OS System Basics Configuration Guide*.

For more information about specific parameters, see *T1 Interfaces Overview* and *T3 Interfaces Overview*. For a configuration example, see [“Examples: Configuring Channelized DS3-to-DS1 Interfaces” on page 19](#).

Configuring the Junos OS to Enable Channelization on DS3/E3 MIC

By default, the DS3/E3 MIC functions in clear-channel mode. To enable the DS3/E3 MIC to function in channelized mode, you need to use the software license S-MIC-3D-8CHDS3. To enable channelization, set the **channelization** statement at the **[edit chassis fpc *MPC-slot-number* pic *MIC-slot-number*]** hierarchy level. You can use the **channelization** option to channelize only individual DS3 interfaces.



NOTE:

- You can configure the **channelization** statement to enable channelization for the DS3/E3 MIC only. Moreover, you can use the **channelization** statement only on MX Series routers with Queuing and Enhanced Queuing MPCs (MX-MPC1-3D-Q, MX-MPC2-3D-Q, and MX-MPC2-3D-EQ) or on MX80 routers. Configuring the **channelization** statement on other MPCs does not have any effect, and the MICs continue to operate in clear-channel mode.
 - Only clear-channel E3 mode is supported on the DS3/E3 MIC. Therefore, configuring the **channelization** statement does not impact the E3 functionality.
-

To configure channelization on the DS3/E3 MIC:

1. At the **[edit chassis]** hierarchy level in configuration mode, navigate to the hierarchy level that indicates the slot on which the DS3/E3 MIC is located.

```
[edit chassis]
user@host# edit fpc MPC-slot-number pic MIC-slot-number
```

For example, to navigate to the **[edit chassis fpc 1 pic 2]** hierarchy level:

```
[edit chassis]
user@host# edit fpc 1 pic 2
```

2. Configure the **channelization** statement.

```
[edit chassis fpc MPC-slot-number pic MIC-slot-number]
user@host# set channelization
```

For example:

```
[edit chassis fpc 1 pic 2]
user@host# set channelization
```

3. Verify the configuration by using the **show** command at the **[edit chassis]** hierarchy level:

```
[edit chassis]
user@host# show
fpc 1 {
  pic 2 {
    channelization;
  }
}
```

To enable the DS3/E3 MIC to function in clear-channel mode, you need to disable channelization. To do this, delete the **channelization** option at the **[chassis fpc MPC-slot-number pic MIC-slot-number]** hierarchy level.

To disable channelization on the DS3/E3 MIC:

1. At the **[edit chassis]** hierarchy level in configuration mode, navigate to the hierarchy level that indicates the slot on which the DS3/E3 MIC is located.

```
[edit chassis]
user@host# edit fpc MPC-slot-number pic MIC-slot-number
```

For example:

```
[edit chassis]
user@host# edit fpc 1 pic 2
```

2. Delete the **channelization** statement.

```
[edit chassis fpc MPC-slot-number pic MIC-slot-number]
user@host# delete channelization
```

For example:

```
[edit chassis fpc 1 pic 2]
user@host# delete channelization
```

Related Documentation • [channelization on page 52](#)

Configuring the Channelized T3 Loop Timing

By default, internal clocking (line timing) is used on channelized IQ and IQE interfaces. To configure SONET/SDH or DS3-level external clocking, include the **loop-timing** statement:

```
loop-timing;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces ct3-fpc/pic/port t3-options]**
- **[edit interfaces stm1-fpc/pic/port sonet-options]**

To explicitly configure the default line timing, include the **no-loop-timing** statement in the configuration:

```
no-loop-timing;
```

The **loop-timing** and **no-loop-timing** statements apply only to E1 and T1 interfaces you configure on channelized IQ and IQE PICs. If you attempt to include these statements on any other interface type, they are ignored.

For all channelized IQ and IQE PICs, the **clocking** statement is supported on all channels. To configure clocking on individual interfaces, include the **clocking** statement at the **[edit interfaces type-fpc/pic/port:channel]** hierarchy level. If you do not include the **clocking** statement, the individual interfaces use internal clocking by default.

For more information, see *Configuring the Clock Source*.

Example: Configuring Channelized T3 IQ Interfaces

Configure a channelized T3 interface as an unpartitioned, clear channel.

Configuring a T3 Interface

```
[edit interfaces]
ct3-5/0/0 {
```

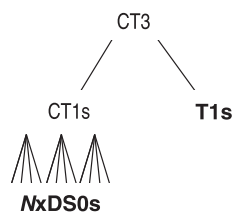
```
no-partition interface-type t3;
}
```

Configuring NxDSO and T1 Interfaces

Figure 1 on page 16 shows the following interfaces on a Channelized DS3 IQ or IQE PIC:

- A channelized T1, which is partitioned into NxDSO interfaces
- T1 interfaces

Figure 1: Sample Channelization of DS3 IQ or IQE PIC



Bold entries correspond to actual packet channels.

g003015

```
[edit interfaces]
ct3-1/1/0 {
  description "CT3 to CT1 and CT3 to T1.";
  t3-options {
    loopback remote;
    looptiming;
  }
  partition 1 interface-type ct1; # ct1-1/1/0:1.
  partition 2-28 interface-type t1; # t1-1/1/0:[2-28]
}
ct1-1/1/0:1 {
  description "case (a) CT1s to NxDSOs.";
  t1-options {
    bert-algorithm all-ones-repeating;
    framing sf;
    line-encoding ami;
  }
  partition 1 timeslots 2 - 10 interface-type ds0; # ds-1/1/0:1:1, channel group with 10 DS0s
  partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:1:2, channel group with 13 DS0s
  ...
}
```

Examples: Configuring Channelized DS3-to-DS0 Interfaces

The following configuration is sufficient to get the channelized DS3-to-DS0 interface up and running. The T3 interface can be divided into 28 channels, each at T1 line rate. DS3 channels can use the following encapsulation types for their logical interfaces:

- PPP, PPP CCC, and PPP TCC
- Frame Relay, Frame Relay CCC, and Frame Relay TCC
- Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

For more information, see Configuring Frame Relay DLCIs.



NOTE: All these configuration examples specify channel group 0 in the interface address, which is required for configuring the **t3-options** and **t1-options** statements.

**Configuring Cisco
HDLC Encapsulation
on a Channelized
DS3-to-DS0 Interface**

```
[edit interfaces]
ds-2/0/1:20:0 {
  encapsulation cisco-hdlc;
  unit 0 {
    family inet {
      address 10.0.4.40/32 {
        destination 10.0.4.41;
      }
    }
  }
}
[edit chassis]
fpc 2 {
  pic 0 {
    ct3 {
      port 1 {
        t1 20 {
          channel-group 0 timeslots 1-5;
        }
      }
    }
  }
}
```

**Configuring PPP
Encapsulation on a
Channelized
DS3-to-DS0 Interface**

```
[edit interfaces]
ds-2/0/1:20:0 {
  encapsulation ppp;
  unit 0 {
    family inet {
      address 10.0.4.40/32 {
        destination 10.0.4.41;
      }
    }
  }
}
[edit chassis]
fpc 2 {
  pic 0 {
    ct3 {
      port 1 {
        t1 20 {
          channel-group 0 timeslots 1-5;
        }
      }
    }
  }
}
```

**Configuring Three
Frame Relay DLCIs on
a Channelized DS3
Interface**

```
[edit interfaces]
t1-5/1/3:0 {
  mtu 9192;
  encapsulation frame-relay;
  unit 1 {
    dlci 101;
    family inet {
      mtu 9000;
      address 10.123.1.2/32 {
        destination 10.123.1.1;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 2 {
    dlci 102;
    family inet {
      mtu 9000;
      address 10.123.1.4/32 {
        destination 10.123.1.3;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 3 {
    dlci 103;
    family inet {
      mtu 9000;
      address 10.123.1.6/32 {
        destination 10.123.1.5;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
}
```

**Configuring Cisco
HDLC Encapsulation
with Byte-Encoding**

```
[edit interfaces ds-0/1/0:5:0]
no-keepalives;
encapsulation cisco-hdlc;
ds0-options {
```

	<pre> byte-encoding nx56; } unit 0 { family inet { address 10.221.2.8/24; } } </pre>
Configuring Cisco HDLC Encapsulation with Byte-Encoding and Framing	<pre> [edit interfaces ds-0/1/0:5:0] no-keepalives; encapsulation cisco-hdlc; t1-options { byte-encoding nx56; framing sf; } unit 0 { family inet { address 10.221.2.8/24; } } </pre>
Use Time Slots 1 Through 10	<pre> [edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number] channel-group group-number; timeslots 1-10; </pre>
Use Time Slots 1 Through 5, 10, and 24	<pre> [edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number] channel-group group-number; timeslots 1-5,10,24; </pre>

Examples: Configuring Channelized DS3-to-DS1 Interfaces

The following configuration is sufficient to get the channelized DS3-to-DS1 interface up and running. The T3 interface can be divided into 28 channels, each at T1 line rate. DS3 channels can use the following encapsulation types for their logical interfaces:

- PPP, PPP CCC, and PPP TCC
- Frame Relay, Frame Relay CCC, and Frame Relay TCC
- Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

For more information, see Configuring Frame Relay DLCIs.

Configuring Cisco HDLC Encapsulation on a Channelized DS3 Interface	<pre> [edit interfaces] t1-2/0/1:20 { encapsulation cisco-hdlc; unit 0 { family inet { address 10.0.4.40/32 { destination 10.0.4.41; } } } } </pre>
---	---

**Configuring PPP
Encapsulation on a
Channelized DS3
Interface**

```
[edit interfaces]
t1-2/0/1:20 {
  encapsulation ppp;
  unit 0 {
    family inet {
      address 10.0.4.40/32 {
        destination 10.0.4.41;
      }
    }
  }
}
```

**Configuring Five Frame
Relay DLCIs on a
Channelized DS3
Interface**

```
[edit interfaces]
t1-5/1/3:0 {
  mtu 9192;
  encapsulation frame-relay;
  unit 1 {
    dlci 101;
    family inet {
      mtu 9000;
      address 10.123.1.2/32 {
        destination 10.123.1.1;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 2 {
    dlci 102;
    family inet {
      mtu 9000;
      address 10.123.1.4/32 {
        destination 10.123.1.3;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 3 {
    dlci 103;
    family inet {
      mtu 9000;
      address 10.123.1.6/32 {
        destination 10.123.1.5;
      }
    }
    family iso {
```

```

        mtu 9000;
    }
    family mpls {
        mtu 9000;
    }
}
unit 4 {
    dlci 104;
    family inet {
        mtu 9000;
        address 10.123.1.8/32 {
            destination 10.123.1.7;
        }
    }
    family iso {
        mtu 9000;
    }
    family mpls {
        mtu 9000;
    }
}
unit 5 {
    dlci 105;
    family inet {
        mtu 9000;
        address 10.123.1.10/32 {
            destination 10.123.1.9;
        }
    }
    family iso {
        mtu 9000;
    }
    family mpls {
        mtu 9000;
    }
}
}

```

**Configuring Cisco
HDLC Encapsulation
with Byte-Encoding**

```

[edit interfaces t1-1/1/0:1]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
    byte-encoding nx56;
}
unit 0 {
    family inet {
        address 10.221.2.8/24;
    }
}

```

**Configuring Cisco
HDLC Encapsulation
with Byte-Encoding
and Framing**

```

[edit interfaces t1-1/1/0:1]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
    byte-encoding nx56;
}

```

```
    framing sf;  
  }  
  unit 0 {  
    family inet {  
      address 10.221.2.8/24;  
    }  
  }  
}
```

CHAPTER 3

Network Interfaces Configuration Statements and Hierarchy

- [\[edit chassis\] Hierarchy Level on page 23](#)
- [\[edit interfaces\] Hierarchy Level on page 24](#)
- [\[edit logical-systems\] Hierarchy Level on page 40](#)

[\[edit chassis\] Hierarchy Level](#)

```
chassis {
  aggregated-devices {
    ethernet {
      device-count number;
    }
    sonet {
      device-count number;
    }
  }
  channel-group number {
    ethernet {
      device-count number;
    }
  }
  fpc slot-number {
    pic pic-number {
      adaptive-services {
        service-package (layer-2 | layer-3);
      }
      aggregate-ports;
      atm-cell-relay-accumulation;
      atm-l2circuit-mode (aal5 | cell | trunk trunk);
      cel {
        el link-number {
          channel-group group-number;
          timeslots time-slot-range;
        }
      }
      channelization;
    }
    ct1 {
      t1 link-number {
        channel-group group-number;
        timeslots time-slot-range;
      }
    }
  }
}
```

```

    }
  }
  ct3 {
    port port-number {
      tl link-number {
        channel-group group-number;
        timeslots time-slot-range;
      }
    }
    framing sdh;
  }
  max-queues-per-interface number;
  mlfr-uni-nni-bundles num-intf;
  no-concatenate;
  shdsl {
    pic-mode (1-port-atm | 2-port-atm);
  }
  vtmapping (klm | itu-t);
}
}
fpc slot-number{
pic pic-number{
  egress-policer-overhead bytes;
  ingress-policer-overhead bytes;
}
}
}
}

```

[edit interfaces] Hierarchy Level

The statements at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level can also be configured at the [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*] hierarchy level.



NOTE: The accounting-profile statement is an exception to this rule. The accounting-profile statement can be configured at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level, but it cannot be configured at the [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*] hierarchy level.

```

interfaces {
  traceoptions {
    file filename <files number> <match regular-expression> <size size> <world-readable |
      no-world-readable> ;
    flag flag <disable>;
  }
  interface-name {
    accounting-profile name;
    aggregated-ether-options {
      (flow-control | no-flow-control);
    }
    lacp {
      (active | passive);
    }
  }
}

```



```

    link-protection {
        disable;
        (revertive | non-revertive);
        periodic interval;
        system-priority priority;
    }
    link-protection;
    link-speed speed;
    (loopback | no-loopback);
    mc-ae {
        chassis-id chassis-id;
        mc-ae-id mc-ae-id;
        mode (active-active | active-standby);
        redundancy-group group-id;
        status-control (active | standby);
    }
    minimum-links number;
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
}
aggregated-sonet-options {
    link-speed speed | mixed;
    minimum-links number;
}
atm-options {
    cell-bundle-size cells;
    ilmi;
    linear-red-profiles profile-name {
        high-plp-max-threshold percent;
        low-plp-max-threshold percent;
        queue-depth cells high-plp-threshold percent low-plp-threshold percent;
    }
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
}
pic-type (atm1 | atm2);
plp-to-clp;
promiscuous-mode {
    vpi vpi-identifier;
}
scheduler-maps map-name {
    forwarding-class class-name {
        epd-threshold cells plp1 cells;
        linear-red-profile profile-name;
        priority (high | low);
        transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
}
use-null-cw;
vpi vpi-identifier {
    maximum-vcs maximum-vcs;
}

```

```
oam-liveness {
  down-count cells;
  up-count cells;
}
oam-period (seconds | disable);
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
  burst length);
  queue-length number;
}
}
}
clocking clock-source;
data-input (system | interface interface-name);
dce;
serial-options {
  clock-rate rate;
  clocking-mode (dce | internal | loop);
  control-polarity (negative | positive);
  cts-polarity (negative | positive);
  dcd-polarity (negative | positive);
  dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dsr-polarity (negative | positive);
  dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  }
  dtr-circuit (balanced | unbalanced);
  dtr-polarity (negative | positive);
  encoding (nrz | nrzi);
  indication-polarity (negative | positive);
  line-protocol protocol;
  loopback mode;
  rts-polarity (negative | positive);
  tm-polarity (negative | positive);
  transmit-clock invert;
}
description text;
dialer-options {
```

```

    pool pool-name <priority priority>;
}
disable;
ds0-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    byte-encoding (nx56 | nx64);
    fcs (16 | 32);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback payload;
    start-end-flag (filler | shared);
}
e1-options {
    bert-error-rate rate;
    bert-period seconds;
    fcs (16 | 32);
    framing (g704 | g704-no-crc4 | unframed);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback (local | remote);
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
e3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    framing feet;
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
    fcs (16 | 32);
    framing (g.751 | g.832);
    idle-cycle-flag (filler | shared);
    invert-data;
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
    (unframed | no-unframed);
}
encapsulation type;
es-options {
    backup-interface es-fpc/pic/port;
}
fastether-options {
    802.3ad aex;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    ingress-rate-limit rate;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
}

```

Copyright © 2012, Juniper Networks, Inc.

```

ima-group-options {
    differential-delay number;
    frame-length (32 | 64 | 128 | 256);
    frame-synchronization {
        alpha number;
        beta number;
        gamma number;
    }
    minimum-links number;
    symmetry (symmetrical-config-and-operation |
        symmetrical-config-asymmetrical-operation);
    test-procedure {
        ima-test-start;
        ima-test-stop;
        interface name;
        pattern number;
        period number;
    }
    transmit-clock (common | independent);
    version (1.0 | 1.1);
}
ima-link-options group-id group-id;
interface-set interface-set-name {
    interface ethernet-interface-name {
        (unit unit-number | vlan-tags-outer vlan-tag);
    }
    interface interface-name {
        (unit unit-number);
    }
}
isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
    lmi-type (ansi | itu | c-lmi);
    n391dte number;
    n392dce number;
    n392dte number;
    n393dce number;
    n393dte number;
    t391dte seconds;
    t392dce seconds;
}
lsq-failure-options {
    no-termination-request;
    [ trigger-link-failure interface-name ];
}

```

```

}
mac mac-address;
mlfr-uni-nni-bundle-options {
    acknowledge-retries number;
    acknowledge-timer milliseconds;
    action-red-differential-delay (disable-tx | remove-link);
    drop-timeout milliseconds;
    fragment-threshold bytes;
    cisco-interoperability send-lip-remove-link-for-link-reject;
    hello-timer milliseconds;
    link-layer-overhead percent;
    lmi-type (ansi | itu | c-lmi);
    minimum-links number;
    mrru bytes;
    n391 number;
    n392 number;
    n393 number;
    red-differential-delay milliseconds;
    t391 seconds;
    t392 seconds;
    yellow-differential-delay milliseconds;
}
modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
}
mtu bytes;
multi-chassis-protection {
    peer a.b.c.d {
        interface interface-name;
    }
}
multiservice-options {
    (core-dump | no-core-dump);
    (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
    interface-type type;
}
no-vpivci-swapping;
otn-options {
    fec (efec | gfec | none);
    (laser-enable | no-laser-enable);
    (line-loopback | no-line-loopback);
    pass-thru;
    rate (fixed-stuff-bytes | no-fixed-stuff-bytes | pass-thru);
    transmit-payload-type number;
    trigger (oc-lof | oc-lom | oc-los | oc-wavelength-lock | odu-ais | odu-bbe-th | odu-bdi
        | odu-es-th | odu-lck | odu-oci | odu-sd | odu-ses-th | odu-ttim | odu-uas-th |
        opu-ptm | otu-ais | otu-bbe-th | otu-bdi | otu-es-th | otu-fec-deg | otu-fec-exe |
        otu-iae | otu-sd | otu-ses-th | otu-ttim | otu-uas-th);
    tti;
}

```

```

optics-options {
    wavelength nm;
    alarm alarm-name {
        (syslog | link-down);
    }
    warning warning-name {
        (syslog | link-down);
    }
}
partition partition-number oc-slice oc-slice-range interface-type type;
timeslots time-slot-range;
passive-monitor-mode;
per-unit-scheduler;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
    dynamic-profile profile-name;
    no-termination-request;
    pap {
        access-profile name;
        local-name name;
        local-password password;
        compression;
    }
}
psn-vcipsn-vci-identifier;
psn-vpipsn-vpi-identifier;
receive-bucket {
    overflow (discard | tag);
    rate percentage;
    threshold bytes;
}
redundancy-options {
    priority sp-fpc/pic/port;
    secondary sp-fpc/pic/port;
    hot-standby;
}
satop-options {
    payload-size n;
}
schedulers number;
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {

```

```

    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dsr-polarity (negative | positive);
  dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dtr-circuit (balanced | unbalanced);
  dtr-polarity (negative | positive);
  encoding (nrz | nrzi);
  indication-polarity (negative | positive);
  line-protocol protocol;
  loopback mode;
  rts-polarity (negative | positive);
  tm-polarity (negative | positive);
  transmit-clock invert;
}
services-options {
  inactivity-timeout seconds;
  open-timeout seconds;
  session-limit {
    maximum number;
    rate new-sessions-per-second;
  }
  syslog {
    host hostname {
      facility-override facility-name;
      log-prefix prefix-number;
      services priority-level;
    }
  }
}
shdsl-options {
  annex (annex-a | annex-b);
  line-rate line-rate;
  loopback (local | remote);
  snr-margin {
    current margin;
    snext margin;
  }
}

```



```

sonet-options {
  aggregate asx;
  aps {
    advertise-interval milliseconds;
    annex-b;
    authentication-key key;
    fast-aps-switch;
    force;
    hold-time milliseconds;
    lockout;
    neighbor address;
    paired-group group-name;
    preserve-interface;
    protect-circuit group-name;
    request;
    revert-time seconds;
    switching-mode (bidirectional | unidirectional);
    working-circuit group-name;
  }
  bytes {
    c2 value;
    e1-quiet value;
    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
  }
  fcs (16 | 32);
  loopback (local | remote);
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  path-trace trace-string;
  (payload-scrambler | no-payload-scrambler);
  rfc-2615;
  trigger {
    defect ignore;
    hold-time up milliseconds down milliseconds;
  }
  vtmapping (itu-t | klm);
  (z0-increment | no-z0-increment);
}
speed (10m | 100m | 1g | oc3 | oc12 | oc48);
stacked-vlan-tagging;
switch-options {
  switch-port port-number {
    (auto-negotiation | no-auto-negotiation);
    speed (10m | 100m | 1g);
    link-mode (full-duplex | half-duplex);
  }
}
t1-options {
  bert-algorithm algorithm;

```

```
bert-error-rate rate;  
bert-period seconds;  
buildout value;  
byte-encoding (nx56 | nx64);  
crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);  
crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);  
fcs (16 | 32);  
framing (esf | sf);  
idle-cycle-flag (flags | ones);  
invert-data;  
line-encoding (ami | b8zs);  
loopback (local | payload | remote);  
remote-loopback-respond;  
start-end-flag (filler | shared);  
timeslots time-slot-range;  
}  
t3-options {  
  atm-encapsulation (direct | plcp);  
  bert-algorithm algorithm;  
  bert-error-rate rate;  
  bert-period seconds;  
  buildout feet;  
  (cbit-parity | no-cbit-parity);  
  compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate  
    value>;  
  fcs (16 | 32);  
  (feac-loop-respond | no-feac-loop-respond);  
  idle-cycle-flag value;  
  (long-buildout | no-long-buildout);  
  (loop-timing | no-loop-timing);  
  loopback (local | payload | remote);  
  (mac | no-mac);  
  (payload-scrambler | no-payload-scrambler);  
  start-end-flag (filler | shared);  
}  
traceoptions {  
  flag flag <flag-modifier> <disable>;  
}  
transmit-bucket {  
  overflow discard;  
  rate percentage;  
  threshold bytes;  
}  
(traps | no-traps);  
unidirectional;  
vlan-tagging;  
vlan-vci-tagging;  
unit logical-unit-number {  
  accept-source-mac {  
    mac-address mac-address {  
      policer {  
        input cos-policer-name;  
        output cos-policer-name;  
      }  
    }  
  }  
}
```

```

accounting-profile name;
advisory-options {
    downstream-rate rate;
    upstream-rate rate;
}
allow-any-vci;
atm-scheduler-map (map-name | default);
backup-options {
    interface interface-name;
}
bandwidth rate;
cell-bundle-size cells;
clear-dont-fragment-bit;
compression {
    rtp {
        f-max-period number;
        maximum-contexts number <force>;
        queues [ queue-numbers ];
        port {
            minimum port-number;
            maximum port-number;
        }
    }
}
compression-device interface-name;
copy-tos-to-outer-ip-header;
demux-destination family;
demux-source family;
demux-options {
    underlying-interface interface-name;
}
description text;
interface {
    l2tp-interface-id name;
    (dedicated | shared);
}
dialer-options {
    activation-delay seconds;
    callback;
    callback-wait-period time;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
    incoming-map {
        caller (caller-id | accept-all);
        initial-route-check seconds;
        load-interval seconds;
        load-threshold percent;
        pool pool-name;
        redial-delay time;
        watch-list {
            [ routes ];
        }
    }
}
disable;

```

```
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    down-count cells;
    up-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
}
```

```

compression {
  acfc;
  pfc;
  pap;
  default-pap-password password;
  local-name name;
  local-password password;
  passive;
}
dynamic-profile profile-name;
lcp-max-conf-req number;
lcp-restart-timer milliseconds;
loopback-clear-timer seconds;
ncp-max-conf-req number;
ncp-restart-timer milliseconds;
}
pppoe-options {
  access-concentrator name;
  auto-reconnect seconds;
  (client | server);
  service-name name;
  underlying-interface interface-name;
}
proxy-arp;
service-domain (inside | outside);
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
  burst length);
  queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
  backup-destination address;
  destination address;
  key number;
  routing-instance {
    destination routing-instance-name;
  }
  source source-address;
  ttl number;
}
vci vpi-identifier.vci-identifier;
vci-range start start-vci end end-vci;
vpi vpi-identifier;
vlan-id number;
vlan-id-list [vlan-id vlan-id-vlan-id];
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vlan-tags-outer tpid.vlan-id inner-list [vlan-id vlan-id-vlan-id];
family family {
  accounting {
    destination-class-usage;
  }
}

```

```
    source-class-usage {
        direction;
    }
}
access-concentrator name;
address address {
    destination address;
}
bundle ml-fpc/pic/port | ls-fpc/pic/port;
duplicate-protection;
dynamic-profile profile-name;
filter {
    group filter-group-number;
    input filter-name;
    input-list {
        [ filter-names ];
        output filter-name;
    }
    output-list {
        [ filter-names ];
    }
}
ipsec-sa sa-name;
keep-address-and-control;
max-sessions number;
max-sessions-vsa-ignore;
mtu bytes;
multicast-only;
negotiate-address;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check {
    fail-filter filter-name;
    mode loose;
}
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-names <service-filter filter-name>;
    }
}
```

```

service-name-table table-name;
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
    maximum-seconds>;
targeted-broadcast {
    forward-and-send-to-re;
    forward-only;
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name <destination address destination-profile
    profile-name | preferred-source-address address>;
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period (seconds | disable);
        shaping {
            (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
                rate burst length);
            queue-length number;
        }
        vci vpi-identifier.vci-identifier;
    }
    preferred;
    primary;
    (vrrp-group | vrrp-inet6-group) group-number {
        (accept-data | no-accept-data);
        advertise-interval seconds;
        authentication-type authentication;
        authentication-key key;
        fast-interval milliseconds;
        (preempt | no-preempt) {
            hold-time seconds;
        }
    }
    priority-number number;
    track {
        priority-cost seconds;
        priority-hold-time interface-name {
            bandwidth-threshold bits-per-second {
                priority;
            }
            interface priority;
        }
    }
    route ip-address/mask routing-instance instance-name priority-cost cost;
}

```

```
        virtual-address [ addresses ];
    }
}
}
}
```

**Related
Documentation**

- *Junos OS Hierarchy and RFC Reference*
- Junos® OS Ethernet Interfaces
- Junos® OS Network Interfaces

[edit logical-systems] Hierarchy Level

The following lists the statements that can be configured at the **[edit logical-systems]** hierarchy level that are also documented in this manual. For more information about logical systems, see the Junos OS Routing Protocols Configuration Guide.

```
logical-systems logical-system-name {
  interfaces interface-name {
    unit logical-unit-number {
      accept-source-mac {
        mac-address mac-address {
          policer {
            input cos-policer-name;
            output cos-policer-name;
          }
        }
      }
    }
    allow-any-vci;
    atm-scheduler-map (map-name | default);
    bandwidth rate;
    backup-options {
      interface interface-name;
    }
    cell-bundle-size cells;
    clear-dont-fragment-bit;
    compression {
      rtp {
        f-max-period number;
        port {
          minimum port-number;
          maximum port-number;
        }
        queues [ queue-numbers ];
      }
    }
    compression-device interface-name;
    description text;
    interface {
      l2tp-interface-id name;
      (dedicated | shared);
    }
  }
}
```



```

dialer-options {
  activation-delay seconds;
  deactivation-delay seconds;
  dial-string [ dial-string-numbers ];
  idle-timeout seconds;
  initial-route-check seconds;
  load-threshold number;
  pool pool;
  remote-name remote-callers;
  watch-list {
    [ routes ];
  }
}
disable;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
  activation-priority priority;
  bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
input-vlan-map {
  inner-tag-protocol-id;
  inner-vlan-id;
  (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
  tag-protocol-id tpid;
  vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
  input-policer policer-name;
  input-three-color policer-name;
  output-policer policer-name;
  output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
  up-count cells;
  down-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
  inner-tag-protocol-id;
  inner-vlan-id;
  (pop | pop-pop | pop-swap | push | push-push | swap | swap-swap);
  tag-protocol-id tpid;
  vlan-id number;
}

```

```
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
  chap {
    access-profile name;
    default-chap-secret name;
    local-name name;
    passive;
  }
  compression {
    acfc;
    pfc;
  }
}
dynamic-profile profile-name;
pap {
  default-pap-password password;
  local-name name;
  local-password password;
  passive;
}
}
proxy-arp;
service-domain (inside | outside);
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
  burst length);
  queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
  backup-destination address;
  destination address;
  key number;
  routing-instance {
    destination routing-instance-name;
  }
  source source-address;
  ttl number;
}
vci vpi-identifier.vci-identifier;
vlan-id number;
vlan-id-list [vlan-id vlan-id-vlan-id]
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vlan-tags outer tpid.vlan-id inner-list [vlan-id vlan-id-vlan-id]
vpi vpi-identifier;
family family {
  accounting {
    destination-class-usage;
```

```

    source-class-usage {
        direction;
    }
}
bundle interface-name;
filter {
    group filter-group-number;
    input filter-name;
    input-list {
        [ filter-names ];
    }
    output filter-name;
    output-list {
        [ filter-names ];
    }
}
ipsec-sa sa-name;
keep-address-and-control;
mtu bytes;
multicast-only;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name> {
    <mode loose>;
}
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
unnumbered-address interface-name destination address destination-profile
    profile-name;
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
}

```

```
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period (seconds | disable);
        shaping {
            (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
              rate burst length);
            queue-length number;
        }
        vci vpi-identifier.vci-identifier;
    }
    preferred;
    primary;
    (vrrp-group | vrrp-inet6-group) group-number {
        (accept-data | no-accept-data);
        advertise-interval seconds;
        authentication-type authentication;
        authentication-key key;
        fast-interval milliseconds;
        (preempt | no-preempt) {
            hold-time seconds;
        }
        priority-number number;
        track {
            priority-cost seconds;
            priority-hold-time interface-name {
                interface priority;
                bandwidth-threshold bits-per-second {
                    priority;
                }
            }
            route ip-address/mask routing-instance instance-name priority-cost cost;
        }
    }
    virtual-address [ addresses ];
}
}
```

**Related
Documentation**

- [Junos OS Hierarchy and RFC Reference](#)
- [Junos® OS Ethernet Interfaces](#)
- [Junos® OS Network Interfaces](#)

CHAPTER 4

Statement Summary

bert-algorithm

Syntax	<code>bert-algorithm <i>algorithm</i>;</code>
Hierarchy Level	<code>[edit interfaces ce1-fpc/pic/port],</code> <code>[edit interfaces ct1-fpc/pic/port],</code> <code>[edit interfaces interface-name ds0-options],</code> <code>[edit interfaces interface-name e1-options],</code> <code>[edit interfaces interface-name e3-options],</code> <code>[edit interfaces interface-name t1-options],</code> <code>[edit interfaces interface-name t3-options]</code>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
Description	Configure the pattern to send in the bit stream during a bit error rate test (BERT). Applies to T1, E3, T3, and multichannel DS3 interfaces, the channelized interfaces (DS3, OC12, STM1), and channelized IQ and IQE interfaces (E1, E3 and DS3).



NOTE: When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the `bert-algorithm` statement must be included at the `[edit interfaces ce1-fpc/pic/port]` or `[edit interfaces ct1-fpc/pic/port]` hierarchy level as appropriate.

Options	<p><i>algorithm</i>—Pattern to send in the bit stream. There are two categories of test patterns: pseudorandom and repetitive. Both patterns conform to CCITT/ITU O.151, O.152, O.153, and O.161 standards. The algorithm can be one of the following patterns:</p> <ul style="list-style-type: none"> • all-ones-repeating—Pattern is all ones. • all-zeros-repeating—Pattern is all zeros. • alternating-double-ones-zeros—Pattern is alternating pairs of ones and zeros. • alternating-ones-zeros—Pattern is alternating ones and zeros. • pseudo-2e3—Pattern is $2^3 - 1$. • pseudo-2e4—Pattern is $2^4 - 1$. • pseudo-2e5—Pattern is $2^5 - 1$. • pseudo-2e6—Pattern is $2^6 - 1$. • pseudo-2e7—Pattern is $2^7 - 1$. • pseudo-2e9-o153—Pattern is $2^9 - 1$, as defined in the O153 standard. • pseudo-2e10—Pattern is $2^{10} - 1$. • pseudo-2e11-o152—Pattern is $2^{11} - 1$, as defined in the O152 standard.
----------------	---

- **pseudo-2e15-o151**—Pattern is $2^{15} - 1$, as defined in the O151 standard.
- **pseudo-2e17**—Pattern is $2^{17} - 1$.
- **pseudo-2e18**—Pattern is $2^{18} - 1$.
- **pseudo-2e20-o151**—Pattern is $2^{20} - 1$, as defined in the O151 standard.
- **pseudo-2e20-o153**—Pattern is $2^{20} - 1$, as defined in the O153 standard.
- **pseudo-2e21**—Pattern is $2^{21} - 1$.
- **pseudo-2e22**—Pattern is $2^{22} - 1$.
- **pseudo-2e23-o151**—Pattern is $2^{23} - 1$, as defined in the O151 standard.
- **pseudo-2e25**—Pattern is $2^{25} - 1$.
- **pseudo-2e28**—Pattern is $2^{28} - 1$.
- **pseudo-2e29**—Pattern is $2^{29} - 1$.
- **pseudo-2e31**—Pattern is $2^{31} - 1$.
- **pseudo-2e32**—Pattern is $2^{32} - 1$.
- **repeating-1-in-4**—One bit in four is set to 1; the others are set to 0.
- **repeating-1-in-8**—One bit in eight is set to 1; the others are set to 0.
- **repeating-3-in-24**—Three bits in twenty four are set to 1; the others are set to 0.

Default: pseudo-2e3

Required Privilege interface—To view this statement in the configuration.
Level interface-control—To add this statement to the configuration.

Related Documentation

- [Interface Diagnostics on page 151](#)
- Configuring E1 BERT Properties
- Configuring E3 BERT Properties
- Configuring T1 BERT Properties
- Configuring T3 BERT Properties
- Examples: Configuring T3 Interfaces
- [bert-error-rate on page 48](#)
- [bert-period on page 50](#)

bert-error-rate

Syntax	<code>bert-error-rate rate;</code>
Hierarchy Level	<code>[edit interfaces ce1-fpc/pic/port],</code> <code>[edit interfaces ct1-fpc/pic/port],</code> <code>[edit interfaces interface-name ds0-options],</code> <code>[edit interfaces interface-name e1-options],</code> <code>[edit interfaces interface-name e3-options],</code> <code>[edit interfaces interface-name t1-options],</code> <code>[edit interfaces interface-name t3-options]</code>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
Description	Configure the bit error rate to use in a BERT procedure. Applies to E1, E3, T1, or T3 interfaces, and to the channelized interfaces (DS3, OC3, OC12, and STM1).




NOTE: When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the `bert-error-rate` statement must be included at the `[edit interfaces ce1-fpc/pic/port]` or `[edit interfaces ct1-fpc/pic/port]` hierarchy level as appropriate.

When configuring `t3-options bert-error-rate` on J Series routers, only 0 and 3 through 7 are valid values. If you enter 1 or 2, Junos OS will return the error message `configuration check-out failed`.

Options	<p>rate—Bit error rate.</p> <p>Range: 0 through 7, which corresponds to 10^{-1} (1 error per bit) to 10^{-7} (1 error per 10 million bits)</p> <p>Default: 0</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • bert-algorithm on page 46 • bert-period on page 50 • ds0-options on page 53 • e1-options • e3-options • t1-options on page 68 • t3-options on page 69

- [Interface Diagnostics on page 151](#)
- Configuring E1 BERT Properties
- Configuring E3 BERT Properties
- Configuring T1 BERT Properties
- Configuring T3 BERT Properties
- Examples: Configuring T3 Interfaces

bert-period

Syntax	<code>bert-period <i>seconds</i>;</code>
Hierarchy Level	<p>[edit interfaces <i>ce1-fpc/pic/port</i>], [edit interfaces <i>ct1-fpc/pic/port</i>], [edit interfaces <i>interface-name ds0-options</i>], [edit interfaces <i>interface-name e1-options</i>], [edit interfaces <i>interface-name e3-options</i>], [edit interfaces <i>interface-name t1-options</i>], [edit interfaces <i>interface-name t3-options</i>]</p>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
Description	<p>Configure the duration of a BERT test. Applies to E1, E3, T1, and T3 interfaces, and to E1, E3, T1, and T3 partitions on the channelized interfaces (CE1, CT1, DS3, OC3, OC12, OC48, STM1, STM4, and STM16).</p> <p>E1 and T1 IQ, IQE, and standard interfaces support an extended BERT period range, up to 86,400 seconds (24 hours).</p> <div style="margin-top: 10px;">  <p>NOTE: When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <code>bert-period</code> statement must be included at the [edit interfaces <i>ce1-fpc/pic/port</i>] or [edit interfaces <i>ct1-fpc/pic/port</i>] hierarchy level as appropriate.</p> </div>
Options	<p><i>seconds</i>—Test duration. Range and default values vary by interface type.</p> <p>Range:</p> <ul style="list-style-type: none"> PIC-dependent—Normal BERT period: either 1 through 239 seconds or 1 through 240 seconds PIC-dependent—Extended BERT period: from 1 through 86,400 seconds <p>Default:</p> <ul style="list-style-type: none"> Normal BERT period: 10 seconds Extended BERT period (on supported E1 interfaces): 10 seconds Extended BERT period (on supported T1 interfaces): 240 seconds
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Interface Diagnostics on page 151 Configuring E1 BERT Properties

- Configuring E3 BERT Properties
- Configuring T1 BERT Properties
- Configuring T3 BERT Properties
- [bert-algorithm on page 46](#)
- [bert-error-rate on page 48](#)

byte-encoding

Syntax	byte-encoding (nx56 nx64);
Hierarchy Level	[edit interfaces t1- <i>fpc/pic/port</i>], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> t1-options]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
Description	Set the byte encoding on a DS0 or T1 interface to use 7 bits per byte or 8 bits per byte.



NOTE: When configuring T1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the `byte-encoding` statement must be included at the [edit interfaces t1-*fpc/pic/port*] hierarchy level.

Default	The default byte encoding is 8 bits per byte (nx64).
Options	nx56—Use 7 bits per byte. nx64—Use 8 bits per byte.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring T1 Byte Encoding

cbit-parity

Syntax	(cbit-parity no-cbit-parity);
Hierarchy Level	[edit interfaces <i>interface-name</i> t3-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For T3 interfaces only, enable or disable C-bit parity mode, which controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the far-end block error (FEBE), far-end alarm and control (FEAC), terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. For ATM and ATM2 IQ2 and IQ2-E interfaces, M23 framing is used when the no-cbit-parity statement is included. For all other interfaces, M13 framing is used when the no-cbit-parity statement is included.
Default	C-bit parity mode is enabled.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring E3 and T3 Parameters on ATM Interfaces• Disabling T3 C-Bit Parity Mode

channelization

Syntax	channelization;
Hierarchy Level	[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i>]
Release Information	Statement introduced in Junos OS Release 11.4.
Description	Enable the DS3/E3 MIC on MX Series routers with Queuing and Enhanced Queuing MPCs (MX-MPC1-3D-Q, MX-MPC2-3D-Q, and MX-MPC2-3D-EQ) or on MX80 routers to function in channelized mode.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Junos OS to Enable Channelization on DS3/E3 MIC on page 13

ds0-options

Syntax	<pre>ds0-options { bert-algorithm <i>algorithm</i>; bert-error-rate <i>rate</i>; bert-period <i>seconds</i>; byte-encoding (nx56 nx64); fcs (16 32); idle-cycle-flag (flags ones); invert-data; loopback <i>payload</i>; start-end-flag (filler shared); }</pre>
Hierarchy Level	[edit interfaces <i>interface-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Configure DS0-specific physical interface properties.</p> <p>The statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Channelized DS3-to-DS0 Interfaces on page 9

fast-aps-switch

Syntax	fast-aps-switch;
Hierarchy Level	[edit interfaces <i>interface-name</i> sonet-options aps]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.




NOTE:

- Configuring this statement reduces the APS switchover time only when the Layer 2 circuit encapsulation type for the interface receiving traffic from a Layer 2 circuit neighbor is SAToP.
 - When the fast-aps-switch statement is configured in revertive APS mode, you must configure an appropriate value for revert time to achieve reduction in APS switchover time.
 - To prevent the logical interfaces in the data path from being shut down, configure appropriate hold-time values on all the interfaces in the data path that support TDM.
 - The fast-aps-switch statement cannot be configured when the APS annex-b option is configured.
 - The interfaces that have the fast-aps-switch statement configured cannot be used in virtual private LAN service (VPLS) environments.
-

Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
---------------------------------	---

Related Documentation	<ul style="list-style-type: none">• Reducing APS Switchover Time in Layer 2 Circuits
------------------------------	--

fcs

Syntax	fcs (16 32);
Hierarchy Level	[edit interfaces e1- <i>fpc/pic/port</i>], [edit interfaces t1- <i>fpc/pic/port</i>], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> e1-options], [edit interfaces <i>interface-name</i> e3-options], [edit interfaces <i>interface-name</i> sonet-options], [edit interfaces <i>interface-name</i> t1-options], [edit interfaces <i>interface-name</i> t3-options]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
Description	<p>For E1/E3, SONET/SDH, and T1/T3 interfaces, configure the frame checksum (FCS) on the interface. The checksum must be the same on both ends of the interface.</p> <p>On a channelized OC12 interface, the SONET/SDH fcs statement is not supported. To configure FCS on each DS3 channel, you must include the t3-options fcs statement in the configuration for each channel. For SONET/SDH, the channelized OC12 interface supports DS3 to STS-1 to OC12. For SDH, the channelized OC12 interface supports NxDS3 to NxVC3 to AU3 to STM.</p> <div style="margin-top: 20px;">  <p>NOTE: When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the fcs statement must be included at the [edit interfaces e1-<i>fpc/pic/port</i>] or [edit interfaces t1-<i>fpc/pic/port</i>] hierarchy level as appropriate.</p> </div>
Options	<p>16—Use a 16-bit frame checksum on the interface.</p> <p>32—Use a 32-bit frame checksum on the interface. Using a 32-bit checksum provides more reliable packet verification, but some older equipment might not support 32-bit checksums.</p> <p>Default: 16</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring the E1 Frame Checksum Configuring the E3 Frame Checksum Configuring the SONET/SDH Frame Checksum Configuring the T1 Frame Checksum Configuring the T3 Frame Checksum

feac-loop-respond

Syntax	(feac-loop-respond no-feac-loop-respond);
Hierarchy Level	[edit interfaces <i>interface-name</i> t3-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For T3 interfaces only, configure the router so a remote CSU can place the local router into loopback.</p> <p>If you configure remote or local loopback with the T3 loopback statement, the router does not respond to FEAC requests from the CSU even if you include the feac-loop-respond statement in the configuration. For the router to respond, you must delete the loopback statement from the configuration.</p> <p>You must rollback the setting done on the remote CSU prior to deactivating the feac-loop-respond statement. If the remote CSU cannot comply, clear the remote loop through local configuration to achieve the cleanup. For example, configure remote loopback on the interface and then delete the remote loopback.</p>
Default	The router does not respond to FEAC requests.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Configuring the T3 FEAC Responseloopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 62remote-loopback-respond

framing (E1, E3, and T1 Interfaces)


Syntax	<code>framing (g704 g704-no-crc4 g.751 g.832 unframed sf esf);</code>
Hierarchy Level	[edit interfaces <i>ce1-fpc/pic/port</i>], [edit interfaces <i>ct1-fpc/pic/port</i>], [edit interfaces <i>at-fpc/pic/port</i> e3-options], [edit interfaces <i>e1-fpc/pic/port</i> e1-options], [edit interfaces <i>t1-fpc/pic/port</i> t1-options]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
Description	Configure the framing format.



NOTE: When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the `framing` statement must be included at the [edit interfaces *ce1-fpc/pic/port*] or [edit interfaces *ct1-fpc/pic/port*] hierarchy level as appropriate.

Default	<code>esf</code> for T1 interfaces; <code>g704</code> for E1 interfaces. There is no default value for E3 over ATM interfaces.
Options	<p><code>esf</code>—Extended superframe (ESF) mode for T1 interfaces.</p> <p><code>g704</code>—G.704 framing format for E1 interfaces.</p> <p><code>g704-no-crc4</code>—G.704 framing with no cyclic redundancy check 4 (CRC4) for E1 interfaces.</p> <p><code>g.751</code>—G.751 framing format for E3 over ATM interfaces.</p> <p><code>g.832</code>—G.832 framing format for E3 over ATM interfaces.</p> <p><code>sf</code>—Superframe (SF) mode for T1 interfaces.</p> <p><code>unframed</code>—Unframed mode for E1 interfaces.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring E1 Framing Configuring E3 and T3 Parameters on ATM Interfaces Configuring T1 Framing

idle-cycle-flag

Syntax	<code>idle-cycle-flag value;</code>
Hierarchy Level	<p>[edit interfaces <i>e1-fpc/pic/port</i>], [edit interfaces <i>t1-fpc/pic/port</i>], [edit interfaces <i>interface-name ds0-options</i>], [edit interfaces <i>interface-name e1-options</i>], [edit interfaces <i>interface-name e3-options</i>], [edit interfaces <i>interface-name serial-options</i>], [edit interfaces <i>interface-name t1-options</i>], [edit interfaces <i>interface-name t3-options</i>]</p>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
Description	Configure the value that the DS0, E1, E3, T1, or T3 interface transmits during idle cycles.
<div>  <p>NOTE: When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <code>idle-cycle-flag</code> statement must be included at the [edit interfaces <i>e1-fpc/pic/port</i>] or [edit interfaces <i>t1-fpc/pic/port</i>] hierarchy level as appropriate.</p> </div>	
Options	<p>value—Value to transmit in the idle cycles:</p> <ul style="list-style-type: none"> flags—Transmit the value 0x7E. ones—Transmit the value 0xFF (all ones). <p>Default: Flags</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring the E1 Idle Cycle Flag Configuring the E3 Idle Cycle Flag Configuring the T1 Idle Cycle Flag Configuring the T3 Idle Cycle Flag

interface-type (Interfaces)

Syntax	<code>interface-type (bc coc1 ct1 ct3 dc ds so t1 t3);</code>
Hierarchy Level	<code>[edit interfaces <i>interface-range</i> name no-partition],</code> <code>[edit interfaces <i>interface-range</i> name partition <i>partition-number</i>],</code> <code>[edit interfaces <i>interface-range</i> name partition <i>partition-number</i> oc-slice <i>oc-slice-range</i>],</code> <code>[edit interfaces <i>interface-range</i> name partition <i>partition-number</i> timeslot <i>timeslot-range</i>]</code>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For IQ and IQE interfaces only, configure the sublevel interface type.
Options	<p>bc—Dual—Port Channelized E1 and T1 ISDN PRI interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> timeslot <i>timeslot-range</i>]</code> hierarchy level to create a bearer (B) channel <code>bc-pim/0/port:channel</code> interface for each time you want to function as an ISDN PRI B-channel.</p> <p>coc1—Channelized OC1 interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type coc12-fpc/pic/port]</code> hierarchy level.</p> <p>ct1—Channelized T1 interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> interface-type ct3-fpc/pic/port<:channel>]</code> hierarchy level.</p> <p>ct3—Channelized T3 interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type coc1-fpc/pic/port:channel no-partition]</code> hierarchy level.</p> <p>dc—Dual-Port Channelized E1 and T1 ISDN PRI interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> timeslot <i>timeslot-range</i>]</code> hierarchy level to create a (D) channel <code>dc-pim/0/port</code> to control the B-channels.</p> <p>ds—DS0 interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> interface-type (ce1-fpc/pic/port ct1-fpc/pic/port<:channel>)]</code> hierarchy level.</p> <p>so—SONET/SDH interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type coc12-fpc/pic/port]</code> hierarchy level.</p> <p>t1—T1 interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type (coc12-fpc/pic/port coc1-fpc/pic/port)]</code> hierarchy level.</p> <p>t3—T3 interface type. You can specify this interface type at the <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type (coc12-fpc/pic/port coc1-fpc/pic/port:channel no-partition)]</code> hierarchy level.</p>

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Channelized E1 IQ and IQE Interfaces Overview
- Channelized OC12/STM4 IQ and IQE Interfaces Overview
- [Configuring Channelized T3 IQ Interfaces on page 3](#)

invert-data

Syntax invert-data;

Hierarchy Level [edit interfaces e1-*fpc/pic/port*],
[edit interfaces t1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* e3-options]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.

Description Invert the transmission of unused data bits on the DS0, E1, E3, and T1 interface.



.....

NOTE: When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the invert-data statement must be included at the [edit interfaces e1-*fpc/pic/port*] or [edit interfaces t1-*fpc/pic/port*] hierarchy level as appropriate.

.....

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.



Related Documentation

- Configuring E1 Data Inversion
- Configuring E3 Data Inversion
- Configuring T1 Data Inversion

long-buildout

Syntax	(long-buildout no-long-buildout);
Hierarchy Level	[edit interfaces <i>interface-name</i> t3-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Configure the T3 line buildout. A T3 interface has two settings for the T3 line buildout: a short setting, which is less than 255 feet (68 meters), and a long setting, which is greater than 255 feet and shorter than 450 feet (137 meters).</p> <p>This statement applies to copper-cable-based T3 interfaces only. You cannot configure a line buildout for a DS3 channel on a channelized OC12 interface, which runs over fiber-optic cable.</p>
Default	A T3 interface uses the short line buildout setting (no-long-buildout) for wires shorter than 255 feet (68 meters).
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring the T3 Line Buildout

loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3)

Syntax	loopback (local payload remote);
Hierarchy Level	[edit interfaces ce1- <i>fpc/pic/port</i>], [edit interfaces ct1- <i>fpc/pic/port</i>], [edit interfaces t1- <i>fpc/pic/port</i>], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> dsl-options], [edit interfaces <i>interface-name</i> e1-options], [edit interfaces <i>interface-name</i> e3-options], [edit interfaces <i>interface-name</i> shdsl-options], [edit interfaces <i>interface-name</i> sonet-options], [edit interfaces <i>interface-name</i> t1-options], [edit interfaces <i>interface-name</i> t3-options]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
Description	Configure a loopback connection. To turn off the loopback capability, remove the loopback statement from the configuration.
<div>  <p>NOTE: When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the loopback statement must be included with the local or remote option at the [edit interfaces ce1-<i>fpc/pic/port</i>] or [edit interfaces ct1-<i>fpc/pic/port</i>] hierarchy level as appropriate.</p> <p>When configuring T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the loopback statement must be included with the payload option at the [edit interfaces t1-<i>fpc/pic/port</i>] hierarchy level.</p> </div>	
<div>  <p>NOTE: When configuring CE1 or CT1 interfaces on the 16-port Channelized E1/T1 MIC (MIC-3D-16CHE1-T1-CE), you must include the loopback statement at the [edit interfaces ce1-<i>fpc/pic/port</i>] hierarchy level, or [edit interfaces ct1-<i>fpc/pic/port</i>]</p> </div>	
<p>To configure loopback on channelized IQ and IQE PICs, SONET/SDH level, use the sonet-options loopback statement local and remote options at the controller interface (coc48, cstm16, coc12, cstm4, coc3, cstm1). It is ignored for path-level interfaces so-fpc/pic/port or so-fpc/pic/port:channel.</p>	
Options	local —Loop packets, including both data and timing information, back on the local router's PIC. NxDS0 IQ interfaces do not support local loopback.

payload—For channelized T3, T1, and *NxDSO* IQ interfaces only, loop back data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated. Neither ATM-over-asymmetrical digital subscriber line (ADSL) interfaces nor ATM-over-SHDSL interfaces support payload loopback.

remote—Loop packets, including both data and timing information, back on the remote router's interface card. *NxDSO* IQ interfaces do not support remote loopback.

Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring E3 and T3 Parameters on ATM Interfaces• Configuring E1 Loopback Capability• Configuring E3 Loopback Capability• Configuring SONET/SDH Loopback Capability• Configuring SHDSL Operating Mode on an ATM Physical Interface• Configuring T1 Loopback Capability• Configuring T3 Loopback Capability• feac-loop-respond on page 56

no-partition


Syntax	no-partition interface-type (e1 (cau4 so) (ct3 t3) so t3);
Hierarchy Level	[edit interfaces ce1-fpc/pic/port], [edit interfaces coc1-fpc/pic/port:channel], [edit interfaces coc12-fpc/pic/port], [edit interfaces cstm1-fpc/pic/port], [edit interfaces ct3-fpc/pic/port]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For Channelized E1 IQ PICs only, configure the channelized E1 interface as an unpartitioned, clear channel.</p> <p>For Channelized OC12 PIC only, convert the channelized OC1 IQ interface into a channelized T3 interface or a T3 interface. You perform this configuration task for C-bit parity and M13-mapped configurations.</p> <p>For Channelized OC12 IQ PICs only, configure the channelized OC12 interface as an unpartitioned, clear channel.</p> <p>For Channelized STM1 PIC only, convert the channelized STM1 IQ interface into a channelized Administrative Unit 4 (AU-4) interface or a SONET/SDH STM1 interface.</p> <p>For Channelized DS3 PIC only, configure the channelized T3 interface as an unpartitioned, clear channel.</p>
Default	If you do not include either this statement or the partition statement, the Channelized IQ PIC is not partitioned, and no data channels are configured.
Options	<p>The option used must correspond to the physical interface type:</p> <p>e1—E1 interface type.</p> <p>coc12 so—Channelized OC12 interface type, in SONET mode.</p> <p>cau4—Channelized AU-4 interface type.</p> <p>cstm1—SONET/SDH STM1 interface type, in SDH mode.</p> <p>ct3—Channelized T3 interface type.</p> <p>t3—T3 interface type.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Channelized E1 IQ and IQE Interfaces Overview• Channelized OC12/STM4 IQ and IQE Interfaces Overview• Configuring an OC12/STM4 Interface

- Configuring Channelized STM1 IQ and IQE Interfaces
- [Configuring T3 IQ Interfaces on page 3](#)
- [partition on page 66](#)
- no-partition

partition

Syntax	<code>partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type type timeslots <i>time-slot-range</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For IQ interfaces and J Series interfaces on the Dual-Port Channelized E1 and T1PIM, configure the channelized interface partition. The partition number is correlated with the channel number. Partition and channel numbering on IQ interfaces begins with :1, not :0.
Default	If you omit this statement, the channelized PIC or PIM is not partitioned, and no data channels are configured.
Options	<p><i>partition-number</i>—Sublevel interface partition index.</p> <p>Range:</p> <ul style="list-style-type: none">• 1 through 4 for an OC3 interface on a channelized OC12 IQ interface.• 1 through 12 for a T3 interface on a channelized OC12 IQ interface.• 1 through 4 for a T3 interface on a channelized T3 IQ interface.• 1 through 28 for a T1 IQ interface on a channelized OC12 IQ or channelized T3 IQ interface.• 1 through 10 for an E1 interface on a channelized E1 IQ interface.• 1 through 30 on a channelized E1 interface.• 1 through 23 on a channelized T1 interface.• 1 through 24 for NxDS0 interfaces on either channelized OC12 IQ or channelized DS3 IQ interfaces.• 0 through 31 (with 0 reserved for framing) for NxDS0 interfaces on channelized E1 IQ interfaces. <p>The remaining statements are explained separately.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Channelized E1 IQ and IQE Interfaces Overview• Channelized OC12/STM4 IQ and IQE Interfaces Overview• Configuring Channelized T3 IQ Interfaces on page 3• no-partition on page 64

start-end-flag

Syntax	start-end-flag (filler shared);
Hierarchy Level	[edit interfaces e1- <i>fpc/pic/port</i>], [edit interfaces t1- <i>fpc/pic/port</i>], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> e1-options], [edit interfaces <i>interface-name</i> e3-options], [edit interfaces <i>interface-name</i> t1-options], [edit interfaces <i>interface-name</i> t3-options]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
Description	For DS0, E1, E3, T1, and T3 interfaces, configure the interface to share the transmission of start and end flags.
<div>  <p>NOTE: When configuring E1 or T1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the start-end-flag statement must be included at the [edit interfaces e1-<i>fpc/pic/port</i>] or [edit interfaces t1-<i>fpc/pic/port</i>] hierarchy level as appropriate.</p> </div>	
Options	filler —Wait two idle cycles between the start and end flags. shared —Share the transmission of the start and end flags. This is the default.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring E1 Start and End Flags Configuring the E3 Start and End Flags Configuring T1 Start and End Flags Configuring T3 Start and End Flags



t1-options

Syntax	<pre>t1-options { bert-algorithm <i>algorithm</i>; bert-error-rate <i>rate</i>; bert-period <i>seconds</i>; buildout <i>value</i>; byte-encoding (nx56 nx64); crc-major-alarm-threshold (1e-3 5e-4 1e-4 5e-5 1e-5); crc-minor-alarm-threshold (1e-3 5e-4 1e-4 5e-5 1e-5 5e-6 1e-6); fcs (16 32); framing (esf sf); idle-cycle-flag (flags ones); invert-data; line-encoding (ami b8zs); loopback (local payload remote); remote-loopback-respond; start-end-flag (filler shared); timeslots <i>time-slot-range</i>; }</pre>
Hierarchy Level	[edit interfaces <i>interface-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
Description	Configure T1-specific physical interface properties. The statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• T1 Interfaces Overview

t3-options

Syntax	<pre> t3-options { atm-encapsulation (direct plcp); bert-algorithm <i>algorithm</i>; bert-error-rate <i>rate</i>; bert-period <i>seconds</i>; (cbit-parity no-cbit-parity); compatibility-mode (digital-link kentrox larscom) <subrate <i>value</i>>; fcs (16 32); (feac-loop-respond no-feac-loop-respond); idle-cycle-flag <i>value</i>; (long-buildout no-long-buildout); (loop-timing no-loop-timing); loopback (local payload remote); start-end-flag <i>value</i>; } </pre>
Hierarchy Level	[edit interfaces <i>interface-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Configure T3-specific physical interface properties, including the properties of DS3 channels on a channelized OC12 interface. The long-buildout statement is not supported for DS3 channels on a channelized OC12 interface.</p> <p>On T3 interfaces, the default encapsulation is PPP.</p> <p>For ATM1 interfaces, you can configure a subset of E3 options statements.</p> <p>The statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> T3 Interfaces Overview

timeslots

Syntax	<code>timeslots <i>time-slot-range</i>;</code>
Hierarchy Level	<code>[edit interfaces e1-<i>fpc/pic/port</i>],</code> <code>[edit interfaces t1-<i>fpc/pic/port</i>],</code> <code>[edit interfaces <i>interface-name</i> e1-options],</code> <code>[edit interfaces <i>interface-name</i> partition <i>partition-number</i>],</code> <code>[edit interfaces <i>interface-name</i> t1-options]</code>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For E1 and T1 interfaces, allocate the specific time slots by number.
<div>  <p>NOTE: When configuring E1 or T1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the <code>timeslots</code> statement must be included at the <code>[edit interfaces e1-<i>fpc/pic/port</i>]</code> or <code>[edit interfaces t1-<i>fpc/pic/port</i>]</code> hierarchy level as appropriate.</p> </div>	
Options	<p><i>time-slot-range</i>—Actual time slot numbers allocated:</p> <p>Range: Ranges vary by interface type and configuration option as follows:</p> <ul style="list-style-type: none"> • 1 through 24 for T1 interfaces (0 is reserved) • 1 through 31 for 4-port E1 PICs (0 is reserved) • 1 through 31 for NxDS0 interfaces (0 is reserved) • 2 through 32 for 10-port Channelized E1 and 10-port Channelized E1 IQ PICs (1 is reserved) • 2 through 32 for the setting under e1-options with IQE PICs (1 is reserved) (when creating fractional E1) • 1 through 31 for the setting under partition with IQE PICs (0 is reserved) (when creating NxDS0)
<div>  <p>NOTE: When creating fractional E1 interfaces only, if you connect a 4-port E1 PIC interface to a device that uses time slot numbering from 2 through 32, you must subtract 1 from the configured number of time slots.</p> </div>	
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Fractional E1 IQ and IQE Interfaces • Configuring Fractional T1 IQ and IQE Interfaces on page 4

- Configuring Fractional E1 Time Slots
- Configuring Fractional T1 Time Slots
- Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots

PART 3

Administration

- [Monitoring Commands on page 75](#)
- [Command Summaries on page 145](#)

CHAPTER 5

Monitoring Commands

show interfaces (Channelized DS3-to-DS0)

Syntax	<pre>show interfaces ds-fpc/pic/port:t1channel:ds0channel <brief detail extensive> <descriptions> <media> <snmp-index snmp-index> <statistics></pre>
Release Information	Command introduced before Junos OS Release 7.4.
Description	(M Series and T Series routers only) Display status information about the specified channelized DS3-to-DS0 interface.
Options	<p>ds-fpc/pic/port:t1channel:ds0channel—Display standard information about the specified channelized DS3-to-DS0 interface.</p> <p>brief detail extensive—(Optional) Display the specified level of output interface.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index snmp-index—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	show interfaces extensive (Channelized DS3-to-DS0) on page 84
Output Fields	Table 4 on page 76 lists the output fields for the show interfaces (all Channelized DS3 interfaces) command. Output fields are listed in the approximate order in which they appear.

Table 4: Channelized DS3 show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the "Enabled Field" section under Common Output Fields Description.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source. It can be Internal or External .	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Whether loopback is enabled and the type of loopback (local or remote).	All levels
FCS	Frame check sequence on the interface (either 16 or 32). The default is 16 bits.	All levels
Mode	Whether C-bit parity mode or M13 mode is enabled.	All levels
Framing	Physical layer framing format used on the link. It can be ESF or SF . The default is ESF .	All levels
Parent	(Channelized IQ interfaces only) Name and interface index of the interface to which a particular child interface belongs. None indicates that this interface is the top level.	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels
Link flags	Information about the link. Possible values are described in the “Link Flags” section under Common Output Fields Description.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Keepalive settings	(PPP and HDLC) Configured settings for keepalives. <ul style="list-style-type: none"> • interval seconds—The time in seconds between successive keepalive requests. The range is 10 seconds through 32,767 seconds, with a default of 10 seconds. • down-count number—The number of keepalive packets that a destination must fail to receive before the network takes a link down. The range is 1 through 255, with a default of 3. • up-count number—The number of keepalive packets a destination must receive to change a link’s status from down to up. The range is 1 through 255, with a default of 1. 	detail extensive none

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Keepalive statistics	<p>(PPP and HDLC) Information about keepalive packets.</p> <ul style="list-style-type: none"> Input—Number of keepalive packets received by PPP. <ul style="list-style-type: none"> (last seen 00:00:00 ago)—Time since the last keepalive packet was received, in the format <i>hh:mm:ss</i>. Output—Number of keepalive packets sent by PPP and how long ago the last keepalive packets were sent and received. <ul style="list-style-type: none"> (last seen 00:00:00 ago)—Time since the last keepalive packet was sent, in the format <i>hh:mm:ss</i>. 	detail extensive none
LMI settings	<p>(Frame Relay) Settings for Local Management Interface (LMI) can be either ANSI LMI settings or ITU LMI settings. ANSI LMI settings is the default. The format is (ANSI or ITU) LMI settings: value, value, value...xx seconds, where <i>value</i> can be:</p> <ul style="list-style-type: none"> n391dte—DTE full status polling interval (1–255) n392dce—DCE error threshold (1–10) n392dte—DTE error threshold (1–10) n393dce—DCE monitored event count (1–10) n393dte—DTE monitored event count (1–10) t391dte—DTE polling timer (5–30 seconds) t392dce—DCE polling verification timer (5–30 seconds) 	detail extensive none
LMI	<p>(Frame Relay) LMI packet statistics:</p> <ul style="list-style-type: none"> Input—Number of packets coming in on the interface (<i>nn</i>) and how much time has passed since the last packet arrived. The format is Input: nn (last seen hh:mm:ss ago). Output—Number of packets sent out on the interface (<i>nn</i>) and how much time has passed since the last packet was sent. The format is Output: nn (last seen hh:mm:ss ago). 	detail extensive none
LCP state	<p>(PPP) Link Control Protocol state.</p> <ul style="list-style-type: none"> Conf-ack-received—Acknowledgement was received. Conf-ack-sent—Acknowledgement was sent. Conf-req-sent—Request was sent. Down—LCP negotiation is incomplete (not yet completed or has failed). Not-configured—LCP is not configured on the interface. Opened—LCP negotiation is successful. 	detail extensive none
NCP state	<p>(PPP) Network Control Protocol state.</p> <ul style="list-style-type: none"> Conf-ack-received—Acknowledgement was received. Conf-ack-sent—Acknowledgement was sent. Conf-req-sent—Request was sent. Down—NCP negotiation is incomplete (not yet completed or has failed). Not-configured—NCP is not configured on the interface. Opened—NCP negotiation is successful. 	detail extensive none

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
CHAP state	<p>(PPP) Displays the state of the Challenge Handshake Authentication Protocol (CHAP) during its transaction.</p> <ul style="list-style-type: none"> • Chap-Chal-received—Challenge was received but response not yet sent. • Chap-Chal-sent—Challenge was sent. • Chap-Resp-received—Response was received for the challenge sent, but CHAP has not yet moved into the Success state. (Most likely with RADIUS authentication). • Chap-Resp-sent—Response was sent for the challenge received. • Closed—CHAP authentication is incomplete. • Failure—CHAP authentication failed. • Not-configured—CHAP is not configured on the interface. • Success—CHAP authentication was successful. 	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: <i>year-month-day hour:minute:second timezone hh:mm:ss ago</i> . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes, Output bytes—Number of bytes received and transmitted on the interface. • Input packets, Output packets—Number of packets received and transmitted on the interface. 	detail extensive

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Input errors	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input 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. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Giants—Number of frames received that are larger than the giant threshold. • Runts—Number of frames received that are smaller than the runt threshold. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • L3 incompletes—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. • L2 channel errors—Counter increments when the software could not find a valid logical interface for an incoming frame. • L2 mismatch timeouts—Count of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • SRAM errors—Number of hardware errors that occurred in the static RAM (SRAM) on the PIC. If the value in this field increments, the PIC is malfunctioning. • HS link CRC errors—Count of errors on the high-speed links between the ASICs responsible for handling the router interfaces. 	extensive
Output errors	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments quickly, (perhaps once every 10 seconds), the cable, the far-end system, or the PIC is malfunctioning. • 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 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 malfunctioning hardware. 	extensive

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
DS1 alarms	Media-specific 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.	detail extensive none
DS1 defects	Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router, or turn on the red or yellow alarm LED on the craft interface. <ul style="list-style-type: none"> • LOS—Loss of signal. • LOF—Loss of frame. • AIS—Alarm indication signal. • YLW—Yellow alarm. Indicates errors at the remote site receiver. 	
T1 media	Counts of T1 media-specific errors. <ul style="list-style-type: none"> • Seconds—Number of seconds the defect has been active. • Count—Number of times that the defect has gone from inactive to active. • State—State of the error. State other than OK indicates a problem. <p>The T1 media-specific error types can be:</p> <ul style="list-style-type: none"> • SEF—Severely errored framing • BEE—Bit error event • AIS—Alarm indication signal • LOF—Loss of frame • LOS—Loss of signal • YELLOW—Errors at the remote site receiver • BPV—Bipolar violation • EXZ—Excessive zeros • LCV—Line code violation • PCV—Pulse code violation • CS—Carrier state • LES—Line error seconds • ES—Errored seconds • SEFS—Severely errored framing seconds (section) • SES—Severely errored seconds • BES—Bit error seconds • UAS—Unavailable seconds 	extensive

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
DS3 media	<p>Counts of T3 media-specific errors. 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.</p> <ul style="list-style-type: none"> • PLL Lock—Phase-locked loop out of lock • Reframing—Frame alignment recovery time • AIS—Alarm indication signal • LOF—Loss of frame • LOS—Loss of signal • IDLE—Idle code detected • YELLOW—Remote defect indication • BPV—Bipolar violation • EXZ—Excessive zeros • LCV—Line code violation • PCV—Pulse code violation • CCV—C-bit coding violation • LES—Line error seconds • PES—P-bit errored seconds • PSES—P-bit errored seconds (section) • CES—C-bit errored seconds • CSES—C-bit severely errored seconds • SEFS—Severely errored framing seconds • UAS—Unavailable seconds 	extensive
HDLC configuration	<p>Information about the HDLC configuration.</p> <ul style="list-style-type: none"> • Giant threshold—Giant threshold programmed into the hardware. • Runt threshold—Runt threshold programmed into the hardware. • Timeslots—Configured time slots for the interface. • Byte encoding—Byte encoding used: Nx64K or Nx56K. • Data inversion—HDLC data inversion setting: Enabled or Disabled 	extensive
Interface transmit queues	<p>Name of the transmit queues and their associated statistics for each DS1 channel on the Channelized DS3-to-DS1 PIC.</p> <ul style="list-style-type: none"> • B/W—Queue bandwidth as a percentage of the total interface bandwidth. • WRR—Weighted round-robin (in percent). • Packets—Number of packets transmitted. • Bytes—Number of bytes transmitted. • Drops—Number of packets dropped. • Errors—Number of packet errors. 	extensive

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
DS1 or DS3 BERT configuration	<p>BERT (bit error rate test) checks the quality of the line. This output appears only when a BERT is run on the interface.</p> <ul style="list-style-type: none"> • BERT time period—Configured total time period that the BERT is to run. • Elapsed—Actual time elapsed since the start of the BERT (in seconds). • Induced error rate—Configured rate at which the bit errors are induced in the BERT pattern. • Algorithm—Type of algorithm selected for the BERT. 	detail extensive none
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> • Destination slot—FPC slot number. • PLP byte—Packet Level Protocol byte. 	extensive
CoS information	<p>Information about the CoS queue for the physical interface.</p> <ul style="list-style-type: none"> • CoS transmit queue—Queue number and its associated user-configured forwarding class name. • Bandwidth %—Percentage of bandwidth allocated to the queue. • Bandwidth bps—Bandwidth allocated to the queue (in bps). • Buffer %—Percentage of buffer space allocated to the queue. • Buffer usec—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • Priority—Queue priority: low or high. • Limit—Displayed if rate limiting is configured for the queue. Possible values are none and exact. If exact is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If none is configured, the queue transmits beyond the configured bandwidth if bandwidth is available. 	extensive
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Flags	Information about the logical interface; values are described in the “Logical Interface Flags” section under Common Output Fields Description.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Bandwidth	Bandwidth configured on the interface.	All levels
Protocol	Protocol family configured on the logical interface, such as iso , inet6 , mpls .	detail extensive none

Table 4: Channelized DS3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route table	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.	detail extensive
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	detail extensive none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	detail extensive none
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive none
Redundant Link	(LSQ redundancy) Backup link for Link Services IQ redundancy.	detail extensive none

Sample Output

```

show interfaces extensive (Channelized DS3-to-DS0) user@host> show interfaces ds-0/0/0:0:0 extensive
Physical interface: ds-0/0/0:0:0, Enabled, Physical link is Up
Interface index: 174, SNMP ifIndex: 4298, Generation: 177
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps, FCS: 16,
Mode: C/Bit parity, 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 : 280 (last seen 00:00:09 ago)
  Output: 286 (last sent 00:00:00 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Not-configured
Last flapped   : 2002-05-23 17:53:29 PDT (00:46:46 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes   :          6814          16 bps
  Output bytes  :         28840          72 bps
  Input packets:           568           0 pps
  Output packets:          893           0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 39, Policed discards: 0,

```

```

L3 incompletes: 0, L2 channel errors: 2, L2 mismatch timeouts: 0,
HS link CRC errors: 0
Output errors:
  Carrier transitions: 3, 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          5         1  OK
AIS          0         0  OK
LOF          0         0  OK
LOS          0         0  OK
YELLOW       17         1  OK
BPV          0         0
EXZ          0         0
LCV          5       27765
PCV          0         0
CS           0         0
LES          0
ES           0
SES          5
SEFS         10
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          1       65535
EXZ          1       65535
LCV          2     131070
PCV          1       1825
CCV          0         0
LES          1
PES          1
PSES         1
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       893     28840         0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : 1-10
  Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^15 - 1, Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:

```

```
Destination slot: 0, PLP byte: 2 (0x01)
CoS information:    CoS transmit queue      Bandwidth      Buffer
Priority  Limit
           %      bps    %      usec
0 best-effort      95      608000  95      0    low  none
3 network-control  5       32000   5      0    low  none
Logical interface ds-0/0/0:0:0.0 (Index 5) (SNMP ifIndex 4299)
(Generation 943)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 949, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 18.18.18.1, Local: 18.18.18.2, Broadcast: Unspecified,
Generation: 1849
```

show interfaces (Channelized DS3-to-DS1)

Syntax	<code>show interfaces t1-fpc/pic/port:t1channel</code> <brief detail extensive terse> <descriptions> <media> <snmp-index <i>snmp-index</i> > <statistics>
Release Information	Command introduced before Junos OS Release 7.4.
Description	(M Series and T Series routers only) Display status information about the specified channelized DS3-to-DS1 interface.
Options	<p>t1-fpc/pic/port:t1channel—Display standard information about the specified channelized DS3-to-DS1 interface.</p> <p>brief detail extensive terse—(Optional) Display brief interface information.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index <i>snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	show interfaces extensive (channelized DS3-to-DS1) on page 87
Output Fields	See the output field table for the show interfaces (Channelized DS3-to-DS0) command.

Sample Output

```

user@host> show interfaces t1-0/0/0:0 extensive
Physical interface: t1-0/0/0:0, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 14, Generation: 2977
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps,
  Loopback: None, FCS: 16, Mode: C/Bit parity, 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 : 30 (last seen 00:00:05 ago)
    Output: 29 (last sent 00:00:00 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  Last flapped   : 2002-05-23 17:30:12 PDT (17:29:43 ago)

```

Statistics last cleared: Never

Traffic statistics:

Input bytes :	944	16 bps
Output bytes :	1162	16 bps
Input packets:	66	0 pps
Output packets:	82	0 pps

Input errors:

Errors: 1, Drops: 0, Framing errors: 1, Policed discards: 8,
L3 incompletes: 0, L2 channel errors: 1, L2 mismatch timeouts: 0,
HS link CRC errors: 0, SRAM errors: 0

Output errors:

Carrier transitions: 3, 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	11	5	OK
AIS	28	1	OK
LOF	27	1	OK
LOS	0	0	OK
YELLOW	23	1	OK
BPV	0	0	
EXZ	0	0	
LCV	11	20574	
PCV	0	0	
CS	0	0	
LES	28		
ES	28		
SES	39		
SEFS	50		
BES	0		
UAS	0		

DS3 media:	Seconds	Count	State
PLL Lock	0	0	OK
Reframing	0	0	OK
AIS	0	0	OK
LOF	1	1	OK
LOS	1	1	OK
IDLE	0	0	OK
YELLOW	0	0	OK
BPV	2	131070	
EXZ	3	49910	
LCV	5	180980	
PCV	2	327	
CCV	12	264558	
LES	3		
PES	3		
PSES	2		
CES	13		
CSSES	13		
SEFS	1		
UAS	35		

Interface transmit queues:

	B/W	WRR	Packets	Bytes	Drops	Errors
Queue0	95	95	0	0	0	0
Queue1	5	5	82	1162	0	0

HDLC configuration:

Giant threshold: 1514, Runt threshold: 3
Timeslots : 1-10


```

Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^15 - 1, Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 2 (0x00) CoS information:
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                           %      bps      %      usec
0 best-effort             95      608000  95      0      low  none
3 network-control         5      32000   5      0      low  none
Logical interface t1-0/0/0:0.0 (Index 11) (SNMP ifIndex 23) (Generation 497)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Bandwidth: 0
Protocol inet, MTU: 1500, Generation: 576, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
  Destination: 21.21.21.2, Local: 21.21.21.1, Broadcast: Unspecified,
  Generation: 977

```

show interfaces (Channelized T3 IQ)

Syntax	<code>show interfaces (ct3-fpc/pic/port type-fpc/pic/port<:channel><:channel>)</code> <brief detail extensive terse> <descriptions> <media> <snmp-index <i>snmp-index</i> > <statistics>
Release Information	Command introduced before Junos OS Release 7.4.
Description	(M Series and T Series routers only) Display status information about the specified channelized T3 IQ interface.
Options	<p>type-fpc/pic/port:channel—Interface type. With optional corresponding channel levels, the interface type can be one of the following:</p> <ul style="list-style-type: none">• type-fpc/pic/port—For the physical channelized T3 IQ interface, type is ct3.• type-fpc/pic/port:channel—For the clear channel, type is t3. At the first level of channelization, type can be ct1 or t1.• type-fpc/pic/port:channel:channel—At the second level of channelization, type is ds. <p>brief detail extensive terse—(Optional) Display the specified level of output.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index <i>snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	show interfaces extensive (Channelized T3 IQ) (Physical) on page 91 show interfaces extensive (Channelized T1 on Channelized T3 IQ) on page 91 show interfaces extensive (DSO on Channelized T3 IQ) on page 91
Output Fields	See the output field table for the show interfaces (Channelized T1 IQ) command.

Sample Output

```

show interfaces extensive (Channelized T3 IQ) (Physical) user@host> show interfaces extensive ct3-0/0/1
Physical interface: ct3-0/0/1, Enabled, Physical link is Up
  Interface index: 30, SNMP ifIndex: 317, Generation: 29
  Link-level type: Controller, MTU: 4474, Clocking: Internal, Speed: T3,
  Loopback: None, FCS: 16, Mode: C/Bit parity, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  ...

show interfaces extensive (Channelized T1 on Channelized T3 IQ) user@host> show interfaces extensive ct1-0/0/1:2
Physical interface: ct1-0/0/1:2, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 1505, Generation: 174
  Link-level type: Controller, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Framing: ESF, Parent: ct3-0/0/1 (Index 32)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  ...

show interfaces extensive (DSO on Channelized T3 IQ) user@host> show interfaces extensive ds-0/0/1:2:1
Physical interface: ds-0/0/1:2:1, Enabled, Physical link is Up
  Interface index: 176, SNMP ifIndex: 1563, Generation: 175
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps,
  Loopback: None, FCS: 16, Parent: ct1-0/0/1:2(Index 175)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  ...

```

show interfaces (T1, E1, or DS)

Syntax	<code>show interfaces <i>interface-type</i></code> <code><brief detail extensive terse></code> <code><descriptions></code> <code><media></code> <code><snmp-index <i>snmp-index</i>></code> <code><statistics></code>
Release Information	Command introduced before Junos OS Release 7.4.
Description	Display status information about the specified T1, E1, or DS interface.
Options	<p><i>interface-type</i>—On ACX Series, M Series, MX Series, and T Series routers, the T1 interface type is <i>t1-fpc/pic/port</i>, whereas the E1 interface type is <i>e1-fpc/pic/port</i>, and DS interface type is <i>ds-fpc/pic/port:<channel></i>. On the J Series routers, the T1 interface type is <i>t1-pim/O/port</i>, whereas the E1 interface type is <i>e1-pim/O/port</i>.</p> <p>brief detail extensive terse—(Optional) Display the specified level of output.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index <i>snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• Understanding Interfaces on ACX Series Universal Access Routers
List of Sample Output	show interfaces (T1, IMA Link) on page 104 show interfaces (T1, PPP) on page 104 show interfaces detail (T1, PPP) on page 105 show interfaces extensive (T1 CRC Errors) on page 106 show interfaces extensive (T1, PPP) on page 106 show interfaces (E1, Frame Relay) on page 108 show interfaces detail (E1, Frame Relay) on page 108 show interfaces extensive (E1, Frame Relay) on page 110 show interfaces (E1, IMA Link) on page 112 show interfaces extensive (T1, TDM-CCC-SATOP) on page 112 show interfaces extensive (DS, TDM-CCC-CESoPSN) on page 114
Output Fields	Table 5 on page 93 lists the output fields for the show interfaces (T1 or E1) command. Output fields are listed in the approximate order in which they appear.

Table 5: T1 or E1 show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under Common Output Fields Description.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source: Internal or External .	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Whether loopback is enabled and the type of loopback (local or remote).	All levels
FCS	Frame check sequence on the interface (either 16 or 32). The default is 16 bits.	All levels
Framing	Physical layer framing format used for the E1 interface on the link: G704 , G704-NO-CRC4 , or Unframed . The default is G704 . Physical layer framing format used for the T1 interface on the link: SF and ESF . The default is ESF .	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels
Link flags	Information about the link. Possible values are described in the “Link Flags” section under Common Output Fields Description.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
IMA Link alarms	Current active IMA link alarms, including the following: <ul style="list-style-type: none"> • LIF • LODS • RFI-IMA • Tx-Mis-Connected • Tx-Unusable-FE • Rx-Unusable-FE • Link Fault 	detail extensive none
IMA Link defects	Current active IMA link defects, including the following: <ul style="list-style-type: none"> • LIF • LODS • RFI-IMA • Tx-Mis-Connected • Tx-Unusable-FE • Rx-Unusable-FE • Link Fault 	detail extensive none
IMA Link state	Current active IMA link status, including the following: <ul style="list-style-type: none"> • Line: synchronized or not synchronized • Near end:—Status of near-end receive and transmit links <ul style="list-style-type: none"> • Rx: Usable or Unusable • Tx: Usable or Unusable • Far end:—Status of far-end receive and transmit links <ul style="list-style-type: none"> • Rx: Usable or Unusable • Tx: Usable or Unusable 	detail extensive none

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
IMA link media	<p>IMA Link Media Status, which provides the seconds and count state for the following link media parameters:</p> <ul style="list-style-type: none"> • LIF • LODS • Err-ICP • IV • Rx-FC • Tx-FC • FE-Defects • FE-Rx-FC • FE-Tx-FC • Rx-ICP • Rx-Stuff • Tx-ICP • Tx-Stuff • Rx-SES • Rx-UAS • Rx-UUS • Tx-UUS • FE-Rx-SES • FE-Rx-UAS • FE-Rx-UUS • FE-Tx-UUS 	detail extensive none
Keepalive settings	<p>(PPP and HDLC) Configured settings for keepalives.</p> <ul style="list-style-type: none"> • interval seconds—The time in seconds between successive keepalive requests. The range is 10 seconds through 32,767 seconds, with a default of 10 seconds. • down-count number—The number of keepalive packets a destination must fail to receive before the network takes a link down. The range is 1 through 255, with a default of 3. • up-count number—The number of keepalive packets a destination must receive to change a link's status from down to up. The range is 1 through 255, with a default of 1. 	detail extensive none
Keepalive statistics	<p>(PPP and HDLC) Information about keepalive packets. (When no level of output is specified, the word statistics is not part of the field name and the last seen text is not displayed.)</p> <ul style="list-style-type: none"> • Input—Number of keepalive packets received by PPP. <ul style="list-style-type: none"> • (last seen 00:00:00 ago)—Time since the last keepalive packet was received, in the format hh:mm:ss. • Output—Number of keepalive packets sent by PPP and how long ago the last keepalive packets were sent and received. <ul style="list-style-type: none"> • (last seen 00:00:00 ago)—Time since the last keepalive packet was sent, in the format hh:mm:ss. 	detail extensive none

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
LMI settings	<p>(Frame Relay) Settings for Local Management Interface (LMI) which can be either ANSI LMI settings or ITU LMI settings. ANSI LMI settings is the default. The format is (ANSI or ITU) LMI settings: value, value... xx seconds, where <i>value</i> can be:</p> <ul style="list-style-type: none"> • n391dte—DTE full status polling interval (1–255) • n392dce—DCE error threshold (1–10) • n392dte—DTE error threshold (1–10) • n393dce—DCE monitored event count (1–10) • n393dte—DTE monitored event count (1–10) • t391dte—DTE polling timer (5–30 seconds) • t392dce—DCE polling verification timer (5–30 seconds) 	detail extensive none
LMI	<p>(Frame Relay) Local Management Interface (LMI) packet statistics:</p> <ul style="list-style-type: none"> • Input—Number of packets coming in on the interface (<i>nn</i>) and how much time has passed since the last packet arrived. The format is Input: nn (last seen hh:mm:ss ago). • Output—Number of packets sent out on the interface (<i>nn</i>) and how much time has passed since the last packet was sent. The format is Output: nn (last sent hh:mm:ss ago). 	detail extensive none
DTE statistics	<p>(Frame Relay) Statistics about messages transmitted from the data terminal equipment (DTE) to the data communications equipment (DCE):</p> <ul style="list-style-type: none"> • Enquiries sent—Number of link status enquiries sent from the DTE to the DCE. • Full enquiries sent—Number of full enquiries sent from the DTE to the DCE. • Enquiry responses received—Number of enquiry responses received by the DTE from the DCE. • Full enquiry responses received—Number of full enquiry responses sent from the DTE to the DCE. 	detail extensive none
DCE statistics	<p>(Frame Relay) Statistics about messages transmitted from the DCE to the DTE:</p> <ul style="list-style-type: none"> • Enquiries received—Number of enquiries received by the DCE from the DTE. • Full enquiries received—Number of full enquiries received by the DCE from the DTE. • Enquiry responses sent—Number of enquiry responses sent from the DCE to the DTE. • Full enquiry responses sent—Number of full enquiry responses sent from the DCE to the DTE. 	detail extensive none

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Common statistics	(Frame Relay) Statistics about messages sent between the DTE and the DCE: <ul style="list-style-type: none"> • Unknown messages received—Number of received packets that do not fall into any category. • Asynchronous updates received—Number of link status peer changes received. • Out-of-sequence packets received—Number of packets for which the sequence of the packets received is different from the expected sequence. • Keepalive responses timedout—Number of keepalive responses that timed out when no Local Management Interface (LMI) packet was reported for <code>n392dte</code> or <code>n393dce</code> intervals. (See LMI settings.) 	detail extensive none
Nonmatching DCE-end DLCIs	(Frame Relay. Displayed only from the DTE.) Number of DLCIs configured from the DCE.	detail extensive none
LCP state	(PPP) Link Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—LCP negotiation is incomplete (not yet completed or has failed). • Not configured—LCP is not configured on the interface. • Opened—LCP negotiation is successful. 	detail extensive none
NCP state	(PPP) Network Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—NCP negotiation is incomplete (not yet completed or has failed). • Not configured—NCP is not configured on the interface. • Opened—NCP negotiation is successful. 	detail extensive none
CHAP state	(PPP) State of the Challenge Handshake Authentication Protocol (CHAP) during its transaction. <ul style="list-style-type: none"> • Chap-Chal-received—Challenge was received but response is not yet sent. • Chap-Chal-sent—Challenge was sent. • Chap-Resp-received—Response was received for the challenge sent, but CHAP has not yet moved into the Success state. (Most likely with RADIUS authentication.) • Chap-Resp-sent—Response was sent for the challenge received. • Down—CHAP authentication is incomplete (not yet completed or has failed). • Not-configured—CHAP is not configured on the interface. • Opened—CHAP authentication was successful. 	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: year-month-day hour:minute:second timezone (hour:minute:second ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
CoS Queues	Number of CoS queues configured.	detail extensive none
Input rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface • Output packets—Number of packets transmitted on the interface. 	detail extensive
Input errors	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input 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. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • L3 incompletes—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. • L2 channel errors—Number of times the software did not find a valid logical interface for an incoming frame. • L2 mismatch timeouts—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • HS link CRC errors—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • SRAM errors—Number of hardware errors that occurred in the static RAM (SRAM) on the PIC or PIM. If the value of this field increments, the PIC or PIM is malfunctioning. • Resource errors—Sum of transmit drops. 	extensive

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Output errors	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • 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 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 malfunctioning hardware. • MTU errors—Number of packets whose size exceeded the MTU of the interface. • Resource errors—Sum of transmit drops. 	extensive
Queue counters	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	detail extensive
DS1 alarms DS1 defects	<p>E1 media-specific defects that can prevent the interface from passing 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 turn on the red or yellow alarm LED on the craft interface. The following lists all possible alarms and defects. For complete explanations of most of these alarms and defects, see <i>Belcore Telcordia GR-499-CORE</i>.</p> <ul style="list-style-type: none"> • AIS—Alarm indication signal. • LOF—Loss of frame. • LOS—Loss of signal. • YLW—Yellow alarm. Indicates errors at the remote site receiver. 	detail extensive none

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
T1 media or E1 media	<p>Counts of T1 or E1 media-specific errors.</p> <ul style="list-style-type: none"> • Seconds—Number of seconds the defect has been active. • Count—Number of times that the defect has gone from inactive to active. • State—State of the error. State other than OK indicates a problem. The T1 or E1 media-specific error types are: • SEF—Severely errored framing • BEE—Bit error • AIS—Alarm indication signal • LOF—Loss of frame • LOS—Loss of signal • YELLOW—Errors at the remote site receiver • CRC Major—Cyclic redundancy check major alarm threshold exceeded • CRC Minor—Cyclic redundancy check minor alarm threshold exceeded • BPV—Bipolar violation • EXZ—Excessive zeros • LCV—Line code violation • PCV—Pulse code violation • CS—Carrier state • CRC—Cyclic redundancy check • FEBE—Far-end block error (E1 only) • LES—Line error seconds • ES—Errored seconds • BES—Bursty errored seconds • SES—Severely errored seconds • SEFS—Severely errored framing seconds • UAS—Unavailable seconds 	extensive
SAToP Configuration	<p>Information about the SAToP configuration.</p> <ul style="list-style-type: none"> • payload-size—Configure the payload size, in bytes (from 32 through 1024 bytes). • idle-pattern—An 8-bit hexadecimal pattern to replace TDM data in a lost packet (from 0 through 255). • jitter-buffer-packets—Number of packets in the jitter buffer (from 1 through 64 packets). • jitter-buffer-latency—Time delay in the jitter buffer (from 1 through 1000 milliseconds). • excessive-packet-loss-rate—Set packet loss options. The options are groups, sample-period, and threshold. • sample-period—Time required to calculate excessive packet loss rate (from 1000 through 65,535 milliseconds). • threshold—Percentile designating the threshold of excessive packet loss rate (1–100 percent). 	extensive

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
CESoPSN Configuration	<p>Information about the CESoPSN configuration.</p> <ul style="list-style-type: none"> • packetization-latency—Time required to create packets (from 1000 through 8000 microseconds). • idle-pattern—An 8-bit hexadecimal pattern to replace TDM data in a lost packet (from 0 through 255). • jitter-buffer-packets—Number of packets in the jitter buffer (from 1 through 64 packets). • jitter-buffer-latency—Time delay in the jitter buffer (from 1 through 1000 milliseconds). • excessive-packet-loss-rate—Set packet loss options. The options are sample-period and threshold. • sample-period—Time required to calculate excessive packet loss rate (from 1000 through 65,535 milliseconds). • threshold—Percentile designating the threshold of excessive packet loss rate (1–100 percent). 	extensive
HDLC configuration	<p>Information about the HDLC configuration.</p> <ul style="list-style-type: none"> • Policing bucket—Configured state of the receiving policer. • Shaping bucket—Configured state of the transmitting shaper. • Giant threshold—Giant threshold programmed into the hardware. • Runt threshold—Runt threshold programmed into the hardware. • Timeslots—Time slots configured on the interface. • Buildout—(T1 only) Buildout setting: 0-132, 133-265, 266-398, 399-531, or 532-655 feet. • Timeslots—Configured time slots for the interface. • Byte encoding—(T1 only) Byte encoding used: Nx64K or Nx56K. • Line encoding—Line encoding used. For T1, the value can be B8ZS or AMI. For E1, the value is HDB3. • Data inversion—HDLC data inversion setting: Enabled or Disabled. • Idle cycle flag—Idle cycle flags. • Start end flag—Start and end flag. 	extensive
DS1 BERT configuration	<p>BERT (bit error rate test) checks the quality of the line. This output appears only when a BERT is run on the interface.</p> <ul style="list-style-type: none"> • BERT time period—Configured total time period that the BERT is to run. • Elapsed—Actual time elapsed since the start of the BERT (in seconds). • Induced error rate—Configured rate at which the bit errors are induced in the BERT pattern. • Algorithm—Type of algorithm selected for the BERT. 	detail extensive none
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> • Destination slot—FPC slot number. • PLP byte—Packet Level Protocol byte. 	extensive

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
CoS information	<p>Information about the CoS queue for the physical interface.</p> <ul style="list-style-type: none"> • CoS transmit queue—Queue number and its associated user-configured forwarding class name. • Bandwidth %—Percentage of bandwidth allocated to the queue. • Bandwidth bps—Bandwidth allocated to the queue (in bps). • Buffer %—Percentage of buffer space allocated to the queue. • Buffer usec—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • Priority—Queue priority: low or high. • Limit—Displayed if rate limiting is configured for the queue. Possible values are none and exact. If exact is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If none is configured, the queue transmits beyond the configured bandwidth if bandwidth is available. 	extensive
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Input packets	Number of packets received on the logical interface.	None specified
Output packets	Number of packets transmitted on the logical interface.	None specified
Traffic statistics	<p>(Frame Relay) Number and rate of bytes and packets received and transmitted on the logical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	detail extensive
Local statistics	(Frame Relay) Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes a while (generally, less than 1 second) for this counter to stabilize.	detail extensive

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Transit statistics	(Frame Relay) Statistics for traffic transiting the router. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. This counter normally stabilizes in less than 1 second.	detail extensive
Protocol	Protocol family configured on the logical interface, such as iso , inet6 , mlfr , or mpls .	detail extensive none
Multilink bundle	Interface name for the multilink bundle, if configured.	detail extensive none
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route table	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0 .	detail extensive
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	detail extensive none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	detail extensive none
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive none
DLCI	<p>(Frame Relay) DLCI number of the logical interface. The following DLCI information is displayed: Flags, Total down time, Last down, and Traffic statistics or (Input packets, Output packets). Flags can be one or more of the following:</p> <ul style="list-style-type: none"> • Active—Set when the link is active and the DTE and DCE are exchanging information. • Down—Set when the link is active, but no information is received from the DCE. • DCE-Unconfigured—Set when the corresponding DLCI in the DCE is not configured. • Configured—Set when the corresponding DLCI in the DCE is configured. • DCE-configured—Displayed when the command is issued from the DTE. 	detail extensive none
DLCI statistics	<p>(Frame Relay) Data-link connection identifier (DLCI) statistics.</p> <ul style="list-style-type: none"> • Active DLCI—Number of active DLCIs. • Inactive DLCI—Number of inactive DLCIs. 	detail extensive none

Table 5: T1 or E1 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
CE Info	<p>Information related to the circuit emulation statistics.</p> <ul style="list-style-type: none"> • CE Tx—Number of transmitted packets and bytes (TDM to PSN flow). • CE Rx—Number of received packets and bytes and forward bytes (PSN to TDM flow). • CE Rx Forwarded—Number of forwarded bytes. • CE Strayed—Number of stray packets. • CE Lost—Number of lost packets. • CE Malformed—Number of malformed packets • CE Misinserted—Number of misinserted packets. • CE AIS dropped—Number of dropped bytes due to buffer overrun (PSN to TDM). • CE Dropped—Number of dropped packets during resynchronization • CE Overrun Events—Number of overrun events. • CE Underrun Events—Number of underrun events. 	extensive

Sample Output

```

show interfaces (T1, IMA Link) user@host> show interfaces t1-1/0/0
IMA Link alarms      : None
IMA Link defects     : LIF, LODS
IMA Link state:
  Line      : Not synchronized
  Near end  : Rx: Unusable, Tx: Usable
  Far end   : Rx: Unusable, Tx: Usable
IMA link media:      Seconds      Count  State
LIF                  0           0      OK
LODS                  0           0      OK
Err-ICP              0           0      OK
IV                    0           0      OK
Rx-FC                 0           0      OK
Tx-FC                 0           0      OK
FE-Defects           0           0
FE-Rx-FC             0           0
FE-Tx-FC             0           0
Rx-ICP               0           0
Rx-Stuff             0           0
Tx-ICP              11           0
Tx-Stuff             0           0
Rx-SES                0
Rx-UAS                0
Rx-UUS                1
Tx-UUS                0
FE-Rx-SES            0
FE-Rx-UAS            0
FE-Rx-UUS            0
FE-Tx-UUS            0

show interfaces (T1, PPP) user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
Interface index: 149, SNMP ifIndex: 45
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,

```



```

Loopback: None, FCS: 16, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 0 (never), Output: 0 (never)
LCP state: Opened
NCP state: Opened
CHAP state: Opened
CoS queues : 4 supported, 4 in use
Last flapped : 2005-12-05 08:43:06 PST (02:13:35 ago)
Input rate : 0 bps (0 pps)
Output rate : 72 bps (0 pps)
DS1 alarms : None
DS1 defects : None

Logical interface t1-1/1/0.0 (Index 66) (SNMP ifIndex 51)
Flags: Hardware-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: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255

```

show interfaces detail
(T1, PPP)

```

user@host> show interfaces t1-1/1/0 detail
Physical interface: t1-1/1/0, Enabled, Physical link is Up
Interface index: 149, SNMP ifIndex: 45, Generation: 32
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
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 : 0 (last seen: never)
  Output: 0 (last sent: never)
LCP state: Opened
NCP state: Opened
CHAP state: Opened
CoS queues : 4 supported, 4 in use
Last flapped : 2005-12-05 08:43:06 PST (02:13:52 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes : 0 0 bps
  Output bytes : 798 0 bps
  Input packets: 0 0 pps
  Output packets: 42 0 pps
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     40         40         0

DS1 alarms : None
DS1 defects : None
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds

```

```

Induced Error rate: 10e-0, Algorithm: 2^15 - 1
Logical interface t1-1/1/0.0 (Index 66) (SNMP ifIndex 51) (Generation 5)
Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 14, Route table: 0
Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,
Generation: 18

```

**show interfaces
extensive (T1 CRC
Errors)**

```

user@host> show interfaces t1-3/2/0:1:1 extensive
Physical interface: t1-3/2/0:1:1, Enabled, Physical link is Down
Interface index: 179, SNMP ifIndex: 79, Generation: 180
:
:
DS1  alarms   : AIS, LOF, CRC Major, CRC Minor
DS1  defects  : AIS, LOF, CRC Major, CRC Minor
T1 media:      Seconds      Count   State
SEF              1           1   OK
BEE              1           1   OK
AIS             1128          1 Defect Active
LOF             1128          1 Defect Active
LOS              0           0   OK
YELLOW           0           0   OK
CRC Major        154          1 Defect Active
CRC Minor        154          1 Defect Active
BPV              0           0
EXZ              0           0
LCV              0           0
PCV              0           0
CS               0           0
CRC             154          15400
...

```

**show interfaces
extensive (T1, PPP)**

```

user@host> show interfaces t1-1/1/0 extensive
Physical interface: t1-1/1/0, Enabled, Physical link is Up
Interface index: 149, SNMP ifIndex: 45, Generation: 32
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
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 : 0 (last seen: never)
  Output: 0 (last sent: never)
LCP state: Down
NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Closed
CoS queues   : 4 supported, 4 in use
Last flapped : 2005-12-05 08:43:06 PST (02:13:54 ago)
Statistics last cleared: Never
Traffic statistics:
Input bytes :           0           0 bps
Output bytes :          817          72 bps
Input packets:           0           0 pps
Output packets:          43          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, Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,

Resource errors: 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     42             42             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      1 OK
  BPV          1      1
  EXZ          1      1
  LCV          1     65535
  PCV          1     1023
  CS           0      0
  LES          1
  ES           1
  SES          1
  SEFS         1
  BES          0
  UAS          0

HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS
  Buildout       : 0 to 132 feet
  Byte encoding: Nx64K, 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
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 1 (0x00)
CoS information:
  CoS transmit queue  Bandwidth      Buffer  Priority  Limit
                       %      bps      %      usec
  0 best-effort      95     1459200  95      0      low  none
  3 network-control  5      76800   5      0      low  none

Logical interface t1-1/1/0.0 (Index 66) (SNMP ifIndex 51) (Generation 5)
Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 14, Route table: 0
Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary

```

Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,
Generation: 18

**show interfaces
(E1, Frame Relay)**

```
user@host> show interfaces e1-3/0/0
Physical interface: e1-3/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 37
  Link-level type: Frame-Relay, MTU: 1504, Clocking: Internal, Speed: E1,
  Loopback: None, FCS: 16, Framing: G704
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives DTE
  ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
  LMI: Input: 0 (never), Output: 11 (00:00:05 ago)
  DTE statistics:
    Enquiries sent           : 10
    Full enquiries sent      : 1
    Enquiry responses received : 0
    Full enquiry responses received : 0
  DCE statistics:
    Enquiries received       : 0
    Full enquiries received   : 0
    Enquiry responses sent    : 0
    Full enquiry responses sent : 0
  Common statistics:
    Unknown messages received : 0
    Asynchronous updates received : 0
    Out-of-sequence packets received : 0
    Keepalive responses timedout : 1
  CoS queues   : 8 supported
  Last flapped : 2005-11-30 14:50:34 PST (4d 20:33 ago)
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  DS1 alarms    : None
  DS1 defects   : None
  Logical interface e1-3/0/0.0 (Index 72) (SNMP ifIndex 32)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: FR-NLPID
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 1500
    Flags: None
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 10.1.3/24, Local: 10.1.3.1, Broadcast: 10.1.3.255
  DLCI 100
    Flags: Down, DCE-Unconfigured
    Total down time: 00:01:13 sec, Last down: 00:01:13 ago
    Input packets : 0
    Output packets: 0
  DLCI statistics:
    Active DLCI :0 Inactive DLCI :1
```

**show interfaces detail
(E1, Frame Relay)**

```
user@host> show interfaces e1-3/0/0 detail
Physical interface: e1-3/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 37, Generation: 69
  Link-level type: Frame-Relay, MTU: 1504, Clocking: Internal, Speed: E1,
  Loopback: None, FCS: 16, Framing: G704
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives DTE
  Hold-times     : Up 0 ms, Down 0 ms
  ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
  LMI statistics:
```

```

Input : 0 (last seen: never)
Output: 12 (last sent 00:00:02 ago)
DTE statistics:
  Enquiries sent           : 10
  Full enquiries sent      : 2
  Enquiry responses received : 0
  Full enquiry responses received : 0
DCE statistics:
  Enquiries received       : 0
  Full enquiries received  : 0
  Enquiry responses sent   : 0
  Full enquiry responses sent : 0
Common statistics:
  Unknown messages received : 0
  Asynchronous updates received : 0
  Out-of-sequence packets received : 0
  Keepalive responses timedout : 1
CoS queues : 8 supported
Last flapped : 2005-11-30 14:50:34 PST (4d 20:33 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes : 0 0 bps
  Output bytes : 225 56 bps
  Input packets: 0 0 pps
  Output packets: 15 0 pps
Queue counters:
  Queued packets  Transmitted packets  Dropped packets

0 limited          0          0          0

1 expedited-fo     0          0          0

2 real-plus        0          0          0

3 network-cont     15         15          0

DS1  alarms : None
DS1  defects : None
DS1 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 e1-3/0/0.0 (Index 72) (SNMP ifIndex 32) (Generation 26)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: FR-NLPID
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: 1500, Generation: 32, Route table: 0
Flags: None
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.1.3/24, Local: 10.1.3.1, Broadcast: 10.1.3.255,

```

**show interfaces
extensive
(E1, Frame Relay)**

```

    Generation: 42
    DLCI 100
    Flags: Down, DCE-Unconfigured
    Total down time: 00:01:18 sec, Last down: 00:01:18 ago
    Traffic statistics:
      Input bytes : 0
      Output bytes : 0
      Input packets: 0
      Output packets: 0
    DLCI statistics:
      Active DLCI :0 Inactive DLCI :1

user@host> show interfaces e1-3/0/0 extensive
Physical interface: e1-3/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 37, Generation: 69
  Link-level type: Frame-Relay, MTU: 1504, Clocking: Internal, Speed: E1,
  Loopback: None, FCS: 16, Framing: G704
  Device flags : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps 16384
  Link flags : Keepalives DTE
  Hold-times : Up 0 ms, Down 0 ms
  ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
  LMI statistics:
    Input : 0 (last seen: never)
    Output: 12 (last sent 00:00:05 ago)
  DTE statistics:
    Enquiries sent : 10
    Full enquiries sent : 2
    Enquiry responses received : 0
    Full enquiry responses received : 0
  DCE statistics:
    Enquiries received : 0
    Full enquiries received : 0
    Enquiry responses sent : 0
    Full enquiry responses sent : 0
  Common statistics:
    Unknown messages received : 0
    Asynchronous updates received : 0
    Out-of-sequence packets received : 0
    Keepalive responses timeout : 1
  CoS queues : 8 supported
  Last flapped : 2005-11-30 14:50:34 PST (4d 20:33 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes : 0 0 bps
    Output bytes : 225 0 bps
    Input packets: 0 0 pps
    Output packets: 15 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, Resource errors: 0
  Output errors:
    Carrier transitions: 17, Errors: 0, Drops: 0, Aged packets: 0,
    MTU errors: 0, Resource errors: 0
  Queue counters:
    Queued packets Transmitted packets Dropped packets

    0 limited 0 0 0
    1 expedited-fo 0 0 0

```

```

2 real-plus          0          0          0

3 network-cont       15         15         0

DS1  alarms   : None
DS1  defects  : None
E1   media:
Seconds      Count  State
SEF          0       0  OK
BEE          5       5  OK
AIS          0       0  OK
LOF         245      15  OK
LOS         245       4  OK
YELLOW       0      11  OK
BPV          0       0
EXZ          9       9
LCV          0       0
PCV          0       0
CS           0       0
FEBE         0       0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS         271

HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 1506, Runt threshold: 0
Timeslots      : All active
Line encoding: HDB3, 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: 3, PLP byte: 1 (0x00)
CoS information:
CoS transmit queue    Bandwidth      Buffer  Priority  Limit
                    %      bps      %      usec
0 limited             95    1945600  95       0      low  none
3 network-control     5     102400   5       0      low  none
Logical interface e1-3/0/0.0 (Index 72) (SNMP ifIndex 32) (Generation 26)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: FR-NLPID
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: 1500, Generation: 32, Route table: 0
Flags: None

```

```

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 10.1.3/24, Local: 10.1.3.1, Broadcast: 10.1.3.255,
Generation: 42
DLCI 100
Flags: Down, DCE-Unconfigured
Total down time: 00:01:21 sec, Last down: 00:01:21 ago
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
DLCI statistics:
Active DLCI :0 Inactive DLCI :1

```

**show interfaces (E1,
IMA Link)**

```

user@host> show interfaces e1-1/0/0
IMA Link alarms : None
IMA Link defects : LIF, LODS
IMA Link state:
Line : Not synchronized
Near end : Rx: Unusable, Tx: Usable
Far end : Rx: Unusable, Tx: Usable
IMA link media:
Seconds Count State
LIF 0
LODS 0
Err-ICP 0
IV 0
Rx-FC 0
Tx-FC 0
FE-Defects 0
FE-Rx-FC 0
FE-Tx-FC 0
Rx-ICP 0
Rx-Stuff 0
Tx-ICP 11
Tx-Stuff 0
Rx-SES 0
Rx-UAS 0
Rx-UUS 1
Tx-UUS 0
FE-Rx-SES 0
FE-Rx-UAS 0
FE-Rx-UUS 0
FE-Tx-UUS 0

```

**show interfaces
extensive (T1,
TDM-CCC-SATOP)**

```

user@host>show interfaces t1-1/0/0:1:1 extensive
Physical interface: t1-1/0/0:1:1, Enabled, Physical link is Down
Interface index: 153, SNMP ifIndex: 579, Generation: 817
Link-level type: TDM-CCC-SATOP, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 16, Framing: ESF,
Parent: coc1-1/0/0:1 Interface index 152
Device flags : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps Internal: 0x0
Link flags : None
Hold-times : Up 0 ms, Down 0 ms
CoS queues : 8 supported, 8 maximum usable queues
Last flapped : 2012-10-28 02:12:40 PDT (22:32:13 ago)
Statistics last cleared: 2012-10-29 00:44:52 PDT (00:00:01 ago)
Egress queues: 8 supported, 4 in use
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          0          0          0

Queue number:           Mapped forwarding classes
0                       best-effort
1                       expedited-forwarding
2                       assured-forwarding
3                       network-control

DS1  alarms   : None
DS1  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
CRC Major    0           0  OK
CRC Minor    0           0  OK
BPV          0           0
EXZ          0           0
LCV          0           0
PCV          0           0
CS           0           0
CRC          0           0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS          0

SAtop configuration:
Payload size: 192
Idle pattern: 0xFF
Octet aligned: Disabled
Jitter buffer: packets: 8, latency: 7 ms, auto adjust: Disabled
Excessive packet loss rate: sample period: 10000 ms, threshold: 30%

DS1 BERT configuration:
BERT time period: 10 seconds, Elapsed: 0 seconds
Induced Error rate: 0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)

SONET alarms   : None
SONET defects  : AIS-V, RDI-V
SONET vt:
BIP-BIP2       0           0
REI-V          0           0
LOP-V          0           0  OK
AIS-V          2           0  Defect Active
RDI-V          2           0  Defect Active
UNEQ-V         0           0  OK
PLM-V          0           0  OK
ES-V           0
SES-V          0
UAS-V          2
ES-VFE         0
SES-VFE        0
UAS-VFE        0

Received SONET overhead:

```

```

V5      : 0x07
V5(cmp) : 0x02
Transmitted SONET overhead:
V5      : 0x02
Packet Forwarding Engine configuration:
  Destination slot: 1
  CoS information:
    Direction : Output
    CoS transmit queue      Bandwidth      Buffer Priority
Limit
    0 best-effort           95             1459200    95             0             low
none
    3 network-control       5             76800     5             0             low
none

Logical interface tl-1/0/0:1:1.0 (Index 69) (SNMP ifIndex 580) (Generation 525)

  Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: TDM-CCC-SATOP
CE info      Packets      Bytes Count
CE Tx        1005         192960
CE Rx        1004         192768
CE Rx Forwarded      0
CE Strayed           0
CE Lost              0
CE Malformed         0
CE Misinserted       0
CE AIS dropped       0
CE Dropped           1005      192960
CE Overrun Events    0
CE Underrun Events   0
Protocol ccc, MTU: 1504, Generation: 814, Route table: 0
Flags: Is-Primary

```

```

show interfaces extensive (DS, TDM-CCC-CESoPSN) user@host>show interfaces ds-1/0/0:1:1 extensive
Physical interface: ds-1/0/0:1:1, Enabled, Physical link is Down
  Interface index: 154, SNMP ifIndex: 597, Generation: 819
  Link-level type: TDM-CCC-CESoPSN, MTU: 1504, Speed: 1536kbps, Loopback: None,
  FCS: 16, Parent: ct1-1/0/0:1:1 Interface index 153
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps Internal: 0x0
  Link flags     : None
  Hold-times    : Up 0 ms, Down 0 ms
  CoS queues    : 8 supported, 8 maximum usable queues
  Last flapped  : 2012-10-29 00:49:03 PDT (00:00:35 ago)
  Statistics last cleared: Never
  Egress queues: 8 supported, 4 in use
  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     0              0              0

Queue number:      Mapped forwarding classes
0                  best-effort
1                  expedited-forwarding
2                  assured-forwarding

```

```

3                               network-control
CESoPSN configuration:
  Packetization latency: 1000 us
  Idle pattern: 0xFF
  Jitter buffer: packets: 8, latency: 8 ms, auto adjust: Disabled
  Excessive packet loss rate: sample period: 10000 ms, threshold: 30%
DSO BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1
CoS information:
  Direction : Output
  CoS transmit queue          Bandwidth          Buffer Priority
Limit
                                %          bps          %          usec
0 best-effort                 95          1459200      95          0          low
none
3 network-control             5           76800       5           0          low
none

Logical interface ds-1/0/0:1:1:1.0 (Index 69) (SNMP ifIndex 598) (Generation
549)
  Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: TDM-CCC-CESoPSN
CE info          Packets          Bytes Count
CE Tx              0              0
CE Rx             35712          6856704
CE Rx Forwarded    0
CE Strayed         0
CE Lost            0
CE Malformed       0
CE Misinserted     0
CE AIS dropped     0
CE Dropped         0          0
CE Overrun Events  0
CE Underrun Events 1
Protocol ccc, MTU: 1504, Generation: 857, Route table: 0
  Flags: Is-Primary

```

show interfaces (Channelized T1 IQ)

Syntax	<pre>show interfaces (ct1-fpc/pic/port type-fpc/pic/port<:channel><:channel>) <brief detail extensive terse> <descriptions> <media> <snmp-index snmp-index> <statistics></pre>
Release Information	Command introduced in Junos OS Release 7.4.
Description	(M Series and T Series routers only) Display status information about the specified channelized T1 IQ interface.
Options	<p>type-fpc/pic/port:channel—Interface type. With optional corresponding channel levels, the interface type can be one of the following:</p> <ul style="list-style-type: none"> type-fpc/pic/port—For the physical channelized T1 IQ interface, type is ct1. type-fpc/pic/port:channel—For the clear channel, type is t1. At the first level of channelization, type can be ct1 or t1. type-fpc/pic/port:channel:channel—At the second level of channelization, type can be ds. <p>brief detail extensive terse—(Optional) Display the specified level of output.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index snmp-index—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	<p>show interfaces extensive (CT1) on page 124</p> <p>show interfaces extensive (T1) on page 125</p> <p>show interfaces extensive (DS0) on page 126</p>
Output Fields	Table 6 on page 116 lists the output fields for the show interfaces (Channelized T1 IQ and T3 IQ interfaces) command. Output fields are listed in the approximate order in which they appear.

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under Common Output Fields Description.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source. It can be Internal or External .	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Whether loopback is enabled and the type of loopback (local or remote).	All levels
FCS	Frame check sequence on the interface (either 16 or 32). The default is 16 bits.	All levels
Framing	Physical layer framing format used on the link. It can be ESF or SF . The default is ESF .	All levels
Parent	Name and interface index of the interface to which a particular child interface belongs. None indicates that this interface is the top level.	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels
Link flags	Information about the link. Possible values are described in the “Link Flags” section under Common Output Fields Description.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Keepalive settings	Configured settings for keepalives. <ul style="list-style-type: none"> interval seconds—The time in seconds between successive keepalive requests. The range is 10 seconds through 32,767 seconds, with a default of 10 seconds. down-count number—The number of keepalive packets a destination must fail to receive before the network takes a link down. The range is 1 through 255, with a default of 3. up-count number—The number of keepalive packets a destination must receive to change a link's status from down to up. The range is 1 through 255, with a default of 1. 	detail extensive none

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Keepalive statistics	<p>Information about keepalive packets.</p> <ul style="list-style-type: none"> • Input—Number of keepalive packets received by PPP. <ul style="list-style-type: none"> • (last seen 00:00:00 ago)—Time since the last keepalive packet was received, in the format <i>hh:mm:ss</i>. • Output—Number of keepalive packets sent by PPP and how long ago the last keepalive packets were sent and received. <ul style="list-style-type: none"> • (last seen 00:00:00 ago)—Time since the last keepalive packet was sent, in the format <i>hh:mm:ss</i>. 	detail extensive none
LMI settings	<p>(Frame Relay) Settings for Local Management Interface (LMI) can be either ANSI LMI settings or ITU LMI settings. ANSI LMI settings is the default. The format is (ANSI or ITU) LMI settings: <i>value, value... xx seconds</i>, where <i>value</i> can be:</p> <ul style="list-style-type: none"> • n391dte—DTE full status polling interval (1–255) • n392dce—DCE error threshold (1–10) • n392dte—DTE error threshold (1–10) • n393dce—DCE monitored event count (1–10) • n393dte—DTE monitored event count (1–10) • t391dte—DTE polling timer (5–30 seconds) • t392dce—DCE polling verification timer (5–30 seconds) 	detail extensive none
LMI	<p>(Frame Relay) LMI packet statistics:</p> <ul style="list-style-type: none"> • Input—Number of packets coming in on the interface (<i>nn</i>) and how much time has passed since the last packet arrived. The format is Input: <i>nn</i> (last seen <i>hh:mm:ss</i> ago). • Output—Number of packets sent out on the interface (<i>nn</i>) and how much time has passed since the last packet was sent. The format is Output: <i>nn</i> (last sent <i>hh:mm:ss</i> ago). 	detail extensive none
DTE statistics	<p>(Frame Relay) Statistics about messages transmitted from the data terminal equipment (DTE) to the data communication equipment (DCE):</p> <ul style="list-style-type: none"> • Enquiries sent—Number of link status enquiries sent from the DTE to the DCE. • Full enquiries sent—Number of full enquiries sent from the DTE to the DCE. • Enquiry responses received—Number of enquiry responses received by the DTE from the DCE. • Full enquiry responses received—Number of full enquiry responses sent from the DTE to the DCE. 	detail extensive none
DCE statistics	<p>(Frame Relay) Statistics about messages transmitted from the DCE to the DTE:</p> <ul style="list-style-type: none"> • Enquiries received—Number of enquiries received by the DCE from the DTE. • Full enquiries received—Number of full enquiries received by the DCE from the DTE. • Enquiry responses sent—Number of enquiry responses sent from the DCE to the DTE. • Full enquiry responses sent—Number of full enquiry responses sent from the DCE to the DTE. 	detail extensive none

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Common statistics	<p>(Frame Relay) Statistics about messages sent between the DTE and the DCE:</p> <ul style="list-style-type: none"> • Unknown messages received—Number of received packets that do not fall into any category. • Asynchronous updates received—Number of link status peer changes received. • Out-of-sequence packets received—Number of packets for which the sequence of the packets received is different from the expected sequence. • Keepalive responses timedout—Number of keepalive responses that timed out when no LMI packet was reported for n392dte or n393dce intervals. (See LMI settings.) 	detail extensive none
Nonmatching DCE-end DLCIs	(Frame Relay) Number of DLCIs configured from the DCE, displayed only from the DTE.	detail extensive none
LCP state	<p>(PPP) Link Control Protocol state.</p> <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—LCP negotiation is incomplete (not yet completed or has failed). • Not-configured—LCP is not configured on the interface. • Opened—LCP negotiation is successful. 	detail extensive none
NCP state	<p>(PPP) Network Control Protocol state.</p> <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—NCP negotiation is incomplete (not yet completed or has failed). • Not-configured—NCP is not configured on the interface. • Opened—NCP negotiation is successful. 	detail extensive none
CHAP state	<p>(PPP) Displays the state of the Challenge Handshake Authentication Protocol (CHAP) during its transaction.</p> <ul style="list-style-type: none"> • Chap-Chal-received—Challenge was received but response not yet sent. • Chap-Chal-sent—Challenge was sent. • Chap-Resp-received—Response was received for the challenge sent, but CHAP has not yet moved into the Success state. (Most likely with RADIUS authentication.) • Chap-Resp-sent—Response was sent for the challenge received. • Closed—CHAP authentication is incomplete. • Failure—CHAP authentication failed. • Not-configured—CHAP is not configured on the interface. • Success—CHAP authentication was successful. 	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: year-month-day hour:minute:second timezone (hour:minute:second ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
CoS queues	Number of CoS queues configured.	detail extensive none
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes, Output bytes—Number of bytes received and transmitted on the interface. • Input packets, Output packets—Number of packets received and transmitted on the interface. 	detail extensive
Input errors	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input 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. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Giants—Number of frames received that are larger than the giant threshold. • Runts—Number of frames received that are smaller than the runt threshold. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • L3 incompletes—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. • L2 channel errors—Counter increments when the software could not find a valid logical interface for an incoming frame. • L2 mismatch timeouts—Count of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • HS link CRC errors—Count of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • SRAM errors—Number of hardware errors that occurred in the static RAM (SRAM) on the PIC. If the value in this field increments, the PIC is malfunctioning. • Resource errors—Sum of transmit drops. 	extensive

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Output errors	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly, (perhaps once every 10 seconds), the cable, the far-end system, or the PIC is malfunctioning. • 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 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 malfunctioning hardware. • MTU errors—Number of packets whose size exceeds the MTU of the interface. • Resource errors—Sum of transmit drops. 	extensive
Queue counters	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	detail extensive
DS1 alarms DS1 defects	<p>Media-specific 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 turn on the red or yellow alarm LED on the craft interface.</p> <ul style="list-style-type: none"> • LOS—Loss of signal. • LOF—Loss of frame. • AIS—Alarm indication signal. • YLW—Yellow alarm. Indicates errors at the remote site receiver. 	detail extensive none

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
T1 media	<p>Counts of T1 media-specific errors.</p> <ul style="list-style-type: none"> • Seconds—Number of seconds the defect has been active. • Count—Number of times that the defect has gone from inactive to active. • State—State of the error. State other than OK indicates a problem. <p>The T1 media-specific error types can be:</p> <ul style="list-style-type: none"> • AIS—Alarm indication signal • BEE—Bit error event • BES—Bit error seconds • BPV—Bipolar violation • CS—Carrier state • ES—Errored seconds • EXZ—Excessive zeros • FEBE—Far-end block error • LCV—Line code violation • LES—Line error seconds • LOF—Loss of frame • LOS—Loss of signal • PCV—Pulse code violation • SEF—Severely errored framing • SEFS—Severely errored framing seconds (section) • SES—Severely errored seconds • UAS—Unavailable seconds • YELLOW—Errors at the remote site receiver 	extensive
Line encoding	Line encoding used: B8ZS or AMI .	All levels
Buildout	Buildout setting.	All levels
HDLC configuration	<p>Information about the HDLC configuration.</p> <ul style="list-style-type: none"> • Policing bucket—Configured state of the receiving policer. • Shaping bucket—Configured state of the transmitting shaper. • Giant threshold—Giant threshold programmed into the hardware. • Runt threshold—Runt threshold programmed into the hardware. • Timeslots—Configured time slots for the interface. • Line encoding—Line encoding used: B8ZS or AMI. • Byte encoding—Byte encoding used: Nx64K or Nx56K. • Data inversion—HDLC data inversion setting: Enabled or Disabled. • Idle cycle Flag—Idle cycle flags. • Start end Flag—Start and end flag. 	extensive

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
DSO or DS1 BERT configuration	<p>BERT (bit error rate test) checks the quality of the line. This output appears only when a BERT is run on the interface.</p> <ul style="list-style-type: none"> • BERT time period—Configured total time period that the BERT is to run. • Elapsed—Actual time elapsed since the start of the BERT (in seconds). • Induced error rate—Configured rate at which the bit errors are induced in the BERT pattern. • Algorithm—Type of algorithm selected for the BERT. 	detail extensive none
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> • Destination slot—FPC slot number. • PLP byte—Packet Level Protocol byte. 	extensive
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Flags	Information about the logical interface; values are described in the “Logical Interface Flags” section under Common Output Fields Description.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Protocol	Protocol family configured on the logical interface, such as iso , inet6 , or mpls .	detail extensive none
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route table	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0 .	detail extensive
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	detail extensive none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	detail extensive none
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address.	detail extensive none

Table 6: Channelized T1 IQ and T3 IQ show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
DLCI	<p>(Frame Relay) DLCI number of the logical interface. The following DLCI information is displayed: Flags, Total down time, Last down, and Traffic statistics. Flags is one or more of the following:</p> <ul style="list-style-type: none"> • Active—Set when the link is active and the DTE and DCE are exchanging information. • Down—Set when the link is active, but no information is received from the DCE. • Unconfigured—Set when the corresponding DLCI in the DCE is not configured. • Configured—Set when the corresponding DLCI in the DCE is configured. • Dce-configured—Displayed when the command is issued from the DTE. 	detail extensive none
DLCI statistics	<p>(Frame Relay) Data-link connection identifier (DLCI) statistics.</p> <ul style="list-style-type: none"> • Active DLCI—Number of active DLCIs. • Inactive DLCI—Number of inactive DLCIs. 	detail extensive none

Sample Output

```

show interfaces extensive (CT1) user@host> show interfaces extensive ct1-0/1/1
Physical interface: ct1-0/1/1, Enabled, Physical link is Up
Interface index: 145, SNMP ifIndex: 32, Generation: 28
Link-level type: Controller, Clocking: Internal, Speed: T1,
Loopback: None, Framing: ESF, Parent: None
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps 16384
Link flags     : None
Hold-times     : Up 0 ms, Down 0 ms
CoS queues     : 4 supported
Last flapped   : 2005-08-17 11:47:09 PDT (1d 03:38 ago)
Statistics last cleared: 2005-08-18 15:25:37 PDT (00:00:27 ago)
DS1 alarms    : None
DS1 defects    : None
T1 media:
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

```

```

Line encoding: B8ZS
Buildout      : 0 to 132 feet
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 0 (0x00)

show interfaces extensive (T1) user@host> show interfaces extensive t1-0/2/0
Physical interface: t1-0/2/0, Enabled, Physical link is Up
Interface index: 161, SNMP ifIndex: 33, Generation: 61
Link-level type: PPP, MTU: 1504, Speed: T1, Loopback: None, FCS: 16,
Parent: ct1-0/2/0 Interface index 148
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps 16384
Link flags     : Keepalives DTE
ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
LMI: Input: 51700 (00:00:02 ago), Output: 51701 (00:00:02 ago)
DTE statistics:
  Enquiries sent           : 43186
  Full enquiries sent      : 8515
  Enquiry responses received : 43185
  Full enquiry responses received : 8515
DCE statistics:
  Enquiries received       : 0
  Full enquiries received  : 0
  Enquiry responses sent   : 0
  Full enquiry responses sent : 0
Common statistics:
  Unknown messages received : 0
  Asynchronous updates received : 0
  Out-of-sequence packets received : 0
  Keepalive responses timeout : 0
Nonmatching DCE-end DLCIs:
  2
Hold-times      : Up 0 ms, Down 0 ms
CoS queues      : 4 supported
Last flapped    : 2005-09-07 15:43:47 PDT (00:00:06 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes   : 0          0 bps
  Output bytes  : 14         0 bps
  Input packets : 0          0 pps
  Output packets: 1          0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
  Policed discards: 0, L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0,
  HS link CRC errors: 0, SRAM errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0,
  MTU errors: 0, Resource errors: 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   1          1          0
DS1 alarms      : None
DS1 defects     : None
HDLC configuration:
  Policing bucket: Disabled

```

```

Shaping bucket : Disabled
Giant threshold: 1514, Runt threshold: 2
Timeslots      : All active
Byte encoding: Nx64K, Data inversion: Disabled, Idle cycle flag:
flags, Start end flag: shared
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 4 (0x00)

```

**show interfaces
extensive (DS0)**

```

user@host> show interfaces extensive ds-0/1/0:0
Physical interface: ds-0/1/0:1, Enabled, Physical link is Up
Interface index: 157, SNMP ifIndex: 52, Generation: 46
Link-level type: Frame-Relay, PPP, MTU: 1504, Clocking: Internal,
Speed: 640kbps, Loopback: None, FCS:16,
Parent: ct1-0/1/0 Interface index 143
Device flags      : Present Running
Interface flags: Point-To-Point SNMP-Traps 16384
Link flags       : Keepalives DTE
ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
LMI: Input: 51700 (00:00:02 ago), Output: 51701 (00:00:02 ago)
DTE statistics:
  Enquiries sent           : 43186
  Full enquiries sent      : 8515
  Enquiry responses received : 43185
  Full enquiry responses received : 8515
DCE statistics:
  Enquiries received       : 0
  Full enquiries received  : 0
  Enquiry responses sent   : 0
  Full enquiry responses sent : 0
Common statistics:
  Unknown messages received : 0
  Asynchronous updates received : 0
  Out-of-sequence packets received : 0
  Keepalive responses timedout : 0
Nonmatching DCE-end DLCIs:
  2
Hold-times      : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 8 (last seen 00:00:12 ago)
  Output: 8 (last sent 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    : 2005-08-18 15:23:46 PDT (00:03:17 ago)
Statistics last cleared: 2005-08-18 15:25:37 PDT (00:01:26 ago)
Traffic statistics:
  Input bytes      : 840          0 bps
  Output bytes     : 912          0 bps
  Input packets    : 25           0 pps
  Output packets   : 26           0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
  Policed discards: 0, L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
  Resource errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0,
  MTU errors: 0, Resource errors: 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       26                26                    0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 2
  Timeslots       : 1-10
  Byte encoding: Nx64K, Data inversion: Disabled, Idle cycle flag: flags,
  Start end flag: shared
DSO BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 4 (0x00)
Logical interface ds-0/1/0:1.0 (Index 67) (SNMP ifIndex 53) (Generation 11)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 26, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 11.11.11.0/30, Local: 11.11.11.2, Broadcast: 11.11.11.3,
    Generation: 39
DLCI 100
  Flags: Active, Dce-configured
  Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input bytes : 0
    Output bytes : 0
    Input packets: 0
    Output packets: 0
DLCI statistics:
  Active DLCI :2 Inactive DLCI : 0
...

```

show interfaces (T3 or E3)

Syntax	<pre>show interfaces <i>interface-type</i> <brief detail extensive terse> <descriptions> <media> <snmp-index <i>snmp-index</i>> <statistics></pre>
Release Information	Command introduced before Junos OS Release 7.4.
Description	Display status information about the specified T3 or E3 interface.
Options	<p><i>interface-type</i>—On M Series and T Series routers, the T3 interface type is t3-fpc/pic/port, whereas the E3 interface type is e3-fpc/pic/port. On the J Series routers, the T3 interface type is t3-pim/0/port, whereas the E3 interface type is e3-pim/0/port.</p> <p>brief detail extensive terse—(Optional) Display the specified level of output.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about network interfaces.</p> <p>snmp-index <i>snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	<p>show interfaces (T3, PPP) on page 137</p> <p>show interfaces detail (T3, PPP) on page 138</p> <p>show interfaces extensive (T3, PPP) on page 139</p> <p>show interfaces (E3, Frame Relay) on page 140</p> <p>show interfaces detail (E3, Frame Relay) on page 141</p> <p>show interfaces extensive (E3, Frame Relay) on page 142</p>
Output Fields	Table 7 on page 128 lists the output fields for the show interfaces (T3 or E3) command. Output fields are listed in the approximate order in which they appear.

Table 7: T3 or E3 show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under Common Output Fields Description.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	detail extensive none

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source. It can be Internal or External .	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Whether loopback is enabled and the type of loopback (local or remote).	All levels
FCS	Frame check sequence on the interface (either 16 or 32). The default is 16 bits.	All levels
Mode	(T3 only) Whether C-bit parity mode or M13 mode is enabled.	All levels
Long buildout	(T3 only) Buildout setting: less than 255 feet (68 meters) or greater than 255 feet and shorter than 450 feet (137 meters).	All levels
Framing	(E3 only) Physical layer framing format used on the link. It can be G751 or Unframed . The default is G751 .	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels
Link flags	Information about the link. Possible values are described in the “Link Flags” section under Common Output Fields Description.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Keepalive settings	(PPP and HDLC) Configured settings for keepalives. <ul style="list-style-type: none"> interval seconds—Time in seconds between successive keepalive requests. The range is 10 seconds through 32,767 seconds, with a default of 10 seconds. down-count number—Number of keepalive packets a destination must fail to receive before the network takes a link down. The range is 1 through 255, with a default of 3. up-count number—Number of keepalive packets a destination must receive to change a link’s status from down to up. The range is 1 through 255, with a default of 1. 	detail extensive none

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Keepalive statistics or Keepalive	<p>(PPP and HDLC) Information about keepalive packets.</p> <ul style="list-style-type: none"> Input—Number of keepalive packets received by PPP. <ul style="list-style-type: none"> (last seen 00:00:00 ago)—Time since the last keepalive packet was received, in the format <i>hh:mm:ss</i>. Output—Number of keepalive packets sent by PPP and how long ago the last keepalive packets were sent and received. <ul style="list-style-type: none"> (last seen 00:00:00 ago)—Time since the last keepalive packet was sent, in the format <i>hh:mm:ss</i>. 	detail extensive none
LMI settings	<p>(Frame Relay) Local Management Interface (LMI) settings (ANSI or ITU). ANSI LMI settings is the default. The format is LMI settings: value, value... xx seconds, where <i>value</i> can be:</p> <ul style="list-style-type: none"> n391dte—DTE full status polling interval (1–255) n392dce—DCE error threshold (1–10) n392dte—DTE error threshold (1–10) n393dce—DCE monitored event count (1–10) n393dte—DTE monitored event count (1–10) t391dte—DTE polling timer (5–30 seconds) t392dce—DCE polling verification timer (5–30 seconds) 	detail extensive none
LMI	<p>(Frame Relay) LMI statistics:</p> <ul style="list-style-type: none"> Input—Number of packets coming in on the interface (<i>nn</i>) and how much time has passed since the last packet arrived. The format is Input: nn (last seen hh:mm:ss ago). Output—Number of packets sent out on the interface (<i>nn</i>) and how much time has passed since the last packet was sent. The format is Output: nn (last sent hh:mm:ss ago). 	detail extensive none
DTE statistics	<p>(Frame Relay) Statistics about messages transmitted from the data terminal equipment (DTE) to the data communications equipment (DCE):</p> <ul style="list-style-type: none"> Enquiries sent—Number of link status enquiries sent from the DTE to the DCE. Full enquiries sent—Number of full enquiries sent from the DTE to the DCE. Enquiry responses received—Number of enquiry responses received by the DTE from the DCE. Full enquiry responses received—Number of full enquiry responses sent from the DTE to the DCE. 	detail extensive none
DCE statistics	<p>(Frame Relay) Statistics about messages transmitted from the DCE to the DTE:</p> <ul style="list-style-type: none"> Enquiries received—Number of enquiries received by the DCE from the DTE. Full enquiries received—Number of full enquiries received by the DCE from the DTE. Enquiry responses sent—Number of enquiry responses sent from the DCE to the DTE. Full enquiry responses sent—Number of full enquiry responses sent from the DCE to the DTE. 	detail extensive none

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Common statistics	(Frame Relay) Statistics about messages sent between the DTE and the DCE: <ul style="list-style-type: none"> • Unknown messages received—Number of received packets that do not fall into any category. • Asynchronous updates received—Number of link status peer changes received. • Out-of-sequence packets received—Number of packets for which the sequence of the packets received is different from the expected sequence. • Keepalive responses timedout—Number of keepalive responses that timed out when no LMI packet was reported for n392dte or n393dce intervals. (See LMI settings.) 	detail extensive none
Nonmatching DCE-end DLCIs	(Frame Relay. Displayed only from the DTE.) Number of DLCIs configured from the DCE.	detail extensive none
LCP state	(PPP) Link Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—LCP negotiation is incomplete (not yet completed or has failed). • Opened—LCP negotiation is successful. 	detail extensive none
NCP state	(PPP) Network Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—NCP negotiation is incomplete (not yet completed or has failed). • Opened—NCP negotiation is successful. 	detail extensive none
CHAP state	(PPP) Displays the state of the Challenge Handshake Authentication Protocol (CHAP) during its transaction. <ul style="list-style-type: none"> • Chap-Resp-received—Response received for the challenge sent, but CHAP not yet moved into the Success state. (Most likely with RADIUS authentication.) • Chap-Resp-sent—Response sent for the challenge received. • Chap-Chal-sent—Challenge sent. • Chap-Chal-received—Challenge received but response not yet sent. • Down—CHAP authentication is incomplete (not yet completed or has failed). • Not-configured—CHAP is not configured on the interface. • Opened—CHAP authentication was successful. 	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: year-month-day hour:minute:second timezone (year-month-day hour:minute:second ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none
CoS queues	Number of CoS queues configured.	detail extensive none

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Input rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface • Output packets—Number of packets received on the interface. 	detail extensive
Input errors	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input 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. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Runts—(T3 only) Number of frames received that are smaller than the runt threshold. • Giants—(T3 only) Number of frames received that are larger than the giant threshold. • Bucket Drops—Drops resulting from the traffic load exceeding the interface transmit/receive leaky bucket configuration. The default is off. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • L3 incompletes—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. • L2 channel errors—Number of times the software did not find a valid logical interface for an incoming frame. • L2 mismatch timeouts—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • HS link CRC errors—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • SRAM errors—Number of hardware errors that occurred in the static RAM (SRAM) on the PIC or PIM. If the value of this field increments, the PIC or PIM is malfunctioning. • Resource errors—Sum of transmit drops. 	extensive

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Output errors	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • 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 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 malfunctioning hardware. • MTU errors—Number of packets whose size exceeded the MTU of the interface. • Resource errors—Sum of transmit drops. 	extensive
Queue counters	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	detail extensive
Active alarms Active defects	<p>E3 media-specific 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 turn on the red or yellow alarm LED on the craft interface.</p> <ul style="list-style-type: none"> • AIS—Alarm indication signal • EXZ—Excessive zeros • FERF—Far-end receive failures • IDLE—Idle code detected • LCD—Loss of cell delineation • LCV—Line code violation • LOF—Loss of frame • LOS—Loss of signal • PLL—Phase-locked loop • YLW—Remote defect indication 	detail extensive none

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
DS3 media or E3 media	<p>Counts of DS3 (T3) or E3 media-specific errors.</p> <ul style="list-style-type: none"> • Seconds—Number of seconds the defect has been active. • Count—Number of times that the defect has gone from inactive to active. • State—State of the error. State other than OK indicates a problem. <p>The DS3 or E3 media-specific error types can be:</p> <ul style="list-style-type: none"> • PLL Lock—Phase-locked loop out of lock • Reframing—Frame alignment recovery time • AIS—Alarm indication signal • LOF—Loss of frame • LOS—Loss of signal • IDLE—Idle code detected • YELLOW—Errors at the remote site receiver • BPV—Bipolar violation • EXZ—Excessive zeros • LCV—Line code violation • PCV—(DS3 only) Pulse code violation • CCV—(DS3 only) C-bit coding violation • FEBE—(DS3 only) Far-end block error • LES—Line error seconds • PES—(DS3 only) P-bit errored seconds • PSSES—(DS3 only) P-bit errored seconds (section) • CES—(DS3 only) C-bit errored seconds • CSES—(DS3 only) C-bit severely errored seconds • SEFS—Severely errored framing seconds • UAS—Unavailable seconds 	extensive
HDLC configuration	<p>Information about the HDLC configuration.</p> <ul style="list-style-type: none"> • Policing bucket—Configured state of the receiving policer. • Shaping bucket—Configured state of the transmitting shaper. • Giant threshold—Giant threshold programmed into the hardware. • Runt threshold—Runt threshold programmed into the hardware. • Idle cycle flag—Idle cycle flags. • Start end flag—Start and end flag. 	extensive

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
DSU configuration	<p>Information about the DSU configuration. The last three lines (Bit count, Error bit count, and LOS information) are displayed only if a BERT has ever been run on the interface.</p> <ul style="list-style-type: none"> • Compatibility mod—CSU/DSU compatibility mode: None, Larscom, Kentrox, or Digital-Link. • Scrambling—Payload scrambling: Enabled or Disabled. • Subrate—Configured subrate setting. Applies only when Digital-Link compatibility mode is used. The subrate can be Disabled or display units in Kbps. • FEAC loopbac—(T3) Whether a far-end alarm and control (FEAC) loopback is Active or Inactive. This feature is used to send alarm or status information from the far-end terminal back to the near-end terminal and to initiate T3 loopbacks at the far-end terminal from the near-end terminal. • Response—Whether the FEAC signal is Enabled or Disabled. • Count—Number of FEAC loopbacks. 	extensive
DS3 (or E3) BERT configuration	<p>BERT (bit error rate test) checks the quality of the line. This output appears only when a BERT is run on the interface.</p> <ul style="list-style-type: none"> • BERT time period—Configured total time period that the BERT is to run. • Elapsed—Actual time elapsed since the start of the BERT (in seconds). • Induced error rate—Configured rate at which the bit errors are induced in the BERT pattern. • Algorithm—Type of algorithm selected for the BERT. 	detail extensive none
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> • Destination slot—FPC slot number. • PLP byte—Packet Level Protocol byte. 	extensive
CoS information	<p>Information about the CoS queue for the physical interface.</p> <ul style="list-style-type: none"> • CoS transmit queue—Queue number and its associated user-configured forwarding class name. • Bandwidth %—Percentage of bandwidth allocated to the queue. • Bandwidth bps—Bandwidth allocated to the queue (in bps). • Buffer %—Percentage of buffer space allocated to the queue. • Buffer usec—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • Priority—Queue priority: low or high. • Limit—Displayed if rate limiting is configured for the queue. Possible values are none and exact. If exact is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If none is configured, the queue transmits beyond the configured bandwidth if bandwidth is available. 	extensive

Logical Interface

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Logical interface	Name of the logical interface.	detail extensive none
Index	Logical interface index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	extensive
Flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	detail extensive none
Encapsulation	Encapsulation on the logical interface.	detail extensive none
Input packets	Number of packets received on the logical interface.	None specified
Output packets	Number of packets transmitted on the logical interface.	None specified
Traffic statistics	<p>(Frame Relay) Number and rate of bytes and packets received and transmitted on the logical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	detail extensive
Local statistics	(Frame Relay) Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	detail extensive
Transit statistics	(Frame Relay) Statistics for traffic transiting the router. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. This counter normally stabilizes in less than 1 second.	detail extensive
Protocol	Protocol family configured on the logical interface, such as iso , inet6 , mlfr , or mpls .	detail extensive none
Multilink bundle	(Multilink) Interface name for the multilink bundle.	detail extensive none
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route table	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.	detail extensive
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	detail extensive none

Table 7: T3 or E3 show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	detail extensive none
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive none
DLCI	<p>(Frame Relay) DLCI number of the logical interface. The following DLCI information is displayed: Flags, Total down time, Last down, and Traffic statistics (or Input packets, Output packets). Flags is one or more of the following:</p> <ul style="list-style-type: none"> • Active—Set when the link is active and the DTE and DCE are exchanging information. • Down—Set when the link is active, but no information is received from the DCE. • DCE Unconfigured—Set when the corresponding DLCI in the DCE is not configured. • Configured—Set when the corresponding DLCI in the DCE is configured. • DCE-configured—Displayed when the command is issued from the DTE. 	detail extensive none
DLCI statistics	<p>(Frame Relay) Data-link connection identifier (DLCI) statistics.</p> <ul style="list-style-type: none"> • Active DLCI—Number of active DLCIs. • Inactive DLCI—Number of inactive DLCIs. 	detail extensive none

Sample Output

```

show interfaces user@host> show interfaces t3-0/2/0
(T3, PPP) Physical interface: t3-0/2/0, Enabled, Physical link is Up
          Interface index: 139, SNMP ifIndex: 35
          Link-level type: PPP, MTU: 4474, Clocking: Internal, Speed: T3,
          Loopback: None, FCS: 16, Mode: C/Bit parity,
          Long buildout: Shorter than 255 feet
          Device flags   : Present Running
          Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
          Link flags     : Keepalives
          Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
          Keepalive: Input: 0 (never), Output: 0 (never)
          LCP state: Down
          NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
          mpls: Not-configured
          CHAP state: Closed
          CoS queues    : 4 supported, 4 in use
          Last flapped  : 2005-12-05 08:43:06 PST (02:18:40 ago)
          Input rate    : 0 bps (0 pps)
          Output rate   : 72 bps (0 pps)
          Active alarms  : None

```

```

Active defects : None
DS3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^15 - 1, 0.151, Pseudorandom (9), Induced error rate: 10e-0

```

```

Logical interface t3-0/2/0.0 (Index 66) (SNMP ifIndex 54)
  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: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255

```

show interfaces detail (T3, PPP)

```

user@host> show interfaces t3-0/2/0 detail
Physical interface: t3-0/2/0, Enabled, Physical link is Up
  Interface index: 139, SNMP ifIndex: 35, Generation: 22
  Link-level type: PPP, MTU: 4474, Clocking: Internal, Speed: T3,
  Loopback: None, FCS: 16, Mode: C/Bit parity,
  Long buildout: Shorter than 255 feet
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
  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 : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Closed
  CoS queues   : 4 supported, 4 in use
  Last flapped : 2005-12-05 08:43:06 PST (02:18:45 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes   : 0          0 bps
    Output bytes  : 152        0 bps
    Input packets : 0          0 pps
    Output packets: 8          0 pps
  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	6	6	0

```

  Active alarms : None
  Active defects : None
  DS3 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^15 - 1, 0.151, Pseudorandom (9), Induced error rate: 10e-0

  Logical interface t3-0/2/0.0 (Index 66) (SNMP ifIndex 54) (Generation 8)
    Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 4470, Generation: 17, Route table: 0
    Flags: Protocol-Down
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary

```

Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,
Generation: 24

```

show interfaces extensive (T3, PPP) user@host> show interfaces t3-0/2/0 extensive
Physical interface: t3-0/2/0, Enabled, Physical link is Up
  Interface index: 139, SNMP ifIndex: 35, Generation: 22
  Link-level type: PPP, MTU: 4474, Clocking: Internal, Speed: T3,
  Loopback: None, FCS: 16, Mode: C/Bit parity,
  Long buildout: Shorter than 255 feet
  Device flags      : Present Running
  Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
  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 : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Closed
  CoS queues      : 4 supported, 4 in use
  Last flapped    : 2005-12-05 08:43:06 PST (02:18:47 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes :          0          0 bps
    Output bytes :        171         72 bps
    Input packets:          0          0 pps
    Output packets:         9          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,
    SRAM errors: 0, Resource errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,

    Resource errors: 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        7              7              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
    IDLE           0      0 OK
    YELLOW         0      0 OK
    BPV            0      0
    EXZ            0      0
    LCV            1      4

```

```

PCV                0          0
CCV                0          0
FEBE               1          11
LES                1
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

```

DS3 BERT configuration:

```

  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^15 - 1, 0.151, Pseudorandom (9), Induced error rate: 10e-0

```

Packet Forwarding Engine configuration:

```

  Destination slot: 0, PLP byte: 1 (0x00)

```

CoS information:

CoS transmit queue	%	Bandwidth bps	%	Buffer usec	Priority	Limit
0 best-effort	95	42499200	95	0	low	none
3 network-control	5	2236800	5	0	low	none

Logical interface t3-0/2/0.0 (Index 66) (SNMP ifIndex 54) (Generation 8)

```

  Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 4470, Generation: 17, Route table: 0
  Flags: Protocol-Down
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,
    Generation: 24

```

show interfaces (E3, Frame Relay)

```

user@host> show interfaces e3-1/2/0
Physical interface: e3-1/2/0, Enabled, Physical link is Up
  Interface index: 153, SNMP ifIndex: 49
  Link-level type: Frame-Relay, MTU: 4474, Clocking: Internal, Speed: E3,
  Loopback: None, FCS: 16, Framing: G751
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps Internal: 0x4000
  Link flags     : Keepalives DTE
  ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
  LMI: Input: 0 (never), Output: 4 (00:00:06 ago)
  DTE statistics:
    Enquiries sent           : 4
    Full enquiries sent      : 0
    Enquiry responses received : 0
    Full enquiry responses received : 0
  DCE statistics:
    Enquiries received       : 0
    Full enquiries received  : 0
    Enquiry responses sent   : 0
    Full enquiry responses sent : 0
  Common statistics:
    Unknown messages received : 0
    Asynchronous updates received : 0
    Out-of-sequence packets received : 0

```

```

    Keepalive responses timedout      : 1
    CoS queues      : 4 supported, 4 in use
    Last flapped    : 2005-12-05 08:46:14 PST (02:27:17 ago)
    Input rate      : 0 bps (0 pps)
    Output rate     : 0 bps (0 pps)
    Active alarms   : None
    Active defects  : None

Logical interface e3-1/2/0.0 (Index 66) (SNMP ifIndex 57)
  Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: FR-NLPID
  Input packets : 0
  Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255
  DLCI 100
    Flags: Down, DCE-Unconfigured
    Total down time: 00:00:06 sec, Last down: 00:00:06 ago
    Input packets : 0
    Output packets: 0
  DLCI statistics:
    Active DLCI :0 Inactive DLCI :1

```

**show interfaces detail
(E3, Frame Relay)**

```

user@host> show interfaces e3-1/2/0 detail
Physical interface: e3-1/2/0, Enabled, Physical link is Up
  Interface index: 153, SNMP ifIndex: 49, Generation: 36
  Link-level type: Frame-Relay, MTU: 4474, Clocking: Internal, Speed: E3,
  Loopback: None, FCS: 16, Framing: G751
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps Internal: 0x4000
  Link flags     : Keepalives DTE
  Hold-times     : Up 0 ms, Down 0 ms
  ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds
  LMI statistics:
    Input : 0 (last seen: never)
    Output: 5 (last sent 00:00:07 ago)
  DTE statistics:
    Enquiries sent           : 5
    Full enquiries sent      : 0
    Enquiry responses received : 0
    Full enquiry responses received : 0
  DCE statistics:
    Enquiries received       : 0
    Full enquiries received  : 0
    Enquiry responses sent   : 0
    Full enquiry responses sent : 0
  Common statistics:
    Unknown messages received : 0
    Asynchronous updates received : 0
    Out-of-sequence packets received : 0
    Keepalive responses timedout : 1
  CoS queues      : 4 supported, 4 in use
  Last flapped    : 2005-12-05 08:46:14 PST (02:27:27 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes : 0 0 bps
    Output bytes : 806 0 bps
    Input packets: 0 0 pps
    Output packets: 44 0 pps
  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	43	43	0

Active alarms : None

Active defects : None

Logical interface e3-1/2/0.0 (Index 66) (SNMP ifIndex 57) (Generation 15)

Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: FR-NLPID

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: 24, Route table: 0

Flags: None

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary

Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,
Generation: 38

DLCI 100

Flags: Down, DCE-Unconfigured

Total down time: 00:00:16 sec, Last down: 00:00:16 ago

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

DLCI statistics:

Active DLCI :0 Inactive DLCI :1

show interfaces
extensive
(E3, Frame Relay)

user@host> show interfaces e3-1/2/0 extensive

Physical interface: e3-1/2/0, Enabled, Physical link is Up

Interface index: 153, SNMP ifIndex: 49, Generation: 36

Link-level type: Frame-Relay, MTU: 4474, Clocking: Internal, Speed: E3,
Loopback: None, FCS: 16, Framing: G751

Device flags : Present Running

Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps Internal: 0x4000

Link flags : Keepalives DTE

Hold-times : Up 0 ms, Down 0 ms

ANSI LMI settings: n391dte 6, n392dte 3, n393dte 4, t391dte 10 seconds

LMI statistics:

Input : 0 (last seen: never)
Output: 6 (last sent 00:00:02 ago)

DTE statistics:

Enquiries sent	: 5
Full enquiries sent	: 1

```

    Enquiry responses received      : 0
    Full enquiry responses received : 0
DCE statistics:
    Enquiries received              : 0
    Full enquiries received         : 0
    Enquiry responses sent          : 0
    Full enquiry responses sent     : 0
Common statistics:
    Unknown messages received       : 0
    Asynchronous updates received   : 0
    Out-of-sequence packets received : 0
    Keepalive responses timedout    : 1
CoS queues      : 4 supported, 4 in use
Last flapped   : 2005-12-05 08:46:14 PST (02:27:30 ago)
Statistics last cleared: Never
Traffic statistics:
    Input bytes :                0                0 bps
    Output bytes :               821               56 bps
    Input packets:                0                0 pps
    Output packets:              45                0 pps
Input errors:
    Errors: 0, Drops: 0, Framing errors: 21118, 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,
    Resource errors: 0
Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
    Resource errors: 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     44               44               0

Active alarms : None
Active defects : None
E3 media:
    Seconds    Count    State
    PLL Lock   0        0    OK
    Reframing  187       1    OK
    AIS        0        0    OK
    LOF        187       1    OK
    LOS        187       1    OK
    IDLE       0        0    OK
    YELLOW     0        0    OK
    BPV        0        0
    EXZ        0        0
    LCV        188    12303167
    LES        188
    SEFS       187
    UAS        195
DSU configuration:
    Compatibility mode: None, Scrambling: Disabled
E3 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^15 - 1, 0.151, Pseudorandom (9), Induced Error rate: 10e-0
Packet Forwarding Engine configuration:

```

Destination slot: 1, PLP byte: 1 (0x00)

CoS information:

CoS transmit queue		Bandwidth		Buffer	Priority	Limit
	%	bps	%	usec		
0 best-effort	95	32649600	95	0	low	none
3 network-control	5	1718400	5	0	low	none

Logical interface e3-1/2/0.0 (Index 66) (SNMP ifIndex 57) (Generation 15)

Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: FR-NLPID

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: 24, Route table: 0

Flags: None

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary

Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,

Generation: 38

DLCI 100

Flags: Down, DCE-Unconfigured

Total down time: 00:00:19 sec, Last down: 00:00:19 ago

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

DLCI statistics:

Active DLCI :0 Inactive DLCI :1

CHAPTER 6

Command Summaries

- [Channelized OC Interface Operational Commands on page 145](#)
- [Channelized T1 and T3 Interface Operational Mode Commands on page 146](#)

Channelized OC Interface Operational Commands

[Table 8 on page 145](#) summarizes the command-line interface (CLI) commands to monitor and troubleshoot channelized OC interfaces. Commands are listed in alphabetical order.

Table 8: Channelized OC Interface Operational Mode Commands

Task or Information to Monitor	CLI Command
Display channelized OC3 IQ and IQE interface information.	show interfaces (Channelized OC3 IQ and IQE)
Display status information about channelized OC12 interfaces.	show interfaces (Channelized OC12)
Display channelized OC12 IQ and IQE interface information.	show interfaces (Channelized OC12 IQ and IQE)
Display the interface names of the physical channelized OC3 IQ and IQE interface and the channels configured on each interface.	show interfaces controller (Channelized OC3 IQ and IQE)
Display the interface names of the physical channelized OC12 IQ and IQE interface and the channels configured on each interface.	show interfaces controller (Channelized OC12 IQ and IQE)
Display channelized OC48 IQ and IQE interface information.	show interfaces (Channelized OC48 IQ and IQE)



NOTE: For more information about the channel type and level of channelization, and for information about the number of channels that are supported on channelized OC interfaces, see the *Junos Network Interfaces Configuration Guide*.

For channelization illustrations and configuration examples for channelized IQ and IQE interfaces, see the *Junos Feature Guide*.

Channelized T1 and T3 Interface Operational Mode Commands

Table 9 on page 146 summarizes the command-line interface (CLI) commands that you can use to monitor and troubleshoot channelized T1 and T3 interfaces. Commands are listed in alphabetical order.

Table 9: Channelized T1 and T3 Interface Operational Mode Commands

Task	Command
Display status information about channelized DS3-to-DS0 interfaces.	<code>show interfaces (Channelized DS3-to-DS0)</code>
Display status information about channelized DS3-to-DS1 interfaces.	<code>show interfaces (Channelized DS3-to-DS1)</code>
Display channelized T1 IQ interface information.	<code>show interfaces (Channelized T1 IQ)</code>
Display channelized T3 IQ interface information.	<code>show interfaces (Channelized T3 IQ)</code>
Display the interface names of the physical channelized T1 IQ interface and the channels configured on each interface.	<code>show interfaces controller (Channelized T1 IQ)</code>
Display the interface names of the physical channelized T3 IQ interface and the channels configured on each interface.	<code>show interfaces controller (Channelized T3 IQ)</code>



NOTE: For more information about the channel type and level of channelization, and for information about the number of channels that are supported on the different types of channelized T1 and T3 interfaces, see the *Junos Network Interfaces Configuration Guide*.

For more information on monitoring and troubleshooting channelized DS3-to-DS0 and DS3-to-DS1 interfaces, see the *Junos Interfaces Network Operations Guide*.

For channelization illustrations and configuration examples for channelized IQ interfaces, see the *Junos Feature Guide*.

PART 4

Troubleshooting

- [Interface Diagnostics on page 149](#)
- [Investigate Channelized DS3 Interfaces on page 157](#)
- [Investigate Multichannel DS3 Interfaces on page 189](#)

CHAPTER 7

Interface Diagnostics

- [Interface Diagnostics on page 149](#)

Interface Diagnostics

You can use two diagnostic tools to test the physical layer connections of interfaces: loopback testing and bit error rate test (BERT) testing. Loopback testing enables you to verify the connectivity of a circuit. BERT testing enables you to identify poor signal quality on a circuit. This section contains the following topics:

- [Configuring Loopback Testing on page 149](#)
- [Interface Diagnostics on page 151](#)

Configuring Loopback Testing

Loopback testing allows you to verify the connectivity of a circuit. You can configure any of the following interfaces to execute a loopback test: Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, E1, E3, NxDS0, serial, SONET/SDH, T1, and T3.

The physical path of a network data circuit usually consists of segments interconnected by devices that repeat and regenerate the transmission signal. The transmit path on one device connects to the receive path on the next device. If a circuit fault occurs in the form of a line break or a signal corruption, you can isolate the problem by using a loopback test. Loopback tests allow you to isolate segments of the circuit and test them separately.

To do this, configure a *line loopback* on one of the routers. Instead of transmitting the signal toward the far-end device, the line loopback sends the signal back to the originating router. If the originating router receives back its own data link layer packets, you have verified that the problem is beyond the originating router. Next, configure a line loopback farther away from the local router. If this originating router does not receive its own data link layer packets, you can assume the problem is on one of the segments between the local router and the remote router's interface card. In this case, the next troubleshooting step is to configure a line loopback closer to the local router to find the source of the problem.

There are several types of loopback testing supported by the Junos OS, as follows:

- DCE local—Loops packets back on the local DCE.
- DCE remote—Loops packets back on the remote DCE.

- **Local**—Useful for troubleshooting physical PIC errors. Configuring local loopback on an interface allows transmission of packets to the channel service unit (CSU) and then to the circuit toward the far-end device. The interface receives its own transmission, which includes data and timing information, on the local router's PIC. The data received from the CSU is ignored. To test a local loopback, issue the **show interfaces *interface-name*** command. If PPP keepalives transmitted on the interface are received by the PIC, the **Device Flags** field contains the output **Loop-Detected**.
- **Payload**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A payload loopback loops data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated.
- **Remote**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote router's interface card. A router at one end of the circuit initiates a remote loopback toward its remote partner. When you configure a remote loopback, the packets received from the physical circuit and CSU are received by the interface. Those packets are then retransmitted by the PIC back toward the CSU and the circuit. This loopback tests all the intermediate transmission segments.

Table 10 on page 150 shows the loopback modes supported on the various interface types.

Table 10: Loopback Modes by Interface Type

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	Configuring Ethernet Loopback Capability
Circuit Emulation E1	Local and remote	Configuring E1 Loopback Capability
Circuit Emulation T1	Local and remote	Configuring T1 Loopback Capability
E1 and E3	Local and remote	Configuring E1 Loopback Capability and Configuring E3 Loopback Capability
NxDSO	Payload	Configuring Channelized E1 IQ and IQE Interfaces, Configuring T1 and NxDSO Interfaces, Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode), Configuring Channelized STM1 IQ and IQE Interfaces, and "Configuring an NxDSO IQ Interface" on page 5
Serial (V.35 and X.21)	Local and remote	Configuring Serial Loopback Capability
Serial (EIA-530)	DCE local, DCE remote, local, and remote	Configuring Serial Loopback Capability
SONET/SDH	Local and remote	Configuring SONET/SDH Loopback Capability

Table 10: Loopback Modes by Interface Type (*continued*)

Interface	Loopback Modes	Usage Guidelines
T1 and T3	Local, payload, and remote	Configuring T1 Loopback Capability and Configuring T3 Loopback Capability See also Configuring the T1 Remote Loopback Response

To configure loopback testing, include the **loopback** statement:

loopback mode;

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* ds0-options]
- [edit interfaces *interface-name* e1-options]
- [edit interfaces *interface-name* e3-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]
- [edit interfaces *interface-name* serial-options]
- [edit interfaces *interface-name* sonet-options]
- [edit interfaces *interface-name* t1-options]
- [edit interfaces *interface-name* t3-options]

Interface Diagnostics

BERT allows you to troubleshoot problems by checking the quality of links. You can configure any of the following interfaces to execute a BERT when the interface receives a request to run this test: E1, E3, T1, T3; the channelized DS3, OC3, OC12, and STM1 interfaces; and the channelized DS3 IQ, E1 IQ, and OC12 IQ interfaces.

A BERT test requires a line loop to be in place on either the transmission devices or the far-end router. The local router generates a known bit pattern and sends it out the transmit path. The received pattern is then verified against the sent pattern. The higher the bit error rate of the received pattern, the worse the noise is on the physical circuit. As you move the position of the line loop increasingly downstream toward the far-end router, you can isolate the troubled portion of the link.

To configure BERT, you must configure the duration of the test, the bit pattern to send on the transmit path, and the error rate to monitor when the inbound pattern is received.

To configure the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream, include the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements, respectively, at the [edit interfaces *interface-name* *interface-type*-options] hierarchy level:

```
[edit interfaces interface-name interface-type-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

rate is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from 10^{-0} (1 error per bit) to 10^{-7} (1 error per 10 million bits).

algorithm is the pattern to send in the bit stream. For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152    Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151    Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151    Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153    Pattern is 2^20 - 1 (per 0.153 standard)
...
```

For specific hierarchy information, see the individual interface types.



NOTE: The 4-port E1 PIC supports only the following algorithms:

pseudo-2e11-o152	Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151	Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151	Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e23-o151	Pattern is 2^23 (per 0.151 standard)

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



NOTE: The 12-port T1/E1 Circuit Emulation (CE) PIC supports only the following algorithms:

```
all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e7            Pattern is 2^7 - 1
pseudo-2e9-o153       Pattern is 2^9 - 1 (per 0.153 standard)
repeating-1-in-4       1 bit in 4 is set
repeating-1-in-8       1 bit in 8 is set
repeating-3-in-24      3 bits in 24 are set
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



NOTE: The IQE PICs support only the following algorithms:

```
all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e9-o153       Pattern is 2^9 - 1 (per 0.153 (511 type) standard)
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 and 0.153 (2047 type)
standards)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153      Pattern is 2^20 - 1 (per 0.153 standard)
pseudo-2e23-o151      Pattern is 2^23 - 1 (per 0.151 standard)
repeating-1-in-4       1 bit in 4 is set
repeating-1-in-8       1 bit in 8 is set
repeating-3-in-24      3 bits in 24 are set
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



NOTE: BERT is supported on the PDH interfaces of the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP and the DS3/E3 MIC. The following BERT algorithms are supported:

all-ones-repeating	Repeating one bits
all-zeros-repeating	Repeating zero bits
alternating-double-ones-zeros	Alternating pairs of ones and zeros
alternating-ones-zeros	Alternating ones and zeros
repeating-1-in-4	1 bit in 4 is set
repeating-1-in-8	1 bit in 8 is set
repeating-3-in-24	3 bits in 24 are set
pseudo-2e9-o153	Pattern is $2^9 - 1$ (per 0.153 standard)
pseudo-2e11-o152	Pattern is $2^{11} - 1$ (per 0.152 standard)
pseudo-2e15-o151	Pattern is $2^{15} - 1$ (per 0.151 standard)
pseudo-2e20-o151	Pattern is $2^{20} - 1$ (per 0.151 standard)
pseudo-2e20-o153	Pattern is $2^{20} - 1$ (per 0.153 standard)
pseudo-2e23-o151	Pattern is $2^{23} - 1$ (per 0.151 standard)

Table 11 on page 154 shows the BERT capabilities for various interface types.

Table 11: BERT Capabilities by Interface Type

Interface	T1 BERT	T3 BERT	Comments
12-port T1/E1 Circuit Emulation	Yes (ports 0–11)		<ul style="list-style-type: none"> Limited algorithms
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)		<ul style="list-style-type: none"> Limited algorithms
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time Limited algorithms
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time
Channelized OC12	N/A	Yes (channel 0–11)	<ul style="list-style-type: none"> Single channel at a time Limited algorithms No bit count
Channelized STM1	Yes (channel 0–62)	N/A	<ul style="list-style-type: none"> Multiple channels Only one algorithm No error insert No bit count
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	<ul style="list-style-type: none"> Multiple ports and channels Limited algorithms for T1 No error insert for T1 No bit count for T1

These limitations do not apply to channelized IQ interfaces. For information about BERT capabilities on channelized IQ interfaces, see Channelized IQ and IQE Interfaces Properties.

Starting and Stopping a BERT Test

Before you can start the BERT test, you must disable the interface. To do this, include the **disable** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
disable;
```

After you configure the BERT properties and commit the configuration, begin the test by issuing the **test interface *interface-name interface-type-bert-start*** operational mode command:

```
user@host> test interface interface-name interface-type-bert-start
```

The test runs for the duration you specify with the **bert-period** statement. If you wish to terminate the test sooner, issue the **test interface *interface-name interface-type-bert-stop*** command:

```
user@host> test interface interface-name interface-type-bert-stop
```

For example:

```
user@host> test interface t3-1/2/0 t3-bert-start
user@host> test interface t3-1/2/0 t3-bert-stop
```

To view the results of the BERT test, issue the **show interfaces extensive | find BERT** command:

```
user@host> show interfaces interface-name extensive | find BERT
```

For more information about running and evaluating the results of the BERT procedure, see the Junos OS Operational Mode Commands.



NOTE: To exchange BERT patterns between a local router and a remote router, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local router, issue the **test interface** command.

Example: Configuring Bit Error Rate Testing

Configure a BERT test on a T3 interface. In this example, the run duration lasts for 120 seconds. The configured error rate is 0, which corresponds to a bit error rate of 10^{-0} (1 error per bit). The configured bit pattern of **all-ones-repeating** means that every bit the interface sends is a set to a value of 1.

```
[edit interfaces]
t3-1/2/0 {
  t3-options {
    bert algorithm all-ones-repeating;
    bert-error-rate 0;
    bert-period 120;
```

```
}  
}
```

CHAPTER 8

Investigate Channelized DS3 Interfaces

- [Investigating Interface Steps and Commands on page 157](#)
- [Monitor Channelized DS3 Interfaces on page 160](#)
- [Use Loopback Testing For Channelized DS3 Interfaces on page 173](#)
- [Locate Channelized DS3 Alarms and Errors on page 183](#)

Investigating Interface Steps and Commands

This section includes the following information to assist you when troubleshooting ATM interfaces:

- [Investigating Interface Steps and Commands Overview on page 157](#)
- [Monitoring Interfaces on page 157](#)
- [Performing a Loopback Test on an Interface on page 158](#)
- [Locating Interface Alarms on page 160](#)

Investigating Interface Steps and Commands Overview

The “[Monitoring Interfaces](#)” on [page 157](#) section helps you determine the nature of the interface problem. The “[Performing a Loopback Test on an Interface](#)” on [page 158](#) section provides information to help you isolate the source of the problem. The “[Locating Interface Alarms](#)” on [page 160](#) section explains some of the alarms and errors for the media.

Monitoring Interfaces

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

Solution To monitor interfaces, follow these steps:

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

The [Table 12 on page 158](#) lists and describes the operational mode commands you use to monitor interfaces.

Table 12: Commands Used to Monitor Interfaces

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

Performing a Loopback Test on an Interface

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

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

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

- a. Create a loop from the router to the network.
- b. Create a loop to the router from various points in the network.

The [Table 13 on page 159](#) 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 13: Commands Used to Perform Loopback Testing on Interfaces

CLI Statement or Command	Interface Type	Description
[edit interfaces <i>interface-name</i> <i>interface- options</i>] set loopback (local remote)	All interfaces	The loopback statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU). To turn off loopback, remove the loopback statement from the configuration.
show	All interfaces	Verify the configuration before you commit it.
commit	All interfaces	Save the set of changes to the database and cause the changes to take operational effect. Use after you have verified a configuration in all configuration steps.
[edit interfaces <i>interface-name</i>] 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 <i>interface-name</i>	Used for all interfaces	Display static status information about a specific interface.
[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet <i>address address</i>] arp <i>ip-address</i> mac <i>mac-address</i>	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 <i>interface-name</i>	All interfaces	Reset the statistics for an interface to zero.
[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc	T1, T3, SONET, and Multichannel DS3 interfaces	The encapsulation statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces <i>interface-name</i>] set no-keepalives	T1, T3, SONET, and Multichannel DS3 interfaces	The no-keepalives statement at this level disables the sending of keepalives on the physical interface.

Table 13: Commands Used to Perform Loopback Testing on Interfaces (*continued*)

CLI Statement or Command	Interface Type	Description
show interfaces <i>interface-name</i> 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- <i>x/x/x</i> local-IP-address bypass-routing count 1000 rapid	All interfaces	<p>Check the reachability of network hosts by sending ICMP ECHO_REQUEST messages to elicit ICMP ECHO_RESPONSE messages from the specified host.</p> <p>Use the bypass-routing option to ping a local system through an interface that has no route through it.</p> <p>The count option sends 1000 ping requests through the system.</p> <p>Type Ctrl+C to interrupt a ping command.</p>
show interfaces <i>interface-name</i> extensive	All interfaces	Display very detailed interface information about a specific interface.

Locating Interface Alarms

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

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

Monitor Channelized DS3 Interfaces

- [Checklist for Monitoring Channelized DS3 Interfaces on page 160](#)
- [Monitor Channelized DS3 Interfaces on page 161](#)

Checklist for Monitoring Channelized DS3 Interfaces

Purpose To monitor Channelized DS3 interfaces and begin the process of isolating Channelized DS3 interface problems when they occur.

Action [Table 14 on page 160](#) provides the links and commands for monitoring Channelized DS3 interfaces.

Table 14: Checklist for Monitoring Channelized DS3 Interfaces

Tasks	Command or Action
“Monitor Channelized DS3 Interfaces” on page 161	
1. Display the Status of Channelized DS3 Interfaces on page 161	show interfaces terse t1*

Table 14: Checklist for Monitoring Channelized DS3 Interfaces (*continued*)

Tasks	Command or Action
2. Display the Status of a Specific Channelized DS3 Interface on page 162	<code>show interfaces t1-fpc/pic/port:channel</code>
3. Display Extensive Status Information for a Specific Channelized DS3 Interface on page 165	<code>show interfaces t1-fpc/pic/port:channel extensive</code>
4. Monitor Statistics for a Channelized DS3 Interface on page 170	<code>monitor interfaces t1-fpc/pic/port:channel</code>

Monitor Channelized DS3 Interfaces

By monitoring Channelized DS3 interfaces, you begin the process of isolating Channelized DS3 interface problems when they occur.

To monitor your Channelized DS3 interfaces, follow these steps:

1. [Display the Status of Channelized DS3 Interfaces on page 161](#)
2. [Display the Status of a Specific Channelized DS3 Interface on page 162](#)
3. [Display Extensive Status Information for a Specific Channelized DS3 Interface on page 165](#)
4. [Monitor Statistics for a Channelized DS3 Interface on page 170](#)

Display the Status of Channelized DS3 Interfaces

Purpose To display the status of Channelized DS3 interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

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

Sample Output 1

```

user@host> show interfaces t1* terse
Interface           Admin Link Proto Local           Remote
t1-1/2/0:1          up   down
t1-1/2/0:2          up   down
t1-1/2/0:3          up   down
t1-1/2/0:4          up   down
t1-1/2/0:5          up   up
t1-1/2/0:5.0        up   up   inet  172.16.1.33/30
t1-1/2/0:6          up   up
t1-1/2/0:6.0        up   up   inet  172.16.1.37/30
t1-1/2/0:7          up   up
t1-1/2/0:7.0        up   up   inet  172.16.1.41/30
t1-1/2/0:8          up   down
t1-1/2/0:9          up   down
t1-1/2/0:10         up   down
t1-1/2/0:11         up   up
t1-1/2/0:11.0       up   up   inet  172.16.1.45/30
t1-1/2/0:12         up   up
t1-1/2/0:12.0       up   up   inet  172.16.1.49/30
t1-1/2/0:13         up   up
t1-1/2/0:13.0       up   up   inet  172.16.1.53/30

```

```

t1-1/2/0:14          up    up
t1-1/2/0:14.0        up    up    inet  172.16.1.153/30
t1-1/2/0:15          up    up
t1-1/2/0:15.0        up    up    inet  172.16.1.177/30
t1-1/2/0:16          up    up
t1-1/2/0:16.0        up    up    inet  172.16.1.181/30
t1-1/2/0:17          up    up
t1-1/2/0:17.0        up    up    inet  172.16.1.129/30
t1-1/2/0:18          up    up
t1-1/2/0:18.0        up    up    inet  172.16.1.133/30
t1-1/2/0:19          up    down
t1-1/2/0:19.0        up    down inet  172.16.1.137/30
t1-1/2/0:20          up    down
t1-1/2/0:21          up    down
t1-1/2/0:22          up    down
t1-1/2/0:23          up    down
t1-1/2/0:24          up    down
t1-1/2/0:25          up    down
t1-1/2/0:26          up    down
t1-1/2/0:27          up    down
t1-1/2/0:28          up    down

```

Sample Output 2

```

user@host> show interfaces t1* terse
Interface           Admin Link Proto Local Remote
t1-0/3/3:0          down down
t1-0/3/3:0.0        up  down inet  10.10.10.1/30
t1-0/3/3:1          up    up
t1-0/3/3:1.0        up    up    inet  10.10.10.5/30
t1-0/3/3:2          up    up
t1-0/3/3:2.0        up    up    inet  10.10.10.53/30

```

Meaning The sample output shows the status of both the physical and logical interfaces. Sample output 1 shows that 12 of the possible 28 channels have IP addresses and are connected. Of the 12 connected channels, the last channel (**t1-1/2/0:19.0**) is currently down.

Sample output 2 shows that all links are up except for interface **t1-0/3/3:0**, which has both the physical and logical links down.

Display the Status of a Specific Channelized DS3 Interface

Purpose To display the status of a specific Channelized DS3 interface, use the following Junos OS CLI operational mode command:

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

Sample Output 1

```

user@host> show interfaces t1-1/2/0:5
Physical interface: t1-1/2/0:5, Enabled, Physical link is Up
Interface index: 181, SNMP ifIndex: 210
Description: T1 to Tombstone - Circuit # 123456789
Link-level type: PPP , MTU: 1504, Clocking: Internal , Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,
Parent: ct3-1/2/0 Interface index 173
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps

```

```

Link flags      : Keepalives
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive: Input: 6898 (00:00:48 ago), Output: 6874 (00:00:07 ago)
LCP state: Opened
NCP state: inet: Opened , inet6: Not-configured, iso: Not-configured, mp1s:
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 tl-1/2/0:19
Physical interface: tl-1/2/0:19, Enabled, Physical link is Down
  Interface index: 148, SNMP ifIndex: 224
  Description: T1 to Rock City #6 - Circuit # 987654321
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags    : Keepalives
  Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)
  LCP state: Conf-req-sent
  NCP state: inet: Down , inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Not-configured
  CoS queues    : 4 supported
  Last flapped  : 2004-05-14 15:56:43 EDT (2d 02:47 ago)
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  DS1 alarms    : AIS, LOF
  DS1 defects   : AIS, LOF

  Logical interface tl-1/2/0:19.0 (Index 91) (SNMP ifIndex 256)
    Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation:
PPP
    Protocol inet, MTU: 1500
    Flags: Protocol-Down
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
    Destination: 68.71.141.136/30, Local: 68.71.141.137, Broadcast:
68.71.141.139

```

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

Sample output 1 shows a channel that is connected and operating correctly. You can verify the following information to check that the interface is functioning correctly:

- Encapsulation used on the physical interface, **Link-level type: PPP**
- Reference clock source, **Clocking: Internal**

- Frame checksum sequence, **FCS: 16**
- Physical layer framing format used on the link, **Framing: ESF**

Because the link-level type is Point-to-Point Protocol (PPP), the link control protocol (LCP) state is **Opened**, and the network control protocol (NCP) state has one protocol, **NCP::inet:Opened**, indicating that the link is healthy. There are no DSI alarms or defects.

Sample output 2 shows a channel that is connected and operating correctly. However, this channel has Cisco HDLC configured as the link-level type and a logical interface (**t1-0/3/3:2.0**) configured.

Sample output 3 shows a channel that is not connected, **Physical link is Down**. Loopback is not configured, **Loopback: None**, and the input and output counters are zero. In addition, there are alarm indication signal (AIS) and loss of frame (LOF) alarms and defects.

Sample output 4 shows a channel that is assigned but down, **Physical link is Down**. Information about the physical interfaces shows the device flags are **Present Running Down**, and one of the interface flags is **Hardware-Down**. In addition, interface protocol initialization failed to complete successfully on logical interface **t1-1/2/0:19.0**, **Flags: Hardware-Down Device-Down**.

Display Extensive Status Information for a Specific Channelized DS3 Interface

Purpose To display the status of Channelized DS3 interfaces, use the following Junos OS CLI operational mode command:

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

Sample Output 1

```
user@host> show interfaces t1-1/2/0:5 extensive
Physical interface: t1-1/2/0:5, Enabled, Physical link is Up
  Interface index: 181, SNMP ifIndex: 210, Generation: 96
  Description: T1 to Tombstone - Circuit # 123456789
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 6910 (last seen 00:00:21 ago)
    Output: 6886 (last sent 00:00:04 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported
  Last flapped  : 2004-05-11 16:01:30 EDT (5d 02:53 ago)
  Statistics last cleared: 2004-05-11 23:43:42 EDT (4d 19:10 ago)
  Traffic statistics:
    Input bytes :          551301316          4432 bps
    Output bytes:          4091306894          2696 bps
```

```

Input packets:          5231609          6 pps
Output packets:         4867661          3 pps
Input errors:
  Errors: 47, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
398, L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:         Queued packets  Transmitted packets  Dropped packets

  0 best-effort          4820512          4804578          24909

  1 expedited-fo         0              0              0

  2 assured-forw         0              0              0

  3 network-cont         63083          63083          0

DS1 alarms :None
DS1 defects :None
T1 media:
  SEF      5      4 OK
  BEE     246    127 OK
  AIS              0          0 OK
  LOF              0          0 OK
  LOS              0          0 OK
  YELLOW          0          0 OK
  BPV              0          0
  EXZ              0          0
  LCV             246        538
  PCV              0          0
  CS               0          0
  LES              0
  ES               0
  SES              8
  SEFS             12
  BES              0
  UAS              0

HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x01)
Logical interface t1-1/2/0:5.0 (Index 86) (SNMP ifIndex 238) (Generation 111)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 117, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 68.71.141.32/30, Local: 68.71.141.33, Broadcast: 68.71.141.35,
  Generation: 169

```

Even though there are counts in the t1 media section of the output, notice how the “ State” column has all “ OK”

Sample Output 2

```

user@host> show interfaces t1-0/3/3:2 extensive
Physical interface: t1-0/3/3:2, Enabled, Physical link is Up
  Interface index: 239, SNMP ifIndex: 127, Generation: 122
  Description:
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 124790 (last seen 00:00:03 ago)
    Output: 125379 (last sent 00:00:09 ago)
  CoS queues    : 4 supported
  Last flapped  : 2004-04-30 09:12:44 UTC (2w0d 10:45 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes :          2930724407          9560 bps
    Output bytes :          9983871242         78464 bps
    Input packets:          17011460           14 pps
    Output packets:         20390813           19 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 233516,
    L3 incompletes: 1, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 17341, Aged packets: 0
  DS1 alarms :None
  DS3 alarms :None
  DS1 defects :None
  DS3 defects :None
  T1 media:
    Seconds      Count  State
    SEF          0        0 OK
    BEE          1        1 OK
    AIS          0        0 OK
    LOF          0        0 OK
    LOS          0        0 OK
    YELLOW       7        1 OK
    BPV          0        0
    EXZ          0        0
    LCV          1       1029
    PCV          0        0
    CS           0        0
    LES          0
    ES           0
    SES          1
    SEFS         2
    BES          0
    UAS          0
  DS3 media:
    Seconds      Count  State
    PLL Lock     0        0 OK
    Reframing    0        0 OK
    AIS          0        0 OK
    LOF          0        0 OK
    LOS          0        0 OK

```

```

IDLE                                0          0 OK
YELLOW                             7          1 OK
BPV                                1        65535
EXZ                                1        65535
LCV                                2       131070
PCV                                1        1079
LES                                1
PES                                1
PSES                               1
SEFS                               0
UAS                                0
Interface transmit queues:
      B/W  WRR    Packets      Bytes      Drops      Errors
Queue0   95   95    20265434  9981112904    17341         0
Queue1    5    5     125379    2758338         0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : 1-24
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled,
  Idle cycle flag: flags, Start end flag: shared
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 2 (0x2e)
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                           %      bps      %      bytes
0 best-effort             95      1459200  95      0      low  none
3 network-control          5       76800   5       0      low  none
Logical interface t1-0/3/3:2.0 (Index 132) (SNMP ifIndex 236) (Generation 69)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Traffic statistics:
  Input bytes :      5789719245
  Output bytes :    19909405752
  Input packets:    33897585
  Output packets:   40673646
Local statistics:
  Input bytes :      2930724407
  Output bytes :    9983871242
  Input packets:    17011460
  Output packets:   20390813
Transit statistics:
  Input bytes :      2858994838      14784 bps
  Output bytes :    9925534510      286584 bps
  Input packets:    16886125      25 pps
  Output packets:   20282833      38 pps
Protocol inet, MTU: 1500, Generation: 80, Route table: 0
  Flags: No-Redirects, uRPF, uRPF-loose
  RPF Failures: Packets: 0, Bytes: 0
  Addresses, Flags: Primary Is-Preferred Is-Primary
    Destination: 10.10.10.52/30, Local: 10.10.10.53,
    Broadcast: 10.10.10.55, Generation: 159

```

Sample Output 3

```

user@host> show interfaces 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:
SEF          33          31 OK
BEE          53          47 OK
AIS    3201537    15 Defect Active
LOF    3202041    16 Defect Active
LOS          0              0 OK
YELLOW    1023435          0 OK
BPV          0              0
EXZ          0              0
LCV          53          72
PCV          0              0
CS           0              0
LES    3202041
ES      3202041
SES    3202060
SEFS    3202102
BES          0
UAS    3202160

```

```

HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x04)
Logical interface t1-1/2/0:19.0 (Index 91) (SNMP ifIndex 256) (Generation 115)

Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP

Protocol inet, MTU: 1500, Generation: 121, Route table: 0
Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
  Destination: 68.71.141.136/30, Local: 68.71.141.137, Broadcast:
68.71.141.139, Generation: 179

```

Meaning The sample output shows very detailed interface information which includes where any errors might be occurring. The first line of the output indicates if the link is up. Sample output 1 and 2 show that both links are up. Sample output 3 shows that the link is down. The main sections of the output to examine are:

- DS1 alarms
- DS1 defects
- T1 media

Both sample output 1 and 2 show no DS1 alarms or defects. Sample output 3 shows AIS and LOF alarms and defects. For more information about AIS and LOF alarms and defects, see List of Common SONET Alarms and Errors.

Even though there are counts in the T1 media section of the output in sample output 1 and 2, the **State** column indicates that the media are **OK**. However, sample output 3, in which the link is down, shows that the AIS and LOF defects are active.

Monitor Statistics for a Channelized DS3 Interface

Purpose To display the status of Channelized DS3 interfaces, use the following Junos OS CLI operational mode command:

Action `user@host> monitor interfaces t1-fpc/pic/port:channel`

Sample Output

```

user@host> monitor interfaces t1-1/2/0:5
host      Seconds: 35      Time: 19:02:34      Delay: 0/0/27

Interface: t1-1/2/0:5, Enabled, Link is Up
Encapsulation: PPP, Keepalives, Speed: T1
Traffic statistics:      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 runs:           0          [0]

```

```

Input giants: 0 [0]
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Sample Output 3

```

user@host> monitor t1-1/2/0:19
host      Seconds: 9          Time: 19:05:23          Delay: 0/0/68

Interface: t1-1/2/0:19, Enabled, Link is Down
Encapsulation: PPP, Keepalives, Speed: T1
Traffic statistics:          Current delta
Input bytes: 89198 (0 bps) [0]
Output bytes: 90532 (0 bps) [0]
Input packets: 6371 (0 pps) [0]
Output packets: 6448 (0 pps) [0]
Encapsulation statistics:
Input keepalives: 0 [0]
Output keepalives: 0 [0]
LCP state: Conf-req-sent
Error statistics:
Input errors: 271124 [0]
Input drops: 0 [0]
Input framing errors: 0 [0]
Policed discards: 266254 [0]
L3 incompletes: 0 [0]
L2 channel errors: 2 [0]
L2 mismatch timeouts: 2 [0]
Carrier transitions: 32 [0]
Output errors: 0 [0]
Output drops: 0 [0]
Aged packets: 0 [0]
Active alarms : AIS LOF
Active defects: AIS LOF
T1 statistics:
BPV 0 [0]
EXZ 0 [0]
LCV 72 [0]
PCV 0 [0]
CS 0 [0]
Interface warnings:
o Outstanding DS1 alarm(s)
o INET NCP is not Opened
o LCP state is not Opened
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

Meaning The sample output shows common interface failures, indicates whether loopback is detected, and shows increases in framing errors. Use information from this command to help narrow down possible causes of an interface problem.

The output in the examples is static, however, the counters in real time change as they are updated every second. The counters in sample output 3 show that there is no traffic for the interface that is down, and that it has active alarms, defects, and there are interface warnings.



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



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

Use Loopback Testing For Channelized DS3 Interfaces

- [Checklist for Using Loopback Testing for Channelized DS3 Interfaces on page 173](#)
- [Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface on page 174](#)
- [Create a Loopback on page 175](#)
- [Verify That the Interface Is Up on page 176](#)
- [Clear Interface Statistics on page 177](#)
- [Force the Link Layer to Stay Up on page 177](#)
- [Verify the Status of the Logical Interface on page 179](#)
- [Ping the Channelized Interface on page 180](#)
- [Check for Interface Error Statistics on page 180](#)
- [Diagnose a Suspected Circuit Problem on page 182](#)

Checklist for Using Loopback Testing for Channelized DS3 Interfaces

Purpose To use loopback testing to isolate Channelized DS3 interface problems.

Action [Table 15 on page 173](#) provides the links and commands for using loopback testing for Channelized DS3 interfaces.

Table 15: Checklist for Using Loopback Testing for Channelized DS3 Interfaces

Tasks	Command or Action
“Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 174	
1. Create a Loopback on page 175	
a. Create a Physical Loopback on page 175	Connect the TX port to the RX port.
b. Configure a Local Loopback on page 175	<code>[edit interfaces <i>interface name</i> (t3-options t1-options)]</code> <code>set loopback local</code> <code>show</code> <code>commit</code>
2. Verify That the Interface Is Up on page 176	<code>show interfaces t1-<i>fpc/pic/port:channel</i></code> <code>show interfaces t3-<i>fpc/pic/port:channel</i></code>
3. Clear Interface Statistics on page 177	<code>clear interfaces statistics t1-<i>fpc/pic/port:channel</i></code>
4. Force the Link Layer to Stay Up on page 177	

Table 15: Checklist for Using Loopback Testing for Channelized DS3 Interfaces (*continued*)

Tasks	Command or Action
a. Configure Encapsulation to Cisco-HDLC on page 177	<code>[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc show commit</code>
b. Configure No-Keepalives on page 178	<code>[edit interfaces <i>interface-name</i>] set no-keepalives show commit</code>
5. Verify the Status of the Logical Interface on page 179	<code>show interfaces t1-fpc/pic/port:channel</code>
6. Ping the Channelized Interface on page 180	<code>ping interface t1-fpc/pic/port:channel local-IP-address bypass-routing count 1000 rapid</code>
7. Check for Interface Error Statistics on page 180	<code>show interfaces t1-fpc/pic/port:channel extensive</code>
“Diagnose a Suspected Circuit Problem” on page 182	
8. “Create a Loop from the Router to the Network” on page 182	<code>[edit interfaces t1-fpc/pic/port:channel t1-options] set loopback remote show commit</code>
9. Create a Loop to the Router from Various Points in the Network on page 183	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 174.

Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface

Problem To diagnose a suspected hardware problem with a Channelized DS3 interface, follow these steps:

- Solution**
- [Create a Loopback on page 175](#)
 - [Verify That the Interface Is Up on page 176](#)
 - [Clear Interface Statistics on page 177](#)
 - [Force the Link Layer to Stay Up on page 177](#)
 - [Verify the Status of the Logical Interface on page 179](#)
 - [Ping the Channelized Interface on page 180](#)
 - [Check for Interface Error Statistics on page 180](#)

Create a Loopback

You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the Channelized DS3 port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. [Create a Physical Loopback on page 175](#)
2. [Configure a Local Loopback on page 175](#)

Create a Physical Loopback

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

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

Configure a Local Loopback

Action To configure a local loopback, follow these steps:

1. In configuration mode, go to the following hierarchy level, depending on whether you are configuring a full T3 or T1 interface:

```
[edit]
user@host# edit interfaces interface-name (t3-options | t1-options)
```

2. Configure the local loopback:

```
[edit interfaces interface-name (t3-options | t1-options)]
user@host# set loopback local
```

The following is an example of the name for a T1 channel on a Channelized DS3 port for a Channelized DS3 to DS1 interface:

```
[edit interfaces t1-2/1/1:0 t1-options]
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# show
loopback local;
```

4. Commit the configuration:

```
user@host# commit
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# commit
```

commit complete

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



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

Verify That the Interface Is Up

Purpose Display the status of a Channelized DS1 or DS3 interface to determine whether the physical link is up or down.

Action To verify that the status of the Channelized DS1 or DS3 interface is up, use one of the following Junos OS command-line interface (CLI) operational mode commands:

```
user@host> show interfaces t1-fpc/pic/port:channel
user@host> show interfaces t3-fpc/pic/port:channel
```

Sample Output

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host# show interfaces t1-2/1/0:20
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 39 (00:00:06 ago), Output: 0 (never)
  CoS queues     : 4 supported
  Last flapped   : 2004-05-20 21:46:27 UTC (00:14:28 ago)
  Input rate     : 16 bps (0 pps)
  Output rate    : 160 bps (0 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 10.10.1.1, Local: 10.10.1.2
```

Meaning The sample output shows that the physical link is up and there are no DS1 or DS3 alarms or defects. You should not see any DS1 or DS3 alarms. You can check any interface on the Channelized DS3 port. See [“Checklist for Channelized DS3 Alarms and Errors” on page 183](#) for more information on Channelized DS3 alarms and errors.

Clear Interface Statistics

Purpose You must reset the Channelized DS3 interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current efforts to diagnose the problem.

Action

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

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

Sample Output

```
user@host> clear interfaces statistics t1-2/1/0:20
user@host>
```

Meaning This command clears the interface statistics counters for the Channelized or T1 interface only.



NOTE: After a Graceful Routing Engine switchover (GRES) you must run **clear interface statistics** again or interface statistics will display junk vales.

Force the Link Layer to Stay Up

Purpose To complete the loopback test, the link layer must remain up. However, Junos OS is designed to recognize that loop connections are not valid connections and to bring the link layer down. If you have the Point-to-Point protocol (PPP) configured, you need to change the encapsulation to Cisco High-Level Data Link Control (HDLC) and reconfigure the keepalives in order to force the link layer to stay up.

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

1. [Configure Encapsulation to Cisco-HDLC on page 177](#)
2. [Configure No-Keepalives on page 178](#)

Configure Encapsulation to Cisco-HDLC

Action

To set the encapsulation on a T1 physical interface, follow these steps:

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

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

2. Configure Cisco-HDLC:

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

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# commit
commit complete
```

5. Check the interface configuration

```
user@host# run show interfaces t1-2/1/0:20
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
Interface index: 210, SNMP ifIndex: 173
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1,  Loopback:
Local, FCS:16,
Mode: C/Bit parity, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 39 (00:00:06 ago), Output: 0 (never)
CoS queues : 4 supported
Last flapped : 2004-05-20 21:46:27 UTC (00:14:28 ago)
Input rate : 16 bps (0 pps)
Output rate : 160 bps (0 pps)
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.1.1, Local: 10.10.1.2
```

Meaning This command sets the interface encapsulation to the Cisco HDLC transport protocol. You must configure the interface with Cisco HDLC to ensure that the logical interface remains up in preparation for the ping test.

Configure No-Keepalives

Action

To disable the sending of link-layer keepalives on a channelized DS3 interface, follow these steps:

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

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

2. Configure no-keepalives:

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

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/0:20]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-2/1/0:20]
user@host# commit
commit complete
```

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

Verify the Status of the Logical Interface

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

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

Sample Output 1

```
user@host# show interfaces t1-2/1/0:20
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 39 (00:00:06 ago), Output: 0 (never)
  CoS queues     : 4 supported
  Last flapped   : 2004-05-20 21:46:27 UTC (00:14:28 ago)
  Input rate     : 16 bps (0 pps)
  Output rate    : 160 bps (0 pps)
  DS1 alarms    : None
  DS3 alarms    : None
  DS1 defects   : None
  DS3 defects   : None
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500
  Flags: None
```

Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.1.1, Local: 10.10.1.2

Meaning The sample output shows that the channelized interface has the physical and logical links up.

Ping the Channelized Interface

Purpose Use the ping command to verify the loopback connection.

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

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

Sample Output

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

Meaning This command sends 1000 ping packets out of the channelized interface under the Channelized DS3 port to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for Interface Error Statistics

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

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

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

Sample Output

```
user@host# show interfaces t1-2/1/0:20 extensive
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173, Generation: 93
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
```

```

Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : No-Keepalives
Hold-times    : Up 0 ms, Down 0 ms
CoS queues    : 4 supported
Last flapped   : 2004-05-20 21:46:27 UTC (00:26:47 ago)
Statistics last cleared: 2004-05-20 22:12:03 UTC (00:01:11 ago)
Traffic statistics:
Input bytes   :           88680           27640 bps
Output bytes  :           88680           27640 bps
Input packets :           1010             39 pps
Output packets:           1010             39 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0, L3 incompletes:
0, L2 channel errors: 0,
L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms :None
DS3 alarms :None
DS1 defects :None
DS3 defects :None
T1 media:
Seconds      Count  State
SEF          0        0 OK
BEE          0        0 OK
AIS          0        0 OK
LOF          0        0 OK
LOS          0        0 OK
YELLOW       0        0 OK
BPV          0        0
EXZ          0        0
LCV          0        0
PCV          0        0
CS           0        0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS          0
DS3 media:
Seconds      Count  State
PLL Lock     0        0 OK
Reframing    0        0 OK
AIS          0        0 OK
LOF          0        0 OK
LOS          0        0 OK
IDLE         0        0 OK
YELLOW       0        0 OK
BPV          0
EXZ          0
LCV          0
PCV          0
CCV          0
LES          0
PES          0
PSES         0
CES          0
CSES         0
SEFS         0
UAS          0
Interface transmit queues:

```

```

          B/W  WRR      Packets      Bytes      Drops      Errors
Queue0    95   95          0          0          0          0
Queue1     5    5        1010        88680          0          0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled, Idle
cycle flag: flags,
  Start end flag: shared
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 2, PLP byte: 2 (0x14)
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                           %      bps      %      bytes
0 best-effort             95      1459200  95      0      low  none
3 network-control         5       76800   5       0      low  none
Logical interface t1-2/1/0:20.0 (Index 74) (SNMP ifIndex 213) (Generation 14)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Generation: 24, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
  Destination: 10.10.1.1, Local: 10.10.1.2, Broadcast: Unspecified,
Generation: 24

```

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

Diagnose a Suspected Circuit Problem

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

To diagnose a suspected circuit problem, follow these steps:

1. [Create a Loop from the Router to the Network on page 182](#)
2. [Create a Loop to the Router from Various Points in the Network on page 183](#)

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 t1-options]
user@host# show
loopback remote;
```

4. Commit the configuration:

```
user@host# commit
```

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

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

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

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 7 in [“Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 174](#). Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

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

Locate Channelized DS3 Alarms and Errors

- [Checklist for Channelized DS3 Alarms and Errors on page 183](#)
- [Display Alarms and Errors for Channelized DS3 Interfaces on page 184](#)

Checklist for Channelized DS3 Alarms and Errors

Purpose To check the most common Channelized DS3 alarms and errors when investigating line problems on a Juniper Networks router.

Action [Table 16 on page 184](#) provides links and commands for Channelized DS3 alarms and errors.

Table 16: Checklist for Channelized DS3 Alarms and Errors

Tasks	Command or Action
“Display Alarms and Errors for Channelized DS3 Interfaces” on page 184	<code>show interfaces t1-fpc/pic/port:channel extensive</code>

Display Alarms and Errors for Channelized DS3 Interfaces

Purpose To display channelized DS3 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

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

Sample Output 1

```

user@host> show interfaces t1-1/2/0:5 extensive
Physical interface: t1-1/2/0:5, Enabled, Physical link is Up
  Interface index: 181, SNMP ifIndex: 210, Generation: 96
  Description: T1 to Tombstone - Circuit # 123456789
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input  : 6910 (last seen 00:00:21 ago)
    Output: 6886 (last sent 00:00:04 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported
  Last flapped : 2004-05-11 16:01:30 EDT (5d 02:53 ago)
  Statistics last cleared: 2004-05-11 23:43:42 EDT (4d 19:10 ago)
  Traffic statistics:
    Input bytes   :          551301316          4432 bps
    Output bytes  :          4091306894          2696 bps
    Input packets :          5231609           6 pps
    Output packets:          4867661           3 pps
  Input errors:
    Errors: 47, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
398, L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:      Queued packets  Transmitted packets      Dropped packets

    0 best-effort      4820512          4804578          24909

    1 expedited-fo           0              0              0

    2 assured-forw        0              0              0

    3 network-cont      63083          63083              0

```



```

DS1 alarms : None
DS1 defects : None
T1 media:
SEF      5      4 OK
BEE     246    127 OK
AIS       0      0 OK
LOF       0      0 OK
LOS       0      0 OK
YELLOW    0      0 OK
BPV              0
EXZ              0
LCV            246    538
PCV              0
CS              0
LES              0
ES              0
SES              8
SEFS            12
BES              0
UAS              0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x01)
Logical interface t1-1/2/0:5.0 (Index 86) (SNMP ifIndex 238) (Generation 111)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 117, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 68.71.141.32/30, Local: 68.71.141.33, Broadcast: 68.71.141.35,
  Generation: 169

```

Sample Output 2

```

user@host> show interfaces t1-1/2/0:19 extensive
Physical interface: t1-1/2/0:19, Enabled, Physical link is Down
Interface index: 148, SNMP ifIndex: 224, Generation: 110
Description: T1 to Rock City - Circuit # 987654321
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,
Parent: ct3-1/2/0 Interface index 173
Device flags : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags : Keepalives
Hold-times : Up 0 ms, Down 0 ms
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 0 (last seen: never)
  Output: 0 (last sent: never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:

```

```

Not-configured
CHAP state: Not-configured
CoS queues      : 4 supported
Last flapped    : 2004-05-14 15:56:43 EDT (2d 03:01 ago)
Statistics last cleared: 2004-04-09 13:30:02 EDT (5w2d 05:28 ago)
Traffic statistics:
Input bytes      :          89198          0 bps
Output bytes     :          90532          0 bps
Input packets    :          6371          0 pps
Output packets   :          6448          0 pps
Input errors:
  Errors: 271124, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed
discards: 266254, L3 incompletes: 0,
  L2 channel errors: 2, L2 mismatch timeouts: 2, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 32, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets  Dropped packets

  0 best-effort              0              0              0

  1 expedited-fo             0              0              0

  2 assured-forw             0              0              0

  3 network-cont            6448             6448             0

DS1 alarms : AIS, LOF
DS1 defects : AIS, LOF
T1 media:
SEF              33          31 OK
BEE              53          47 OK
AIS      3201537    15 Defect Active
LOF      3202041    16 Defect Active
LOS              0           0 OK
YELLOW          1023435       0 OK
BPV              0           0
EXZ              0           0
LCV              53          72
PCV              0           0
CS               0           0
LES              3202041
ES               3202041
SES              3202060
SEFS             3202102
BES              0
UAS              3202160
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x04)
Logical interface t1-1/2/0:19.0 (Index 91) (SNMP ifIndex 256) (Generation 115)

```

Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps Encapsulation: PPP

Protocol inet, MTU: 1500, Generation: 121, Route table: 0

Flags: Protocol-Down

Addresses, Flags: Dest-route-down Is-Preferred Is-Primary

Destination: 68.71.141.136/30, Local: 68.71.141.137, Broadcast:
68.71.141.139, Generation: 179

Meaning The sample output shows the active alarms and active defects. Sample output 1 shows no active alarms or defects.

Sample output 2 shows that the physical and logical links are down, with active alarms and defects. When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

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

Table 17 on page 187 shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 17: 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

Table 17: T1 Media Alarms and Error Definitions *(continued)*

T1 Media Alarm or Error	Definitions
PCV	Path code violation
SEF	Severely errored frame
SEFS	Severely errored frame seconds
SES	Severely errored seconds
UAS	Unavailable seconds
YLW	Yellow alarm

See Checklist for T1 Alarms and Errors for more details on T1 alarms and statistics.

CHAPTER 9

Investigate Multichannel DS3 Interfaces

- [Investigating Interface Steps and Commands on page 189](#)
- [Monitor Multichannel DS3 Interfaces on page 192](#)
- [Use Loopback Testing for Multichannel DS3 Interfaces on page 200](#)
- [Locate Multichannel DS3 Alarms and Errors on page 215](#)

Investigating Interface Steps and Commands

This section includes the following information to assist you when troubleshooting ATM interfaces:

- [Investigating Interface Steps and Commands Overview on page 189](#)
- [Monitoring Interfaces on page 189](#)
- [Performing a Loopback Test on an Interface on page 190](#)
- [Locating Interface Alarms on page 192](#)

Investigating Interface Steps and Commands Overview

The “[Monitoring Interfaces](#)” on [page 157](#) section helps you determine the nature of the interface problem. The “[Performing a Loopback Test on an Interface](#)” on [page 158](#) section provides information to help you isolate the source of the problem. The “[Locating Interface Alarms](#)” on [page 160](#) section explains some of the alarms and errors for the media.

Monitoring Interfaces

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

Solution To monitor interfaces, follow these steps:

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

The [Table 12 on page 158](#) lists and describes the operational mode commands you use to monitor interfaces.

Table 18: Commands Used to Monitor Interfaces

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

Performing a Loopback Test on an Interface

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

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

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

- a. Create a loop from the router to the network.
- b. Create a loop to the router from various points in the network.

The [Table 13 on page 159](#) 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 19: Commands Used to Perform Loopback Testing on Interfaces

CLI Statement or Command	Interface Type	Description
[edit interfaces <i>interface-name</i> <i>interface- options</i>] set loopback (local remote)	All interfaces	The loopback statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU). To turn off loopback, remove the loopback statement from the configuration.
show	All interfaces	Verify the configuration before you commit it.
commit	All interfaces	Save the set of changes to the database and cause the changes to take operational effect. Use after you have verified a configuration in all configuration steps.
[edit interfaces <i>interface-name</i>] 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 <i>interface-name</i>	Used for all interfaces	Display static status information about a specific interface.
[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet <i>address address</i>] arp <i>ip-address</i> mac <i>mac-address</i>	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 <i>interface-name</i>	All interfaces	Reset the statistics for an interface to zero.
[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc	T1, T3, SONET, and Multichannel DS3 interfaces	The encapsulation statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces <i>interface-name</i>] set no-keepalives	T1, T3, SONET, and Multichannel DS3 interfaces	The no-keepalives statement at this level disables the sending of keepalives on the physical interface.

Table 19: Commands Used to Perform Loopback Testing on Interfaces (*continued*)

CLI Statement or Command	Interface Type	Description
show interfaces <i>interface-name</i> 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- <i>x/x/x</i> <i>local-IP-address</i> bypass-routing count 1000 rapid	All interfaces	<p>Check the reachability of network hosts by sending ICMP ECHO_REQUEST messages to elicit ICMP ECHO_RESPONSE messages from the specified host.</p> <p>Use the bypass-routing option to ping a local system through an interface that has no route through it.</p> <p>The count option sends 1000 ping requests through the system.</p> <p>Type Ctrl+C to interrupt a ping command.</p>
show interfaces <i>interface-name</i> extensive	All interfaces	Display very detailed interface information about a specific interface.

Locating Interface Alarms

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

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

Monitor Multichannel DS3 Interfaces

- [Checklist for Monitoring Multichannel DS3 Interfaces on page 192](#)
- [Monitor Multichannel DS3 Interfaces on page 193](#)

Checklist for Monitoring Multichannel DS3 Interfaces

Purpose To monitor Multichannel DS3 interfaces and begin the process of isolating Multichannel DS3 interface problems when they occur.

Action [Table 20 on page 192](#) provides the links and commands for monitoring Multichannel DS3 interfaces.

Table 20: Checklist for Monitoring Multichannel DS3 Interfaces

Tasks	Command or Action
“Monitor Multichannel DS3 Interfaces” on page 193	

Table 20: Checklist for Monitoring Multichannel DS3 Interfaces
(continued)

Tasks	Command or Action
1. Display the Status of Channelized Interfaces on page 193	show interfaces terse ds* show interfaces terse t1*
2. Display the Status of a Specific Channelized Interface on page 194	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 195	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 199	monitor interfaces ds-fpc/pic/port:channel:channel monitor interfaces t1-fpc/pic/port:channel

Monitor Multichannel DS3 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. By monitoring channelized DS3 to DS0 interfaces or channelized DS3 to DS1 interfaces, you can begin to isolate Multichannel DS3 problems when they occur.

To monitor Multichannel DS3 interfaces, follow these steps:

1. [Display the Status of Channelized Interfaces on page 193](#)
2. [Display the Status of a Specific Channelized Interface on page 194](#)
3. [Display Extensive Status Information for a Specific T3 Interface on page 195](#)
4. [Monitor Statistics for a Channelized Interface on page 199](#)

Display the Status of Channelized Interfaces

Purpose To display the status of channelized DS3 to DS0 interfaces or channelized DS3 to DS1 interfaces, use one of the following Junos OS command-line interface (CLI) operational mode commands:

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

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces terse ds*
Interface      Admin Link Proto Local Remote
ds-2/1/0:5:1   up    up
ds-2/1/0:5:1.0 up    up   inet 192.168.140.197/30
```

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> show interfaces terse t1*
[...Output truncated...]
t1-2/1/0:16      up    down
t1-2/1/0:16.0   up    down inet 192.168.118.61/30
t1-2/1/0:17      up    up
t1-2/1/0:17.0    up    up  inet 192.168.118.49/30
t1-2/1/0:18      up    up
t1-2/1/0:18.0    up    up  inet 192.168.36.21/30
t1-2/1/0:19      up    up
t1-2/1/0:19.0    up    up  inet 192.168.118.97/30
```

Meaning The sample output shows the status of both the physical and logical interfaces. In both sample outputs, all links are up except for the first interface in the T1 sample output. The first interface, **t1-2/1/0:16**, has both the physical and logical links down.

Display the Status of a Specific Channelized Interface

Purpose To display the status of a specific channelized DS3 to DS0 interface or channelized DS3 to DS1 interface, use one of the following CLI operational mode commands:

Action **user@host> show interfaces ds-fpc/pic/port:channel:channel**
 user@host> show interfaces t1-fpc/pic/port:channel

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces ds-2/1/0:5:1
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1 (00:00:06 ago), Output: 1 (00:00:06 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
  Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.168.140.196/30, Local: 192.168.140.197
```

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
```

```

None, FCS: 16,
Mode: M23, Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
Input rate      : 741512 bps (224 pps)
Output rate     : 1266528 bps (224 pps)
DS1  alarms    : None
DS3  alarms    : None
DS1  defects   : None
DS3  defects   : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 192.168.118.96/30, Local: 192.168.118.97

```

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

Display Extensive Status Information for a Specific T3 Interface

Purpose To display extensive status information about a specific channelized DS3 to DS0 interface or channelized DS3 to DS1 interface, use one of the following CLI operational mode commands:

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

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```

user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)
    Output: 2 (last sent 00:00:05 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
  Traffic statistics:
    Input bytes :          524          304 bps
    Output bytes :          528          304 bps
    Input packets:           8           0 pps
    Output packets:          8           0 pps
  Input errors:

```

Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes: 0,

L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0

Output errors:

Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0

DS1 alarms :None

DS3 alarms :None

DS1 defects :None

DS3 defects :None

T1 media:	Seconds	Count	State
SEF	0	0	OK
BEE	0	0	OK
AIS	0	0	OK
LOF	0	0	OK
LOS	0	0	OK
YELLOW	0	0	OK
BPV	0	0	
EXZ	0	0	
LCV	0	0	
PCV	0	0	
CS	0	0	
LES	0		
ES	0		
SES	0		
SEFS	0		
BES	0		
UAS	0		

DS3 media:	Seconds	Count	State
PLL Lock	0	0	OK
Reframing	0	0	OK
AIS	0	0	OK
LOF	0	0	OK
LOS	0	0	OK
IDLE	0	0	OK
YELLOW	0	0	OK
BPV	0	0	
EXZ	0	0	
LCV	0	0	
PCV	0	0	
LES	0		
PES	0		
PSES	0		
SEFS	0		
UAS	0		

Interface transmit queues:

	B/W	WRR	Packets	Bytes	Drops	Errors
Queue0	95	95	4	336	0	0
Queue1	5	5	1	22	0	0

HDLC configuration:

Giant threshold: 1514, Runt threshold: 3

Timeslots : 1

Byte encoding: Nx64K, Data inversion: Disabled

DS3 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds

Algorithm: Unknown (0), Induced Error rate: 10e-0

DS1 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds

Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)

PFE configuration:

Destination slot: 2, PLP byte: 2 (0x2f)

CoS transmit queue	Bandwidth	Buffer	Priority	Limit
--------------------	-----------	--------	----------	-------

	%	bps	%	bytes		
0 best-effort	0	0	0	0	low	none
1 expedited-forwarding	0	0	0	0	low	none
2 assured-forwarding	0	0	0	0	low	none
3 network-control	0	0	0	0	low	none

Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
 Protocol inet, MTU: 1500, Flags: None, Generation: 20 Route table: 0
 Addresses, Flags: Is-Preferred Is-Primary
 Destination: 192.168.140.196/30, Local: 192.168.140.197,
 Broadcast: Unspecified,
 Generation: 22

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> show interfaces tl-2/1/0:19 extensive
Physical interface: tl-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      0
```

```

ES                                0
SES                              0
SEFS                             0
BES                              0
UAS                              0
DS3 media:                       Seconds      Count  State
PLL Lock                        0           0 OK
Reframing                      0           0 OK
AIS                             0           0 OK
LOF                             0           0 OK
LOS                             0           0 OK
IDLE                            0           0 OK
YELLOW                          0           0 OK
BPV                             0           0
EXZ                             0           0
LCV                             0           0
PCV                             0           0
LES                             0
PES                             0
PSES                            0
SEFS                            0
UAS                             0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0   95  95      234494    162020375      0          0
Queue1    5   5        164       5808          0          0
HDLC configuration:
Giant threshold: 1514, Runt threshold: 3
Timeslots      : All active
Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
BERT time period: 0 seconds, Elapsed: 0 seconds
Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
BERT time period: 10 seconds, Elapsed: 0 seconds
Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
Destination slot: 2, PLP byte: 2 (0xab)
CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                        %      bps      %      bytes
0 best-effort           0          0  0          0      low  none
1 expedited-forwarding  0          0  0          0      low  none
2 assured-forwarding    0          0  0          0      low  none
3 network-control       0          0  0          0      low  none
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.118.96/30, Local: 192.168.118.97,
Broadcast: Unspecified, Generation: 44

```

Meaning The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the DS1 or DS3 interface and diagnose the media accordingly. See [“Checklist for Locating Multichannel DS3 Alarms and Errors” on page 215](#) for an explanation of Multichannel DS3 alarms.

Monitor Statistics for a Channelized Interface

Purpose To monitor statistics for a channelized DS3 to DS0 interface or channelized DS3 to DS1 interface, use one of the following CLI operational mode commands:

Action `user@host> monitor interfaces ds-fpc/pic/port:channel:channel`
`user@host> monitor interfaces t1-fpc/pic/port:channel`

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> monitor interface ds-2/1/0:5:1
host      Seconds: 9                Time: 10:36:11                Delay: 0/0/4

Interface: ds-2/1/0:5:1, Enabled, Link is Up
Encapsulation: Cisco-HDLC, Keepalives, Speed: 64kbps
Traffic statistics:                Current delta
  Input bytes:                    52502 (80 bps)                [262]
  Output bytes:                   52608 (88 bps)                [344]
  Input packets:                   714 (0 pps)                  [4]
  Output packets:                  714 (0 pps)                  [5]
Encapsulation statistics:
  Input keepalives:                133                        [1]
  Output keepalives:               133                        [1]
Error statistics:
  Input errors:                    0                          [0]
  Input drops:                    0                          [0]
  Input framing errors:            0                          [0]
  Input runts:                    0                          [0]
  Input giants:                   0                          [0]
  Policed discards:               410                        [1]
  L3 incompletes:                 0                          [0]
  L2 channel errors:              0                          [0]
  L2 mismatch timeouts:           0                          [0]
  Carrier transitions:            0                          [0]
  Output errors:                  0                          [0]
  Output drops:                  0                          [0]
  Aged packets:                   0Active alarms : N          [0]
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> monitor interface t1-2/1/0:19
host      Seconds: 4                Time: 10:37:53                Delay: 0/0/4

Interface: t1-2/1/0:19, Enabled, Link is Up
Encapsulation: Cisco-HDLC, Keepalives, Speed: T1
Traffic statistics:                Current delta
  Input bytes:                    27046020 (124752 bps)          [32358]
  Output bytes:                   186975710 (623840 bps)         [161809]
  Input packets:                   233498 (139 pps)              [289]
  Output packets:                  273161 (139 pps)              [290]
Encapsulation statistics:
  Input keepalives:                138                        [0]
  Output keepalives:               141                        [0]
Error statistics:
  Input errors:                    0                          [0]
  Input drops:                    0                          [0]
```

```

Input framing errors:      0          [0]
Input runs:                0          [0]
Input giants:              0          [0]
Policed discards:         439        [0]
L3 incompletes:           0          [0]
L2 channel errors:        0          [0]
L2 mismatch timeouts:     0          [0]
Carrier transitions:       0          [0]
Output errors:             0          [0]
Output drops:             0          [0]
Aged packets:             0          [0]
Active alarms : N
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'

```

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



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

Table 21 on page 200 lists additional problem situations and actions to help you further understand an interface problem.

Table 21: Problem Situations and Actions

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



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

Use Loopback Testing for Multichannel DS3 Interfaces

- [Checklist for Using Loopback Testing for Multichannel DS3 Interfaces on page 201](#)
- [Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface on page 202](#)
- [Create a Loopback on page 203](#)

- [Verify That the Interface Is Up on page 204](#)
- [Clear Interface Statistics on page 205](#)
- [Force the Link Layer to Stay Up on page 206](#)
- [Verify the Status of the Logical Interface on page 207](#)
- [Ping the Channelized Interface on page 208](#)
- [Check for Interface Error Statistics on page 209](#)
- [Diagnose a Suspected Circuit Problem on page 212](#)
- [Create a Loop from the Router to the Network on page 213](#)
- [Create a Loop to the Router from Various Points in the Network on page 214](#)

Checklist for Using Loopback Testing for Multichannel DS3 Interfaces

Purpose To use loopback testing to isolate Multichannel DS3 interface problems.

Action [Table 22 on page 201](#) provides links and commands for using loopback testing for Multichannel DS3 interfaces.

Table 22: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces

Tasks	Command or Action
“Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 202	
1. Create a Loopback on page 203	
a. Create a Physical Loopback on page 203	Connect the TX port to the RX port.
b. Configure a Local Loopback on page 203	<code>[edit interfaces <i>interface name</i> (t3-options t1-options)]</code> <code>set loopback local</code> <code>show</code> <code>commit</code>
2. Verify That the Interface Is Up on page 204	<code>show interfaces (ds-<i>fpc/pic/port:channel:channel</i> t1-<i>fpc/pic/port:channel</i>)</code>
3. Clear Interface Statistics on page 205	<code>clear interfaces statistics (t1-<i>fpc/pic/port:channel</i> ds-<i>fpc/pic/port:channel:channel</i>)</code>
4. Force the Link Layer to Stay Up on page 206	
a. Configure Encapsulation to Cisco-HDLC on page 206	<code>[edit interfaces <i>interface-name</i>]</code> <code>set encapsulation cisco-hdlc</code> <code>show</code> <code>commit</code>
b. Configure No-Keepalives on page 206	<code>[edit interfaces <i>interface-name</i>]</code> <code>set no-keepalives</code> <code>show</code> <code>commit</code>

Table 22: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces (*continued*)

Tasks	Command or Action
5. Verify the Status of the Logical Interface on page 207	<code>show interfaces (ds-fpc/pic/port:channel:channel t1-fpc/pic/port:channel)</code>
6. Ping the Channelized Interface on page 208	<code>ping interface (ds-fpc/pic/port:channel:channel t1-fpc/pic/port:channel) local-IP-address</code> <code>bypass-routing count 1000 rapid</code>
7. Check for Interface Error Statistics on page 209	<code>show interfaces (ds-fpc/pic/port:channel:channel t1-fpc/pic/port:channel) extensive</code>
“Diagnose a Suspected Circuit Problem” on page 212	
1. Create a Loop from the Router to the Network on page 213	
a. Loop the Entire T3 Interface Toward the Network on page 213	<code>[edit interfaces interface-name t3-options]</code> <code>set loopback remote</code> <code>show</code> <code>commit</code>
b. Loop a Particular T1 Channel Toward the Network on page 214	<code>[edit interfaces interface-name t1-options]</code> <code>set loopback remote</code> <code>show</code> <code>commit</code>
2. Create a Loop to the Router from Various Points in the Network on page 214	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 202.

Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface

Problem To diagnose a suspected hardware problem with a Multichannel DS3 interface, follow these steps:

- Solution**
- [Create a Loopback on page 203](#)
 - [Verify That the Interface Is Up on page 204](#)
 - [Clear Interface Statistics on page 205](#)
 - [Force the Link Layer to Stay Up on page 206](#)
 - [Verify the Status of the Logical Interface on page 207](#)
 - [Ping the Channelized Interface on page 208](#)
 - [Check for Interface Error Statistics on page 209](#)

Create a Loopback

Purpose You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the Multichannel DS3 port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. [Create a Physical Loopback on page 203](#)
2. [Configure a Local Loopback on page 203](#)

Create a Physical Loopback

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

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

Configure a Local Loopback

Action To configure a local loopback, follow these steps:

1. In configuration mode, go to the following hierarchy level, depending on whether you are configuring a full T3 or T1 interface:

```
[edit]
user@host# edit interfaces interface-name (t3-options | t1-options)
```

2. Configure the local loopback:

```
[edit interfaces interface-name (t3-options | t1-options)]
user@host# set loopback local
```

The following is an example of the name for a T1 channel 0, group 0, on a Multichannel DS3 port for a channelized DS3 to DS0 interface:

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



NOTE: In order to configure T3 options on the Multichannel DS3, you configure the first logical interfaces: **ds-2/1/0:0:0 t3-options**.

The following is an example of the name for a T1 channel on a Multichannel DS3 port for a channelized DS3 to DS1 interface:

```
[edit interfaces t1-2/1/1:0 t1-options]
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
```

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

4. Commit the configuration:

```
user@host# commit
```

For example:

```
[edit interfaces t1-2/1/1:0 t1-options]
user@host# commit
commit complete
```

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



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

Verify That the Interface Is Up

Purpose Display the status of a DS1 or DS3 interface to determine whether the physical link is up or down.

Action To verify that the status of the Multichannel DS3 interface is up, use one of the following Junos OS command-line interface (CLI) operational mode commands:

```
user@host> show interfaces (ds-fpc/pic/port:channel:channel | t1- fpc/pic/port:channel
)
```

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces ds-2/1/0:5:1
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1 (00:00:06 ago), Output: 1 (00:00:06 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
  Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
```

```
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197
```

The following sample output is for a channelized DS3 to DS1 interface:

```
user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
  Input rate      : 741512 bps (224 pps)
  Output rate     : 1266528 bps (224 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 192.168.140.196/30, Local: 192.168.140.197
```

Meaning The sample output shows that the physical link is up and there are no DS1 or DS3 alarms or defects. You should not see any DS1 or DS3 alarms. You can check any interface on the Multichannel DS3 port.

Clear Interface Statistics

Purpose You must reset the Multichannel DS3 interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input/output errors and packet statistics do not interfere with the current efforts to diagnose the problem.

Action

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

```
user@host> clear interfaces statistics (ds-fpc/pic/port:channel:channel |
t1-fpc/pic/port:channel)
```

Sample Output

```
user@host> clear interfaces statistics DS1/1/0:0:0
user@host>
user@host> clear interfaces statistics t1-1/1/0:0
user@host>
```

Meaning This command clears the interface statistics counters for the Multichannel or T1 interface only.



NOTE: After a Graceful Routing Engine switchover (GRES) you must run **clear interface statistics** again or interface statistics will display junk vales.

Force the Link Layer to Stay Up

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

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

1. [Configure Encapsulation to Cisco-HDLC on page 206](#)
2. [Configure No-Keepalives on page 206](#)

Configure Encapsulation to Cisco-HDLC

Action

To set the encapsulation on a T1 physical interface, follow these steps:

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

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

2. Configure Cisco-HDLC:

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

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# commit
commit complete
```

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

Configure No-Keepalives

Action

To disable the sending of link-layer keepalives on a channelized DS3 or DS0 interface, follow these steps:

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

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

2. Configure no-keepalives:

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

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t1-0/1/1:8]
user@host# commit
commit complete
```

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

Verify the Status of the Logical Interface

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

Action `user@host> show interfaces (ds-fpc/pic/port:channel:channel | t1-fpc/pic/port:channel)`

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```
user@host> show interfaces ds-2/1/0:5:1
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1 (00:00:06 ago), Output: 1 (00:00:06 ago)
```

```

Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)
DS1  alarms    : None
DS3  alarms    : None
DS1  defects   : None
DS3  defects   : None
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134)
  Flags: Point-To-Point  SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 10.10.10.196/30, Local: 10.10.10.197

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
  Input rate     : 741512 bps (224 pps)
  Output rate    : 1266528 bps (224 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
  Flags: Point-To-Point  SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 10.10.10.196/30, Local: 10.10.10.197

```

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

Ping the Channelized Interface

Purpose Use the **ping** command to verify the loopback connection.

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

```

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

```

Sample Output

```

user@host> ping interface t1-2/1/0:7 192.168.126.29 bypass-routing count 1000 rapid
PING 192.168.126.29 (192.168.126.29 ): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

```



```

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 192.168.126.29 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 6.068/7.475/74.080/3.696 ms

```

Meaning This command sends 1000 ping packets out of the channelized interface under the Multichannel DS3 port to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at support@juniper.net, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

Check for Interface Error Statistics

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

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

```

user@host> show interfaces (ds-fpc/pic/port:channel:channel | t1-fpc/pic/port:channel)
extensive

```

Sample Output

The following sample output is for a channelized DS3 to DS0 interface:

```

user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)
    Output: 2 (last sent 00:00:05 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
  Traffic statistics:
    Input bytes :          524          304 bps
    Output bytes :          528          304 bps
    Input packets:           8           0 pps
    Output packets:          8           0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes:
  0,
    L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1  alarms : None
  DS3  alarms : None

```

DS1 defects : None

DS3 defects : None

T1 media:	Seconds	Count	State
SEF	0	0	OK
BEE	0	0	OK
AIS	0	0	OK
LOF	0	0	OK
LOS	0	0	OK
YELLOW	0	0	OK
BPV	0	0	
EXZ	0	0	
LCV	0	0	
PCV	0	0	
CS	0	0	
LES	0		
ES	0		
SES	0		
SEFS	0		
BES	0		
UAS	0		

DS3 media:	Seconds	Count	State
PLL Lock	0	0	OK
Reframing	0	0	OK
AIS	0	0	OK
LOF	0	0	OK
LOS	0	0	OK
IDLE	0	0	OK
YELLOW	0	0	OK
BPV	0	0	
EXZ	0	0	
LCV	0	0	
PCV	0	0	
LES	0		
PES	0		
PSES	0		
SEFS	0		
UAS	0		

Interface transmit queues:

	B/W	WRR	Packets	Bytes	Drops	Errors
Queue0	95	95	4	336	0	0
Queue1	5	5	1	22	0	0

HDLC configuration:

Giant threshold: 1514, Runt threshold: 3

Timeslots : 1

Byte encoding: Nx64K, Data inversion: Disabled

DS3 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds

Algorithm: Unknown (0), Induced Error rate: 10e-0

DS1 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds

Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)

PFE configuration:

Destination slot: 2, PLP byte: 2 (0x2f)

CoS transmit queue	Bandwidth	Buffer	Priority	Limit
	% bps	% bytes		
0 best-effort	0	0	0	low none
1 expedited-forwarding	0	0	0	low none
2 assured-forwarding	0	0	0	low none
3 network-control	0	0	0	low none

Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

```

Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 20 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
Unspecified,
Generation: 22

```

The following sample output is for a channelized DS3 to DS1 interface:

```

user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
Interface index: 50, SNMP ifIndex: 59, Generation: 49
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
Mode: M23, Framing: ESF
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Hold-times : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
Input : 117 (last seen 00:00:08 ago)
Output: 121 (last sent 00:00:01 ago)
Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
Traffic statistics:
Input bytes :          22459734          236888 bps
Output bytes :         162288645         1322208 bps
Input packets:          201233          214 pps
Output packets:         236341          227 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:
0,
L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms : None
DS3 alarms : None
DS1 defects : None
DS3 defects : None
T1 media:
Seconds          Count  State
SEF              0         0 OK
BEE              0         0 OK
AIS              0         0 OK
LOF              0         0 OK
LOS              0         0 OK
YELLOW           0         0 OK
BPV              0         0
EXZ              0         0
LCV              0         0
PCV              0         0
CS               0         0
LES              0
ES               0
SES              0
SEFS             0
BES              0
UAS              0
DS3 media:
Seconds          Count  State
PLL Lock         0         0 OK

```

```

Reframing                0          0 OK
AIS                      0          0 OK
LOF                      0          0 OK
LOS                      0          0 OK
IDLE                     0          0 OK
YELLOW                   0          0 OK
BPV                      0          0
EXZ                      0          0
LCV                      0          0
PCV                      0          0
LES                      0
PES                      0
PSES                     0
SEFS                     0
UAS                      0

Interface transmit queues:
      B/W  WRR  Packets      Bytes      Drops      Errors
Queue0   95  95    234494    162020375      0          0
Queue1    5   5      164      5808      0          0

HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0xab)
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      bytes
0 best-effort             0          0  0          0      low  none
1 expedited-forwarding    0          0  0          0      low  none
2 assured-forwarding      0          0  0          0      low  none
3 network-control         0          0  0          0      low  none

Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
  Unspecified, Generation: 44

```

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

Diagnose a Suspected Circuit Problem

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

Solution To diagnose a suspected circuit problem, follow these steps:

- [Create a Loop from the Router to the Network on page 213](#)
- [Create a Loop to the Router from Various Points in the Network on page 214](#)

Create a Loop from the Router to the Network

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

1. [Loop the Entire T3 Interface Toward the Network on page 213](#)
2. [Loop a Particular T1 Channel Toward the Network on page 214](#)

Loop the Entire T3 Interface Toward the Network

Purpose Creating a loop from the entire T3 interface to the network allows the transport-layer engineer to test the router from various points in the network and isolate the problem.

Action

To create a loop from the entire T3 interface to the network, follow these steps:

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

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

2. Configure the loopback:

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

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-2/1/1:0 t3-options]
user@host# show
loopback remote;
```

4. Commit the configuration:

```
user@host# commit
```

Meaning

The **loopback remote** command loops any traffic from the network back into the network.

The interface name is one of the following:

- T1 channel 0, channel group 0, on the Multichannel DS3 port for a channelized DS3 to DS0 interface (for example, **ds-2/1/1:0:0**)
- T1 channel 0 on the Multichannel DS3 port for a channelized DS3 to DS1 interface (for example, **t1-2/1/1:0**)

Loop a Particular T1 Channel Toward the Network

Purpose Creating a loop from a particular T1 interface to the network allows the transport-layer engineer to test the T1 interface from various points in the network and isolate the problem.

Action

To create a loop from a particular T1 interface to the network, follow these steps:

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

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

2. Configure the loopback:

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

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces ds-2/1/1:0:0 t1-options]  
user@host# show  
loopback remote;
```

4. Commit the configuration:

```
user@host# commit
```

Meaning

This command loops any traffic from the network back into the network. The interface name is one of the following:

- Channel group 0 for the particular T1 channel on the Multichannel DS3 port for a channelized DS3 to DS3 interface (for example, **ds-2/1/1:2:0**)
- Particular T1 channel on the Multichannel DS3 port for a channelized DS3 to DS1 interface (for example, **t1-2/1/1:3**)

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

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

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Step 2 through Step 7 in [“Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 202](#). Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

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

Locate Multichannel DS3 Alarms and Errors

- [Checklist for Locating Multichannel DS3 Alarms and Errors on page 215](#)
- [Display Alarms and Errors for Channelized DS3 to DS1 Interfaces on page 215](#)
- [Display Alarms and Errors for Channelized DS3 to DS0 Interfaces on page 218](#)

Checklist for Locating Multichannel DS3 Alarms and Errors

Purpose To check for the most common Multichannel DS3 alarms and errors encountered when investigating line problems on a Juniper Networks router.

Action [Table 23 on page 215](#) provides links and commands for Multichannel DS3 alarms and errors.

Table 23: Checklist for Multichannel DS3 Alarms and Errors

Tasks	Command or Action
“Display Alarms and Errors for Channelized DS3 to DS1 Interfaces” on page 215	<code>show interfaces t1-fpc/pic/port:channel extensive</code>
“Display Alarms and Errors for Channelized DS3 to DS0 Interfaces” on page 218	<code>show interfaces ds-fpc/pic/port:channel:channel extensive</code>

Display Alarms and Errors for Channelized DS3 to DS1 Interfaces

Purpose To display channelized DS3 to DS1 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

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

Sample Output

```

user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59, Generation: 49
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 117 (last seen 00:00:08 ago)
    Output: 121 (last sent 00:00:01 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
  Traffic statistics:
    Input  bytes :           22459734           236888 bps
    Output bytes :          162288645          1322208 bps
    Input  packets:           201233           214 pps
    Output packets:           236341           227 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:
    0,

```

L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0

Output errors:

Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0

DS1 alarms :None

DS3 alarms :None

DS1 defects :None

DS3 defects :None

T1 media:	Seconds	Count	State
SEF	0	0	OK
BEE	0	0	OK
AIS	0	0	OK
LOF	0	0	OK
LOS	0	0	OK
YELLOW	0	0	OK
BPV	0	0	
EXZ	0	0	
LCV	0	0	
PCV	0	0	
CS	0	0	
LES	0		
ES	0		
SES	0		
SEFS	0		
BES	0		
UAS	0		

DS3 media:	Seconds	Count	State
PLL Lock	0	0	OK
Reframing	0	0	OK
AIS	0	0	OK
LOF	0	0	OK
LOS	0	0	OK
IDLE	0	0	OK
YELLOW	0	0	OK
BPV	0	0	
EXZ	0	0	
LCV	0	0	
PCV	0	0	
LES	0		
PES	0		
PSES	0		
SEFS	0		
UAS	0		

Interface transmit queues:

	B/W	WRR	Packets	Bytes	Drops	Errors
Queue0	95	95	234494	162020375	0	0
Queue1	5	5	164	5808	0	0

HDLC configuration:

Giant threshold: 1514, Runt threshold: 3

Timeslots : All active

Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled

DS3 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds

Algorithm: Unknown (0), Induced Error rate: 10e-0

DS1 BERT configuration:

BERT time period: 10 seconds, Elapsed: 0 seconds

Induced Error rate: 10e-0, Algorithm: 2¹⁵ - 1, 0.151, Pseudorandom (9)

PFE configuration:

Destination slot: 2, PLP byte: 2 (0xab)

CoS transmit queue	Bandwidth	Buffer	Priority	Limit
	%	bytes		
	bps	%		


```

0 best-effort          0          0 0          0      low none
1 expedited-forwarding 0          0 0          0      low none
2 assured-forwarding   0          0 0          0      low none
3 network-control      0          0 0          0      low none
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
Unspecified, Generation: 44

```

Meaning

The sample output shows that there are no active alarms and active defects. When a major error (such as an alarm indication signal [AIS]) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

Notification messages are logged at the alarm level. Depending on the type of T1 alarm, you can configure the craft panel to display the red or yellow alarm LED and simultaneously have the alarm relay activate a physically connected device (such as a bell). [Table 24 on page 217](#) shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 24: 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

Table 24: T1 Media Alarms and Error Definitions (*continued*)

T1 Media Alarm or Error	Definitions
SEF	Severely errored frame
SEFS	Severely errored frame seconds
SES	Severely errored seconds
UAS	Unavailable seconds
YLW	Yellow alarm

See Checklist for T1 Alarms and Errors for more details on T1 alarms and statistics.

Display Alarms and Errors for Channelized DS3 to DS0 Interfaces

Purpose To display T3 alarms and errors for channelized DS3 to DS0 interfaces, use the following Junos OS CLI operational mode command:

Action `user@host> show interfaces ds-fpc/pic/port:channel:channel extensive`

Sample Output

```

user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags      : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags       : Keepalives
  Hold-times       : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)
    Output: 2 (last sent 00:00:05 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
  Traffic statistics:
    Input  bytes :           524           304 bps
    Output bytes :           528           304 bps
    Input  packets:             8             0 pps
    Output packets:            8             0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes:
  0,
    L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1  alarms   : None
  DS3  alarms   : None
  DS1  defects  : None
  DS3  defects  : None
  T1  media:           Seconds          Count   State

```

```

SEF          0          0 OK
BEE          0          0 OK
AIS          0          0 OK
LOF          0          0 OK
LOS          0          0 OK
YELLOW       0          0 OK
BPV          0          0
EXZ          0          0
LCV          0          0
PCV          0          0
CS           0          0
LES          0
ES           0
SES          0
SEFS         0
BES          0
UAS          0
DS3 media:   Seconds    Count  State
PLL Lock     0          0 OK
Reframing    0          0 OK
AIS          0          0 OK
LOF          0          0 OK
LOS          0          0 OK
IDLE         0          0 OK
YELLOW       0          0 OK
BPV          0          0
EXZ          0          0
LCV          0          0
PCV          0          0
LES          0
PES          0
PSES         0
SEFS         0
UAS          0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0   95  95          4       336         0         0
Queue1    5   5          1        22         0         0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : 1
  Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0x2f)
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      bytes
0 best-effort             0          0  0         0      low  none
1 expedited-forwarding    0          0  0         0      low  none
2 assured-forwarding      0          0  0         0      low  none
3 network-control         0          0  0         0      low  none
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 1500, Flags: None, Generation: 20 Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary

```

Destination: 192.168.118.96/30, Local: 192.168.118.97, Broadcast:
Unspecified,
Generation: 22

Meaning

The sample output shows that there are no active alarms and active defects. When a major error (such as an AIS) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

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



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

“T1 Media Alarms and Error Definitions” on page 215 shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 25: 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 Checklist of Common T3 Alarms and Errors for more details on T3 alarms and statistics.

PART 5

Index

- [Index on page 225](#)

Index

Symbols

#, comments in configuration statements.....	xiv
(), in syntax descriptions.....	xiv
< >, in syntax descriptions.....	xiv
[], in configuration statements.....	xiv
{ }, in configuration statements.....	xiv
(pipe), in syntax descriptions.....	xiv

A

alarms

Channelized DS3 interfaces, checklist	184
Multichannel DS3 interfaces, checklist	215

B

BERT

configuring interface diagnostics.....	151
bert-algorithm statement.....	46
usage guidelines.....	151
bert-error-rate statement.....	48
usage guidelines.....	151
bert-period statement.....	50
usage guidelines.....	151
bit error rate test See BERT	
braces, in configuration statements.....	xiv
brackets	
angle, in syntax descriptions.....	xiv
square, in configuration statements.....	xiv
byte encoding.....	51
byte-encoding statement.....	51

C

C-bit parity mode.....	52
cbit-parity statement.....	52
channelization	
configuring.....	13
channelization statement.....	52
Channelized DS3 interfaces	
alarms and errors.....	184
circuit problem	182
clear interfaces statistics command.....	177
edit interfaces command.....	177, 178

edit interfaces t1-options command	175, 183
edit interfaces t3-options command.....	175
encapsulation, configuring.....	177
errors	170
link layer, forcing up.....	177
local loopback, configuring.....	175
logical interface	179
loopback, configuring	
from specific T1 interface.....	182
monitor interface command	170
monitor, checklist.....	160
no keepalives, configuring.....	178
notification messages.....	187
physical link status.....	162, 176
physical loopback, creating	175
ping interface command.....	180
set encapsulation command.....	177
set loopback local command.....	175
set loopback remote command.....	183
set no-keepalives command.....	179
show interfaces command.....	162, 176, 179
show interfaces extensive	
command.....	165, 180, 184
show interfaces terse command.....	161
statistics	
checking error.....	180
monitoring	170
resetting.....	177
status	
displaying	161, 176
displaying specific	162, 165
extensive	165
logical interface, verifying.....	179
t1-options statement.....	175, 183
t3-options statement.....	175
channelized DS3 to DS0 interfaces	
alarms and errors	218
clear interfaces statistics command.....	205
logical interface	207
monitor interfaces command	199
ping interface command.....	208
show interfaces command.....	204, 207
show interfaces extensive	
command.....	209, 218
channelized DS3 to DS1 interfaces	
alarms and errors	215
show interfaces command.....	176, 205, 207
show interfaces extensive command.....	215

channelized DS3-to-DS0 interfaces		edit interfaces command.....159, 191	
status information, displaying.....76		Channelized DS3 interfaces177, 178	
channelized DS3-to-DS1 interfaces		Multichannel DS3 interfaces206, 207	
status information, displaying.....87		edit interfaces t1-options command	
channelized interfaces.....192		Channelized DS3 interfaces175, 183	
Channelized DS3, status, displaying.....161		Multichannel DS3 interfaces203, 214	
errors.....170, 198		edit interfaces t3-options command	
Multichannel DS3, status, displaying.....193		Channelized DS3 interfaces175	
notification messages.....217		Multichannel DS3 interfaces203, 213	
statistics monitoring199		encoding	
status.....176, 204		byte.....51	
extensive.....165, 195		errors	
channelized T1 IQ interfaces		Channelized DS3 interfaces170	
status information, displaying.....116		channelized interfaces198	
channelized T3 IQ interfaces			
status information, displaying.....90		F	
checklist for alarms		fast-aps-switch statement.....54	
Channelized DS3 alarms184		fcs statement.....55	
Multichannel DS3 alarms.....215		feac-loop-respond statement.....56	
checklist for monitoring		font conventions.....xiii	
Channelized DS3 interfaces160		fractional T1 IQ interfaces	
Multichannel DS3 interfaces192		example configuration.....4	
circuit problems		framing statement	
Channelized DS3 interfaces.....182		E1, E3, and T1 interfaces.....57	
clear interfaces statistics command			
Channelized DS3 interfaces.....177		I	
channelized DS3 to DS0 interfaces205		idle-cycle-flag statement.....58	
commands for router management,		interface-type statement.....59	
interfaces.....158, 159, 190, 191		interfaces	
comments, in configuration statements.....xiv		alarms160, 192	
conventions		configuration statements.....24	
text and syntax.....xiii		investigation process160, 192	
curly braces, in configuration statements.....xiv		locating alarms.....160, 192	
customer support.....xv		loopback test commands, table.....159, 191	
contacting JTAC.....xv		monitoring commands, table.....158, 190	
		monitoring, general steps.....157, 189	
D		troubleshooting overview, (monitoring,	
documentation		loopback testing, and locating	
comments on.....xv		alarms).....157, 189	
DS interfaces		invert-data statement.....60	
status information, displaying.....92		investigation process	
ds0-options statement.....53		interfaces.....160, 192	
E		L	
E1 interfaces		logical systems	
status information, displaying.....92		configuration statements.....40	
E3 interfaces		long-buildout statement.....61	
status information, displaying.....128			

loopback statement	
ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3.....	62
loopback testing.....	149
loopback, configuring local	
Channelized DS3 interfaces.....	175
Multichannel DS3 interfaces.....	203
loopback, creating physical	
Channelized DS3 interfaces.....	175
Multichannel DS3 interfaces.....	203

M

manuals	
comments on.....	xv
monitor interface command	
Channelized DS3 interfaces	170
channelized DS3 to DS0 interfaces.....	199
Multichannel DS3 interfaces	
alarms and errors.....	215, 218
checklist for alarms.....	215
clear interface statistics command.....	205
edit interfaces command.....	206, 207
edit interfaces t1-options command	203, 214
edit interfaces t3-options command.....	203, 213
encapsulation, configuring.....	206
errors.....	198
link layer, forcing up.....	206
local loopback, configuring.....	203
loopback, configuring	
for entire T3 interface.....	213
from specific T1 interface.....	214
monitor	
channelized.....	199
checklist.....	192
monitor interfaces command.....	199
no keepalives, configuring.....	207
physical link status.....	194, 200, 204
physical loopback, creating	203
ping interface command.....	208
problems, table.....	200
set cli terminal command.....	200
set encapsulation command.....	206
set loopback local command.....	203
set loopback remote command.....	213, 214
set no-keepalives command.....	207
show command.....	203
show interfaces command.....	204, 205
show interfaces extensive command.....	209, 218

statistics	
checking error.....	209
monitoring.....	199
resetting.....	205
status	
displaying.....	193, 204
displaying specific.....	194
extensive.....	195
logical interface, verifying.....	207
t1-options statement.....	203, 214
t3-options statement.....	203, 213

N

network.....	182, 212
no-cbit-parity statement.....	52
no-feac-loop-respond statement.....	56
no-long-buildout statement.....	61
no-partition statement.....	64
notification messages, logging for.....	187, 217
NxDS0 IQ interfaces	
example configuration.....	5

P

parentheses, in syntax descriptions.....	xiv
partition statement.....	66
physical interfaces	
byte encoding.....	51
C-bit parity mode.....	52
physical link down	
Channelized DS3 interfaces.....	165
channelized interfaces.....	195
Multichannel DS3 interfaces, table	200
physical link up	
Channelized DS3 interfaces.....	164
channelized interfaces.....	195
physical loopback	
Channelized DS3 interfaces	175
channelized interfaces	203
ping interface command	
Channelized DS3 interfaces	180
channelized interfaces	208
problems	
channelized interfaces, table.....	200
T1 interfaces, table	200

S

set cli terminal command	
Multichannel DS3 interfaces	200

set encapsulation command	
Channelized DS3 interfaces	177
Multichannel DS3 interfaces	206
set loopback local command	
Channelized DS3 interfaces	175
Multichannel DS3 interfaces	203
set loopback remote command	
Channelized DS3 interfaces	183
Multichannel DS3 interfaces	213, 214
set no-keepalives command	
Channelized DS3 interfaces	179
Multichannel DS3 interfaces	207
show command	203
show interfaces (Channelized DS3-to-DS0)	
command.....	76
show interfaces (Channelized DS3-to-DS1)	
command.....	87
show interfaces (Channelized T1 IQ)	
command.....	116
show interfaces (Channelized T3 IQ)	
command.....	90
show interfaces (T1, E1, or DS) command.....	92
show interfaces (T3 or E3) command.....	128
show interfaces command	
Channelized DS3 interfaces	162, 176, 179
channelized DS3 to DS0 interfaces	204, 207
DS3 to DS1 interfaces	176, 205
show interfaces extensive command	
Channelized DS3 interfaces.....	165, 180, 184
channelized DS3 to DS0 interfaces.....	209, 218
channelized DS3 to DS1 interfaces.....	215
show interfaces terse command	
Channelized DS3 interfaces	161
start-end-flag statement.....	67
statistics	
channelized interfaces	170, 199
status	
Channelized DS3 interfaces	161, 176
channelized interfaces.....	204
Multichannel DS3 interfaces	193
status extensive	
Channelized DS3 interfaces	165
channelized interfaces	195
support, technical See technical support	
syntax conventions.....	xiii

T

T1 interfaces	
byte encoding.....	51
clear statistics command.....	177, 205
status information, displaying.....	92
T1 IQ interfaces	
example configuration.....	4
T1 media alarms, table.....	187, 217
t1-options statement.....	68, 175, 183, 203, 214
T3 interfaces	
C-bit parity mode.....	52
status information, displaying.....	128
t3-options statement.....	69, 175, 183, 203, 213, 214
technical support	
contacting JTAC.....	xv
timeslots statement.....	70