



---

Junos<sup>®</sup> OS

# Channelized Interfaces Configuration Guide

Release  
12.1



---

Published: 2012-03-08

Juniper Networks, Inc.  
1194 North Mathilda Avenue  
Sunnyvale, California 94089  
USA  
408-745-2000  
[www.juniper.net](http://www.juniper.net)

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

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

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

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

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

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

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

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

#### *Junos® OS Channelized Interfaces Configuration Guide*

Release 12.1

Copyright © 2012, Juniper Networks, Inc.

All rights reserved.

#### Revision History

March 2012—R1 Junos OS 12.1

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.

# Abbreviated Table of Contents

	About This Guide .....	xxi
Part 1	Channelized Interfaces Configuration Statements Overview	
Chapter 1	Channelized Interfaces Configuration Statements and Hierarchy .....	3
Part 2	Configuring Channelized Interfaces	
Chapter 2	Channelized Interfaces .....	27
Chapter 3	Configuring Channelized OC48/STM16 IQE Interfaces .....	49
Chapter 4	Configuring Channelized OC12/STM4 Interfaces .....	67
Chapter 5	Configuring Channelized OC3 IQ and IQE Interfaces .....	99
Chapter 6	Configuring Channelized STM1 Interfaces .....	107
Chapter 7	Configuring Channelized T3 Interfaces .....	125
Chapter 8	Configuring Channelized T1 Interfaces .....	141
Chapter 9	Configuring Channelized E1 Interfaces .....	147
Chapter 10	Configuring Channelized E1 PRI and T1 PRI Interfaces .....	155
Part 3	Configuring E1, E3, T1, and T3 Interfaces	
Chapter 11	Configuring E1 Interfaces .....	165
Chapter 12	Configuring E3 Interfaces .....	173
Chapter 13	Configuring T1 Interfaces .....	181
Chapter 14	Configuring T3 Interfaces .....	191
Part 4	Configuring Frame Relay	
Chapter 15	Configuring Frame Relay .....	207
Part 5	Channelized Interface Configuration Statements	
Chapter 16	Summary of Channelized Interface Configuration Statements .....	223
Part 6	Troubleshooting	
Chapter 17	Investigate Channelized DS3 Interfaces .....	309
Chapter 18	Investigate Multichannel DS3 Interfaces .....	341
Chapter 19	Investigate Channelized OC12 Interfaces .....	373

## Part 7

## Index

Index .....	417
Index of Statements and Commands .....	427

# Table of Contents

	<b>About This Guide</b> .....	<b>xxi</b>
	Junos Documentation and Release Notes .....	xxi
	Objectives .....	xxii
	Audience .....	xxii
	Supported Routing Platforms .....	xxii
	Using the Indexes .....	xxiii
	Using the Examples in This Manual .....	xxiii
	Merging a Full Example .....	xxiii
	Merging a Snippet .....	xxiv
	Documentation Conventions .....	xxiv
	Documentation Feedback .....	xxvi
	Requesting Technical Support .....	xxvi
	Self-Help Online Tools and Resources .....	xxvii
	Opening a Case with JTAC .....	xxvii
<b>Part 1</b>	<b>Channelized Interfaces Configuration Statements Overview</b>	
<b>Chapter 1</b>	<b>Channelized Interfaces Configuration Statements and Hierarchy</b> .....	<b>3</b>
	[edit chassis] Hierarchy Level .....	3
	[edit interfaces] Hierarchy Level .....	4
	[edit logical-systems] Hierarchy Level .....	20
<b>Part 2</b>	<b>Configuring Channelized Interfaces</b>	
<b>Chapter 2</b>	<b>Channelized Interfaces</b> .....	<b>27</b>
	Channelized Interfaces Overview .....	27
	Channelized Interface Capabilities .....	28
	Data-Link Connection Identifiers on Channelized Interfaces .....	30
	Clock Sources on Channelized Interfaces .....	32
	Channel Scaling Numbers of Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP .....	36
	Channel Scaling Numbers of DS3/E3 MIC .....	37
	Channelized E1 and T1 PIM Properties .....	38
	Channelized IQ and IQE Interfaces Properties .....	38
	Structure of Channelized IQ and Channelized IQE PICs .....	40

<b>Chapter 3</b>	<b>Configuring Channelized OC48/STM16 IQE Interfaces . . . . .</b>	<b>49</b>
	Channelized OC48/STM16 IQE Interfaces Overview . . . . .	49
	Configuring Channelized OC48/STM16 IQE Interfaces in SONET Mode . . . . .	51
	Configuring OC12 Interfaces . . . . .	51
	Example: Configuring OC12 Interfaces . . . . .	52
	Configuring OC3 Interfaces . . . . .	52
	Example: Configuring OC3 Interfaces . . . . .	53
	Configuring T3 Interfaces . . . . .	53
	Example: Configuring T3 Interfaces . . . . .	54
	Configuring T1 Interfaces . . . . .	54
	Example: Configuring T1 Interfaces . . . . .	55
	Configuring Fractional T1 Interfaces . . . . .	56
	Example: Configuring Fractional T1 Interfaces . . . . .	56
	Configuring NxDS0 Interfaces . . . . .	56
	Example: Configuring NxDS0 Interfaces . . . . .	58
	Configuring Channelized OC48/STM16 IQE Interfaces (SDH Mode) . . . . .	58
	Configuring a Channelized OC48/STM16 IQE PIC for SDH Mode . . . . .	59
	Configuring Clear Channel STM1 and STM4 Interfaces . . . . .	59
	Configuring Channelized AU-4 Interfaces . . . . .	60
	Example: Configuring Channelized AU-4 Interfaces . . . . .	60
	Configuring E3 Interfaces . . . . .	60
	Example: Configuring E3 Interfaces . . . . .	61
	Configuring E1 or Channelized E1 Interfaces . . . . .	61
	Example: Configuring E1 and Channelized E1 Interfaces . . . . .	62
	Configuring NxDS0 IQE Interfaces . . . . .	62
	Example: Configuring NxDS0 IQE Interfaces . . . . .	62
	Configuring T3 or Channelized T3 Interfaces . . . . .	62
	Example: Configuring T3 or Channelized T3 Interfaces . . . . .	63
	Configuring T1 or Channelized T1 Interfaces . . . . .	63
	Example: Configuring T1 or Channelized T1 Interfaces . . . . .	63
	Configuring Link PIC Failover on Channelized OC48/STM16 IQE Interfaces . . . .	64
	Example: Configuring Channelized OC48 Interfaces with Partitioned Channels . . . . .	64
<b>Chapter 4</b>	<b>Configuring Channelized OC12/STM4 Interfaces . . . . .</b>	<b>67</b>
	Channelized OC12/STM4 IQ and IQE Interfaces Overview . . . . .	67
	Channelization of OC12/STM4 IQ and Channelized OC12/STM4 IQE PICs (SONET Mode) . . . . .	67
	Channelization of OC12/STM4 IQE PIC (SDH Mode) . . . . .	68
	Channelization of OC12/STM4 IQ PIC (SDH Mode) . . . . .	69
	Channelization of OC12 PIC (SONET Mode) . . . . .	70
	Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode) . . . .	71
	Configuring an OC12/STM4 Interface . . . . .	71
	Configuring T3 Interfaces . . . . .	71
	Example: Configuring T3 Interfaces . . . . .	72
	Configuring OC3 Interfaces . . . . .	73
	Example: Configuring OC3 Interfaces . . . . .	73
	Configuring T1 Interfaces on Channelized OC12 IQ and IQE Interfaces . . . . .	73
	Example: Configuring T1 Interfaces . . . . .	75

Configuring NxDS0 Interfaces .....	75
Example: Configuring NxDS0 Interfaces .....	76
Configuring Fractional T1 Interfaces .....	77
Example: Configuring Fractional T1 Interfaces .....	77
Configuring Channelized OC12/STM4 IQE Interfaces (SDH Mode) .....	78
Configuring Channelized OC12/STM4 IQE PICs for SDH Mode .....	78
Configuring an Unpartitioned SDH (VC-4-4C) Interface on a Channelized OC12/STM4 IQE PIC .....	79
Example: Configuring an Unpartitioned SDH (VC-4-4C) Interface .....	79
Configuring SDH (VC-4) Interfaces on Channelized OC12/STM4 IQE PICs .....	79
Example: Configuring SDH (VC-4) Interfaces .....	80
Configuring Channelized AU-4 Interfaces .....	80
Example: Configuring Channelized AU-4 Interfaces .....	81
Configuring E3 Interfaces .....	81
Example: Configuring E3 Interfaces .....	82
Configuring E1 or Channelized E1 Interfaces .....	82
Example: Configuring E1 or Channelized CE1 Interfaces .....	83
Configuring NxDS0 Interfaces on Channelized OC12/STM4 IQE PICs .....	83
Example: Configuring NxDS0 Interfaces .....	83
Configuring Channelized OC12/STM4 IQ Interfaces (SDH Mode) .....	83
Configuring Channelized OC12/STM4 IQ PICs for SDH Mode .....	84
Configuring an Unpartitioned SDH (VC-4-4C) Interface on a Channelized OC12/STM4 IQ PIC .....	85
Example: Configuring an Unpartitioned SDH (VC-4-4C) Interface .....	85
Configuring SDH (VC-4) Interfaces on Channelized OC12/STM4 IQ PICs .....	85
Example: Configuring SDH (VC-4) Interfaces .....	86
Configuring Channelized AU-4 Interfaces .....	86
Example: Configuring Channelized AU-4 Interfaces .....	86
Configuring T3 or Channelized T3 Interfaces Under Channelized AU-4 Interfaces .....	87
Example: Configuring T3 or Channelized T3 Interfaces .....	87
Configuring T1 or Channelized T1 Interfaces Under Channelized AU-4 Interfaces .....	87
Example: Configuring T1 or Channelized T1 Interfaces Under Channelized AU-4 Interfaces .....	88
Configuring T1 or Channelized T1 Interfaces Under Channelized T3 Interfaces .....	88
Example: Configuring T1 or Channelized T1 Interfaces Under Channelized T3 Interfaces .....	88
Configuring NxDS0 Interfaces on Channelized OC12/STM4 IQ PICs .....	89
Example: Configuring NxDS0 Interfaces .....	89
Configuring Channelized OC12 Interfaces .....	89
Example: Configuring Channelized OC12 Interfaces .....	90

	Configuring Link PIC Failover on Channelized OC12/STM4 IQ and IQE Interfaces . . . . .	92
	Example: Configuring a Channelized OC12 IQ Interface as an Unpartitioned Clear Channel . . . . .	92
	Example: Configuring Channelized OC12 Interfaces with Partitioned Channels . . . . .	96
<b>Chapter 5</b>	<b>Configuring Channelized OC3 IQ and IQE Interfaces . . . . .</b>	<b>99</b>
	Channelized OC3 IQ and IQE Overview . . . . .	99
	Partitions, OC Slices, Interface Types, and Time Slots . . . . .	100
	Configuring a Clear Channel on Channelized OC3 IQ and IQE PICs . . . . .	101
	Configuring T3 Interfaces on IQ and IQE Interfaces . . . . .	101
	Example: Configuring T3 Interfaces . . . . .	102
	Configuring T1 and NxDS0 Interfaces . . . . .	102
	Example: Configuring T1 and NxDS0 Interfaces . . . . .	104
	Example: Setting Remote Loopback and Running BERT Tests on NxDS0 Interfaces . . . . .	105
	Configuring Fractional T1 IQ Interfaces . . . . .	105
	Example: Configuring Fractional T1 IQ Interfaces . . . . .	106
	Configuring Link PIC Failover on Channelized OC3 IQ and IQE Interfaces . . . . .	106
<b>Chapter 6</b>	<b>Configuring Channelized STM1 Interfaces . . . . .</b>	<b>107</b>
	Channelized STM1 Interfaces Overview . . . . .	107
	Configuring Channelized STM1 IQ and IQE Interfaces . . . . .	107
	Configuring an STM1 IQ or STM1 IQE Interface . . . . .	107
	Configuring E1 IQ and IQE Interfaces . . . . .	108
	Example: Configuring E1 IQ and IQE Interfaces . . . . .	108
	Configuring Fractional E1 IQ and IQE Interfaces . . . . .	109
	Example: Configuring Fractional E1 Interfaces . . . . .	110
	Configuring an NxDS0 IQ Interface . . . . .	110
	Example: Configuring an NxDS0 IQ Interface . . . . .	111
	Example: Configuring Channelized STM1 IQ and IQE Interfaces . . . . .	111
	Configuring Channelized STM1 Interfaces . . . . .	112
	Configuring Channelized STM1 Interface Properties . . . . .	113
	Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces . . . . .	114
	Configuring Link PIC Failover on Channelized STM1 Interfaces . . . . .	121
	Example: Configuring Channelized STM1 Interfaces . . . . .	121
<b>Chapter 7</b>	<b>Configuring Channelized T3 Interfaces . . . . .</b>	<b>125</b>
	Configuring Channelized T3 IQ Interfaces . . . . .	125
	Configuring T3 IQ Interfaces . . . . .	125
	Configuring T1 IQ Interfaces . . . . .	126
	Example: Configuring T1 IQ and IQE Interfaces . . . . .	126
	Configuring Fractional T1 IQ and IQE Interfaces . . . . .	126
	Example: Configuring Fractional T1 IQ Interfaces . . . . .	127
	Configuring an NxDS0 IQ Interface . . . . .	127
	Example: Configuring an NxDS0 IQ Interface . . . . .	128
	Configuring Channelized DS3-to-DS0 Interfaces . . . . .	128



	Configuring Channelized DS3-to-DS1 Interfaces . . . . .	131
	Configuring the Junos OS to Enable Channelization on DS3/E3 MIC . . . . .	132
	Example: Configuring Channelized T3 IQ Interfaces . . . . .	134
	Examples: Configuring Channelized DS3-to-DS0 Interfaces . . . . .	135
	Examples: Configuring Channelized DS3-to-DS1 Interfaces . . . . .	137
<b>Chapter 8</b>	<b>Configuring Channelized T1 Interfaces . . . . .</b>	<b>141</b>
	Channelized T1 IQ and IQE Interfaces Overview . . . . .	141
	Configuring Channelized T1 IQ and IQE Interfaces . . . . .	141
	Configuring T1 IQ and IQE Interfaces . . . . .	141
	Configuring Fractional T1 IQ and IQE Interfaces . . . . .	142
	Example: Configuring Fractional T1 IQ and IQE Interfaces . . . . .	142
	Configuring NxDS0 IQ and IQE Interfaces . . . . .	143
	Example: Configuring an NxDS0 IQ or IQE Interface . . . . .	143
	Configuring Payload Loopback . . . . .	143
	Configuring Channelized T1 Interface Properties . . . . .	144
	Example: Configuring Channelized T1 IQ and IQE Interfaces . . . . .	145
<b>Chapter 9</b>	<b>Configuring Channelized E1 Interfaces . . . . .</b>	<b>147</b>
	Channelized E1 IQ and IQE Interfaces Overview . . . . .	147
	Configuring Channelized E1 IQ and IQE Interfaces . . . . .	147
	Configuring E1 IQ and IQE Interfaces . . . . .	147
	Configuring Fractional E1 IQ and IQE Interfaces . . . . .	148
	Example: Configuring Fractional E1 IQ and IQE Interfaces . . . . .	148
	Configuring NxDS0 IQ and IQE Interfaces . . . . .	148
	Example: Configuring an NxDS0 IQ or IQE Interface . . . . .	149
	Configuring Channelized E1 Interfaces . . . . .	149
	Configuring Channelized E1 Interface Properties . . . . .	150
	Example: Configuring Channelized E1 IQ or IQE Interfaces . . . . .	151
	Example: Configuring Channelized E1 Interfaces . . . . .	152
<b>Chapter 10</b>	<b>Configuring Channelized E1 PRI and T1 PRI Interfaces . . . . .</b>	<b>155</b>
	Channelized E1 PRI and T1 PRI Overview . . . . .	155
	Configuring a Clear Channel on a Dual-Port Channelized T1-E1 PIM . . . . .	156
	Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots . . . . .	156
	Configuring Primary Rate Interfaces . . . . .	157
	Allocating B-Channels for Dialout . . . . .	159
	Configuring PRI Interfaces . . . . .	159
	Example: Configuring a Channelized T1 Interface as Primary Rate Interface . . . . .	160
<b>Part 3</b>	<b>Configuring E1, E3, T1, and T3 Interfaces</b>	
<b>Chapter 11</b>	<b>Configuring E1 Interfaces . . . . .</b>	<b>165</b>
	E1 Interfaces Overview . . . . .	165
	Configuring E1 Physical Interface Properties . . . . .	166
	Configuring E1 BERT Properties . . . . .	166
	Configuring the E1 Frame Checksum . . . . .	167
	Configuring E1 Framing . . . . .	167
	Configuring the E1 Idle Cycle Flag . . . . .	168
	Configuring E1 Data Inversion . . . . .	168

	Configuring E1 Loopback Capability . . . . .	168
	Example: Configuring E1 Loopback Capability . . . . .	169
	Configuring E1 Start and End Flags . . . . .	170
	Configuring Fractional E1 Time Slots . . . . .	170
	Example: Configuring Fractional E1 Time Slots . . . . .	171
<b>Chapter 12</b>	<b>Configuring E3 Interfaces . . . . .</b>	<b>173</b>
	E3 Interfaces Overview . . . . .	173
	Configuring E3 Physical Interface Properties . . . . .	174
	Configuring E3 BERT Properties . . . . .	174
	Configuring the E3 CSU Compatibility Mode . . . . .	175
	Configuring the E3 Frame Checksum . . . . .	176
	Configuring the E3 Idle Cycle Flag . . . . .	177
	Configuring E3 Data Inversion . . . . .	177
	Configuring E3 Loopback Capability . . . . .	177
	Example: Configuring E3 Loopback Capability . . . . .	178
	Configuring E3 HDLC Payload Scrambling . . . . .	179
	Configuring the E3 Start and End Flags . . . . .	179
	Configuring E3 IQ and IQE Unframed Mode . . . . .	179
<b>Chapter 13</b>	<b>Configuring T1 Interfaces . . . . .</b>	<b>181</b>
	T1 Interfaces Overview . . . . .	181
	Configuring T1 Physical Interface Properties . . . . .	182
	Configuring T1 BERT Properties . . . . .	182
	Configuring the T1 Buildout . . . . .	183
	Configuring T1 Byte Encoding . . . . .	183
	Configuring T1 CRC Error Major Alarm Thresholds . . . . .	184
	Configuring T1 CRC Error Minor Alarm Thresholds . . . . .	184
	Configuring T1 Data Inversion . . . . .	185
	Configuring the T1 Frame Checksum . . . . .	185
	Configuring the T1 Remote Loopback Response . . . . .	185
	Configuring T1 Framing . . . . .	186
	Configuring T1 Line Encoding . . . . .	186
	Configuring T1 Loopback Capability . . . . .	186
	Configuring the T1 Idle Cycle Flag . . . . .	188
	Configuring T1 Start and End Flags . . . . .	188
	Configuring Fractional T1 Time Slots . . . . .	189
	Example: Configuring Fractional T1 Time Slots . . . . .	189
<b>Chapter 14</b>	<b>Configuring T3 Interfaces . . . . .</b>	<b>191</b>
	T3 Interfaces Overview . . . . .	191
	Configuring T3 Physical Interface Properties . . . . .	192
	Configuring T3 BERT Properties . . . . .	192
	Disabling T3 C-Bit Parity Mode . . . . .	193
	Configuring the T3 CSU Compatibility Mode . . . . .	194
	Configuring the T3 Frame Checksum . . . . .	197
	Configuring the T3 FEAC Response . . . . .	197
	Configuring the T3 Idle Cycle Flag . . . . .	198
	Configuring the T3 Line Buildout . . . . .	198
	Configuring T3 Loopback Capability . . . . .	198

	Configuring T3 HDLC Payload Scrambling . . . . .	200
	Configuring T3 Start and End Flags . . . . .	201
	Examples: Configuring T3 Interfaces . . . . .	201
<b>Part 4</b>	<b>Configuring Frame Relay</b>	
<b>Chapter 15</b>	<b>Configuring Frame Relay . . . . .</b>	<b>207</b>
	Frame Relay Overview . . . . .	207
	Configuring Frame Relay Interface Encapsulation . . . . .	208
	Configuring the Frame Relay Encapsulation on a Physical Interface . . . . .	208
	Example: Configuring the Encapsulation on a Physical Interface . . . . .	211
	Configuring the Frame Relay Encapsulation on a Logical Interface . . . . .	211
	Configuring Frame Relay Control Bit Translation . . . . .	212
	Configuring the Media MTU on Frame Relay Interfaces . . . . .	213
	Setting the Protocol MTU with Frame Relay Encapsulation . . . . .	214
	Configuring Frame Relay Keepalives . . . . .	214
	Configuring Tunable Keepalives for Frame Relay LMI . . . . .	215
	Configuring Inverse Frame Relay ARP . . . . .	216
	Configuring the Router as a DCE with Frame Relay Encapsulation . . . . .	217
	Configuring Frame Relay DLCIs . . . . .	217
	Configuring a Point-to-Point Frame Relay Connection . . . . .	217
	Configuring a Point-to-Multipoint Frame Relay Connection . . . . .	218
	Configuring a Multicast-Capable Frame Relay Connection . . . . .	219
<b>Part 5</b>	<b>Channelized Interface Configuration Statements</b>	
<b>Chapter 16</b>	<b>Summary of Channelized Interface Configuration Statements . . . . .</b>	<b>223</b>
	address . . . . .	224
	advertise-interval . . . . .	226
	aps . . . . .	227
	authentication-key . . . . .	228
	bchannel-allocation . . . . .	228
	bert-algorithm . . . . .	229
	bert-error-rate . . . . .	231
	bert-period . . . . .	233
	buildout (T1 Interfaces) . . . . .	234
	byte-encoding . . . . .	235
	bytes . . . . .	236
	cbit-parity . . . . .	237
	channelization . . . . .	237
	clocking . . . . .	238
	compatibility-mode . . . . .	239
	crc-minor-alarm-threshold . . . . .	240
	data-input . . . . .	241
	dce . . . . .	242
	dlci . . . . .	243
	ds0-options . . . . .	244
	e1-options . . . . .	245

e3-options .....	246
encapsulation .....	247
encapsulation (Logical Interface) .....	248
encapsulation (Physical Interface) .....	252
family .....	256
fast-aps-switch .....	260
fcs .....	261
feac-loop-respond .....	262
force .....	263
framing (E1, E3, and T1 Interfaces) .....	264
hold-time (APS) .....	265
idle-cycle-flag .....	266
interface-type .....	267
inverse-arp .....	268
invert-data .....	269
isdn-options .....	270
line-encoding .....	271
lmi (Frame Relay) .....	272
lmi-type .....	273
lockout .....	274
long-buildout .....	274
loop-timing .....	275
loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) .....	276
loopback-clear-timer .....	277
mtu .....	278
multicast-dlci .....	279
multipoint-destination .....	280
neighbor .....	281
no-keepalives .....	282
no-partition .....	283
no-termination-request .....	284
oc-slice .....	285
paired-group .....	285
partition .....	286
payload-scrambler .....	287
protect-circuit .....	288
remote-loopback-respond .....	288
request .....	289
revert-time .....	289
sonet-options .....	290
start-end-flag .....	292
switching-mode .....	293
t1-options .....	294
t3-options .....	295
timeslots .....	296
translate-discard-eligible .....	297
unframed .....	297
unit .....	298
vtmapping .....	304

	working-circuit . . . . .	305
<b>Part 6</b>	<b>Troubleshooting</b>	
<b>Chapter 17</b>	<b>Investigate Channelized DS3 Interfaces . . . . .</b>	<b>309</b>
	Investigate Interface Steps and Commands . . . . .	309
	Investigate Interface Steps and Commands Overview . . . . .	309
	Monitor Interfaces . . . . .	309
	Perform a Loopback Test on an Interface . . . . .	310
	Locate Interface Alarms . . . . .	312
	Monitor Channelized DS3 Interfaces . . . . .	312
	Checklist for Monitoring Channelized DS3 Interfaces . . . . .	312
	Monitor Channelized DS3 Interfaces . . . . .	313
	Display the Status of Channelized DS3 Interfaces . . . . .	313
	Display the Status of a Specific Channelized DS3 Interface . . . . .	314
	Display Extensive Status Information for a Specific Channelized DS3 Interface . . . . .	317
	Monitor Statistics for a Channelized DS3 Interface . . . . .	322
	Use Loopback Testing For Channelized DS3 Interfaces . . . . .	325
	Checklist for Using Loopback Testing for Channelized DS3 Interfaces . . . . .	325
	Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface . . . . .	326
	Create a Loopback . . . . .	327
	Create a Physical Loopback . . . . .	327
	Configure a Local Loopback . . . . .	327
	Verify That the Interface Is Up . . . . .	328
	Clear Interface Statistics . . . . .	329
	Force the Link Layer to Stay Up . . . . .	329
	Configure Encapsulation to Cisco-HDLC . . . . .	329
	Configure No-Keepalives . . . . .	330
	Verify the Status of the Logical Interface . . . . .	331
	Ping the Channelized Interface . . . . .	332
	Check for Interface Error Statistics . . . . .	332
	Diagnose a Suspected Circuit Problem . . . . .	334
	Create a Loop from the Router to the Network . . . . .	334
	Create a Loop to the Router from Various Points in the Network . . . . .	335
	Locate Channelized DS3 Alarms and Errors . . . . .	335
	Checklist for Channelized DS3 Alarms and Errors . . . . .	335
	Display Alarms and Errors for Channelized DS3 Interfaces . . . . .	336
<b>Chapter 18</b>	<b>Investigate Multichannel DS3 Interfaces . . . . .</b>	<b>341</b>
	Investigate Interface Steps and Commands . . . . .	341
	Investigate Interface Steps and Commands Overview . . . . .	341
	Monitor Interfaces . . . . .	341
	Perform a Loopback Test on an Interface . . . . .	342

Locate Interface Alarms . . . . .	344
Monitor Multichannel DS3 Interfaces . . . . .	344
Checklist for Monitoring Multichannel DS3 Interfaces . . . . .	344
Monitor Multichannel DS3 Interfaces . . . . .	345
Display the Status of Channelized Interfaces . . . . .	345
Display the Status of a Specific Channelized Interface . . . . .	346
Display Extensive Status Information for a Specific T3 Interface . . . . .	347
Monitor Statistics for a Channelized Interface . . . . .	351
Use Loopback Testing for Multichannel DS3 Interfaces . . . . .	352
Checklist for Using Loopback Testing for Multichannel DS3 Interfaces . . . . .	353
Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface . . . . .	354
Create a Loopback . . . . .	355
Create a Physical Loopback . . . . .	355
Configure a Local Loopback . . . . .	355
Verify That the Interface Is Up . . . . .	356
Clear Interface Statistics . . . . .	357
Force the Link Layer to Stay Up . . . . .	358
Configure Encapsulation to Cisco-HDLC . . . . .	358
Configure No-Keepalives . . . . .	358
Verify the Status of the Logical Interface . . . . .	359
Ping the Channelized Interface . . . . .	360
Check for Interface Error Statistics . . . . .	361
Diagnose a Suspected Circuit Problem . . . . .	364
Create a Loop from the Router to the Network . . . . .	365
Loop the Entire T3 Interface Toward the Network . . . . .	365
Loop a Particular T1 Channel Toward the Network . . . . .	365
Create a Loop to the Router from Various Points in the Network . . . . .	366
Locate Multichannel DS3 Alarms and Errors . . . . .	366
Checklist for Locating Multichannel DS3 Alarms and Errors . . . . .	367
Display Alarms and Errors for Channelized DS3 to DS1 Interfaces . . . . .	367
Display Alarms and Errors for Channelized DS3 to DS0 Interfaces . . . . .	370
<b>Chapter 19 Investigate Channelized OC12 Interfaces . . . . .</b>	<b>373</b>
Investigate Interface Steps and Commands . . . . .	373
Investigate Interface Steps and Commands Overview . . . . .	373
Monitor Interfaces . . . . .	373
Perform a Loopback Test on an Interface . . . . .	374
Locate Interface Alarms . . . . .	376
Monitor Channelized OC12 Interfaces . . . . .	376
Checklist for Monitoring Channelized OC12 Interfaces . . . . .	376
Monitor Channelized OC12 Interfaces . . . . .	377
Display the Status of Channelized OC12 Interfaces . . . . .	378
Display the Status of a Specific Channelized OC12 Interface . . . . .	378
Display Extensive Status Information for a Specific Channelized OC12 Interface . . . . .	379

Monitor Statistics for a Channelized OC12 Interface . . . . .	381
Monitor Channelized OC12 IQ Interfaces . . . . .	382
Display the Status of a Channelized OC12 IQ Interface . . . . .	382
Display the Status of the Controller Channelized OC12 IQ Interface . . . . .	386
Display the Status of a Specific Channel of a Channelized OC12 IQ Interface . . . . .	388
Display Extensive Status Information for a Channelized OC12 IQ Interface . . . . .	390
Monitor Statistics for a Channelized OC12 IQ Interface . . . . .	393
Use Loopback Testing for Channelized OC12 Interfaces . . . . .	395
Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces . . . . .	395
Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface . . . . .	396
Create a Loopback . . . . .	397
Create a Physical Loopback . . . . .	397
Configure a Local Loopback . . . . .	397
Verify That the Interface Is Up . . . . .	398
Clear Interface Statistics . . . . .	401
Force the Link Layer to Stay Up . . . . .	401
Configure Encapsulation to Cisco-HDLC . . . . .	401
Configure No-Keepalives . . . . .	402
Verify the Status of the Logical Interface . . . . .	403
Ping the Channelized Interface . . . . .	403
Check for Interface Error Statistics . . . . .	404
Diagnose a Suspected Circuit Problem . . . . .	407
Loop the Entire T3 Interface Toward the Network . . . . .	407
Create a Loop to the Router from Various Points in the Network . . . . .	408
Locate Channelized OC12 Alarms and Errors . . . . .	408
Checklist for Channelized OC12 Alarms and Errors . . . . .	408
Display Channelized OC12 Alarms and Errors . . . . .	408
Display Channelized OC12 IQ Alarms and Errors . . . . .	412

## Part 7

## Index

Index . . . . .	417
Index of Statements and Commands . . . . .	427





# List of Figures

<b>Part 2</b>	<b>Configuring Channelized Interfaces</b>	
<b>Chapter 2</b>	<b>Channelized Interfaces</b>	<b>27</b>
	Figure 1: Channelized OC48/STM16 IQE PIC (in SONET Mode)	40
	Figure 2: Channelized OC48/STM16 IQE PIC (in SDH Mode)	41
	Figure 3: Channelized OC12 IQ PIC and Channelized OC12/STM4 IQE PIC (in SONET Mode)	41
	Figure 4: Channelized OC12/STM4 IQE PIC (in SDH Mode)	42
	Figure 5: Channelized OC12/STM4 IQ PIC (in SDH Mode)	42
	Figure 6: Channelized OC3 Ports (in SONET Mode) on Channelized OC3 IQ and Channelized OC3/STM1 IQE PICs	43
	Figure 7: Channelized CSTM1 Ports (in SDH Mode) on Channelized OC3/STM1 IQE PIC	43
	Figure 8: Channelized STM1 IQ PIC	44
	Figure 9: Channelized CDS3/E3 IQE PIC (in DS3 Mode)	44
	Figure 10: Channelized CDS3/E3 IQE PIC (in E3 Mode)	44
	Figure 11: Channelized DS3 IQ PIC	45
	Figure 12: Channelized T1 IQ and IQE PIC	45
	Figure 13: Channelized E1 IQ and IQE PIC	45
<b>Chapter 3</b>	<b>Configuring Channelized OC48/STM16 IQE Interfaces</b>	<b>49</b>
	Figure 14: Sample Channelization of OC48/STM16 IQE PIC (SONET Mode)	49
	Figure 15: Sample Channelization of OC48/STM16 IQE PIC (SDH Mode)	50
	Figure 16: Sample Channelization of OC48/STM16 IQE PIC to E3 Channels	51
	Figure 17: T1 Interfaces on a Channelized OC48 PIC	55
	Figure 18: Sample Channelization of OC48 IQE PIC	58
<b>Chapter 4</b>	<b>Configuring Channelized OC12/STM4 Interfaces</b>	<b>67</b>
	Figure 19: Sample Channelization of OC12/STM4 IQ or IQE PIC (SONET Mode)	68
	Figure 20: Sample Channelization of OC12/STM4 IQE PIC (SDH Mode)	69
	Figure 21: Sample Channelization of OC12/STM4 IQ PIC (SDH Mode)	70
	Figure 22: Sample Channelization of OC12 PIC (non IQ and IQE)	70
	Figure 23: T1 Interfaces on a Channelized OC12 PIC	74
	Figure 24: Sample Channelization of OC12 IQE PIC	76
<b>Chapter 5</b>	<b>Configuring Channelized OC3 IQ and IQE Interfaces</b>	<b>99</b>
	Figure 25: Channelized OC3 IQ Interface Example for Show Interfaces Controller	100
	Figure 26: T1 Interfaces on a Channelized OC3 PIC	103
	Figure 27: Sample Channelization of OC3 IQ or IQE PIC	104
<b>Chapter 7</b>	<b>Configuring Channelized T3 Interfaces</b>	<b>125</b>

	Figure 28: Sample Channelization of DS3 IQ or IQE PIC . . . . .	134
<b>Part 3</b>	<b>Configuring E1, E3, T1, and T3 Interfaces</b>	
<b>Chapter 11</b>	<b>Configuring E1 Interfaces . . . . .</b>	<b>165</b>
	Figure 29: Remote and Local E1 Loopback . . . . .	169
<b>Chapter 12</b>	<b>Configuring E3 Interfaces . . . . .</b>	<b>173</b>
	Figure 30: Remote and Local E3 Loopback . . . . .	178
<b>Chapter 13</b>	<b>Configuring T1 Interfaces . . . . .</b>	<b>181</b>
	Figure 31: Remote and Local T1 Loopback . . . . .	187
<b>Chapter 14</b>	<b>Configuring T3 Interfaces . . . . .</b>	<b>191</b>
	Figure 32: Remote and Local T3 Loopback . . . . .	199
<b>Part 6</b>	<b>Troubleshooting</b>	
<b>Chapter 19</b>	<b>Investigate Channelized OC12 Interfaces . . . . .</b>	<b>373</b>
	Figure 33: Sample Configuration of Channelized OC12 IQ Interface . . . . .	384
	Figure 34: Controller Interfaces at Different Levels of Channelization . . . . .	388
	Figure 35: Specific Channels of a Channelized OC12 IQ Interface . . . . .	390

# List of Tables

	<b>About This Guide</b> . . . . .	<b>xxi</b>
	Table 1: Notice Icons . . . . .	xxv
	Table 2: Text and Syntax Conventions . . . . .	xxv
<b>Part 2</b>	<b>Configuring Channelized Interfaces</b>	
<b>Chapter 2</b>	<b>Channelized Interfaces</b> . . . . .	<b>27</b>
	Table 3: Frame Relay DLCI Limitations for Channelized Interfaces . . . . .	30
	Table 4: Per Unit Scheduler DLCI Limitations for Channelized Interfaces . . . . .	31
	Table 5: Protocol Family Combinations . . . . .	32
	Table 6: Clocking Capabilities by Channelized PIC Type . . . . .	33
	Table 7: Channel Scaling Numbers of MIC-3D-8CHOC3-4CHOC12 . . . . .	36
	Table 8: Channel Scaling Numbers of MIC-3D-4CHOC3-2CHOC12 . . . . .	36
	Table 9: Channel Scaling Numbers of MIC-3D-8DS3-E3 . . . . .	37
	Table 10: Structural Differences: Channelized IQE PICs . . . . .	46
	Table 11: Structural Differences: Channelized IQ PICs . . . . .	47
	Table 12: Structural Differences: Channelized PICs . . . . .	48
<b>Chapter 4</b>	<b>Configuring Channelized OC12/STM4 Interfaces</b> . . . . .	<b>67</b>
	Table 13: OC12-to-DS3 Numbering Scheme . . . . .	90
<b>Chapter 6</b>	<b>Configuring Channelized STM1 Interfaces</b> . . . . .	<b>107</b>
	Table 14: Channelized STM1-to-E1 Channel Mapping . . . . .	114
	Table 15: Channelized STM1-to-T1 Channel Mapping . . . . .	117
<b>Chapter 7</b>	<b>Configuring Channelized T3 Interfaces</b> . . . . .	<b>125</b>
	Table 16: Ranges for Channelized DS3-to-DS0 Configuration . . . . .	129
<b>Chapter 8</b>	<b>Configuring Channelized T1 Interfaces</b> . . . . .	<b>141</b>
	Table 17: Ranges for Channelized T1 IQ Configuration . . . . .	144
<b>Chapter 9</b>	<b>Configuring Channelized E1 Interfaces</b> . . . . .	<b>147</b>
	Table 18: Ranges for Channelized E1 Configuration . . . . .	150
<b>Part 3</b>	<b>Configuring E1, E3, T1, and T3 Interfaces</b>	
<b>Chapter 12</b>	<b>Configuring E3 Interfaces</b> . . . . .	<b>173</b>
	Table 19: Subrate Values for E3 Digital Link Compatibility Mode . . . . .	176
<b>Chapter 14</b>	<b>Configuring T3 Interfaces</b> . . . . .	<b>191</b>
	Table 20: Subrate Values for T3 Digital Link Compatibility Mode . . . . .	195

<b>Part 4</b>	<b>Configuring Frame Relay</b>	
<b>Chapter 15</b>	<b>Configuring Frame Relay . . . . .</b>	<b>207</b>
	Table 21: PIC Support for Enhanced Frame Relay Encapsulation Types . . . . .	210
<b>Part 6</b>	<b>Troubleshooting</b>	
<b>Chapter 17</b>	<b>Investigate Channelized DS3 Interfaces . . . . .</b>	<b>309</b>
	Table 22: Commands Used to Monitor Interfaces . . . . .	310
	Table 23: Commands Used to Perform Loopback Testing on Interfaces . . . . .	311
	Table 24: Checklist for Monitoring Channelized DS3 Interfaces . . . . .	312
	Table 25: Checklist for Using Loopback Testing for Channelized DS3 Interfaces . . . . .	325
	Table 26: Checklist for Channelized DS3 Alarms and Errors . . . . .	335
	Table 27: T1 Media Alarms and Error Definitions . . . . .	339
<b>Chapter 18</b>	<b>Investigate Multichannel DS3 Interfaces . . . . .</b>	<b>341</b>
	Table 28: Commands Used to Monitor Interfaces . . . . .	342
	Table 29: Commands Used to Perform Loopback Testing on Interfaces . . . . .	343
	Table 30: Checklist for Monitoring Multichannel DS3 Interfaces . . . . .	344
	Table 31: Problem Situations and Actions . . . . .	352
	Table 32: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces . . . . .	353
	Table 33: Checklist for MultichannelDS3 Alarms and Errors . . . . .	367
	Table 34: T1 Media Alarms and Error Definitions . . . . .	369
	Table 35: T3 Interface Error Counter Definitions . . . . .	372
<b>Chapter 19</b>	<b>Investigate Channelized OC12 Interfaces . . . . .</b>	<b>373</b>
	Table 36: Commands Used to Monitor Interfaces . . . . .	374
	Table 37: Commands Used to Perform Loopback Testing on Interfaces . . . . .	375
	Table 38: Checklist for Monitoring Channelized OC12 Interfaces . . . . .	376
	Table 39: Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces . . . . .	395
	Table 40: Checklist for Channelized OC12 Alarms and Errors . . . . .	408
	Table 41: T3 Interface Error Counter Definitions . . . . .	411

# About This Guide

This preface provides the following guidelines for using the *Junos<sup>®</sup> OS Channelized Interfaces Configuration Guide*:

- [Junos Documentation and Release Notes on page xxi](#)
- [Objectives on page xxii](#)
- [Audience on page xxii](#)
- [Supported Routing Platforms on page xxii](#)
- [Using the Indexes on page xxiii](#)
- [Using the Examples in This Manual on page xxiii](#)
- [Documentation Conventions on page xxiv](#)
- [Documentation Feedback on page xxvi](#)
- [Requesting Technical Support on page xxvi](#)

## Junos Documentation and Release Notes

---

For a list of related Junos documentation, see <http://www.juniper.net/techpubs/software/junos/>.

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

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

Juniper Networks supports a technical book program to publish books by Juniper Networks engineers and subject matter experts with book publishers around the world. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration using the Junos operating system (Junos OS) and Juniper Networks devices. In addition, the Juniper Networks Technical Library, published in conjunction with O'Reilly Media, explores improving network security, reliability, and availability using Junos OS configuration techniques. All the books are for sale at technical bookstores and book outlets around the world. The current list can be viewed at <http://www.juniper.net/books>.

## Objectives

---

This guide provides an overview of the network interfaces features of the JUNOS Software and describes how to configure these properties on the routing platform.



**NOTE:** For additional information about the Junos OS—either corrections to or information that might have been omitted from this guide—see the software release notes at <http://www.juniper.net/>.

---

## Audience

---

This guide is designed for network administrators who are configuring and monitoring a Juniper Networks M Series, MX Series, T Series, EX Series, or J Series router or switch.

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

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

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

## Supported Routing Platforms

---

For the features described in this manual, the JUNOS Software currently supports the following routing platforms:

- J Series
- M Series

- MX Series
- T Series

## Using the Indexes

---

This reference contains two indexes: a complete index that includes topic entries, and an index of statements and commands only.

In the index of statements and commands, an entry refers to a statement summary section only. In the complete index, the entry for a configuration statement or command contains at least two parts:

- The primary entry refers to the statement summary section.
- The secondary entry, *usage guidelines*, refers to the section in a configuration guidelines chapter that describes how to use the statement or command.

## 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 [Junos OS CLI User Guide](#).

---

## Documentation Conventions

Table 1 on page xxiv 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 xxv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  <code>user@host&gt; configure</code>
Fixed-width text like this	Represents output that appears on the terminal screen.	<code>user@host&gt; show chassis alarms</code> <code>No alarms currently active</code>
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces important new terms.</li> <li>Identifies book names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS System Basics Configuration Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<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@# <b>set system domain-name</b> <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; interface names; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Enclose optional keywords or variables.	<code>stub &lt;default-metric metric&gt;;</code>

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

Convention	Description	Examples
(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.	<b>broadcast   multicast</b>  <i>(string1   string2   string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	<b>community name members [ community-ids ]</b>
Indentation and braces ( { } )	Identify a level in the configuration hierarchy.	<b>[edit]</b> <b>routing-options {</b> <b>static {</b> <b>route default {</b> <b>nexthop address;</b> <b>retain;</b> <b>}</b> <b>}</b> <b>}</b>
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
<b>J-Web GUI Conventions</b>		
<b>Bold text like this</b>	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## 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](mailto:techpubs-comments@juniper.net), or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

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

## Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract,

or are covered under warranty, and need postsales technical support, you can access our tools and resources online or open a case with JTAC.

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

## Self-Help Online Tools and Resources

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

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

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

## Opening a Case with JTAC

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

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

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



## PART 1

# Channelized Interfaces Configuration Statements Overview

- [Channelized Interfaces Configuration Statements and Hierarchy on page 3](#)



## CHAPTER 1

# Channelized Interfaces Configuration Statements and Hierarchy

The following network interfaces hierarchy listings show the complete configuration statement hierarchy for the indicated hierarchy levels, listing all possible configuration statements within the indicated hierarchy levels, and showing their level in the configuration hierarchy. When you are configuring the Junos OS, your current hierarchy level is shown in the banner on the line preceding the **user@host#** prompt.

This section contains the following topics:

- [\[edit chassis\] Hierarchy Level on page 3](#)
- [\[edit interfaces\] Hierarchy Level on page 4](#)
- [\[edit logical-systems\] Hierarchy Level on page 20](#)

### [\[edit chassis\] 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 {
        t1 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;
    }
}
source-address-filter {
    mac-address;
}
(source-filtering | no-source-filtering);
}
flexible-vlan-tagging;
gigether-options {
    802.3ad aex;
    (asynchronous-notification | no-asynchronous-notification);
    (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
        local-interface-offline>;
    auto-reconnect seconds;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    no-auto-mdix;
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
    ethernet-switch-profile {
        (mac-learn-enable | no-mac-learn-enable);
        tag-protocol-id [ tpids ];
        ethernet-policer-profile {
            input-priority-map {
                ieee802.1p premium [ values ];
            }
            output-priority-map {
                classifier {
                    premium {
                        forwarding-class class-name {
                            loss-priority (high | low);
                        }
                    }
                }
            }
        }
    }
    policer cos-policer-name {
        aggregate {
            bandwidth-limit bps;
            burst-size-limit bytes;
        }
    }
}
```

9

```
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;  
}  
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;
    }
}
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 | 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 Configuration Guide](#)
  - [Junos OS Network Interfaces Configuration Guide](#)

---

## [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 Configuration Guide](#)
- [Junos OS Network Interfaces Configuration Guide](#)

## PART 2

# Configuring Channelized Interfaces

- [Channelized Interfaces on page 27](#)
- [Configuring Channelized OC48/STM16 IQE Interfaces on page 49](#)
- [Configuring Channelized OC12/STM4 Interfaces on page 67](#)
- [Configuring Channelized OC3 IQ and IQE Interfaces on page 99](#)
- [Configuring Channelized STM1 Interfaces on page 107](#)
- [Configuring Channelized T3 Interfaces on page 125](#)
- [Configuring Channelized T1 Interfaces on page 141](#)
- [Configuring Channelized E1 Interfaces on page 147](#)
- [Configuring Channelized E1 PRI and T1 PRI Interfaces on page 155](#)



## CHAPTER 2

# Channelized Interfaces

This section provides a high-level overview of channelized interfaces, focusing mainly on the capabilities, properties, and structure of channelized IQ and IQE interfaces, and includes the following topics:

- [Channelized Interfaces Overview on page 27](#)
- [Channelized Interface Capabilities on page 28](#)
- [Data-Link Connection Identifiers on Channelized Interfaces on page 30](#)
- [Clock Sources on Channelized Interfaces on page 32](#)
- [Channel Scaling Numbers of Channelized SONET/SDH OC3/STM1 \(Multi-Rate\) MICs with SFP on page 36](#)
- [Channel Scaling Numbers of DS3/E3 MIC on page 37](#)
- [Channelized E1 and T1 PIM Properties on page 38](#)
- [Channelized IQ and IQE Interfaces Properties on page 38](#)
- [Structure of Channelized IQ and Channelized IQE PICs on page 40](#)

### Channelized Interfaces Overview

---

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.



**NOTE:** Channelized intelligent queuing (IQ) and channelized enhanced intelligent queuing (IQE) interfaces require M Series Enhanced Flexible PIC Concentrators (FPCs) and MX Series Enhanced Flexible PIC Concentrators (FPCs).

Wherever Junos configuration guides refer to channelized interfaces and PICs without the “intelligent queuing IQ or IQE” descriptor, they are referring to the original channelized interfaces and PICs.

On M40e routers, all supported interface types support a maximum number of 784 traffic-bearing interfaces that can be created per interface port and includes ports on channelized PICs.

MX Series routers support two Type 2 Channelized IQ PICs: OC12/STM4 IQE PIC with SFP and OC48/STM16 IQE PIC with SFP. Each channelized OC12/STM4 PIC supports 4 ports, and the channelized OC48/STM16 PIC supports one port.

T640 and TX Matrix routers support Type 3 Channelized IQE PICs: 4xCOC12 IQE PIC with SFP.

Channelized 4xCOC12 IQE PICs support deep-channelization of up to six OC slices (STS1) per port. For example, only six OC slices can be channelized to CT1/T1 or CE1/E1.

Channelized COC48 IQE PICs support deep-channelization of up to six OC slices (STS1) in a block of 12 contiguous OC slices. For example, only six OC slices out of OC slice 1-12 can be channelized to CT1/T1 or CE1/E1. The PIC supports deep-channelization of maximum 24 OC slices in this way.

Channelized OC48 IQE PICs do not support STS-48 clear-channel mode.

IQ and IQE PICs do not support aggregated SONET (link bonding).

For channelized IQ and IQE logical interfaces, you can configure class of service (CoS). For more information, see the [Junos OS Class of Service Configuration Guide](#).

---

## Channelized Interface Capabilities

You can configure each port of a channelized IQ PIC or channelized IQE PIC as a single interface that uses the entire available bandwidth, or partition each port into smaller data channels. In either case, you start with a channelized interface (designated by a **c** in the interface name, as in **coc12**). From the channelized interfaces, you configure data channels. Following are the channelized interface names and data-channel interface names associated with channelized IQ and IQE PICs.



### Channelized Interface Names

This section lists the channelized interface names.

- **coc48-fpc/pic/port**—Channelized OC48 IQE interface. Configure on a Channelized OC48 IQE PIC.
- **coc12-fpc/pic/port**—Channelized OC12 interface. Configure on Channelized OC12 IQ or IQE PICs.
- **coc3-fpc/pic/port:channel**—Channelized OC3 interface. Configure on Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE PICs.
- **coc1-fpc/pic/port:channel**—Channelized OC1 interface. Configure on Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, or Channelized OC48 IQE PICs.
- **ct3-fpc/pic/port:channel**—Channelized T3 interface. Configure on Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized OC48 IQE, or Channelized DS3 IQ or IQE PICs.
- **cstm16-fpc/pic/port**—Channelized STM16 interface. Configure on a Channelized OC48 IQE PIC in SDH mode.
- **cstm4-fpc/pic/port**—Channelized STM4 interface. Configure on a Channelized OC12 IQ or IQE PIC in SDH mode.
- **cstm1-fpc/pic/port**—Channelized STM1 interface. Configure on a Channelized STM1 IQ or IQE PIC.
- **cau4-fpc/pic/port:channel**—Channelized AU-4 IQ interface. Configure on Channelized STM1 IQ or IQE, Channelized OC48 IQE, or Channelized OC12 IQE PICs.
- **ct1-fpc/pic/port:channel**—Channelized T1 interface. Configure on Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized T1 IQ or IQE, Channelized OC48 IQE, or Channelized DS3 IQ or IQE PICs.
- **ce1-fpc/pic/port:channel**—Channelized E1 interface. Configure on Channelized E1 IQ or IQE, Channelized STM1 IQ or IQE, Channelized OC48/STM16 IQE, or Channelized OC12/STM4 IQE PICs.

### Data-Channel Interface Names

This section lists the data-channel interface names.

- **e1-fpc/pic/port:channel**—E1 channel. Configure on Channelized E1 IQ or IQE, Channelized STM1 IQ or IQE, Channelized OC12/STM4 IQE, or Channelized OC48/STM16 IQE PICs.
- **e3-fpc/pic/port:channel**—E3 channel. Configure on Channelized OC3/STM1 IQE, or Channelized OC12/STM4 IQE, Channelized OC48 IQE, or Channelized/Clear channel DS3E3 IQE or E3 IQ PICs.
- **ds-fpc/pic/port:channel**—NxDS0 channel. Configure on Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized OC48/STM16 IQE, Channelized STM1 IQ or IQE, Channelized DS3 IQ or IQE, Channelized T1 IQ, or Channelized E1 IQ or IQE PICs.
- **so-fpc/pic/port:channel**—SONET/SDH channel. Configure one OC3 channel on a Channelized OC3 IQ or IQE, four OC3 channels on a Channelized OC12 IQ or IQE, one OC12 channel on a Channelized OC12 IQ or IQE, four OC12 channels on Channelized OC48 IQE, or one STM1 channel on a Channelized STM1 IQ or IQE PICs.

- **t1-fpc/pic/port:channel**—T1 channel. Configure on Channelized T1 IQ or IQE, Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized OC48 IQE, or Channelized DS3 IQ or IQE PICs.
- **t3-fpc/pic/port:channel**—T3 channel. Configure on Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized OC48 IQE, Clear Channel DS3E3 IQE, or Channelized DS3 IQ or IQE PICs.

## Data-Link Connection Identifiers on Channelized Interfaces

If you use Frame Relay encapsulation on a channelized interface, see [Table 3 on page 30](#) for the maximum number of data-link connection identifiers (DLCIs) per channel that you can configure at each channel level for various channelized PICs.

If you use a per-unit-scheduler configuration on a channelized interface, see [Table 4 on page 31](#) for the maximum number of data-link connection identifiers (DLCIs) per channel that you can configure at each channel level for various channelized PICs.



**NOTE:** The actual number of DLCIs you can configure for each channel is determined by the capabilities of your system, such as the number and types of PICs installed. If the number of DLCIs in the configuration exceeds the capabilities of your system, the router might not be able to support the maximum DLCI values shown in [Table 3 on page 30](#). To determine the capabilities of your system, please contact Juniper Networks customer support.

**Table 3: Frame Relay DLCI Limitations for Channelized Interfaces**

PIC Types	Number of DLCIs per Level	Range
<b>Original Channelized PICs</b>		
DS0 level channels	3 for sparse mode	1–1022 for sparse mode (0 is reserved for the Local Management Interface [LMI])
T3 and T1 level channels	63 for regular mode	1–63 for regular mode
	3 for sparse mode	1–1022 for sparse mode (0 is reserved for the LMI)
<b>Channelized IQ and IQE PICs</b>		
DS0 level channels (Channelized DS3 IQ or IQE, Channelized STM1 IQ or IQE, Channelized E1 IQ or IQE, Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PICs)	16	1–1022 (0 is reserved for the LMI)
E1 level channels (Channelized E1 IQ or IQE PIC)	64	1–1022 (0 is reserved for the LMI)

**Table 3: Frame Relay DLCI Limitations for Channelized Interfaces (*continued*)**

PIC Types	Number of DLCIs per Level	Range
E1 level channels (Channelized STM1 IQ or IQE PIC)	64	1–1022 (0 is reserved for the LMI)
OC3 level channels (Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PIC)	1022	1–1022 (0 is reserved for the LMI)
OC12 level channels (Channelized OC12 IQ or IQE, Channelized OC48/STM16 IQE PICs, and (per port on) OC12 ports on 4xOC12/STM4 IQE PICs)	1022	1–1022 (0 is reserved for the LMI)
STM1 level channel (Channelized STM1 IQ or IQE PIC)	1022	1–1022 (0 is reserved for the LMI)
T1 level channels (Channelized DS3 IQ or IQE PIC)	64	1–1022 (0 is reserved for the LMI)
T1 level channels (Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PIC)	64	1–1022 (0 is reserved for the LMI)
T3 level channel (Channelized DS3 IQ or IQE, Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PIC)	1022	1–1022 (0 is reserved for the LMI)

**Table 4: Per Unit Scheduler DLCI Limitations for Channelized Interfaces**

PIC Types	Number of DLCIs per Level			
	Non M40e Platforms		M40e Platform Only	
	With Per-Unit-Scheduler	Without Per-Unit-Scheduler	With Per-Unit-Scheduler	Without Per-Unit-Scheduler
DS0 level channels	64	64	16	16
T1/E1 level channels	64	64	64	64
DS3/E3 level channels	975	† Protocol family combinations apply	256	256
SONET	975	† Protocol family combinations apply	975	† Protocol family combinations apply

† In these router, PIC, and scheduler configurations, combining multiple protocol families per PIC changes the number of Frame Relay DLCIs as shown in [Table 5 on page 32](#).

Table 5: Protocol Family Combinations

Protocol Family Combinations	Number of DLCIs per PIC
inet	3600
inet6	3600
mpls	3000
inet, inet6	2400
inet, mpls	2000
inet6, mpls	2000
inet, inet6, mpls	1550

## Clock Sources on Channelized Interfaces

Channelized interfaces, channelized IQ interfaces, and channelized IQE interfaces have different clocking capabilities. For channelized IQ and IQE interfaces, you can configure clocking on each interface independently by including the **clocking (internal | external)** statement at the **[edit interfaces *interface-name*]** hierarchy level.

For channelized IQ and IQE interfaces, clocking is provided as follows:

- 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.
- SONET/SDH-level clocking is provided at the root controller interface at the **[edit interfaces *type-fpc/pic/port*]** hierarchy level.
- Configure T3-level clocking by including the **clocking** statement at the **[edit interfaces *ct3-fpc/pic/port*]** hierarchy level.
- Configure T1-level clocking by including the **clocking** statement at the **[edit interfaces *t1-fpc/pic/port:channel*]** hierarchy level.
- Configure E1-level clocking by including the **clocking** statement at the **[edit interfaces *ce1-fpc/pic/port*]** hierarchy level.
- Configure clocking for all NxDSO channels by including the **clocking** statement at the **[edit interfaces *ct1-fpc/pic/port:channel*]** or **[edit interfaces *ce1-fpc/pic/port*]** hierarchy level.

- The **clocking** statement is ignored if you include it at the **[edit interfaces coc1-fpc/pic/port:channel]** or **[edit interfaces cau4-fpc/pic/port:channel]** hierarchy level.
- SONET/SDH level clocking is applicable only at the controller interfaces for channelized IQ and IQE PICs. Clocking configuration is not effective at the **so-fpc/pic/port** or **so-fpc/pic/port:channel** for channelized IQ and IQE PICs.

For non-IQ and non-IQE channelized interfaces, clocking at each channel level is provided as follows:

- For Channelized OC12, DS3, and E1 PICs, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of other channels. The clock source configured for channel 0 applies to all channels on these channelized interfaces.
- For the Channelized STM1 PIC, the **clocking** statement is supported on channels 0 through 62. To configure clocking on the STM1 interface, include the **loop-timing** statement at the **[edit interfaces e1-fpc/pic/port:0 sonet-options]** hierarchy level. To configure clocking on individual E1 interfaces, include the **clocking** statement at the **[edit interfaces e1-fpc/pic/port:channel]** hierarchy level. The channel number can be 0 through 62. If you do not include the **clocking** statement, the individual E1 interfaces use internal clocking by default.
- For channelized STM1 interfaces, you should configure the clock source at one side of the connection to be internal and configure the other side of the connection to be external.
- When you configure the clock source for a channelized interface—**t3-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.

Table 6 on page 33 lists the clocking capabilities for each channelized PIC.

**Table 6: Clocking Capabilities by Channelized PIC Type**

PIC Type	SONET/SDH Level	DS3 Level	DS1/E1 Level
<b>Channelized PICs</b>			
Channelized DS3 and Multichannel DS3	Not applicable.	The <b>loop-timing</b> statement is supported at the <b>[edit interfaces t1-fpc/pic/port:0 t3-options]</b> or <b>[edit interfaces fpc/pic/port:0:0 t3-options]</b> hierarchy level.	The <b>clocking</b> statement is supported at the <b>[edit interfaces t1-fpc/pic/port:0]</b> or <b>[edit interfaces ds-fpc/pic/port:0:0]</b> hierarchy level.
Channelized E1	Not applicable.	Not applicable.	The <b>clocking</b> statement is supported at the <b>[edit interfaces e1-fpc/pic/port:0]</b> or <b>[edit interfaces ds-fpc/pic/port:0]</b> hierarchy level.
Channelized OC12	Not configurable.	The <b>clocking</b> statement is supported at the <b>[edit interfaces t3-fpc/pic/port:0]</b> hierarchy level.	Not applicable.

Table 6: Clocking Capabilities by Channelized PIC Type (*continued*)

PIC Type	SONET/SDH Level	DS3 Level	DS1/E1 Level
Channelized STM1	Not configurable.	Not applicable.	The <b>clocking</b> statement is supported at the <b>[edit interfaces e1-fpc/pic/port:[0-62]]</b> hierarchy level.
Channelized IQ and IQE PICs			
Channelized DS3 IQ or IQE	Not applicable.	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces ct3-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces t3-fpc/pic/port]</b> hierarchy level.</p>	<p>For T1 channels, the <b>clocking</b> statement is supported at the <b>[edit interfaces t1-fpc/pic/port:[1-28]]</b> hierarchy level.</p> <p>For NxDS0 channels, the <b>clocking</b> statement is supported at the <b>[edit interfaces ct1-fpc/pic/port:[1-28]]</b> hierarchy level.</p>
Channelized E1 IQ	Not applicable.	Not applicable.	<p>For E1 and NxDS0 channels, the <b>clocking</b> statement is supported at the <b>[edit interfaces ce1-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces e1-fpc/pic/port]</b> hierarchy level.</p>
Channelized OC3 IQ or IQE	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces coc3-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces so-fpc/pic/port]</b> hierarchy level.</p>	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces t3-fpc/pic/port:[1-12]]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces coc1-fpc/pic/port:channel]</b> hierarchy level.</p>	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces ct1-fpc/pic/port:[1-12]:[1-28]]</b> and <b>[edit interfaces t1-fpc/pic/port:[1-12]:[1-28]]</b> hierarchy levels.</p>
Channelized OC12 IQ or IQE	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces coc12-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces so-fpc/pic/port]</b> hierarchy level.</p>	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces t3-fpc/pic/port:[1-12]]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces coc1-fpc/pic/port:channel]</b> hierarchy level.</p>	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces ct1-fpc/pic/port:[1-12]:[1-28]]</b> and <b>[edit interfaces t1-fpc/pic/port:[1-12]:[1-28]]</b> hierarchy levels.</p>

Table 6: Clocking Capabilities by Channelized PIC Type (*continued*)

PIC Type	SONET/SDH Level	DS3 Level	DS1/E1 Level
Channelized OC48 IQE	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces coc48-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces so-fpc/pic/port]</b> hierarchy level.</p>	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces t3-fpc/pic/port:[1-48]]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces coc1-fpc/pic/port:channel]</b> hierarchy level.</p>	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces ct1fpc/pic/port:[1-48]:[1-28]]</b> and <b>[edit interfaces t1-fpc/pic/port:[1-48]:[1-28]]</b> hierarchy levels.</p>
Channelized STM1 IQ or IQE	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces cstm1-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces cau4-fpc/pic/port:channel]</b> or <b>[edit interfaces so-fpc/pic/port]</b> hierarchy level.</p>	Not applicable.	<p>For E1 and NxDS0 channels, the <b>clocking</b> statement is supported at the <b>[edit interfaces ce1-fpc/pic/port[1-63]]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces e1-fpc/pic/port]</b> hierarchy level.</p>
Channelized STM4 IQ or IQE	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces cstm4-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces cau4-fpc/pic/port:channel]</b> or <b>[edit interfaces so-fpc/pic/port]</b> hierarchy level.</p>	Not applicable.	<p>For E1 and NxDS0 channels, the <b>clocking</b> statement is supported at the <b>[edit interfaces ce1-fpc/pic/port[1-4]:[1-63]]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces e1-fpc/pic/port]</b> hierarchy level.</p>
Channelized STM16 IQE	<p>The <b>clocking</b> statement is supported at the <b>[edit interfaces cstm16-fpc/pic/port]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces cau4-fpc/pic/port:channel]</b> or <b>[edit interfaces so-fpc/pic/port]</b> hierarchy level.</p>	Not applicable.	<p>For E1 and NxDS0 channels, the <b>clocking</b> statement is supported at the <b>[edit interfaces ce1-fpc/pic/port[1-16]:[1-63]]</b> hierarchy level.</p> <p>The <b>clocking</b> statement is ignored if you include it at the <b>[edit interfaces e1-fpc/pic/port]</b> hierarchy level.</p>

Related • [clocking on page 238](#)  
Documentation

## Channel Scaling Numbers of Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP

There are two types of Channelized SONET/SDH OC3/STM1 (Multi-Rate) MICs with SFP—the 8-port Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP (model number: MIC-3D-8CHOC3-4CHOC12), and the 4-port Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP (model number: MIC-3D-4CHOC3-2CHOC12). These MICs support POS/PDH interfaces on the MX80 3D Universal Edge Routers and other MX Series routers using the MX-MPC1-3D-Q, MX-MPC2-3D-Q, and MX-MPC2-3D-EQ MPCs to position a single device to meet multiservice edge requirements.

Channel scaling numbers of the 8-port Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP are listed in [Table 7 on page 36](#).

**Table 7: Channel Scaling Numbers of MIC-3D-8CHOC3-4CHOC12**

SONET Channel Scaling Numbers	SDH Channel Scaling Numbers
<ul style="list-style-type: none"> <li>4xSTS12c</li> <li>16xSTS3c (when all ports are configured as channelized OC12)</li> <li>8xSTS3c (when all ports are configured as channelized OC3)</li> </ul>	<ul style="list-style-type: none"> <li>4xSTM4</li> <li>16xSTM1 (when all ports are configured as channelized STM4)</li> <li>8xSTM1 (when all ports are configured as channelized STM1)</li> </ul>
<ul style="list-style-type: none"> <li>48xDS3 (when all ports are configured as channelized OC12)</li> <li>24xDS3 (when all ports are configured as channelized OC3)</li> </ul>	<ul style="list-style-type: none"> <li>48xE3 (when all ports are configured as channelized STM4)</li> <li>24xE3 (when all ports are configured as channelized STM1)</li> </ul>
<ul style="list-style-type: none"> <li>672xDS1</li> <li>168xDS1 per channelized OC12 when the port is configured as channelized OC12</li> <li>84xDS1 per channelized OC3 when the port is configured as channelized OC3</li> </ul>	<ul style="list-style-type: none"> <li>504xE1</li> <li>126xE1 per channelized STM4 when the port is configured as channelized STM4</li> <li>62xE1 per channelized STM1 when the port is configured as channelized STM1</li> </ul>
<ul style="list-style-type: none"> <li>4044xDS0</li> <li>1011xDS0 per channelized OC12 when the port is configured as channelized OC12</li> <li>1011xDS0 per two channelized OC3 when the port is configured as channelized OC3</li> </ul>	<ul style="list-style-type: none"> <li>4044xDS0</li> <li>1011xDS0 per channelized STM4 when the port is configured as channelized STM4</li> <li>1011xDS0 per two channelized STM1 when the port is configured as channelized STM1</li> </ul>

Channel scaling numbers of the 4-port Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP are listed in [Table 8 on page 36](#).

**Table 8: Channel Scaling Numbers of MIC-3D-4CHOC3-2CHOC12**

SONET Channel Scaling Numbers	SDH Channel Scaling Numbers
<ul style="list-style-type: none"> <li>2xSTS12c</li> <li>8xSTS3c (when all ports are configured as channelized OC12)</li> <li>4xSTS3c (when all ports are configured as channelized OC3)</li> </ul>	<ul style="list-style-type: none"> <li>2xSTM4</li> <li>8xSTM1 (when all ports are configured as channelized STM4)</li> <li>4xSTM1 (when all ports are configured as channelized STM1)</li> </ul>



Table 8: Channel Scaling Numbers of MIC-3D-4CHOC3-2CHOC12 (*continued*)

SONET Channel Scaling Numbers	SDH Channel Scaling Numbers
<ul style="list-style-type: none"> <li>24xDS3 (when all ports are configured as channelized OC12)</li> <li>12xDS3 (when all ports are configured as channelized OC3)</li> </ul>	<ul style="list-style-type: none"> <li>24xE3 (when all ports are configured as channelized STM4)</li> <li>12xE3 (when all ports are configured as channelized STM1)</li> </ul>
<ul style="list-style-type: none"> <li>336xDS1</li> <li>168xDS1 per channelized OC12 when the port is configured as channelized OC12</li> <li>84xDS1 per channelized OC3 when the port is configured as channelized OC3</li> </ul>	<ul style="list-style-type: none"> <li>252xE1</li> <li>126xE1 per channelized STM4 when the port is configured as channelized STM4</li> <li>62xE1 per channelized STM1 when the port is configured as channelized STM1</li> </ul>
<ul style="list-style-type: none"> <li>2022xDS0</li> <li>1011xDS0 per channelized OC12 when the port is configured as channelized OC12</li> <li>1011xDS0 per two channelized OC3 when the port is configured as channelized OC3</li> </ul>	<ul style="list-style-type: none"> <li>2022xDS0</li> <li>1011xDS0 per channelized STM4 when the port is configured as channelized STM4</li> <li>1011xDS0 per two channelized STM1 when the port is configured as channelized STM1</li> </ul>



**NOTE:** When a port is configured as channelized OC12, only six of the twelve OC1 slices can be deep-channelized from T1 through DS0. The remaining six OC1 slices can be channelized only to T3 or can be combined to form two OC3 slices. They cannot be channelized to T1 or DS0.

## Channel Scaling Numbers of DS3/E3 MIC

You can configure the DS3/E3 MIC (model number: MIC-3D-8DS3-E3) to function either in clear-channel mode or in channelized mode. When functioning in channelized mode, the DS3/E3 MIC supports PDH interfaces on the MX80 3D Universal Edge Router and MX Series routers that use MX-MPC1-3D-Q, MX-MPC2-3D-Q, or MX-MPC2-3D-EQ. When functioning in clear-channel mode, this MIC also supports PDH interfaces on the MX-MPC1-3D and MX-MPC2-3D MPCs.

Channel scaling numbers of the DS3/E3 MIC are listed in [Table 9 on page 37](#).

Table 9: Channel Scaling Numbers of MIC-3D-8DS3-E3

DS3	E3
8xDS3	8xE3
224xDS1	
2038xDS0	

**Related Documentation**

- [Configuring the Junos OS to Enable Channelization on DS3/E3 MIC on page 132](#)
- [channelization on page 237](#)

## Channelized E1 and T1 PIM Properties

---

Channelized E1 and T1 PIMs on J Series routers provide support for ISDN Primary Rate Interface (PRI) connectivity for dial-in and callback and for use as primary or backup network connections. You can configure up to 30 channelized E1 time slots (**ce1-pim/0/port**) or 23 channelized T1 time slots (**ct1-pim/0/port**) as an ISDN PRI group, with the 16th E1 time slot or the 24th T1 time slot operating as the D-channel to control the group of time slots as B-channels. These B-channels can operate unconfigured. The encapsulation type **multilink-ppp**, **cisco-hdlc**, or **ppp** is configured under the dialer interface.

For more information about configuring the dialer interface, see *Configuring ISDN Logical Interface Properties*.

E1 and T1 time slots unused by ISDN PRI can operate normally as DS0 interfaces. PRI B-channels run at 64 Kbps, but do not support the 56-Kbps line rate.

For more information about Channelized E1 PIMs, ISDN PRI connectivity, and the ISDN features they support, see the *Junos OS Interfaces and Routing Configuration Guide*.

## Channelized IQ and IQE Interfaces Properties

---

On channelized IQ and IQE interfaces, you can specify options that are globally applied to all interface types associated with channelized IQ and IQE interfaces. For example, **e1-options** statements that you include at the **[edit interfaces ce1-fpc/pic/port]** hierarchy level apply globally to all E1 and NxDS0 interfaces that you create by partitioning **ce1-fpc/pic/port**. Likewise, **t3-options** statements that you include at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level apply globally to all T1 and NxDS0 interfaces that you create by partitioning **ct3-fpc/pic/port**.

You can also apply interface options at the channel level. For example, you can include **t1-options** statements at the **[edit interfaces t1-fpc/pic/port <:channel>]** hierarchy level, and **ds0-options** statements at the **[edit interfaces ds-0/1/1<:channel>]** hierarchy level.

Only a subset of the interface options is valid on each type of channelized IQ interface. You configure all HDLC information at the end-data channel level, not at the parent level. For example, configure HDLC information at the **[edit interfaces ds-fpc/pic/port<:channel>]** hierarchy level, not at the **[edit interfaces ct1-fpc/pic/port<:channel>]** hierarchy level.

Automatic Protection Switching (APS) is supported on channelized OC3, OC12, STM1, and STM4 IQ interfaces. To configure APS, include the **aps** statement with options at the **[edit interfaces interface-name sonet-options]** hierarchy level. For information about configuring APS, see *Configuring SONET/SDH Physical Interface Properties*.

In interchassis and intrachassis redundant LSQ configurations that use MLPPP and SONET APS, you can inhibit a router from sending PPP termination-request messages to the remote host if the link PIC fails. To inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails, include the **no-termination-request** statement at the **[edit interfaces interface-name ppp-options]** hierarchy level.

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only. The supported PIC types are as follows:

- Channelized OC48/STM16 IQE PICs
- Channelized OC12/STM4 IQ and IQE PICs
- Channelized OC3 IQ and IQE PICs
- Channelized STM1 IQ and IQE PICs

Channelized IQ and IQE interfaces do not support receive buckets or transmit buckets.

For channelized IQ and IQE interfaces, there are some limitations on where you place certain statements in the configuration. When you configure clocking, bit error rate testing (BERT), C-bit parity, and loopback statements on T3, T1, or DS0 channels, you must follow these guidelines:

- For T3 IQ interfaces, you can include the **loopback payload** statement at the **[edit interfaces ct3-fpc/pic/port]** and **[edit interfaces t3-fpc/pic/port:channel]** hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement at the **[edit interfaces t1-fpc/pic/port:channel]** hierarchy level; it is ignored if included at the **[edit interfaces ct1-fpc/pic/port]** hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.
- If you include clocking, BERT, and C-bit parity configurations at both the **[edit interfaces ct3-fpc/pic/port<:channel> t3-options]** and **[edit interfaces t3-fpc/pic/port<:channel> t3-options]** hierarchy levels, the channelized T3-level statements are valid, and the T3-level statements are ignored.
- If you include clocking, BERT, and C-bit parity configurations at both the **[edit interfaces ct3-fpc/pic/port<:channel> t3-options]** and **[edit interfaces t1-fpc/pic/port<:channel> t1-options]** hierarchy levels, the channelized T3-level statements are operational for the T3 connections and the T1-level statements are operational for the T1 connections.
- Because DS0 channels do not have clocking capability, you must configure clocking at the **[edit interfaces ct1-fpc/pic/port<:channel> t1-options]** or **[edit interfaces ce1-fpc/pic/port<:channel> e1-options]** hierarchy level for channelized NxDS0 IQ interfaces.
- You can set BERT at the **[edit interfaces t3-fpc/pic/port<:channel> t3-options]** hierarchy level or on any partitioned channel of the channelized T3 interface. There are 12 BERT patterns available for NxDS0 channels and 28 BERT patterns for T1, channelized T1, T3, and channelized T3 interfaces within channelized IQ interfaces.
- For 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**.
- For channelized interfaces that use Frame Relay encapsulation, the number of configurable DLCIs varies by channelized interface type.

- For channelized interfaces, you can configure class of service (CoS) on channels, but not at the controller level.
- For original Channelized OC12 PICs, limited CoS functionality is supported. For more information, contact Juniper Networks customer support.
- CoS is not configurable on controller interfaces.

## Structure of Channelized IQ and Channelized IQE PICs

Figure 1 on page 40 through Figure 13 on page 45 show the structural organization of the channelized PICs, channelized IQ PICs, and channelized IQE PICs. Table 10 on page 46 through Table 12 on page 48 show the structure of channelized IQE PICs, channelized IQ PICs, and channelized PICs.

Figure 1: Channelized OC48/STM16 IQE PIC (in SONET Mode)

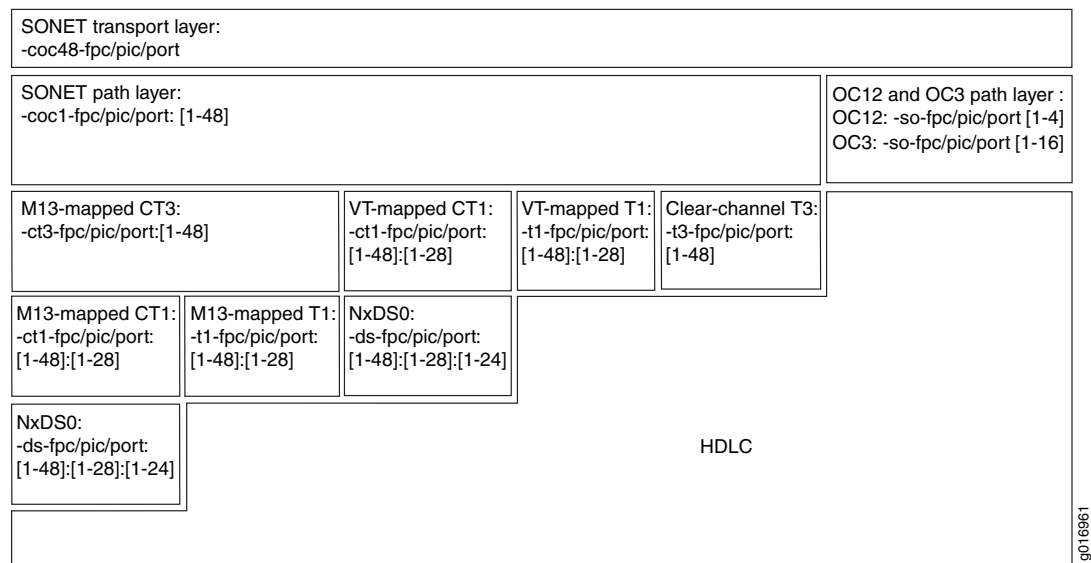


Figure 2: Channelized OC48/STM16 IQE PIC (in SDH Mode)

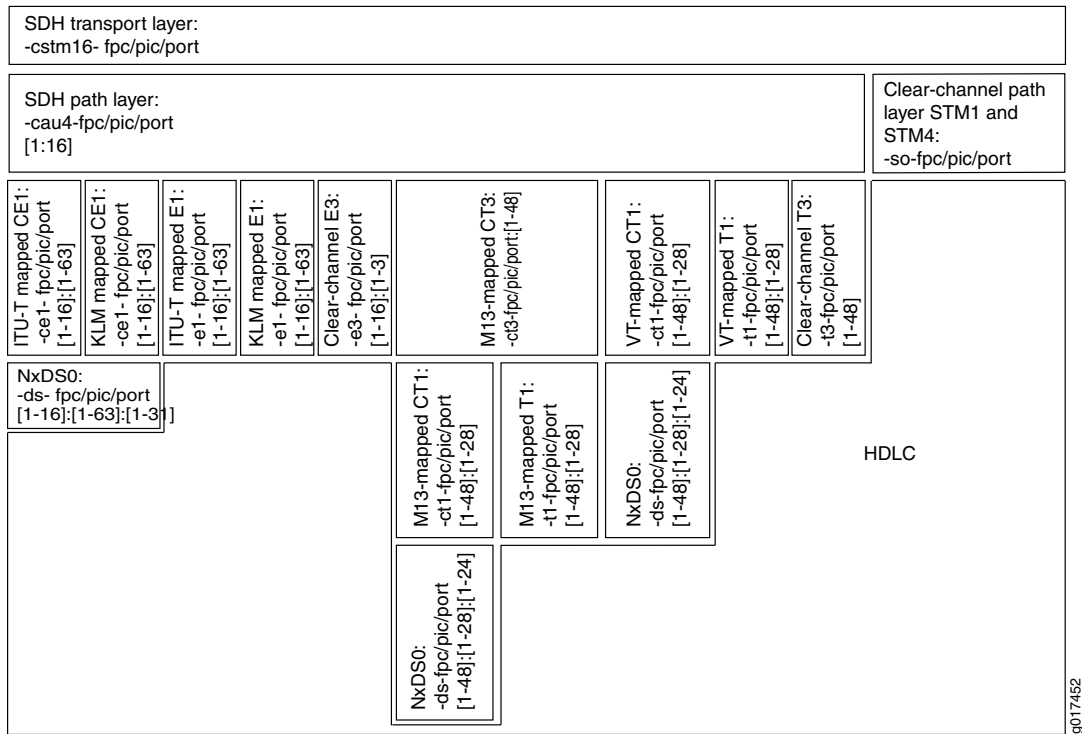


Figure 3: Channelized OC12 IQ PIC and Channelized OC12/STM4 IQE PIC (in SONET Mode)

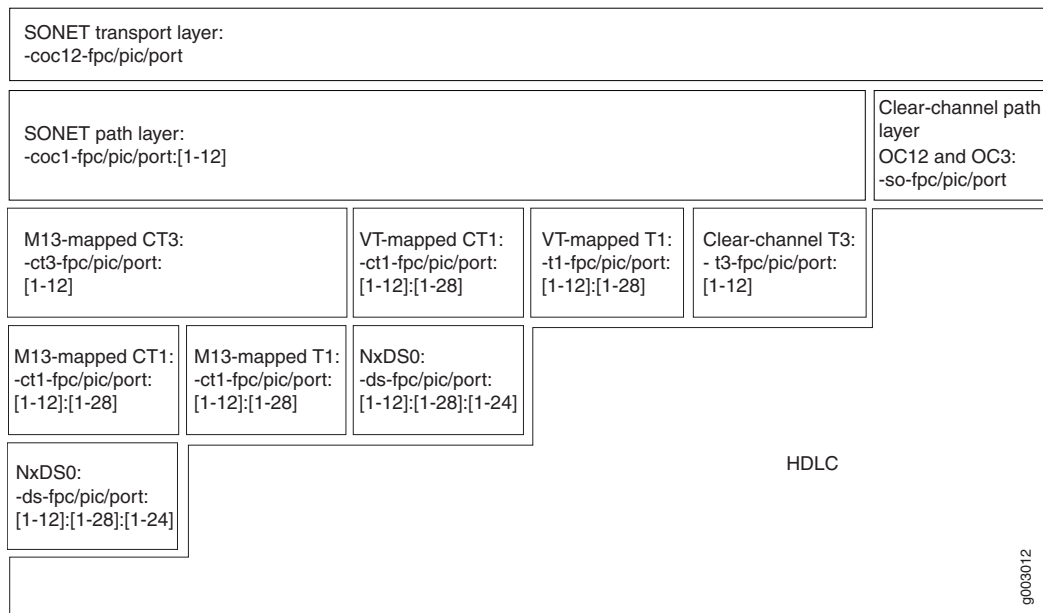


Figure 4: Channelized OC12/STM4 IQE PIC (in SDH Mode)

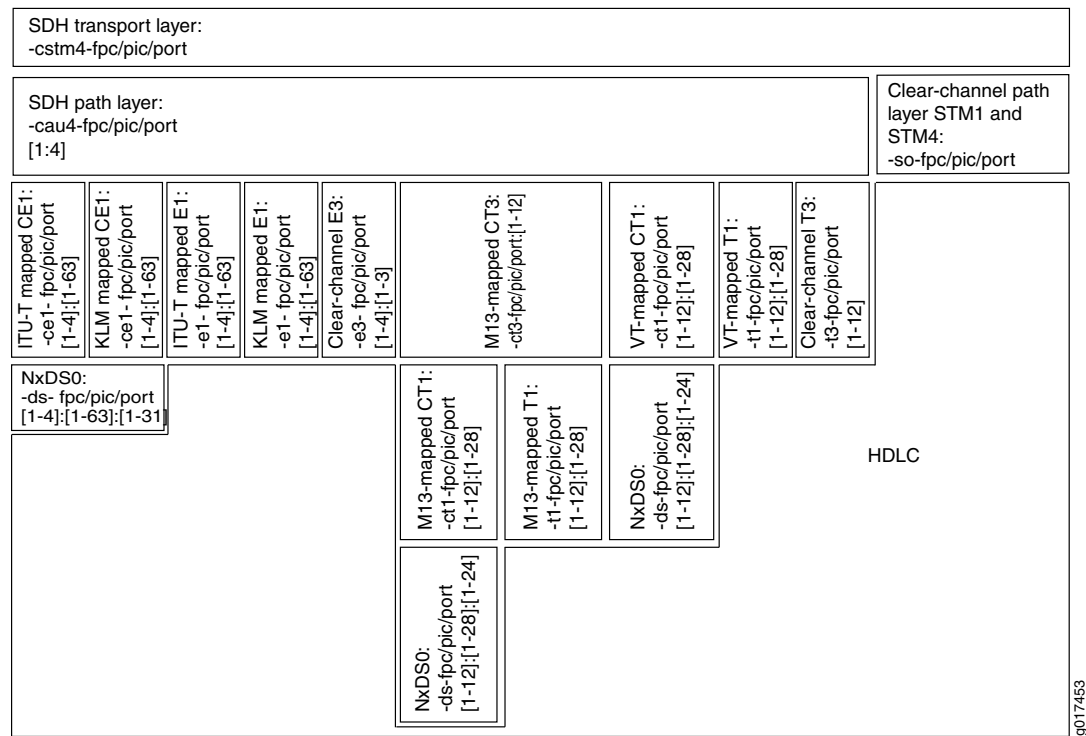
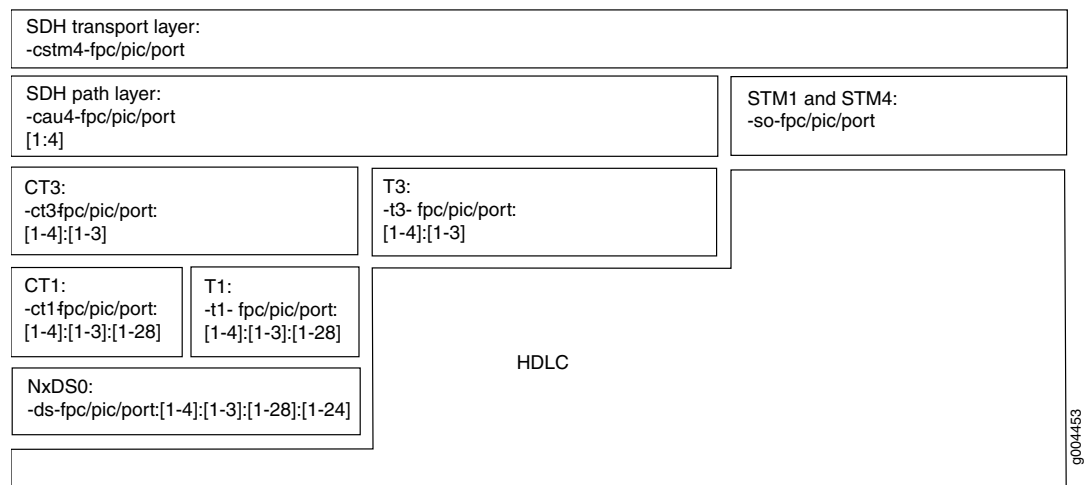
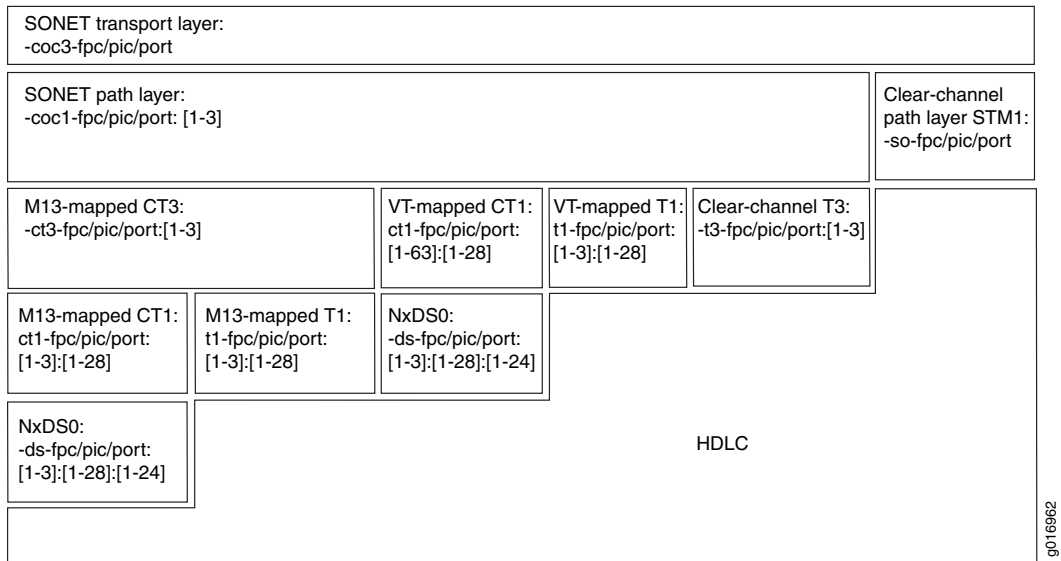


Figure 5: Channelized OC12/STM4 IQ PIC (in SDH Mode)



**Figure 6: Channelized OC3 Ports (in SONET Mode) on Channelized OC3 IQ and Channelized OC3/STM1 IQE PICs**



**Figure 7: Channelized CSTM1 Ports (in SDH Mode) on Channelized OC3/STM1 IQE PIC**

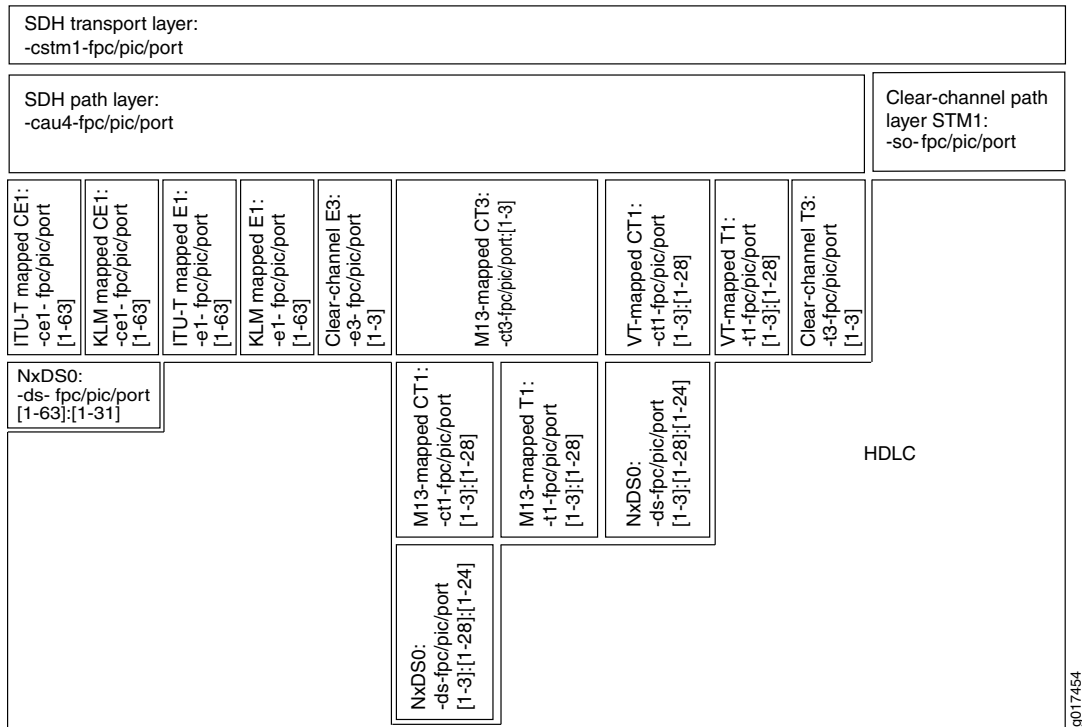


Figure 8: Channelized STM1 IQ PIC

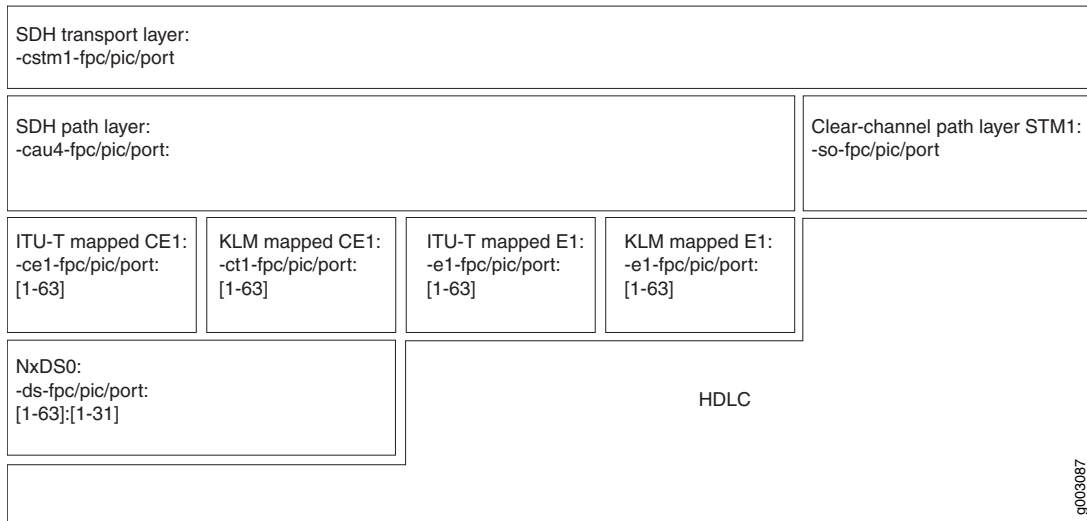


Figure 9: Channelized CDS3/E3 IQE PIC (in DS3 Mode)

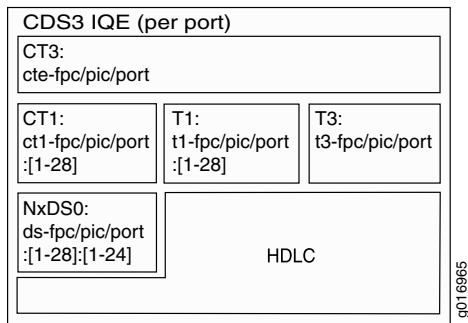


Figure 10: Channelized CDS3/E3 IQE PIC (in E3 Mode)

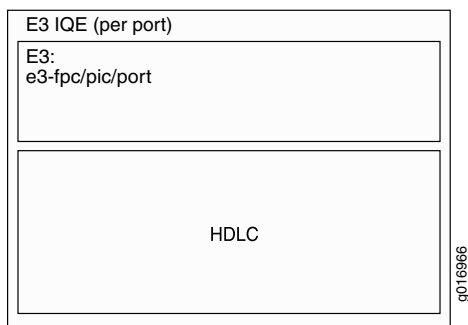




Figure 11: Channelized DS3 IQ PIC

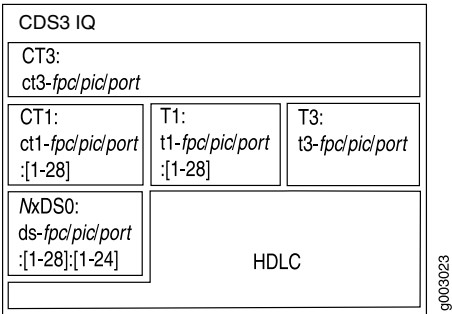


Figure 12: Channelized T1 IQ and IQE PIC

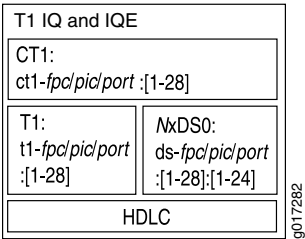


Figure 13: Channelized E1 IQ and IQE PIC

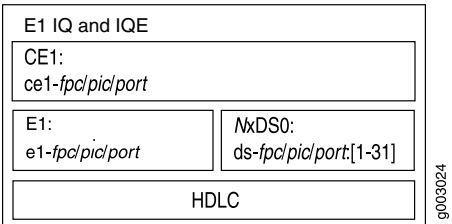


Table 10: Structural Differences: Channelized IQE PICs

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized IQE PICs					
Channelized OC48/STM16 IQE (SONET Mode)	<i>coc48-fpc/pic/port</i>	<i>coc1-fpc/pic/port</i> :[1-48]	<i>ct3-fpc/pic/port</i> :[1-48]	<i>ct1-fpc/pic/port</i> :[1-48]:[1-28]	Not applicable.
		<i>so-fpc/pic/port</i>	<i>t3-fpc/pic/port</i> :[1-48]	<i>t1-fpc/pic/port</i> :[1-48]:[1-28]	
Channelized OC48/STM16 IQE (SDH Mode)	<i>cstm16-fpc/pic/port</i>	<i>cau4-fpc/pic/port</i> :[1-16]	<i>ct3-fpc/pic/port</i> :[1:16]:[1:3]	<i>ce1-fpc/pic/port</i> :[1-16]:[1-63]	<i>e3-fpc/pic/port</i> :[1-16]:[1-3]
		<i>so-fpc/pic/port</i>	<i>t3-fpc/pic/port</i> :[1:16]:[1:3]	<i>e1-fpc/pic/port</i> :[1-16]:[1-63]	
			<i>ct1-fpc/pic/port</i> :[1:16]:[1-84]	<i>ct1-fpc/pic/port</i> :[1:16]:[1-3]:[1-28]	
			<i>t1-fpc/pic/port</i> :[1:16]:[1-84]	<i>t1-fpc/pic/port</i> :[1:16]:[1-3]:[1-28]	
Channelized OC12 IQE (SONET Mode)	<i>coc12-fpc/pic/port</i>	<i>coc1-fpc/pic/port</i> :[1-12]	<i>ct3-fpc/pic/port</i> :[1-12]	<i>ct1-fpc/pic/port</i> :[1-12]:[1-28]	Not applicable.
		<i>so-fpc/pic/port</i>	<i>t3-fpc/pic/port</i> :[1-12]	<i>t1-fpc/pic/port</i> :[1-12]:[1-28]	
Channelized STM4 IQE (SDH Mode)	<i>cstm4-fpc/pic/port</i>	<i>cau4-fpc/pic/port</i> : [1-4]	<i>ct3-fpc/pic/port</i> :[1-4]:[1-3]	<i>ce1-fpc/pic/port</i> :[1-4]:[1-63]	<i>e3-fpc/pic/port</i> :[1-4]:[1-3]
		<i>so-fpc/pic/port</i>	<i>t3-fpc/pic/port</i> :[1-4]:[1-3]	<i>e1-fpc/pic/port</i> :[1-4]:[1-63]	
			<i>ct1-fpc/pic/port</i> :[1-4]:[1-84]	<i>ct1-fpc/pic/port</i> :[1-4]:[1-3]:[1-28]	
			<i>t1-fpc/pic/port</i> :[1-4]:[1-84]	<i>t1-fpc/pic/port</i> :[1-4]:[1-3]:[1-28]	
Channelized OC3 IQE (SONET)	<i>coc3-fpc/pic/port</i>	<i>coc1-fpc/pic/port</i> :[1-3]	<i>ct3-fpc/pic/port</i> :[1-3]	<i>ct1-fpc/pic/port</i> :[1-3]:[1-28]	Not applicable.
		<i>so-fpc/pic/port</i>	<i>t3-fpc/pic/port</i> :[1-3]	<i>t1-fpc/pic/port</i> :[1-3]:[1-28]	
Channelized STM1 IQE	<i>cstm1-fpc/pic/port</i>	<i>cau4-fpc/pic/port</i>	<i>ct3-fpc/pic/port</i> :[1-3]	<i>ce1-fpc/pic/port</i> :[1-63]	<i>e3-fpc/pic/port</i> :[1:3]]
		<i>so-fpc/pic/port</i>	<i>t3-fpc/pic/port</i> :[1-3]	<i>e1-fpc/pic/port</i> :[1-63]	
			<i>ct1-fpc/pic/port</i> :[1-84]	<i>ct1-fpc/pic/port</i> :[1-3]:[1-28]	
			<i>t1-fpc/pic/port</i> :[1-84]	<i>t1-fpc/pic/port</i> :[1-3]:[1-28]	

Table 10: Structural Differences: Channelized IQE PICs (*continued*)

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized DS3 IQE	Not applicable.	Not applicable.	<i>ct3-fpc/pic/port</i> <i>t3-fpc/pic/port</i>	<i>ct1-fpc/pic/port</i> :[1-28] <i>t1-fpc/pic/port</i> :[1-28]	Not applicable.
Channelized E3 IQE	Not applicable.	Not applicable.	Not applicable.	Not applicable.	<i>e3-fpc/pic/port</i> :[1:4]
Channelized T1 IQE	Not applicable.	Not applicable.	Not applicable.	<i>ct1-fpc/pic/port</i> <i>t1-fpc/pic/port</i>	Not applicable.
Channelized E1 IQE	Not applicable.	Not applicable.	Not applicable.	<i>ce1-fpc/pic/port</i> <i>e1-fpc/pic/port</i>	Not applicable.

Table 11: Structural Differences: Channelized IQ PICs

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized IQ PICs					
Channelized OC12/STM4 IQ (SONET Mode)	<i>coc12-fpc/pic/port</i>	<i>coc1-fpc/pic/port</i> :[1-12] <i>so-fpc/pic/port</i>	<i>ct3-fpc/pic/port</i> :[1-4]:[1-3] <i>t3-fpc/pic/port</i> :[1-4]:[1-3]	<i>ct1-fpc/pic/port</i> :[1-3]:[1-28] <i>t1-fpc/pic/port</i> :[1-4]:[1-3]:[1-28]	Not applicable.
Channelized OC12/STM4 IQ (SDH Mode)	<i>cstm4-fpc/pic/port</i>	<i>cau4-fpc/pic/port</i> : [1-4] <i>so-fpc/pic/port</i>	<i>ct3-fpc/pic/port</i> :[1-4]:[1-3] <i>t3-fpc/pic/port</i> :[1-4]:[1-3]	<i>ct1-fpc/pic/port</i> :[1-3]:[1-28] <i>t1-fpc/pic/port</i> :[1-4]:[1-3]:[1-28]	Not applicable.
Channelized OC3 IQ (SONET)	<i>coc3-fpc/pic/port</i>	<i>coc1-fpc/pic/port</i> :[1-3] <i>so-fpc/pic/port</i>	<i>ct3-fpc/pic/port</i> :[1-3] <i>t3-fpc/pic/port</i> :[1-3]	<i>ct1-fpc/pic/port</i> :[1-3]:[1-28] <i>t1-fpc/pic/port</i> :[1-3]:[1-28]	Not applicable.
Channelized STM1 IQ (SDH)	Not applicable.	<i>cau4-fpc/pic/port</i> <i>so-fpc/pic/port</i>	Not applicable.	<i>ce1-fpc/pic/port</i> :[1-63] <i>e1-fpc/pic/port</i> :[1-63]	Not applicable.
Channelized DS3 IQ	Not applicable.	Not applicable.	<i>ct3-fpc/pic/port</i> <i>t3-fpc/pic/port</i>	<i>ct1-fpc/pic/port</i> :[1-28] <i>t1-fpc/pic/port</i> :[1-28]	Not applicable.

Table 11: Structural Differences: Channelized IQ PICs (*continued*)

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized E1 IQ	Not applicable.	Not applicable.	Not applicable.	<i>ce1-fpc/pic/port</i> <i>e1-fpc/pic/port</i>	Not applicable.

Table 12: Structural Differences: Channelized PICs

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized PICs					
Channelized OC12	<i>t3-fpc/pic/port</i> :0	<i>t3-fpc/pic/port</i> :[0-11]	<i>t3-fpc/pic/port</i> :[0-11]	Not applicable.	Not applicable.
Channelized STM1	<i>e1-fpc/pic/port</i> :0	<i>e1-fpc/pic/port</i> :0	Not applicable.	<i>e1-fpc/pic/port</i> :[0-63]	Not applicable.
Channelized T3 and Multichannel T3	Not applicable.	Not applicable.	<i>t1-fpc/pic/port</i> :0	<i>t1-fpc/pic/port</i> :[0-27]	Not applicable.
Channelized E1	Not applicable.	Not applicable.	Not applicable.	<i>e1-fpc/pic/port</i>  <i>ds-fpc/pic/port</i> :0	Not applicable.

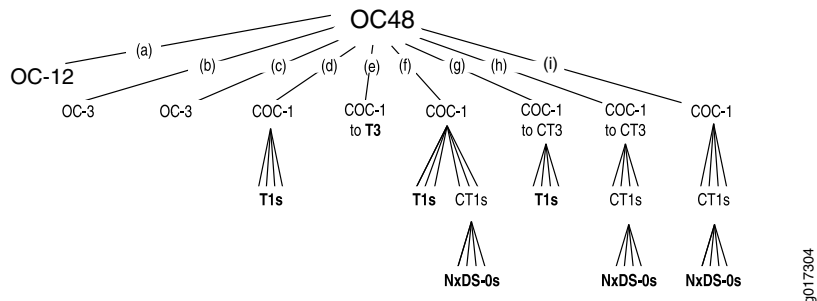
# Configuring Channelized OC48/STM16 IQE Interfaces

- [Channelized OC48/STM16 IQE Interfaces Overview on page 49](#)
- [Configuring Channelized OC48/STM16 IQE Interfaces in SONET Mode on page 51](#)
- [Configuring Channelized OC48/STM16 IQE Interfaces \(SDH Mode\) on page 58](#)
- [Configuring Link PIC Failover on Channelized OC48/STM16 IQE Interfaces on page 64](#)
- [Example: Configuring Channelized OC48 Interfaces with Partitioned Channels on page 64](#)

## Channelized OC48/STM16 IQE Interfaces Overview

Channelized enhanced intelligent queuing (IQE) interfaces allow arbitrary and dynamic channelization of serial links, allowing greater flexibility than the channelized interfaces. [Figure 14 on page 49](#), [Figure 15 on page 50](#), and [Figure 16 on page 51](#) illustrate the Channelized OC48/STM16 IQE Physical Interface Cards (PICs) in several examples of many possible configurations.

**Figure 14: Sample Channelization of OC48/STM16 IQE PIC (SONET Mode)**



**Bold entries** correspond to actual packet channels.

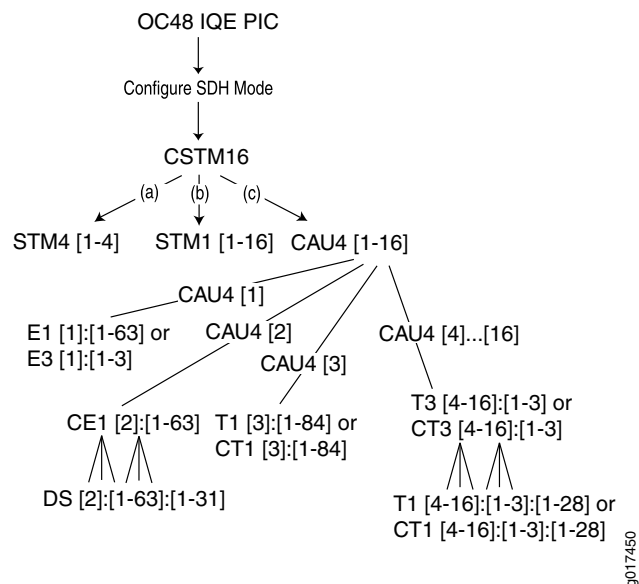
In the example in [Figure 14 on page 49](#), a Channelized OC48/STM16 IQE PIC operating in SONET mode is partitioned into the following OC slices:

- A clear channel OC12 interface.
- An OC3 interface.
- A channelized COC1 partitioned into T1 interfaces.

- d. A channelized COC1 partitioned into a T3 interface.
- e. A channelized COC1 partitioned into CT3, partitioned into T1 interfaces, and CT1s partitioned into NxDS0 interfaces.
- f. A channelized COC1 partitioned into CT3, partitioned into T1 interfaces.
- g. A channelized COC1 partitioned into CT3, partitioned into CT1s, partitioned into NxDS0 interfaces.
- h. A channelized COC1 partitioned into CT1s, partitioned into NxDS0 interfaces.

This is one of thousands of ways to configure a Channelized OC48/STM16 IQE PIC. To configure the interfaces shown in [Figure 15 on page 50](#), see “[Configuring Channelized OC48/STM16 IQE Interfaces \(SDH Mode\)](#)” on page 58.

**Figure 15: Sample Channelization of OC48/STM16 IQE PIC (SDH Mode)**



In [Figure 15 on page 50](#), a Channelized OC48/STM16 IQE PIC operating in SDH mode results in a channelized STM16 interface, which can be partitioned as the following:

- a. Up to 4 STM4s.
- b. Up to 16 STM1s.
- c. Up to 16 CAU4s that can each be partitioned into up to 63 E1s, up to 3 E3s, or up to 63 CE1s. Up to 16 CAU4s that can each be partitioned into up to 84 T1s, 84 CT1s, 63 E1s, 63 CE1s, 3 E3s, 3 T3s or 3 CT3s. Each CE1 can be partitioned into up to 31 NxDS0s. Each CT1 can be partitioned into up to 24 NxDS0s. Each CT3 can be partitioned into up to 28 T1s or 28 CT1s.

This is one of thousands of ways to configure a Channelized OC48/STM16 IQE PIC.

Figure 16: Sample Channelization of OC48/STM16 IQE PIC to E3 Channels

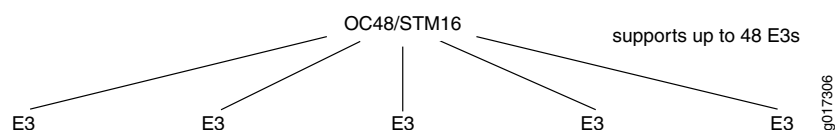


Figure 16 on page 51 shows five E3 channels configured on the Channelized OC48/STM16 IQE PIC. You can configure 43 additional E3 channels. For more information about configuring E3 channels on Channelized OC48/STM16 IQE PICs, see “Configuring E3 Interfaces” on page 60.

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

## Configuring Channelized OC48/STM16 IQE Interfaces in SONET Mode

- [Configuring OC12 Interfaces on page 51](#)
- [Configuring OC3 Interfaces on page 52](#)
- [Configuring T3 Interfaces on page 53](#)
- [Configuring T1 Interfaces on page 54](#)
- [Configuring Fractional T1 Interfaces on page 56](#)
- [Configuring NxDS0 Interfaces on page 56](#)

### Configuring OC12 Interfaces

You can configure up to four OC12 interfaces on a 1-port Channelized OC48/STM16 IQE PIC. To configure an OC12 interface, include the **partition**, **oc-slice**, and **interface-type** statements at the `[edit interfaces coc48-fpc/pic/port]` hierarchy level, specifying the **so** interface type:

```
[edit interfaces coc48-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

The partition number is the sublevel interface partition index. For SONET/SDH interfaces, the partition number does not correlate with bandwidth size. For OC12 interfaces, the partition number can be from 1 through 4.



**NOTE:** For channelized OC48 IQE interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. OC12 interfaces must occupy 12 consecutive OC slices per interface, in one of the following forms:

- 1–12
- 13–24

- 25–26
- 37–48

By contrast, the T3 and OC1 interfaces each occupy one OC slice per interface and OC3 interfaces occupy three slices per interface.

The interface type is the channelized interface type or data channel you are creating. For channelized OC48 IQE interfaces, the interface type can be **so**.

### Example: Configuring OC12 Interfaces

---

Configure an OC12 interface, using partition 1 and OC slices 1 through 12. This configuration creates interface **so-1/1/0:1**.

```
[edit interfaces coc48-1/1/0]
partition 1 oc-slice 1-12 interface-type so;
```

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

## Configuring OC3 Interfaces

To configure an OC3 interface, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc48-fpc/pic/port]** hierarchy level, specifying the **so** interface type:

```
[edit interfaces coc48-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

The partition number is the sublevel interface partition index. For SONET/SDH interfaces, the partition number does not correlate with bandwidth size. For OC3 interfaces, the partition number can be from 1 through 16.



**NOTE:** For channelized OC48 IQE interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. OC3 interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12
- and so on (in groups of 3), up to 48

By contrast, the T3 and OC1 interfaces each occupy one OC slice per interface.

The interface type is the channelized interface type or data channel you are creating. For channelized OC48 IQE interfaces, the interface type can be **so**.



### Example: Configuring OC3 Interfaces

Configure an OC3 interface, using partition 1 and OC slices 4 through 6. This configuration creates interface **so-1/1/0:1**.

```
[edit interfaces coc48-1/1/0]
partition 1 oc-slice 4-6 interface-type so;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring T3 Interfaces

To configure a T3 interface on an OC48/STM16 IQE PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc48-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc48-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

This configuration creates interface **coc1-fpc/pic/port:channel**.

Then, include the **no-partition interface-type** statement at the **[edit interfaces coc1-fpc/pic/port:channel]** hierarchy level, specifying the **t3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition interface-type t3;
```

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

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized OC1 interfaces, the partition number can be from 1 through 48. For channelized OC48/STM16 IQE interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. For channelized OC1 interfaces, the OC slice can be from 1 through 12. You can configure only one OC slice per channelized OC1 interface.

The interface type is the channelized interface type or clear channel you are creating. For channelized OC48 interfaces, **type** can be **so** or **coc1**.



**NOTE:** Channelized OC48/STM16 IQE interfaces in M Series, MX Series, and T Series routers reserve channels 0 through 3 of each OC12 space for STS3c SONET channels.

When you configure E3 or T3 channels in OC12 spaces on the described PICs, the Junos OS allocates them starting from channel 4 because channels 0 through 3 are reserved for four STS3c SONET channels. Channel numbers are allocated sequentially in the following order: 4, 5, 6, 7, 8, 9, 11, 0, 1, 2, 3.

Only after channels 4 through 11 of the OC12 space are exhausted (all 4 through 11 configured) for E3 or T3 channels will the Junos OS then allocate channel 0 through 3 space for further E3 or T3 channels; thereby using up the 0 through 3 space previously reserved for four STS3c SONET channels.

If a subsequent reconfiguration of this OC12 space occurs, where you try to replace channels 4 through 6 or 7 through 9 with an OC3 SONET channel; the configuration fails because the channel 0 through 3 space is already occupied by the last E3 or T3 channels configured. This causes a failure in channel allocation and the Device Control Daemon (DCD) keeps retrying forever to configure the channel allocation on the interface. The only resolution is to reconfigure the last configured E3/T3 channels with OC3 channels, to free channels 0 through 3.

---

### Example: Configuring T3 Interfaces

Configure a T3 interface using partition 3 and OC slice 3. This configuration creates interface **t3-1/1/0:3**:

```
[edit interfaces coc48-1/1/0]
partition 3 oc-slice 3 interface-type coc1;
[edit interfaces coc1-1/1/0:3]
no-partition interface-type t3;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring T1 Interfaces

To configure T1 interfaces on a Channelized OC48 IQE PIC, perform the following tasks:

1. Partition the channelized OC48 IQE interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc48-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc48-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port]** hierarchy level, specifying the **t1** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
partition partition-number interface-type t1;
```

- If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the **ct3** interface type. Note that because the **no-partition** statement is included, this configuration does not create another level of channelization, as denoted by the number of colons in the resulting interface.

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition partition-number interface-type ct3;
```

- Partition the channelized T3 interface into T1 interfaces by including the **partition** and **interface-type** statements at the `[edit interfaces ct3-fpc/pic/port:channel]` hierarchy level, specifying the **t1** interface type:

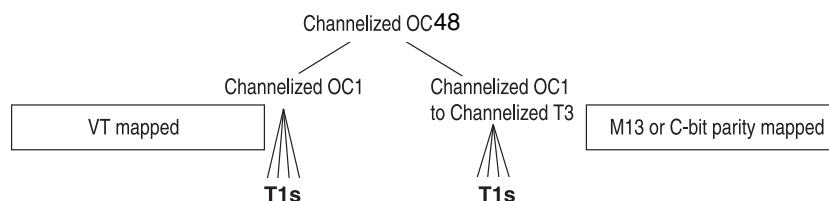
```
[edit interfaces ct3-fpc/pic/port:channel]
partition partition-number interface-type t1;
```



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

Figure 17 on page 55 shows VT-mapped and M13 or C-bit parity-mapped configurations of T1 interfaces.

Figure 17: T1 Interfaces on a Channelized OC48 PIC



g017307

**Bold** entries correspond to actual packet channels.

### Example: Configuring T1 Interfaces

Configure the following T1 interfaces:

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

#### VT-Mapped Configuration

```
[edit interfaces coc48-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
```

```
[edit interfaces coc1-0/0/0:1]
partition 1-5 interface-type t1;
```

**M13 or C-bit  
Parity-Mapped  
Configuration**

```
[edit interfaces coc48-0/0/0]
partition 1 oc-slice 1 interface-type coc1;

[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;

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

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring Fractional T1 Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized OC48 IQE PIC, perform the following tasks:

1. Configure a T1 interface. For more information, see “[Configuring T1 Interfaces](#)” on [page 54](#).
2. Configure the number of time slots allocated to the T1 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<:channel> t1-options]
timeslots time-slot-range;
```

For channelized T1 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, see “[Configuring Fractional T1 Time Slots](#)” on [page 189](#).

### Example: Configuring Fractional T1 Interfaces

---

Configure a fractional T1 interface that uses time slots 1 through 5 and 10:

```
[edit interfaces coc48-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-5,10;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring NxDS0 Interfaces

To configure NxDS0 interfaces on a Channelized OC48 IQE PIC, perform the following tasks:

1. Partition the channelized OC48 IQE interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc48-fpc/pic/port:channel]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc48-fpc/pic/port:channel]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into channelized T1 interfaces by including the **partition** and **interface-type** statements at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the **ct1** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
partition partition-number interface-type ct1;
```



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

If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the `[edit interfaces coc1-fpc/pic/port]` hierarchy level, specifying the **ct3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition partition-number interface-type ct3;
```



**NOTE:** Because the **no-partition** statement is included, this configuration task does not create another level of channelization, as denoted by the number of colons in the resulting interface.

3. 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:channel]` hierarchy level, specifying the **ct1** interface type:

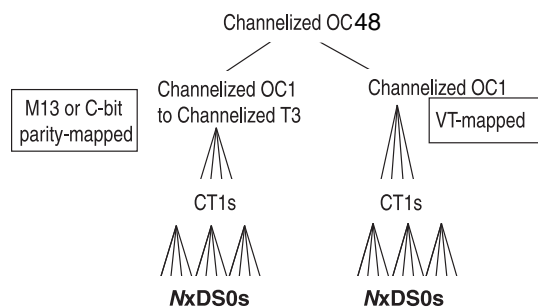
```
[edit interfaces ct3-fpc/pic/port:channel]
partition partition-number interface-type ct1;
```

4. Configure channelized NxDS0 interfaces on the channelized T1 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:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

Figure 18 on page 58 shows VT-mapped and M13 or C-bit parity-mapped configurations of NxDS0 interfaces.

Figure 18: Sample Channelization of OC48 IQE PIC



g017308

**Bold** entries correspond to actual packet channels.

### Example: Configuring NxDS0 Interfaces

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

	<pre>ds-0/0/0:1:2:1 ds-0/0/0:1:2:2</pre>
<b>VT-Mapped Configuration</b>	<pre>[edit interfaces coc48-0/0/0] partition 1 oc-slice 1 interface-type coc1;  [edit interfaces coc1-0/0/0:1] partition 2 interface-type ct1;  [edit interfaces ct1-0/0/0:1:2] partition 1 timeslots 1-10 interface-type ds; partition 2 timeslots 12-15 interface-type ds;</pre>
<b>M13 or C-bit Parity-Mapped Configuration</b>	<pre>[edit interfaces coc48-0/0/0] partition 1 oc-slice 1 interface-type coc1;  [edit interfaces coc1-0/0/0:1] no-partition interface-type ct3;  [edit interfaces ct3-0/0/0:1] partition 2 interface-type ct1;  [edit interfaces ct1-0/0/0:1:2] partition 1 timeslots 1-10 interface-type ds; partition 2 timeslots 12-15 interface-type ds;</pre>

For a full configuration example, see the [Junos OS Feature Guides](#).

### Configuring Channelized OC48/STM16 IQE Interfaces (SDH Mode)

The Channelized OC48 IQE PIC configured for SDH mode creates a single channelized STM16 interface. You can configure the STM16 interface using the **partition** statement

at the `[edit interfaces cstm16-fpc/pic/port]` hierarchy level to partition it into the following OC slices:

- 16 channelized AU-4 interfaces or a path layer with 4 STM4 or 16 STM1 interfaces.
- 16 channelized AU-4 interfaces, each partitioned to 3 clear channel E3 interfaces or 63 CE1 or E1 (ITU-T or KLM) interfaces. Combination of E1, CE1 and E3 are not supported in a single cau4.
- 16 channelized AU-4 interfaces, each partitioned to 63 CE1 (ITU-T or KLM) interfaces each partitioned to 31 NxDS0 interfaces

This section describes how to configure the following channelized OC48 IQE interfaces on a Channelized OC48 IQE PIC configured in SDH mode:

- [Configuring a Channelized OC48/STM16 IQE PIC for SDH Mode on page 59](#)
- [Configuring Clear Channel STM1 and STM4 Interfaces on page 59](#)
- [Configuring Channelized AU-4 Interfaces on page 60](#)
- [Configuring E3 Interfaces on page 60](#)
- [Configuring E1 or Channelized E1 Interfaces on page 61](#)
- [Configuring NxDS0 IQE Interfaces on page 62](#)
- [Configuring T3 or Channelized T3 Interfaces on page 62](#)
- [Configuring T1 or Channelized T1 Interfaces on page 63](#)

## Configuring a Channelized OC48/STM16 IQE PIC for SDH Mode

To configure a Channelized OC48/STM16 IQE PIC to operate in SDH mode, include the **framing sdh** statement at the `[edit chassis fpc fpc/pic/port]` hierarchy level:

```
[edit chassis ]
  fpc 0 {
    pic 2 {
      framing sdh;
    }
  }
}
```

This configuration creates interface **cstm16-0/2/0**.

For more information, see the *Junos OS System Basics Configuration Guide*.

## Configuring Clear Channel STM1 and STM4 Interfaces

On a Channelized OC48/STM16 IQE PIC, you can partition the CSTM16 transport layer into 4 clear channel STM4 interfaces or 16 clear channel STM1 interfaces. Combinations of STM4 and STM1 are also permitted, but you must observe the OC-slice parameters.

To configure an STM4 interface, include the **partition** and **interface-type** statements at the `[edit interfaces cstm16-fpc/pic/port]` hierarchy level:

```
[edit interfaces cstm16-fpc/pic/port]
  partition partition-number oc-slice oc-slice-range interface-type so;
```

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

To configure an STM1 interface, include the **partition** and **interface-type** statements at the **[edit interfaces cstm16-fpc/pic/port]** hierarchy level:

```
[edit interfaces cstm16-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

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

## Configuring Channelized AU-4 Interfaces

To configure a channelized AU-4 interface, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces cstm16-fpc/pic/port:channel]** hierarchy level, specifying the **cau4** interface type:

```
[edit interfaces cstm16-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type cau4;
```

This configuration creates interface *cau4-fpc/pic/port:channel*.

The partition number is the sublevel interface partition index. For SDH interfaces, the partition number is not correlated with bandwidth size. For channelized OC48/STM16 IQE interfaces, channelized STM16 interface can have from 1 through 16 partition numbers and channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. The interface type is the channelized interface type or data channel you are creating.

### Example: Configuring Channelized AU-4 Interfaces

---

Configure channelized AU-4 interfaces:

```
[edit interfaces cstm16-0/2/0]
partition 1 oc-slice 1-3 interface-type cau4;
```

## Configuring E3 Interfaces

To configure E3 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e3** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type e3;
}
```

This configuration creates the interfaces *e3-fpc/pic/port:channel*.



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

---





**NOTE:** Channelized OC48/STM16 IQE interfaces in M Series, MX Series, and T Series routers reserve channels 0-3 of each OC12 space for STS3c SONET channels.

When you configure E3 or T3 channels in OC12 spaces on the described PICs, Junos OS allocates them starting from channel 4 because channels 0-3 are reserved for four STS3c SONET channels. Channel numbers are allocated sequentially in the following order: 4, 5, 6, 7, 8, 9, 11, 0, 1, 2, 3.

Only after channels 4 through 11 of the OC12 space are exhausted (all 4 through 11 configured) for E3 or T3 channels will Junos OS then allocate channel 0-3 space for further E3 or T3 channels; thereby using up the 0-3 space previously reserved for four STS3c SONET channels.

If a subsequent reconfiguration of this OC12 space occurs, where you try to replace channels 4-6 or 7-9 with an OC3 SONET channel; it fails because the channel 0-3 space is already occupied by the last E3 or T3 channels configured. This causes a failure in channel allocation and the Device Control Daemon (DCD) keeps retrying forever to configure the channel allocation on the interface. The only resolution is to reconfigure the last configured E3/T3 channels with OC3 channels, to free channels 0-3.

### Example: Configuring E3 Interfaces

Configure E3 interfaces, using partition 1:

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 1 interface-type e3;
}
e3-0/2/0:1;
```

### Configuring E1 or Channelized E1 Interfaces

To configure E1 or channelized E1 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e1** or **ce1** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type e1;
}
cau4-fpc/pic/port {
  partition partition-number interface-type ce1;
}
```

This configuration creates the interfaces **e1-fpc/pic/port:channel** and **ce1-fpc/pic/port:channel**.



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

### Example: Configuring E1 and Channelized E1 Interfaces

Configure E1 or channelized E1 interfaces, using partition 3 and partition 4:

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 3 interface-type e1;
}
cau4-0/2/0:1 {
  partition 4 interface-type ce1;
}
```

This configuration creates interfaces **e1-0/2/0:1:3** and **ce1-0/2/0:1:4**.

### Configuring NxDS0 IQE Interfaces

Configure channelized NxDS0 IQE interfaces on the channelized E1 IQE interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces ce1-fpc/pic/port:channel]** hierarchy level, specifying the **ds** interface type:

```
[edit interfaces ce1-fpc/pic/port:channel:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

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

The time-slot range is from 1 through 31. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. You can use a combination of ranges and discontinuous time slots, for example:

```
1,9-18,21
```

### Example: Configuring NxDS0 IQE Interfaces

Configure channelized NxDS0 interfaces, using partition 4 and time slots 1 through 10:

```
[edit interfaces]
ce1-0/2/0:1:2:3 {
  partition 4 interface-type ds0 timeslots 1-10;
}
```

This configuration creates interface **ds0-0/2/0:1:2:3:4**.

### Configuring T3 or Channelized T3 Interfaces

To configure T3 or channelized T3 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **t3** or **ct3** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type t3;
```

```

}
cau4-fpc/pic/port {
  partition partition-number interface-type ct3;
}

```

This configuration creates the interfaces **t3-fpc/pic/port:channel** and **t3-fpc/pic/port:channel**.



**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.

### Example: Configuring T3 or Channelized T3 Interfaces

Configure T3 and channelized T3 interfaces, using partition 1 and partition 2:

```

[edit interfaces]
cau4-0/2/0:1 {
  partition 1 interface-type t3;
}
cau4-0/2/0:1 {
  partition 2 interface-type ct3;
}
t3-0/2/0:1:1 ct3-0/2/0:1:2;

```

### Configuring T1 or Channelized T1 Interfaces

To configure T1 or channelized T1 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **t1** or **ct1** interface type:

```

[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type t1;
}
cau4-fpc/pic/port {
  partition partition-number interface-type ct1;
}

```

This configuration creates the interfaces **t1-fpc/pic/port:channel** and **t1-fpc/pic/port:channel**.



**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.

### Example: Configuring T1 or Channelized T1 Interfaces

Configure T1 and channelized T1 interfaces, using partition 1 and partition 2:

```

[edit interfaces]
cau4-0/2/0:1 {

```

```
    partition 1 interface-type t1;
  }
  cau4-0/2/0:1 {
    partition 2 interface-type ct1;
  }
  t1-0/2/0:1:1 ct1-0/2/0:1:2;
```

---

## Configuring Link PIC Failover on Channelized OC48/STM16 IQE Interfaces

For Channelized OC48 IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the **no-termination-request** statement at the **[edit interfaces *interface-name* ppp-options]** hierarchy level:

```
no-termination-request;
```

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the [Junos OS Services Interfaces Configuration Guide](#).

---

## Example: Configuring Channelized OC48 Interfaces with Partitioned Channels

The following configuration is sufficient to get the channelized OC48 interface up and running. The OC48 interface can be divided into up to 4 OC12 channels, up to 16 OC3 channels, or up to 48 OC1 channels and combinations are permitted; for example, 1 OC12, 4 OC3s, and 24 OC1s. There are 48 OC1 slices available on the OC48 IQE interface. An OC48 configuration uses all 48 slices, each OC12 uses 12 slices, each OC1 uses 1 slice. Permissible combinations must fit within the 48 available OC1 slices. DS1 channels can use the following encapsulation types:

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

The channels can also have logical interfaces.

```
[edit interfaces]
t3-fpc/pic/port:0 {
  encapsulation cisco-hdlc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.1/30;
    }
    family iso;
  }
}
```

```
t3-fpc/pic/port:1 {
  encapsulation ppp;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.5/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:2 {
  encapsulation frame-relay;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    dlci 100;
    family inet {
      address 10.11.30.9/30;
    }
    family iso;
  }
  unit 1 {
    dlci 101;
    family inet {
      address 10.11.31.9/30;
    }
    family iso;
  }
}
t3-lfpc/pic/port:3 {
  encapsulation cisco-hdlc-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0;
}
t3-fpc/pic/port:4 {
  encapsulation ppp-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0;
}
t3-fpc/pic/port:5 {
  dce;
  encapsulation frame-relay-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
}
```

```
    }  
    unit 0 {  
        encapsulation frame-relay-ccc;  
        dlci 1000;  
    }  
    unit 1 {  
        encapsulation frame-relay-ccc;  
        dlci 1001;  
    }  
}
```

## CHAPTER 4

# Configuring Channelized OC12/STM4 Interfaces

- [Channelized OC12/STM4 IQ and IQE Interfaces Overview on page 67](#)
- [Channelization of OC12/STM4 IQ and Channelized OC12/STM4 IQE PICs \(SONET Mode\) on page 67](#)
- [Channelization of OC12/STM4 IQE PIC \(SDH Mode\) on page 68](#)
- [Channelization of OC12/STM4 IQ PIC \(SDH Mode\) on page 69](#)
- [Channelization of OC12 PIC \(SONET Mode\) on page 70](#)
- [Configuring Channelized OC12/STM4 IQ and IQE Interfaces \(SONET Mode\) on page 71](#)
- [Configuring Channelized OC12/STM4 IQE Interfaces \(SDH Mode\) on page 78](#)
- [Configuring Channelized OC12/STM4 IQ Interfaces \(SDH Mode\) on page 83](#)
- [Configuring Channelized OC12 Interfaces on page 89](#)
- [Configuring Link PIC Failover on Channelized OC12/STM4 IQ and IQE Interfaces on page 92](#)
- [Example: Configuring a Channelized OC12 IQ Interface as an Unpartitioned Clear Channel on page 92](#)
- [Example: Configuring Channelized OC12 Interfaces with Partitioned Channels on page 96](#)

## Channelized OC12/STM4 IQ and IQE Interfaces Overview

---

Channelized IQ and channelized IQE interfaces allow arbitrary and dynamic channelization of serial links, allowing greater flexibility than the channelized interfaces. Channelized OC12/STM4 IQ and IQE Physical Interface Cards (PICs) can be configured to operate in SONET or SDH mode. Each physical port on a multiple-port IQE PIC can be configured to operate in either SONET or SDH mode for increased granularity. The following sections describe the different modes of operation and channelization possibilities.

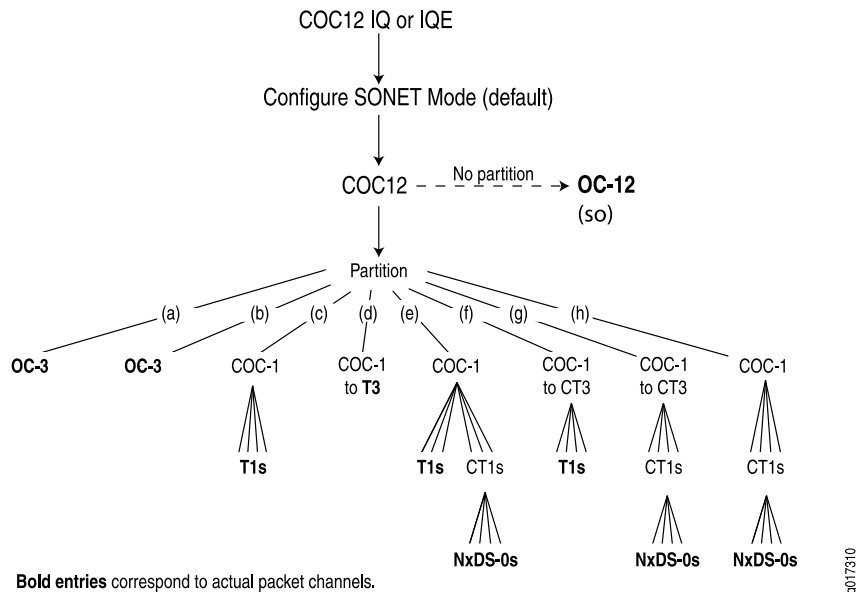
## Channelization of OC12/STM4 IQ and Channelized OC12/STM4 IQE PICs (SONET Mode)

---

Channelized OC12/STM4 IQ PICs and Channelized OC12/STM4 IQE PICs can be configured to operate in SONET or SDH mode and partitioned into various partitions. [Figure 19 on](#)

page 68 illustrates one possible channelization configuration for Channelized OC12/STM4 IQ and IQE PICs operating in SONET mode.

**Figure 19: Sample Channelization of OC12/STM4 IQ or IQE PIC (SONET Mode)**



In the example in Figure 19 on page 68, a Channelized OC12/STM4 IQ or IQE PIC operating in SONET mode is partitioned into the following OC slices:

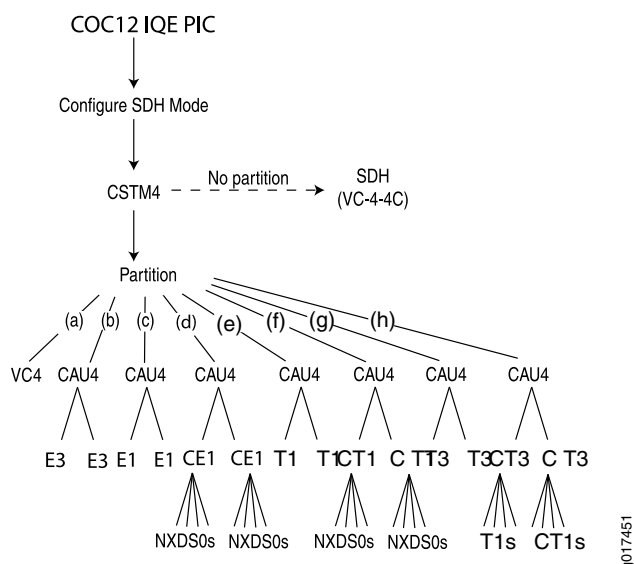
- An OC3 interface.
- Another OC3 interface.
- A channelized OC1 partitioned into T1 interfaces.
- A channelized OC1 converted into a T3 interface.
- A channelized OC1 partitioned into T1 interfaces and channelized T1s, which are partitioned into NxDS0 interfaces.
- A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces.
- A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces and a channelized T1, which is partitioned into NxDS0 interfaces.
- A channelized OC1 partitioned into channelized T1s, which are partitioned into NxDS0 interfaces.

## Channelization of OC12/STM4 IQE PIC (SDH Mode)

Channelized OC12/STM4 IQE PICs can be configured to operate in SONET or SDH mode and partitioned to various smaller partitions. Figure 20 on page 69 illustrates one possible channelization configuration for Channelized OC12/STM4 IQE PICs operating in SDH mode.



Figure 20: Sample Channelization of OC12/STM4 IQE PIC (SDH Mode)



In [Figure 20 on page 69](#), a Channelized OC12/STM4 IQE PIC operating in SDH mode results in a channelized STM4 interface, which can be nonpartitioned into one SDH VC-4-VC interface or partitioned into the following OC slices:

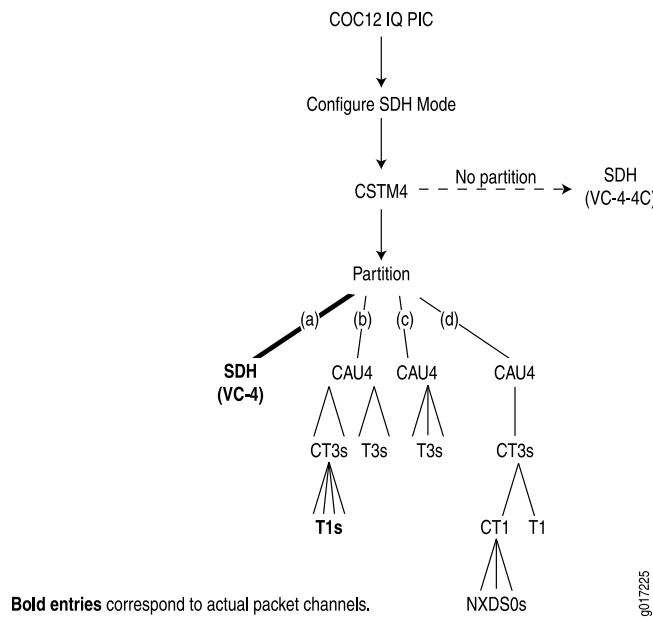
- a. An SDH VC-4 interface.
- b. A channelized AU-4 partitioned into E3 interfaces.
- c. A channelized AU-4 interface partitioned into E1 interfaces.
- d. A channelized AU-4 interface partitioned into CE1 interfaces partitioned into NxDS0 interfaces.
- e. A channelized AU-4 interface partitioned into T1 interfaces.
- f. A channelized AU-4 interface partitioned into CT1 interfaces.
- g. A channelized AU-4 interface partitioned into T3 interfaces partitioned into T1 interfaces.
- h. A channelized AU-4 interface partitioned into CT3 interfaces partitioned into CT1 interfaces.

This is one of thousands of ways to configure a Channelized OC12/STM4 IQE PIC.

## Channelization of OC12/STM4 IQ PIC (SDH Mode)

Channelized OC12/STM4 IQ PICs can be configured to operate in SONET or SDH mode and partitioned into various smaller partitions. [Figure 21 on page 70](#) illustrates one possible channelization configuration for Channelized OC12/STM4 IQ PICs operating in SDH mode.

**Figure 21: Sample Channelization of OC12/STM4 IQ PIC (SDH Mode)**



**Bold entries** correspond to actual packet channels.

In [Figure 21 on page 70](#), a Channelized OC12/STM4 IQ PIC operating in SDH mode results in a channelized STM4 interface, which can be nonpartitioned into one SDH VC-4-VC interface or partitioned into the following OC slices:

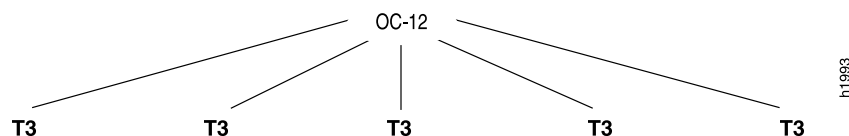
- An SDH VC-4 interface.
- A channelized AU-4 partitioned into channelized T3 interfaces and T3 interfaces.
- Another channelized AU-4 interface converted into T3 interfaces.
- Another channelized AU-4 interface converted into a channelized T3 interface, which is partitioned further into a channelized T1 and a T1 interface. The channelized T1 interface is further partitioned into NxDS0 interfaces.

This is one of thousands of ways to configure a Channelized OC12/STM4 IQ PIC.

## Channelization of OC12 PIC (SONET Mode)

OC12 PICs can be configured to various smaller partitions, such as T3s.

**Figure 22: Sample Channelization of OC12 PIC (non IQ and IQE)**



[Figure 22 on page 70](#) shows five T3 channels configured on the Channelized OC12 PIC. You can configure seven additional T3 channels. For more information about configuring Channelized OC12 PICs, see [“Configuring Channelized OC12 Interfaces” on page 89](#).

## Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode)

This section describes how to configure channelized OC12/STM4 intelligent queuing (IQ) and enhanced intelligent queuing (IQE) interfaces, discussing the following topics:

- [Configuring an OC12/STM4 Interface on page 71](#)
- [Configuring T3 Interfaces on page 71](#)
- [Configuring OC3 Interfaces on page 73](#)
- [Configuring T1 Interfaces on Channelized OC12 IQ and IQE Interfaces on page 73](#)
- [Configuring NxDS0 Interfaces on page 75](#)
- [Configuring Fractional T1 Interfaces on page 77](#)

### Configuring an OC12/STM4 Interface

You can configure one OC12 interface on a 1-port Channelized OC12/STM4 IQ or IQE PIC. On a 4-port OC12/STM4 IQ or IQE PIC, you can configure one OC12 interface per port. To configure an OC12 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level:

```
[edit interfaces coc12-fpc/pic/port]
no-partition interface-type so;
```

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



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



**NOTE:** If you configure the **per-unit-scheduler** statement on the physical interface of a 4-port Channelized OC-12 IQ PIC and configure 975 logical interfaces or DLCIs, some of the logical interfaces or data link connection identifiers (DLCIs) will drop all packets intermittently.

### Configuring T3 Interfaces

To configure a T3 interface on an OC12 PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

This configuration creates interface **coc1-fpc/pic/port:channel**.

Then, include the **no-partition interface-type** statement at the **[edit interfaces coc1-fpc/pic/port:channel]** hierarchy level, specifying the **t3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]  
no-partition interface-type t3;
```

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

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized OC1 interfaces, the partition number can be from 1 through 12.



**NOTE:** For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12/STM4 IQ and IQE interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. For channelized OC1 interfaces, the OC slice can be from 1 through 12. You can configure only one OC slice per channelized OC1 interface.

The interface type is the channelized interface type or clear channel you are creating. For channelized OC12 interfaces, **type** can be **so** or **coc1**.



**NOTE:** Channelized OC12/STM4 IQ and IQE interfaces in M Series, MX Series, and T Series routers reserve channels 0 through 3 of each OC12 space for STS3c SONET channels.

When you configure E3 or T3 channels in OC12 spaces on the described PICs, Junos OS allocates them starting from channel 4 because channels 0 through 3 are reserved for four STS3c SONET channels. Channel numbers are allocated sequentially in the following order: 4, 5, 6, 7, 8, 9, 11, 0, 1, 2, 3.

Only after channels 4 through 11 of the OC12 space are exhausted (that is, channels 4 through 11 are configured) for E3 or T3 channels will Junos OS then allocate the channel 0–3 space for further E3 or T3 channels; thereby using up the 0–3 space previously reserved for four STS3c SONET channels.

If a subsequent reconfiguration of this OC12 space occurs, where you try to replace channels 4–6 or 7–9 with an OC3 SONET channel; it fails because the channel 0–3 space is already occupied by the last E3 or T3 channels configured. This causes a failure in channel allocation and the device control daemon (dcd) keeps retrying forever to configure the channel allocation on the interface. The only resolution is to reconfigure the last configured E3 or T3 channels with OC3 channels, to free channels 0 through 3.

---

### Example: Configuring T3 Interfaces

Configure a T3 interface using partition 3 and OC slice 3. This configuration creates interface **t3-1/1/0:3**:

```
[edit interfaces coc12-1/1/0]
```

```
partition 3 oc-slice 3 interface-type coc1;
[edit interfaces coc1-1/1/0:3]
no-partition interface-type t3;
```

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

## Configuring OC3 Interfaces

To configure an OC3 interface, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level, specifying the **so** interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

The partition number is the sublevel interface partition index. For SONET/SDH interfaces, the partition number does not correlate with bandwidth size. For OC3 interfaces, the partition number can be from 1 through 4.



**NOTE:** For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12 IQ and IQE interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. OC3 interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12

By contrast, the T3 and OC1 IQ interfaces each occupy one OC slice per interface.

The interface type is the channelized interface type or data channel you are creating. For channelized OC12 interfaces, the interface type can be **coc1** or **so**.

### Example: Configuring OC3 Interfaces

Configure an OC3 interface, using partition 1 and OC slices 4 through 6. This configuration creates interface **so-1/1/0:1**:

```
[edit interfaces coc12-1/1/0]
partition 1 oc-slice 4-6 interface-type so;
```

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

## Configuring T1 Interfaces on Channelized OC12 IQ and IQE Interfaces

To configure T1 interfaces on a Channelized OC12 IQ or IQE PIC, perform the following tasks:

1. Partition the channelized OC12 interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses virtual tributary (VT) mapping, partition the channelized OC1 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port]** hierarchy level, specifying the **t1** interface type:

```
[edit interfaces coc1-fpc/pic/port]
partition partition-number interface-type t1;
```

3. If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port:channel]** hierarchy level, specifying the **ct3** interface type. Note that because the **no-partition** statement is included, this configuration does not create another level of channelization, as denoted by the number of colons in the resulting interface.

```
[edit interfaces coc1-fpc/pic/port]
no-partition partition-number interface-type ct3;
```

4. Partition the channelized T3 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level, specifying the **t1** interface type:

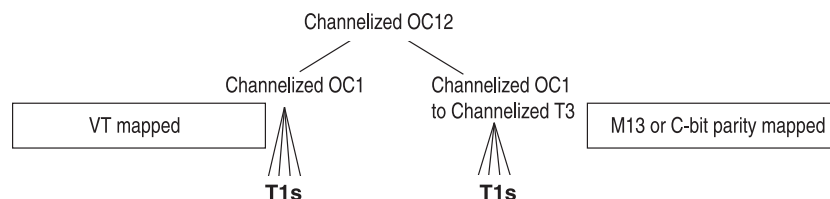
```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type t1;
```



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

Figure 23 on page 74 shows VT-mapped and M13 or C-bit parity-mapped configurations of T1 interfaces.

**Figure 23: T1 Interfaces on a Channelized OC12 PIC**



**Bold** entries correspond to actual packet channels.

9003013

### Example: Configuring T1 Interfaces

Configure the following T1 interfaces:

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

#### VT-Mapped Configuration

```
[edit interfaces coc12-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
```

```
[edit interfaces coc1-0/0/0:1]
partition 1-5 interface-type t1;
```

#### M13 or C-bit Parity-Mapped Configuration

```
[edit interfaces coc12-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
```

```
[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;
```

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

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

## Configuring NxDSO Interfaces

To configure NxDSO interfaces on a Channelized OC12 IQE PIC, perform the following tasks:

1. Partition the channelized OC12 IQE interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into channelized T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port]** hierarchy level, specifying the **ct1** interface type:

```
[edit interfaces coc1-fpc/pic/port]
partition partition-number interface-type ct1;
```



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

3. If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the **[edit interfaces coc1-*fpc/pic/port*]** hierarchy level, specifying the **ct3** interface type:

```
[edit interfaces coc1-fpc/pic/port]
no-partition partition-number interface-type ct3;
```



**NOTE:** Because the **no-partition** statement is included, this configuration task does not create another level of channelization, as denoted by the number of colons in the resulting interface.

4. 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:

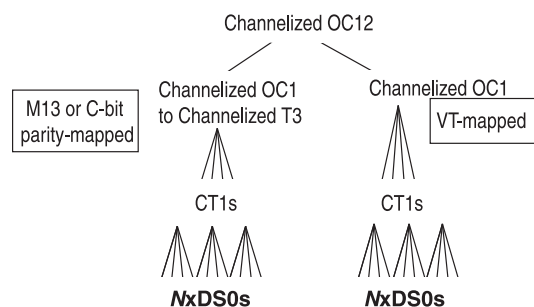
```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type ct1;
```

5. Configure channelized NxDS0 IQ interfaces on the channelized T1 IQ interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces ct1-*fpc/pic/port:channel:channel*]** hierarchy level, specifying the **ds** interface type:

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

Figure 24 on page 76 shows VT-mapped and M13 or C-bit parity-mapped configurations of NxDS0 IQ interfaces.

**Figure 24: Sample Channelization of OC12 IQE PIC**



**Bold** entries correspond to actual packet channels.

g003014

### Example: Configuring NxDS0 Interfaces

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

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



**VT-Mapped Configuration**

```
[edit interfaces coc12-0/0/0]
partition 1 oc-slice 1 interface-type coc1;

[edit interfaces coc1-0/0/0:1]
partition 2 interface-type ct1;

[edit interfaces ct1-0/0/0:1:2]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;
```

**M13 or C-bit Parity-Mapped Configuration**

```
[edit interfaces coc12-0/0/0]
partition 1 oc-slice 1 interface-type coc1;

[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;

[edit interfaces ct3-0/0/0:1]
partition 2 interface-type ct1;

[edit interfaces ct1-0/0/0:1:2]
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](#).

## Configuring Fractional T1 Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized OC12 IQE PIC, perform the following tasks:

1. Configure a T1 interface. For more information, see [“Configuring T1 Interfaces” on page 54](#).
2. Configure the number of time slots allocated to the T1 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<:channel> t1-options]
timeslots time-slot-range;
```

For channelized T1 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, see [“Configuring Fractional T1 Time Slots” on page 189](#).

### Example: Configuring Fractional T1 Interfaces

Configure a fractional T1 interface that uses time slots 1 through 5 and 10:

```
[edit interfaces coc12-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
```

timeslots 1-5,10;

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

## Configuring Channelized OC12/STM4 IQE Interfaces (SDH Mode)

---

The Channelized OC12 IQE PIC configured for SDH mode creates a single channelized STM4 interface. You can configure this interface as unpartitioned using the **no-partition** statement at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level to create a single SDH VC-4-4C interface, or you can partition it into the following OC slices:

- SDH virtual concatenation 4 (VC-4) and channelized AU-4 interfaces (4 interfaces, any combination)
- E3 interfaces from a channelized AU-4 interface (3 interfaces, any combination)
- Channelized E1 or E1 interfaces from a channelized AU-4 interface (63 interfaces, any combination)
- NxDS0 interfaces from a channelized E1 interface

This section describes how to configure the following channelized OC12 IQE interfaces on a Channelized OC12 IQE PIC configured in SDH mode:

- [Configuring Channelized OC12/STM4 IQE PICs for SDH Mode on page 78](#)
- [Configuring an Unpartitioned SDH \(VC-4-4C\) Interface on a Channelized OC12/STM4 IQE PIC on page 79](#)
- [Configuring SDH \(VC-4\) Interfaces on Channelized OC12/STM4 IQE PICs on page 79](#)
- [Configuring Channelized AU-4 Interfaces on page 80](#)
- [Configuring E3 Interfaces on page 81](#)
- [Configuring E1 or Channelized E1 Interfaces on page 82](#)
- [Configuring NxDS0 Interfaces on Channelized OC12/STM4 IQE PICs on page 83](#)

## Configuring Channelized OC12/STM4 IQE PICs for SDH Mode

The 4-port Channelized OC12 IQE PIC allows SONET/SDH configuration on a per port basis, permitting combinations of SONET and SDH ports on the same PIC. The 1-port Channelized OC12 IQE PIC operates in either SONET or SDH mode only.

To configure a 1-port Channelized OC12 IQE PIC to operate in SDH mode, include the **framing sdh** statement at the **[edit chassis fpc fpc/pic/port]** hierarchy level:

```
[edit chassis]
fpc 0 {
  pic 2 {
    framing sdh;
  }
}
```

This configuration creates interface **cstm4-0/2/0**.

You can also use the above configuration example to configure all 4 ports of a 4-port Channelized OC12 IQE PIC for SDH mode. To configure individual ports to operate in SDH

mode, include the **framing sdh** statement at the **[edit chassis fpc fpc/pic/port]** hierarchy level. The following example configures port 2 for SDH mode:

```
[edit chassis]
fpc 0 {
  pic 2 {
    port 2 {
      framing sdh;
    }
  }
}
```

This configuration creates interface **cstm4-0/2/2**.

For more information, see the *Junos OS System Basics Configuration Guide*.

## Configuring an Unpartitioned SDH (VC-4-4C) Interface on a Channelized OC12/STM4 IQE PIC

On a Channelized OC12 IQE PIC, you can configure one SDH (VC-4-4C) interface. To configure an SDH (VC-4-4C) interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level:

```
[edit interfaces cstm4-fpc/pic/port]
no-partition interface-type so;
```

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

### Example: Configuring an Unpartitioned SDH (VC-4-4C) Interface

Configure an unpartitioned SDH (VC-4-4C) interface, using partition 1 and OC slices 4 through 6:

```
[edit interfaces cstm4-0/2/0]
no-partition interface-type so;
```

This configuration creates the interface **so-0/2/0**.

## Configuring SDH (VC-4) Interfaces on Channelized OC12/STM4 IQE PICs

To configure an SDH (VC-4) interface on a Channelized OC12 IQE PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level, specifying the **so** interface type:

```
[edit interfaces cstm4-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

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

The partition number is the sublevel interface partition index and is correlated with the channel number. For Channelized OC12 IQE PICs, the OC-slice range can be from 1 through 12.



**NOTE:** For channelized OC12 IQE interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. SDH (VC-4) interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12

The interface type is the channelized interface type or data channel you are creating.

### Example: Configuring SDH (VC-4) Interfaces

---

Configure SDH (VC-4) interfaces:

```
[edit interfaces cstm4-0/2/0]
partition 1 oc-slice 1-3 interface-type so;
partition 2 oc-slice 4-6 interface-type so;
partition 3 oc-slice 7-9 interface-type so;
partition 4 oc-slice 10-12 interface-type so;
```

This configuration creates the interfaces **so-0/2/0:1** through **so-0/2/0:4**.

## Configuring Channelized AU-4 Interfaces

To configure a channelized AU-4 interface, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level, specifying the **cau4** interface type:

```
[edit interfaces cstm4-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type cau4;
```

This configuration creates interface **cau4-fpc/pic/port:channel**.

The partition number is the sublevel interface partition index. For SDH interfaces, the partition number is not correlated with bandwidth size. A channelized STM-4 interface can have from 1 through 4 partition numbers.



**NOTE:** For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12 interfaces (both IQ and IQE), channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. Channelized AU-4 IQ interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6

- 7–9
- 10–12

The interface type is the channelized interface type or data channel you are creating.

### Example: Configuring Channelized AU-4 Interfaces

Configure channelized AU-4 interfaces, using partitions 1 through 4:

```
[edit interfaces cstm4-0/2/0]
partition 1 oc-slice 1-3 interface-type cau4;
partition 2 oc-slice 4-6 interface-type cau4;
partition 3 oc-slice 7-9 interface-type cau4;
partition 4 oc-slice 10-12 interface-type cau4;
```

This configuration creates the interfaces **cau4-0/2/0:1** through **cau4-0/2/0:4**.

## Configuring E3 Interfaces

To configure E3 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e3** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type e3;
}
```

This configuration creates the interfaces **e3-fpc/pic/port:channel** and **e3-fpc/pic/port:channel**.



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



**NOTE:** Channelized OC12/STM4 IQ and IQE interfaces in M Series, MX Series, and T Series routers reserve channels 0-3 of each OC12 space for STS3C SONET channels.

When you configure E3 or T3 channels in OC12 spaces on the described PICs, Junos OS allocates them starting from channel 4 because channels 0-3 are reserved for four STS3c SONET channels. Channel numbers are allocated sequentially in the following order: 4, 5, 6, 7, 8, 9, 11, 0, 1, 2, 3.

Only after channels 4 through 11 of the OC12 space are exhausted (all 4 through 11 configured) for E3 or T3 channels will Junos OS then allocate channel 0-3 space for further E3 or T3 channels; thereby using up the 0-3 space previously reserved for four STS3c SONET channels.

If a subsequent reconfiguration of this OC12 space occurs, where you try to replace channels 4-6 or 7-9 with an OC3 SONET channel; it fails because the channel 0-3 space is already occupied by the last E3 or T3 channels configured. This causes a failure in channel allocation and the Device Control Daemon (DCD) keeps retrying forever to configure the channel allocation on the interface. The only resolution is to reconfigure the last configured E3/T3 channels with OC3 channels, to free channels 0-3.

---

### Example: Configuring E3 Interfaces

---

Configure E3 interfaces, using partition 1:

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 1 interface-type e3;
}
e3-0/2/0:1;
```

### Configuring E1 or Channelized E1 Interfaces

To configure E1 or channelized E1 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e1** or **ce1** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type e1;
}
cau4-fpc/pic/port {
  partition partition-number interface-type ce1;
}
```

This configuration creates the interfaces **e1-fpc/pic/port:channel** and **ce1-fpc/pic/port:channel**.



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

### Example: Configuring E1 or Channelized CE1 Interfaces

Configure E1 or channelized CE1 interfaces, using partition 3 and partition 4:

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 3 interface-type e1;
}
cau4-0/2/0:1 {
  partition 4 interface-type ce1;
}
```

This configuration creates interfaces **e1-0/2/0:1:3** and **ce1-0/2/0:1:4**.

### Configuring NxDS0 Interfaces on Channelized OC12/STM4 IQE PICs

Configure channelized NxDS0 interfaces on the channelized E1 interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces ce1-fpc/pic/port:channel]** hierarchy level, specifying the **ds** interface type:

```
[edit interfaces ce1-fpc/pic/port:channel:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

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

The time-slot range is from 1 through 32. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. You can use a combination of ranges and discontinuous time slots, for example:

```
1,9-18,21
```

### Example: Configuring NxDS0 Interfaces

Configure channelized NxDS0 interfaces, using partition 4 and time slots 1 through 10:

```
[edit interfaces]
ce1-0/2/0:1:2:3 {
  partition 4 interface-type ds0 timeslots 1-10;
}
```

This configuration creates interface **ds-0/2/0:1:2:4**.

### Configuring Channelized OC12/STM4 IQ Interfaces (SDH Mode)

The Channelized OC12 IQ PIC configured for SDH mode creates a single channelized STM4 interface. You can configure this interface as unpartitioned using the **no-partition** statement at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level to create a single SDH VC-4-4C interface, or you can partition it into the following OC slices:

- SDH virtual concatenation 4 (VC-4) and channelized AU-4 interfaces (4 interfaces, any combination)
- Channelized T3 or T3 interfaces from a channelized AU-4 interface (3 interfaces, any combination)
- Channelized T1 or T1 interfaces from a channelized T3 interface (28 interfaces, any combination)
- NxDSO interfaces from a channelized T1 interface



**NOTE:** If you configure the `per-unit-scheduler` statement on the physical interface of a 4-port channelized OC-12 IQ PIC and configure 975 logical interfaces or data link connection identifiers (DLCIs), some of the logical interfaces or DLCIs will drop all packets intermittently.

This section describes how to configure the following channelized OC12 IQ interfaces on a Channelized OC12 IQ PIC configured in SDH mode:

- [Configuring Channelized OC12/STM4 IQ PICs for SDH Mode on page 84](#)
- [Configuring an Unpartitioned SDH \(VC-4-4C\) Interface on a Channelized OC12/STM4 IQ PIC on page 85](#)
- [Configuring SDH \(VC-4\) Interfaces on Channelized OC12/STM4 IQ PICs on page 85](#)
- [Configuring Channelized AU-4 Interfaces on page 86](#)
- [Configuring T3 or Channelized T3 Interfaces Under Channelized AU-4 Interfaces on page 87](#)
- [Configuring T1 or Channelized T1 Interfaces Under Channelized AU-4 Interfaces on page 87](#)
- [Configuring T1 or Channelized T1 Interfaces Under Channelized T3 Interfaces on page 88](#)
- [Configuring NxDSO Interfaces on Channelized OC12/STM4 IQ PICs on page 89](#)

## Configuring Channelized OC12/STM4 IQ PICs for SDH Mode

To configure a Channelized OC12 IQ PIC to operate in SDH mode, include the **framing sdh** statement at the **[edit chassis fpc fpc/pic/port]** hierarchy level:

```
[edit chassis]
fpc 0 {
  pic 2 {
    framing sdh;
  }
}
```

This configuration creates interface **cstm4-0/2/0**.

For more information, see the [Junos OS System Basics Configuration Guide](#).



## Configuring an Unpartitioned SDH (VC-4-4C) Interface on a Channelized OC12/STM4 IQ PIC

On a Channelized OC12 IQ PIC, you can configure one SDH (VC-4-4C) interface. To configure an SDH (VC-4-4C) interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level:

```
[edit interfaces cstm4-fpc/pic/port]
no-partition interface-type so;
```

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

### Example: Configuring an Unpartitioned SDH (VC-4-4C) Interface

Configure an unpartitioned SDH (VC-4-4C) interface, using partition 1 and OC slices 4 through 6:

```
[edit interfaces cstm4-0/2/0]
no-partition interface-type so;
```

This configuration creates the interface **so-0/2/0**.

## Configuring SDH (VC-4) Interfaces on Channelized OC12/STM4 IQ PICs

To configure an SDH (VC-4) interface on a Channelized OC12 IQ PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces cstm4-fpc/pic/port]** hierarchy level, specifying the **so** interface type:

```
[edit interfaces cstm4-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

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

The partition number is the sublevel interface partition index and is correlated with the channel number. For Channelized OC12 IQ PICs, the OC-slice range can be from 1 through 12.



**NOTE:** For channelized OC12 IQ interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. SDH (VC-4) interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12

The interface type is the channelized interface type or data channel you are creating.

### Example: Configuring SDH (VC-4) Interfaces

---

Configure SDH (VC-4) interfaces:

```
[edit interfaces cstm4-0/2/0]
partition 1 oc-slice 1-3 interface-type so;
partition 2 oc-slice 4-6 interface-type so;
partition 3 oc-slice 7-9 interface-type so;
partition 4 oc-slice 10-12 interface-type so;
```

This configuration creates the interfaces **so-0/2/0:1** through **so-0/2/0:4**.

### Configuring Channelized AU-4 Interfaces

To configure a channelized AU-4 interface, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces cstm4-*fpc/pic/port*]** hierarchy level, specifying the **cau4** interface type:

```
[edit interfaces cstm4-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type cau4;
```

This configuration creates interface **cau4-*fpc/pic/port:channel***.

The partition number is the sublevel interface partition index. For SDH interfaces, the partition number is not correlated with bandwidth size. A channelized STM-4 interface can have from 1 through 4 partition numbers.



**NOTE:** For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12 interfaces (both IQ and IQE), channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. Channelized AU-4 IQ interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12

The interface type is the channelized interface type or data channel you are creating.

### Example: Configuring Channelized AU-4 Interfaces

---

Configure channelized AU-4 interfaces, using partitions 1 through 4:

```
[edit interfaces cstm4-0/2/0]
partition 1 oc-slice 1-3 interface-type cau4;
partition 2 oc-slice 4-6 interface-type cau4;
partition 3 oc-slice 7-9 interface-type cau4;
```

```
partition 4 oc-slice 10-12 interface-type cau4;
```

This configuration creates the interfaces **cau4-0/2/0:1** through **cau4-0/2/0:4**.

## Configuring T3 or Channelized T3 Interfaces Under Channelized AU-4 Interfaces

To configure T3 or channelized T3 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **t3** or **ct3** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type t3;
}
cau4-fpc/pic/port {
  partition partition-number interface-type ct3;
}
```

This configuration creates the interfaces **t3-fpc/pic/port:channel** and **ct3-fpc/pic/port:channel**.



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

### Example: Configuring T3 or Channelized T3 Interfaces

Configure T3 and channelized T3 interfaces, using partition 1 and partition 2:

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 1 interface-type t3;
}
cau4-0/2/0:1 {
  partition 2 interface-type ct3;
}
t3-0/2/0:1:1 ct3-0/2/0:1:2;
```

## Configuring T1 or Channelized T1 Interfaces Under Channelized AU-4 Interfaces

To configure T1 or channelized T1 interfaces under channelized AU-4 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **t1** or **ct1** interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type t1;
}
cau4-fpc/pic/port {
  partition partition-number interface-type ct1;
}
```

This configuration creates the interfaces **t1-fpc/pic/port:channel** and **ct1-fpc/pic/port:channel**.



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

### Example: Configuring T1 or Channelized T1 Interfaces Under Channelized AU-4 Interfaces

Configure T1 and channelized T1 interfaces, using partition 1 and partition 2:

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 1 interface-type t1;
}
cau4-0/2/0:1 {
  partition 2 interface-type ct1;
}
t1-0/2/0:1:1 ct1-0/2/0:1:2;
```

### Configuring T1 or Channelized T1 Interfaces Under Channelized T3 Interfaces

To configure T1 or channelized T1 interfaces under channelized T3 interfaces, include the **partition** and **interface-type** statements at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level, specifying the **t1** or **ct1** interface type:

```
[edit interfaces]
ct3-fpc/pic/port {
  partition partition-number interface-type t1;
}
ct3-fpc/pic/port {
  partition partition-number interface-type ct1;
}
```

This configuration creates the interfaces **t1-fpc/pic/port:channel** and **ct1-fpc/pic/port:channel**.



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

### Example: Configuring T1 or Channelized T1 Interfaces Under Channelized T3 Interfaces

Configure T1 or channelized T1 interfaces, using partition 3 and partition 4:

```
[edit interfaces]
ct3-0/2/0:1:2 {
  partition 3 interface-type t1;
}
ct3-0/2/0:1:2 {
  partition 4 interface-type ct1;
}
```

This configuration creates interfaces **t1-0/2/0:1:2:3** and **ct1-0/2/0:1:2:4**.

## Configuring NxDS0 Interfaces on Channelized OC12/STM4 IQ PICs

Configure channelized NxDS0 IQ interfaces on the channelized T1 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:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

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

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. You can use a combination of ranges and discontinuous time slots:

1,9-18,21

### Example: Configuring NxDS0 Interfaces

Configure channelized NxDS0 interfaces, using partition 4 and time slots 1 through 10:

```
[edit interfaces]
ct1-0/2/0:1:2:3 {
  partition 4 interface-type ds0 timeslots 1-10;
}
```

This configuration creates interface **ds-0/2/0:1:2:3:4**.

## Configuring Channelized OC12 Interfaces

On Channelized OC12 PICs, you can configure 12 T3 channels per port. To configure channelized OC12 interface properties, you can include the **sonet-options** and **t3-options** statements at the **[edit interfaces interface-name]** hierarchy level. Some SONET/SDH options are ignored, and some can only be configured for channel 0, though they apply equally to all channels. The **long-buildout** statement under **t3-options** is also ignored.

For T3 channels on a channelized OC12 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 OC12 interface. The individual T3 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” on page 32](#).

For more information, see SONET/SDH Interfaces Overview and [“T3 Interfaces Overview” on page 191](#). For a configuration example, see [Configuring Aggregated SONET/SDH Interfaces](#).

[Table 13 on page 90](#) summarizes the OC12-to-DS3 numbering scheme.

Table 13: OC12-to-DS3 Numbering Scheme

Two-Level STS-1 Number (STS-3,STS-1)	One-Level STS Number	OC12-to-DS3 PIC DS3 Number
1,1	1	0
1,2	2	1
1,3	3	2
2,1	4	3
2,2	5	4
2,3	6	5
3,1	7	6
3,2	8	7
3,3	9	8
4,1	10	9
4,2	11	10
4,3	12	11

### Example: Configuring Channelized OC12 Interfaces

The following configuration is sufficient to get the channelized OC12 interface up and running. The OC12 interface can be divided into 12 channels. DS3 channels can use the following encapsulation types:

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

The channels can also have logical interfaces.

```
[edit interfaces]
t3-fpc/pic/port:0 {
  encapsulation cisco-hdlc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.1/30;
    }
  }
}
```

```

    }
    family iso;
  }
}
t3-fpc/pic/port:1 {
  encapsulation ppp;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.5/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:2 {
  encapsulation frame-relay;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    dlci 100;
    family inet {
      address 10.11.30.9/30;
    }
    family iso;
  }
  unit 1 {
    dlci 101;
    family inet {
      address 10.11.31.9/30;
    }
    family iso;
  }
}
t3-lfpc/pic/port:3 {
  encapsulation cisco-hdlc-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0;
}
t3-fpc/pic/port:4 {
  encapsulation ppp-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0;
}
t3-fpc/pic/port:5 {
  dce;
}

```

```
encapsulation frame-relay-ccc;
t3-options {
    compatibility-mode larscom;
    payload-scrambler;
}
unit 0 {
    encapsulation frame-relay-ccc;
    dlci 1000;
}
unit 1 {
    encapsulation frame-relay-ccc;
    dlci 1001;
}
}
```

---

## Configuring Link PIC Failover on Channelized OC12/STM4 IQ and IQE Interfaces

For Channelized OC12 IQ or IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the **no-termination-request** statement at the **[edit interfaces *interface-name* ppp-options]** hierarchy level:

```
no-termination-request;
```

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the *Junos OS Services Interfaces Configuration Guide*.

---

## Example: Configuring a Channelized OC12 IQ Interface as an Unpartitioned Clear Channel

### Configuring a SONET/SDH Interface

Configure a channelized OC12 interface as an unpartitioned, clear channel:

```
[edit interfaces]
coc12-5/0/0 {
    no-partition interface-type so; # so-5/0/0
}
```

### Configuring Multiple Interface Types

Configure the following interfaces on a Channelized OC12 IQ or IQE PIC:

- a. An OC3 interface
- b. Another OC3 interface
- c. A channelized OC1 partitioned into T1 interfaces
- d. A channelized OC1 converted into a T3 interface
- e. A channelized OC1 partitioned into T1 interfaces and channelized T1s, which are partitioned into NxDS0 interfaces
- f. A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces



- g. A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces and a channelized T1, which is partitioned into NxDS0 interfaces
- h. A channelized OC1 partitioned into channelized T1s, which are partitioned into NxDS0 interfaces

#### Configuring the Interface Partitions

```
[edit interfaces]
coc12-1/1/0 {
  sonet-options {
    sonet-options-statements;
  }
  partition 1 oc-slice 1-3 interface-type so; # (a) so-1/1/0:1
  partition 2 oc-slice 4-6 interface-type so; # (b) so-1/1/0:2
  partition 3 oc-slice 7 interface-type coc1; # (c) coc1-1/1/0:3
  partition 4 oc-slice 8 interface-type coc1; # (d) coc1-1/1/0:5
  partition 5 oc-slice 9 interface-type coc1; # (e) coc1-1/1/0:5
  partition 6 oc-slice 10 interface-type coc1; # (f) coc1-1/1/0:6
  partition 7 oc-slice 11 interface-type coc1; # (g) coc1-1/1/0:7
  partition 8 oc-slice 12 interface-type coc1; # (h) coc1-1/1/0:8
}

(a) so-1/1/0:1 {
  description "(a) OC-slice 1-3 of coc12-1/1/0. COC12 > OC3;";
  sonet-options {
    sonet-options-statements;
  }
}

(b) so-1/1/0:2 {
  description "(b) OC-slice 4-6 of coc12-1/1/0. COC12 > OC3;";
  sonet-options {
    sonet-options-statements;
  }
}

(c) coc1-1/1/0:3 {
  description "(c) OC-slice 7 of coc12-1/1/0. COC12 to COC1 VT-mapped to T1s.";
  sonet-options {
    sonet-options-statements;
  }
  partition 1 - 10 interface-type t1; # t1-1/1/0:[1-10]
}
t1-1/1/0:3:1 {
  description "(c) OC-slice 7 of coc12-1/1/0. T1 interface configuration.";
  t1-options {
    t1-options-statements;
  }
}
...

(d) coc1-1/1/0:4 {
  description "(d) OC-slice 8 of coc12-1/1/0. COC12 to COC1 converted to a T3.";
  sonet-options {
    sonet-options-statements;
  }
}
```

```

    no-partition interface-type t3; # t3-1/1/0:4
  }
  t3-1/1/0:4 {
    description "(d) OC-slice 8 of coc12-1/1/0. T3 interface configuration.";
  }

(e) coc1-1/1/0:5 {
  description "(e) OC-slice 9 of coc12-1/1/0. COC12 to COC1 VT-mapped to T1s.";
  sonet-options {
    sonet-options-statements;
  }
  partition 1 - 3 interface-type t1; # t1-1/1/0:5:[1-3]
  partition 4 interface-type ct1; # ct1-1/1/0:5:4
}
t1-1/1/0:5:1 {
  description "(e) OC-slice 9 of coc12-1/1/0. T1 interface configuration.";
  t1-options {
    t1-options-statements;
  }
}
...
ct1-1/1/0:5:4 {
  description "(e) OC-slice 9 of coc12-1/1/0. CT1 to NxDSOs.;
  t1-options {
    t1-options-statements;
  }
  partition 1 timeslots 0 - 10 interface-type ds0; # ds-1/1/0:5:4:1
  partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:5:4:2
  ...
}

(f) coc1-1/1/0:6 {
  description "(f) OC-slice 10 of coc12-1/1/0. COC12 to COC1 converted to a CT3 to T1s.";
  sonet-options {
    sonet-options-statements;
  }
  no-partition interface-type ct3; # ct3-1/1/0:6
}
ct3-1/1/0:6 {
  description "(f) COC12 to CT3 M-13 and C-bit parity-mapped to T1s.;
  sonet-options {
    sonet-options-statements;
  }
  partition 1 - 10 interface-type t1; # t1-1/1/0:6:[1-10]
}
t1-1/1/0:6:1 {
  description "(f) T1 interface configuration.";
  t1-options {
    t1-options-statements;
  }
}
...

(g) coc1-1/1/0:7 {

```

```

description "(g) OC-slice 11 of coc12-1/1/0. COC12 to COC1 converted to a CT3 to T1s and
CT1 to NxDSOs.";
sonet-options {
    sonet-options-statements;
}
no-partition interface-type ct3; # ct3-1/1/0:7
}
ct3-1/1/0:7 {
    description "(g) COC12 to CT3 M-13 and C-bit parity-mapped to T1s and CT1.";
    sonet-options {
        sonet-options-statements;
    }
    partition 1 - 10 interface-type t1; # t1-1/1/0:7:[1-10]
    partition 2 interface-type ct1; # ct1-1/1/0:7:11
}
t1-1/1/0:7:1 {
    description "(g) T1 interface configuration.";
    t1-options {
        t1-options-statements;
    }
}
...
ct1-1/1/0:7:11 {
    description "(g) CT1 to NxDSOs.";
    t1-options {
        t1-options-statements;
    }
    partition 1 timeslots 0 - 10 interface-type ds0; # ds-1/1/0:7:11:1
    partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:7:11:2
    ...
}

(h) coc1-1/1/0:8 {
    description "(h) OC-slice 12 of coc12-1/1/0. COC12 to COC1 VT-mapped to CT1 to NxDSOs.";
    sonet-options {
        sonet-options-statements;
    }
    partition 1 interface-type t1; # ct1-1/1/0:8:1
}
ct1-1/1/0:8:1 {
    description "(h) CT1 to NxDSOs.";
    t1-options {
        t1-options-statements;
    }
    partition 1 timeslots 0 - 10 interface-type ds0; # ds-1/1/0:8:1:1
    partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:8:1:2
    ...
}

```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Example: Configuring Channelized OC12 Interfaces with Partitioned Channels

The following configuration is sufficient to get the channelized OC12 interface up and running. The OC12 interface can be divided into 12 channels. DS3 channels can use the following encapsulation types:

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

The channels can also have logical interfaces.

```
[edit interfaces]
t3-fpc/pic/port:0 {
  encapsulation cisco-hdlc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.1/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:1 {
  encapsulation ppp;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.5/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:2 {
  encapsulation frame-relay;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    dlci 100;
    family inet {
      address 10.11.30.9/30;
    }
    family iso;
  }
  unit 1 {
```

```
        dlci 101;
        family inet {
            address 10.11.31.9/30;
        }
        family iso;
    }
}
t3-fpc/pic/port:3 {
    encapsulation cisco-hdlc-ccc;
    t3-options {
        compatibility-mode larscom;
        payload-scrambler;
    }
    unit 0;
}
t3-fpc/pic/port:4 {
    encapsulation ppp-ccc;
    t3-options {
        compatibility-mode larscom;
        payload-scrambler;
    }
    unit 0;
}
t3-fpc/pic/port:5 {
    dce;
    encapsulation frame-relay-ccc;
    t3-options {
        compatibility-mode larscom;
        payload-scrambler;
    }
    unit 0 {
        encapsulation frame-relay-ccc;
        dlci 1000;
    }
    unit 1 {
        encapsulation frame-relay-ccc;
        dlci 1001;
    }
}
```



## CHAPTER 5

# Configuring Channelized OC3 IQ and IQE Interfaces

- [Channelized OC3 IQ and IQE Overview on page 99](#)
- [Partitions, OC Slices, Interface Types, and Time Slots on page 100](#)
- [Configuring a Clear Channel on Channelized OC3 IQ and IQE PICs on page 101](#)
- [Configuring T3 Interfaces on IQ and IQE Interfaces on page 101](#)
- [Configuring T1 and NxDS0 Interfaces on page 102](#)
- [Configuring Fractional T1 IQ Interfaces on page 105](#)
- [Configuring Link PIC Failover on Channelized OC3 IQ and IQE Interfaces on page 106](#)

### Channelized OC3 IQ and IQE Overview

---

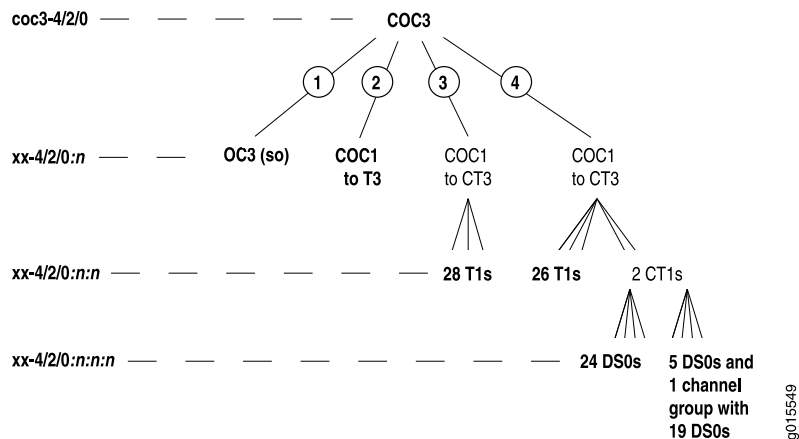
Channelized intelligent queuing (IQ) and channelized enhanced intelligent queuing (IQE) interfaces allow arbitrary and dynamic channelization of serial links, allowing greater flexibility than regular channelized interfaces.

On each port of a Channelized OC3 IQ or a Channelized OC3 IQE interface, you can configure the following interface types:

- One OC3 SONET interface
- Up to three T3 interfaces
- Up to 84 T1 interfaces
- Up to three E3 interfaces (COC3 IQE PICs in SDH mode)
- Up to 63 E1 interfaces (COC3 IQE PICs in SDH mode)
- Up to 336 NxDS0 interfaces on an M Series router
- Up to 768 NxDS0 interfaces on a T Series router

[Figure 25 on page 100](#) shows an example of how a Channelized OC3 PIC might be partitioned. In the figure, the OC3 SONET interface would be a standalone interface because it would use the entire bandwidth of the PIC. The same applies to each port of the 2-port Channelized OC3 Enhanced IQ (IQE) PIC.

Figure 25: Channelized OC3 IQ Interface Example for Show Interfaces Controller



You can configure the following encapsulation types:

- PPP
- Frame Relay
- Cisco HDLC
- CCC
- TCC
- MPLS—On IQE interfaces.

For more information about interface encapsulation, see [Configuring Interface Encapsulation on Physical Interfaces](#) and [Configuring Interface Encapsulation on Logical Interfaces](#).

To configure channelized interfaces, include the following statements at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
no-partition interface-type type;
partition partition-number oc-slice oc-slice-range interface-type type;
partition partition-number timeslots time-slot-range interface-type type;
```

## Partitions, OC Slices, Interface Types, and Time Slots

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized OC3 interfaces, you can configure up to three OC1 interfaces, so the partition number can be 1, 2, or 3. For channelized T3 interfaces (**ct3**), you can configure multiple interfaces at once by including a partition range, such as 1-3. This creates three T1 interfaces with channel numbers 1 through 3.





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

You configure the OC-slice range for SONET/SDH interfaces only. The OC-slice range is correlated with the bandwidth size required for the interface type you are configuring. For example, a channelized OC3 interface (**coc3**) can be divided into three OC1 interfaces, each containing one OC slice. Therefore the OC-slice value must be **1, 2, or 3**.

The configurable interface types are dependent on the hierarchy level at which you include the **interface-type** and **partition** or **no-partition** statements. For example, when you include the **no-partition** statement at the **[edit interfaces coc3-fpc/pic/port]** hierarchy level, the only configurable interface type is **so**, because the **no-partition** statement signals that you are creating a clear-channel SONET/SDH interface. When you include the **partition** statement at the **[edit interfaces coc1-fpc/pic/port]** hierarchy level, the configurable interface types are **ct1** or **t1**. If you want to create a T1 interface, include the **t1** option. If you want to further channelize down to the NxDS0 level, include the **ct1** option as an intermediate step before dividing the channelized T1 interface (**ct1**) into NxDS0 interfaces.

You configure time slots for fractional T1 interfaces and NxDS0 interfaces. You can configure ranges by using hyphens. You can configure discontinuous time slots by using commas. Do not include spaces.

## Configuring a Clear Channel on Channelized OC3 IQ and IQE PICs

A *clear channel* is an interface that uses the entire bandwidth of the PIC. To configure a clear channel, include the **no-partition** and **interface-type** statements in the configuration.

On Channelized OC3 IQ and IQE PICs, you can configure one OC3 clear-channel interface per port. To configure an OC3 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces coc3-fpc/pic/port]** hierarchy level:

```
[edit interfaces coc3-fpc/pic/port]
no-partition interface-type so;
```

This configuration creates interface **so-fpc/pic/port**. When you include the **no-partition** statement at the **[edit interfaces coc3-fpc/pic/port]** hierarchy level, the only configurable interface type is **so**, because the **no-partition** statement signals that you are creating a clear-channel SONET/SDH interface.

On a 2-port or 4-port Channelized OC3 IQE PIC, you can configure two to four separate OC3 clear-channel interfaces by additionally specifying the port numbers. Configuration is otherwise the same as previously described on a (1-port) Channelized OC3 IQ PIC.

## Configuring T3 Interfaces on IQ and IQE Interfaces

To configure a T3 interface on an OC3 PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc3-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc3-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

When you include the **partition** statement at the **[edit interfaces coc3-fpc/pic/port]** hierarchy level, the only configurable interface type is **coc1**. This configuration creates interface **coc1-fpc/pic/port:channel**.



**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.

Then, include the **no-partition interface-type** statement at the **[edit interfaces coc1-fpc/pic/port:channel]** hierarchy level, specifying the **t3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition interface-type t3;
```

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

## Example: Configuring T3 Interfaces

Configure a T3 interface using partition 3 and OC slice 3. This configuration creates interface **t3-1/1/0:3**.

```
[edit interfaces coc3-1/1/0]
partition 3 oc-slice 3 interface-type coc1;
[edit interfaces coc1-1/1/0:3]
no-partition interface-type t3;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

---

## Configuring T1 and NxDSO Interfaces

To configure T1 interfaces on a Channelized OC3 IQ or IQE PIC, perform the following tasks:

1. Partition the channelized OC3 interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc3-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc3-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port:channel]** hierarchy level, specifying the **t1** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
partition partition-number interface-type t1;
```

3. If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port:channel]** hierarchy level, specifying the **ct3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition partition-number interface-type ct3;
```



**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.

Note that because the **no-partition** statement is included, this configuration does not create another level of channelization, as denoted by the number of colons in the resulting interface.

- To configure T1 interfaces, partition the channelized T3 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces ct3-fpc/pic/port:channel]** hierarchy level, specifying the **t1** interface type:

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

- To configure NxDS0 interfaces, 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:channel]** hierarchy level and specifying the **ct1** interface type:

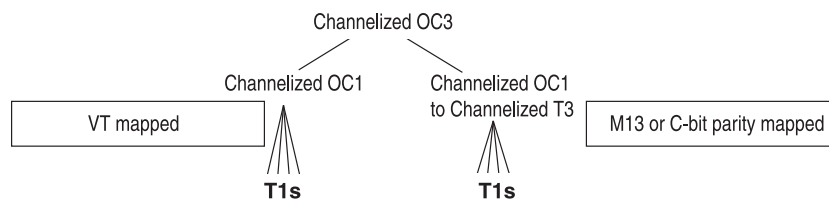
```
[edit interfaces ct3-fpc/pic/port:channel]
partition partition-number interface-type ct1;
```



**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.

Figure 26 on page 103 shows VT-mapped and M13 or C-bit parity-mapped configurations of T1 IQ interfaces.

**Figure 26: T1 Interfaces on a Channelized OC3 PIC**



**Bold** entries correspond to actual packet channels.

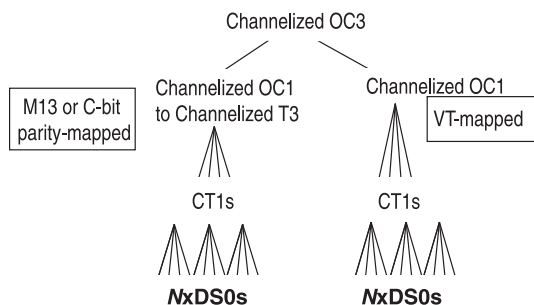
g015503

- Configure channelized NxDS0 IQ interfaces on the channelized T1 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;
```

Figure 27 on page 104 shows VT-mapped and M13 or C-bit parity-mapped configurations of NxDS0 IQ interfaces.

Figure 27: Sample Channelization of OC3 IQ or IQE PIC



**Bold** entries correspond to actual packet channels.

g015504

### Example: Configuring T1 and NxDS0 Interfaces

Configure the following T1 interfaces:

```

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

```

#### VT-Mapped Configuration

```

[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1-5 interface-type t1;

```

#### M13 or C-bit Parity-Mapped Configuration

```

[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;
[edit interfaces ct3-0/0/0:1]
partition 1-5 interface-type t1;

```

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

```

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

```

#### VT-Mapped Configuration

```

[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 2 interface-type ct1;
[edit interfaces ct1-0/0/0:1:2]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;

```

<b>M13 or C-bit Parity-Mapped Configuration</b>	<pre>[edit interfaces coc3-0/0/0] partition 1 oc-slice 1 interface-type coc1; [edit interfaces coc1-0/0/0:1] no-partition interface-type ct3; [edit interfaces ct3-0/0/0:1] partition 2 interface-type ct1; [edit interfaces ct1-0/0/0:1:2] partition 1 timeslots 1-10 interface-type ds; partition 2 timeslots 12-16 interface-type ds;</pre>
---	--

For a full configuration example, see the [Junos OS Feature Guides](#).

### Example: Setting Remote Loopback and Running BERT Tests on NxDSO Interfaces

For Channelized OC3 IQ and IQE PICs, if you need remote loopback on a far-end NxDSO interface, and you are running a BERT test from the local NxDSO interface, you must set remote loopback on the far-end router's associated channelized T1 interface (**ct1**). To do this, include the **loopback remote** statement at the **[edit interfaces ct1-fpc/pic/port t1-options]** hierarchy level. For example:

Local router:

```
[edit interfaces]
ct1-0/0/0:2:2 {
  partition 1 timeslots 1-10 interface-type ds;
  ds-0/0/0:2:2:1 {
    ds0-options {
      bert-period 30;
    }
  }
}
```

Remote router:

```
[edit interfaces]
ct1-0/0/0:2:2 {
  partition 1 timeslots 1-10 interface-type ds;
  t1-options {
    loopback remote;
  }
}
```

### Configuring Fractional T1 IQ Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized OC3 IQ or IQE PIC, you must perform the following tasks:

1. Configure a T1 interface on the Channelized OC3 IQ or IQE PIC. For more information, see [“Configuring T1 and NxDSO Interfaces” on page 102](#).
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<:channel> 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, see [“Configuring Fractional T1 Time Slots” on page 189](#).

### Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 1 through 5 and 10:

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-5,10;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

---

### Configuring Link PIC Failover on Channelized OC3 IQ and IQE Interfaces

For Channelized OC3 IQ or IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the **no-termination-request** statement at the **[edit interfaces *interface-name* ppp-options]** hierarchy level:

**no-termination-request**;

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the [Junos OS Services Interfaces Configuration Guide](#).

## CHAPTER 6

# Configuring Channelized STM1 Interfaces

- [Channelized STM1 Interfaces Overview on page 107](#)
- [Configuring Channelized STM1 IQ and IQE Interfaces on page 107](#)
- [Configuring Channelized STM1 Interfaces on page 112](#)
- [Configuring Link PIC Failover on Channelized STM1 Interfaces on page 121](#)
- [Example: Configuring Channelized STM1 Interfaces on page 121](#)

## Channelized STM1 Interfaces Overview

---

Each Channelized STM1 PIC and Channelized STM1 Intelligent Queuing (IQ) PIC has one STM1 port.

For the Channelized STM1 IQ or IQE PIC, you can channelize the single port to the *NxDS0* level. Each E1 interface has 32 time slots (DS0), in which time slot 0 is reserved.

You can combine one or more of these DS0 time slots (channels) to create a channel group (*NxDS0*).

## Configuring Channelized STM1 IQ and IQE Interfaces

---

This section includes the following topics:

- [Configuring an STM1 IQ or STM1 IQE Interface on page 107](#)
- [Configuring E1 IQ and IQE Interfaces on page 108](#)
- [Configuring Fractional E1 IQ and IQE Interfaces on page 109](#)
- [Configuring an \*NxDS0\* IQ Interface on page 110](#)
- [Example: Configuring Channelized STM1 IQ and IQE Interfaces on page 111](#)

## Configuring an STM1 IQ or STM1 IQE Interface

On a one-port Channelized STM1 IQ PIC, or each individual port of the 4-port Channelized STM1 IQE PIC, you can configure one SDH STM1 interface. To configure an SDH STM1 interface, include the **no-partition interface-type** statement at the **[edit interfaces cstm1-*fpc/pic/port*]** hierarchy level, specifying the **so** interface type:

```
[edit interfaces cstm1-fpc/pic/port]  
no-partition interface-type so;
```

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



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

## Configuring E1 IQ and IQE Interfaces

To configure an E1 interface on a Channelized STM1 IQ or IQE PIC, perform the following tasks:

1. Include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm1-fpc/pic/port]** hierarchy level, specifying the **cau4** interface type. This converts the channelized STM1 interface into a channelized AU-4 interface. The resulting interface name is **cau4-fpc/pic/port**:

```
[edit interfaces cstm1-fpc/pic/port]
no-partition interface-type cau4;
```

2. Partition the channelized AU-4 interface into E1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e1** interface type. This configuration creates interface **e1-fpc/pic/port:channel**. The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized E1 interfaces, the partition number can be from 1 through 63. The interface type is the channelized interface type or clear channel you are creating. For channelized AU-4 interfaces, **type** can be **ce1** or **e1**.

```
[edit interfaces cau4-fpc/pic/port]
partition partition-number interface-type e1;
```



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



**NOTE:** For channelized STM1 interfaces, channel numbering begins with 0 (:0). For channelized STM1 IQ and IQE interfaces, channel numbering begins with 1 (:1).

### Example: Configuring E1 IQ and IQE Interfaces

Configure the following five E1 interfaces:

```
e1-0/0/0:1
e1-0/0/0:2
e1-0/0/0:3
e1-0/0/0:4
```



```
e1-0/0/0:5
```

```
[edit interfaces cstm1-0/0/0]
no-partition interface-type cau4;
[edit interfaces cau4-0/0/0]
partition 1-5 interface-type e1;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring Fractional E1 IQ and IQE Interfaces

By default, all the time slots on a channelized E1 interface are used. To configure a fractional E1 interface on a Channelized STM1 IQ or IQE PIC, perform the following tasks:

1. Include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm1-fpc/pic/port]** hierarchy level, specifying the **cau4** interface type. This converts the channelized STM1 interface into a channelized AU-4 interface. The resulting interface name is **cau4-fpc/pic/port**:

```
[edit interfaces cstm1-fpc/pic/port]
no-partition interface-type cau4;
```

2. Partition the channelized AU-4 interface into E1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e1** interface type. The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized E1 interfaces, the partition number can be from 1 through 63. The interface type is the channelized interface type or clear channel you are creating. For channelized AU-4 interfaces, **type** can be **ce1** or **e1**. This configuration creates interface **e1-fpc/pic/port:channel**:

```
[edit interfaces cau4-fpc/pic/port]
partition partition-number interface-type e1;
```

3. Configure the number of time slots allocated to the E1 IQ or IQE interface by including the **timeslots** statement at the **[edit interfaces e1-fpc/pic/port:channel e1-options]** hierarchy level. NxDS0 time slots configured on either a channelized STM1 IQ or IQE interface or channelized E1 IQ or IQE interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots range from 2 to 32 (1 is reserved). To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

```
[edit interfaces e1-fpc/pic/port:channel e1-options]
timeslots time-slot-range;
```



**NOTE:** For channelized STM1 interfaces, channel numbering begins with 0 (:0). For channelized STM1 IQ or IQE interfaces, channel numbering begins with 1 (:1).

For more information about E1 time slots, see “[Configuring Fractional E1 Time Slots](#)” on [page 170](#).

### Example: Configuring Fractional E1 Interfaces

Configure a fractional E1 interface that uses time slots 2 through 10:

```
[edit interfaces cstm1-0/0/0]
no-partition cau4;
[edit interfaces cau4-0/0/0]
partition 1 interface-type e1;
[edit interfaces e1-0/0/0 e1-options]
timeslots 2-10;
```

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 STM1 interface are used. To configure an NxDS0 IQ interface on a Channelized STM1 IQ or IQE PIC, perform the following tasks:

1. Include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm1-fpc/pic/port]** hierarchy level, specifying the **cau4** interface type. This converts the channelized STM1 interface into a channelized AU-4 interface. The resulting interface name is **cau4-fpc/pic/port**:

```
[edit interfaces cstm1-fpc/pic/port]
no-partition interface-type cau4;
```

2. Partition the channelized AU-4 interface into E1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **ce1** interface type. This configuration creates interface **ce1-fpc/pic/port:channel**. The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized E1 interfaces, the partition number can be from 1 through 63. The interface type is the channelized interface type or clear channel you are creating. For channelized AU-4 interfaces, **type** can be **ce1** or **e1**:

```
[edit interfaces cau4-fpc/pic/port]
partition partition-number interface-type ce1;
```

3. 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 e1-fpc/pic/port:channel]** hierarchy level, specifying the **ds** interface type. For channelized E1 IQ interfaces, the partition number range is from 1 through 31. For E1 IQ interfaces (**e1-fpc/pic/port**), the time-slot range is from 2 through 31. For channelized E1 IQ interfaces (**ce1-fpc/pic/port**), the time-slot range is from 1 through 31. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces:

```
[edit interfaces ce1-fpc/pic/port:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```



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



**NOTE:** For channelized STM1 interfaces, channel numbering begins with 0 (:0). For channelized STM1 IQ and IQE interfaces, channel numbering begins with 1 (:1).

For more information about E1 time slots, see “Configuring Fractional E1 Time Slots” on page 170.

### Example: Configuring an NxDS0 IQ Interface

Configure an NxDS0 interface that uses time slots 1 through 10. This configuration creates the `ds-0/0/0:1:1` interface.

```
[edit interfaces cstm1-0/0/0]
no-partition interface-type cau4;
[edit interfaces cau4-0/0/0]
partition 1 interface-type ce1;
[edit interfaces ce1-0/0/0:1]
partition 1 timeslots 1-10 interface-type ds;
```

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

### Example: Configuring Channelized STM1 IQ and IQE Interfaces

Configure STM1, E1, fractional E1, and NxDS0 interfaces:

<b>STM1 Interface</b>	<pre>[edit interfaces] cstm1-0/0/0 {   no-partition interface-type so; } so-0/0/0 {   unit 0 {     family inet {       address 10.10.12.1/30;     }   } }</pre>
<b>E1 Interface</b>	<pre>[edit interfaces] cstm1-1/1/0 {   no-partition interface-type cau4; } [edit interfaces] cau4-1/1/0 {   partition 1-63 interface-type e1; } [edit interfaces] e1-1/1/0:1 {   unit 0 {     family inet {       address 10.10.10.1/30;     }   } } ... </pre>

<b>Fractional E1 Interface</b>	<pre>[edit interfaces] cstm1-1/0/0 {   no-partition interface-type cau4; } [edit interfaces] cau4-1/0/0 {   partition 1-63 interface-type e1; } [edit interfaces] e1-1/1/0:1 {   e1-options {     timeslots 2-10;   }   unit 0 {     family inet {       address 10.10.10.1/30;     }   } } ...</pre>
<b>DS0 Interface</b>	<pre>[edit interfaces] cstm1-2/0/0 {   no-partition interface-type cau4; } [edit interfaces] cau4-2/0/0 {   partition 1-10 interface-type ce1; } [edit interfaces] ce1-2/0/0:1 {   partition 1 interface-type ds timeslots 2-10;   [edit interfaces]   ds-2/0/0:1:1 {     unit 0 {       family inet {         address 10.12.12.1/30;       }     }   } } ...</pre>

For a full configuration example, see the [Junos OS Feature Guides](#).

---

## Configuring Channelized STM1 Interfaces

To specify the channel number, include it after the colon (:) in the interface name. For example, a Channelized STM1-to-E1 PIC in FPC 1 and slot 1 will have the following physical interface, depending on the media type:

e1-1/1/0:x

The E1 channel number can be from 0 through 62.

This section contains the following topics:

- [Configuring Channelized STM1 Interface Properties on page 113](#)
- [Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces on page 114](#)

## Configuring Channelized STM1 Interface Properties

To configure the interface properties for Channelized STM1-to-E1 PICs, include the **e1-options** and **sonet-options** statements for both sides of the connection. The following configurations list all the valid statements.

To specify options for each of the E1 channels on the Channelized STM1-to-E1 PIC, include the **e1-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
e1-options {
  bert-error-rate;
  bert-period;
  fcs (16 | 32);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (filler | shared);
  timeslots time-slot-number;
}
```



**NOTE:** When a channelized STM1 interface experiences a line transition, the E1 channels configured in unframed mode log a large number of drops (around 24,000) as the channelized STM1 interface clocks resynchronize. This does not occur on framed channels, because the framing resynchronizes clocks very quickly.

To specify options for the SONET/SDH side of the connection, include the **sonet-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
sonet-options {
  aps {
    advertise-interval milliseconds;
    authentication-key key;
    force;
    hold-time milliseconds;
    lockout;
    neighbor address;
    paired-group group-name;
    protect-circuit group-name;
    request;
    revert-time seconds;
    switching-mode (bidirectional | unidirectional);
    working-circuit group-name;
  }
  bytes {
    e1-quiet value;
  }
}
```

```

    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
  }
  loopback (local | remote);
}

```



**NOTE:** On channelized STM1 interfaces, you should configure the clock source on one side of the connection to be internal (the default Junos configuration) and on the other side of the connection to be external.

For information about Frame Relay DLCI limitations for channelized interfaces, see [“Data-Link Connection Identifiers on Channelized Interfaces” on page 30](#). For more information about Frame Relay DLCIs, see [“Configuring a Point-to-Point Frame Relay Connection” on page 217](#). For information about DLCI sparse mode, see the [Junos OS System Basics Configuration Guide](#).

For more information about specific statements, see [“E1 Interfaces Overview” on page 165](#), [SONET/SDH Interfaces Overview](#), and [“T1 Interfaces Overview” on page 181](#). For a configuration example, see [“Example: Configuring Channelized STM1 Interfaces” on page 121](#).

## Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces

You can configure virtual tributary mapping to use KLM mode or ITU-T mode. To configure virtual tributary mapping, include the **vtmapping** statement at the **[edit chassis fpc slot-number pic pic-number]** hierarchy level:

```

[edit chassis fpc slot-number pic pic-number]
  vtmapping (klm | itu-t);

```

By default, virtual tributary mapping uses KLM mode. For more information, see the [Junos OS System Basics Configuration Guide](#).

For the Channelized STM1 IQ and IQE PICs, you can configure virtual tributary mapping by including the **vtmapping** statement at the **[edit interfaces cau4-fpc/pic/port sonet-options]** hierarchy level:

```

[edit interfaces cau4-fpc/pic/port sonet-options]
  vtmapping (klm | itu-t);

```

[Table 14 on page 114](#) lists the KLM mappings used by the channelized STM1-to-E1 PIC interfaces. The PIC defaults to KLM numbering with an offset of -1; for example, KLM 1= STM1 PIC 0.

**Table 14: Channelized STM1-to-E1 Channel Mapping**

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
0	1	1	1	1	1

Table 14: Channelized STM1-to-E1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
1	2	1	1	2	22
2	3	1	1	3	43
3	4	1	2	1	4
4	5	1	2	2	25
5	6	1	2	3	46
6	7	1	3	1	7
7	8	1	3	2	28
8	9	1	3	3	49
9	10	1	4	1	10
10	11	1	4	2	31
11	12	1	4	3	52
12	13	1	5	1	13
13	14	1	5	2	34
14	15	1	5	3	55
15	16	1	6	1	16
16	17	1	6	2	37
17	18	1	6	3	58
18	19	1	7	1	19
19	20	1	7	2	40
20	21	1	7	3	61
21	22	2	1	1	2
22	23	2	1	2	23
23	24	2	1	3	44

Table 14: Channelized STM1-to-E1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
24	25	2	2	1	5
25	26	2	2	2	26
26	27	2	2	3	47
27	28	2	3	1	8
28	29	2	3	2	29
29	30	2	3	3	50
30	31	2	4	1	11
31	32	2	4	2	32
32	33	2	4	3	53
33	34	2	5	1	14
34	35	2	5	2	35
35	36	2	5	3	56
36	37	2	6	1	17
37	38	2	6	2	38
38	39	2	6	3	59
39	40	2	7	1	20
40	41	2	7	2	41
41	42	2	7	3	62
42	43	3	1	1	3
43	44	3	1	2	24
44	45	3	1	3	45
45	46	3	2	1	6
46	47	3	2	2	27



Table 14: Channelized STM1-to-E1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
47	48	3	2	3	48
48	49	3	3	1	9
49	50	3	3	2	30
50	51	3	3	3	51
51	52	3	4	1	12
52	53	3	4	2	33
53	54	3	4	3	54
54	55	3	5	1	15
55	56	3	5	2	36
56	57	3	5	3	57
57	58	3	6	1	18
58	59	3	6	2	39
59	60	3	6	3	60
60	61	3	7	1	21
61	62	3	7	2	42
62	63	3	7	3	63

Table 15 on page 117 lists the KLM mappings used by the channelized STM1-to-T1 PIC interfaces. The PIC defaults to KLM numbering with an offset of -1; for example, KLM 1= STM1 PIC 0.

Table 15: Channelized STM1-to-T1 Channel Mapping

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
0	1	1	1	1	1
1	2	1	1	2	22
2	3	1	1	3	43

Table 15: Channelized STM1-to-T1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
3	4	1	2	1	4
4	5	1	2	2	25
5	6	1	2	3	46
6	7	1	3	1	7
7	8	1	3	2	28
8	9	1	3	3	49
9	10	1	4	1	10
10	11	1	4	2	31
11	12	1	4	3	52
12	13	1	5	1	13
13	14	1	5	2	34
14	15	1	5	3	55
15	16	1	6	1	16
16	17	1	6	2	37
17	18	1	6	3	58
18	19	1	7	1	19
19	20	1	7	2	40
20	21	1	7	3	61
21	22	2	1	1	2
22	23	2	1	2	23
23	24	2	1	3	44
24	25	2	2	1	5
25	26	2	2	2	26

Table 15: Channelized STM1-to-T1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
26	27	2	2	3	47
27	28	2	3	1	8
28	29	2	3	2	29
29	30	2	3	3	50
30	31	2	4	1	11
31	32	2	4	2	32
32	33	2	4	3	53
33	34	2	5	1	14
34	35	2	5	2	35
35	36	2	5	3	56
36	37	2	6	1	17
37	38	2	6	2	38
38	39	2	6	3	59
39	40	2	7	1	20
40	41	2	7	2	41
41	42	2	7	3	62
42	43	3	1	1	3
43	44	3	1	2	24
44	45	3	1	3	45
45	46	3	2	1	6
46	47	3	2	2	27
47	48	3	2	3	48
48	49	3	3	1	9

Table 15: Channelized STM1-to-T1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
49	50	3	3	2	30
50	51	3	3	3	51
51	52	3	4	1	12
52	53	3	4	2	33
53	54	3	4	3	54
54	55	3	5	1	15
55	56	3	5	2	36
56	57	3	5	3	57
57	58	3	6	1	18
58	59	3	6	2	39
59	60	3	6	3	60
60	61	3	7	1	21
61	62	3	7	2	42
62	63	3	7	3	63
63	64	4	1	1	24
64	65	4	1	2	45
65	66	4	1	3	66
66	67	4	2	1	27
67	68	4	2	2	48
68	69	4	2	3	69
69	70	4	3	1	30
70	71	4	3	2	51
71	72	4	3	3	72

Table 15: Channelized STM1-to-T1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
72	73	4	4	1	33
73	74	4	4	2	54
74	75	4	4	3	75
75	76	4	5	1	36
76	77	4	5	2	57
77	78	4	5	3	78
78	79	4	6	1	39
79	80	4	6	2	60
80	81	4	6	3	81
81	82	4	7	1	42
82	83	4	7	2	63
83	84	4	7	3	84

## Configuring Link PIC Failover on Channelized STM1 Interfaces

For Channelized STM1 IQ and IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the **no-termination-request** statement at the **[edit interfaces *interface-name* ppp-options]** hierarchy level:

```
no-termination-request;
```

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the [Junos OS Services Interfaces Configuration Guide](#).

## Example: Configuring Channelized STM1 Interfaces

The following configuration is sufficient to get the Channelized STM1-to-E1 PIC interface up and running. The channelized STM1-to-E1 interface is an STM1 that is divided into 63 E1 interfaces. E1 interfaces can use the following encapsulation types:

- PPP, PPP CCC, and PPP TCC

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

The channels can also have logical interfaces. For information about Frame Relay DLCI limitations for channelized interfaces, see [“Data-Link Connection Identifiers on Channelized Interfaces” on page 30](#). For more information about Frame Relay DLCIs, see [“Configuring a Point-to-Point Frame Relay Connection” on page 217](#). For more information about DLCI sparse mode, see the *Junos OS System Basics Configuration Guide*.

You apply all STM1 interface SONET/SDH options to the first E1 interface in the configuration by including the **sonet-options** statement at the **[edit interfaces e1-fpc/pic/port:channel]** hierarchy level:

```
[edit]
interfaces {
  e1-0/0/1:0 {
    encapsulation cisco-hdlc;
    sonet-options {
      no-z0-increment;
    }
    e1-options {
      framing g704;
    }
    unit 0 {
      family inet {
        address 10.11.30.1/30;
      }
    }
  }
  e1-0/0/1:1 {
    encapsulation frame-relay;
    e1-options {
      framing g704;
    }
    unit 1 {
      dlci 16;
      family inet {
        address 10.11.31.9/30;
      }
    }
  }
  e1-0/0/1:2 {
    encapsulation ppp;
    no-keepalives;
    unit 0 {
      family inet {
        address 10.11.31.47/30;
      }
    }
  }
}
[edit]
chassis {
  fpc 2 {
```

```
pic 0 {  
    vtmapping klm;  
}  
}
```





## CHAPTER 7

# Configuring Channelized T3 Interfaces

- [Configuring Channelized T3 IQ Interfaces on page 125](#)
- [Configuring Channelized DS3-to-DS0 Interfaces on page 128](#)
- [Configuring Channelized DS3-to-DS1 Interfaces on page 131](#)
- [Configuring the Junos OS to Enable Channelization on DS3/E3 MIC on page 132](#)
- [Example: Configuring Channelized T3 IQ Interfaces on page 134](#)
- [Examples: Configuring Channelized DS3-to-DS0 Interfaces on page 135](#)
- [Examples: Configuring Channelized DS3-to-DS1 Interfaces on page 137](#)

## 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 125](#)
- [Configuring T1 IQ Interfaces on page 126](#)
- [Configuring Fractional T1 IQ and IQE Interfaces on page 126](#)
- [Configuring an NxDS0 IQ Interface on page 127](#)

## 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 126.

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” on page 189.

### 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” on page 189](#).

### 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](#).

## 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 16 on page 129](#).

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 16 on page 129 shows the ranges you can specify for each of the elements in the preceding configuration.

**Table 16: Ranges for Channelized DS3-to-DS0 Configuration**

Item	Option	Range
FPC slot	<b>slot-number</b>	0 through 7 (see note below)
PIC slot	<b>pic-number</b>	0 through 3
Port	<b>port-number</b>	0 through 1
T1 link	<b>link-number</b>	0 through 27
DS0 channel group	<b>group-number</b>	0 through 7
Time slot	<b>time-slot-range</b>	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 135](#).

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” on page 165](#), [“E3 Interfaces Overview” on page 173](#), [“T1 Interfaces Overview” on page 181](#), and [“T3 Interfaces Overview” on page 191](#). For a configuration example, see [“Examples: Configuring Channelized DS3-to-DS0 Interfaces” on page 135](#).

For information about Frame Relay DLCI limitations for channelized interfaces, see [“Data-Link Connection Identifiers on Channelized Interfaces” on page 30](#). For more information about Frame Relay DLCIs, see [“Configuring a Point-to-Point Frame Relay Connection” on page 217](#). 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” on page 32](#).

For information about Frame Relay DLCI limitations for channelized interfaces, see [“Data-Link Connection Identifiers on Channelized Interfaces” on page 30](#). For more information about Frame Relay DLCIs, see [“Configuring a Point-to-Point Frame Relay Connection” on page 217](#). 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” on page 181](#) and [“T3 Interfaces Overview” on page 191](#). For a configuration example, see [“Examples: Configuring Channelized DS3-to-DS1 Interfaces” on page 137](#).

---

## 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 237](#)

## Example: Configuring Channelized T3 IQ Interfaces

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

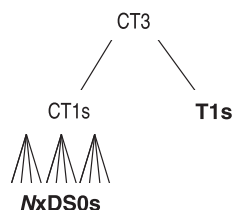
**Configuring a T3 Interface**

```
[edit interfaces]
ct3-5/0/0 {
  no-partition interface-type t3;
}
```

**Configuring NxDSO and T1 Interfaces** Figure 28 on page 134 shows the following interfaces on a Channelized DS3 IQ or IQE PIC:

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

Figure 28: 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 a Point-to-Point Frame Relay Connection” on page 217](#).



**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 {  
    dlc1 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 {  
    dlc1 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 {  
    dlc1 103;  
    family inet {  
      mtu 9000;  
      address 10.123.1.6/32 {  
        destination 10.123.1.5;  
      }  
    }  
  }  
}
```

	<pre>         }         family iso {             mtu 9000;         }         family mpls {             mtu 9000;         }     } } </pre>
Configuring Cisco HDLC Encapsulation with Byte-Encoding	<pre> [edit interfaces ds-0/1/0:5:0] no-keepalives; encapsulation cisco-hdlc; ds0-options {     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 a Point-to-Point Frame Relay Connection”](#) on [page 217](#).

**Configuring Cisco  
HDLC Encapsulation  
on a Channelized DS3  
Interface**

```
[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;
      }
    }
  }
}
```

**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 {
    dlc1 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 {
    dlc1 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 {
    dlc1 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 8

# Configuring Channelized T1 Interfaces

- [Channelized T1 IQ and IQE Interfaces Overview on page 141](#)
- [Configuring Channelized T1 IQ and IQE Interfaces on page 141](#)
- [Example: Configuring Channelized T1 IQ and IQE Interfaces on page 145](#)

### Channelized T1 IQ and IQE Interfaces Overview

---

The Channelized T1 intelligent queuing (IQ) and enhanced intelligent queuing (IQE) PICs have 10 T1 ports that you can channelize to the DS0 level. Each T1 interface has 24 DS0 time slots. You can combine DS0 time slots (channels) to create a channel group (NxDS0).

The Channelized T1 IQ and IQE PICs are supported on the M7i, M10i, M20, M40e, M120, and M320 routers.

### Configuring Channelized T1 IQ and IQE Interfaces

---

- [Configuring T1 IQ and IQE Interfaces on page 141](#)
- [Configuring Fractional T1 IQ and IQE Interfaces on page 142](#)
- [Configuring NxDS0 IQ and IQE Interfaces on page 143](#)
- [Configuring Payload Loopback on page 143](#)
- [Configuring Channelized T1 Interface Properties on page 144](#)

### Configuring T1 IQ and IQE Interfaces

To configure a T1 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces ct1-fpc/pic/port]** hierarchy level:

```
[edit interfaces ct1-fpc/pic/port]  
no-partition interface-type t1;
```

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



**NOTE:** For a T1 (t1-) interface configured on channelized T1 (ct1-) interface on a Channelized T1 IQ or IQE PIC, you can configure the following T1 options, but these options do not take effect for the T1 interface:

- bert-algorithm
- bert-error-rate
- bert-period
- buildout
- framing
- line-encoding
- loopback
- remote-loopback-respond

The T1 interface inherits these option settings from the parent channelized T1 interface.

---

## 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 T1 IQ or IQE PIC, perform the following tasks:

1. Include the **no-partition** statement at the **[edit interfaces ct1-fpc/pic/port]** hierarchy level. This configuration creates the interface **t1-fpc/pic/port**.

```
[edit interfaces ct1-fpc/pic/port]
no-partition interface-type t1;
```

2. Configure the number of time slots allocated to the T1 IQ or IQE interface by including the **timeslots** statement at the **[edit interfaces t1-fpc/pic/port t1-options]** hierarchy level. DSO time slots configured on the channelized T1 IQ or IQE interface are numbered from 1 to 24. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

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

For more information about T1 time slots, see [“Configuring Fractional T1 Time Slots” on page 189](#).

---

### Example: Configuring Fractional T1 IQ and IQE Interfaces

Configure a fractional T1 interface that uses time slots 2 through 10:

```
[edit interfaces t1-0/0/0]
no-partition interface-type t1;
[edit interfaces t1-0/0/0 t1-options]
timeslots 1-10;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring NxDS0 IQ and IQE Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure an NxDS0 IQ or IQE interface on a Channelized T1 IQ or IQE PIC, you must configure the number of time slots allocated to the NxDS0 IQ or IQE interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces t1-fpc/pic/port]** hierarchy level, specifying the **ds** interface type:

```
[edit interfaces t1-fpc/pic/port]
partition partition-number timeslots time-slot-range interface-type ds;
```

For channelized T1 IQ or IQE interfaces, the partition number range is from 1 through 24.

For channelized T1 IQ or IQE interfaces (**t1-fpc/pic/port**), 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” on page 189.

### Example: Configuring an NxDS0 IQ or IQE Interface

Configure an NxDS0 interface that uses time slots 2 through 10. This configuration creates the **ds-0/0/0:1** interface.

```
[edit interfaces t1-0/0/0:1]
partition 1 timeslots 1-10 interface-type ds;
```

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

## Configuring Payload Loopback

Clocking and loopback options are configured at the controller level for all IQ-based and IQE-based interfaces. However, for the channelized T1 IQ or IQE interfaces, configure the payload loopback on the T1 interfaces instead of the channelized T1 IQ or IQE interface. To configure the payload option, include the **loopback payload** statement at the **[edit interfaces t1-fpc/pic/port t1-options loopback]** hierarchy level.

By default, all the time slots on a channelized T1 IQ or IQE interface are used. There can be a maximum of 24 channel groups per channelized T1 IQ or IQE interface. Thus, you can configure a maximum of 240 channel groups per PIC.

To specify the DS0 channel group number in the interface name, include a colon (:) as a separator. For example, a Channelized T1 IQ or IQE PIC might have the following physical and virtual interfaces:

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

**x** is a DS0 channel group from 1 through 24 (for more information about ranges, see [Table 17 on page 144](#)).

You can use any of the values within the range available for **x**; 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** statement, you must set channel group **x** to **0**:  
`ds-0/0/0:0`
- There are no restrictions on configuring the **ds0-options** statement.
- If you delete a configuration you previously committed for channel group 0, the options return to default values.

To configure the channel groups and time slots for a channelized T1 IQ or IQE interface, include the following statements at the **[edit chassis]** hierarchy level:

```
[edit chassis]
fpc slot-number {
  pic pic-number {
    ct1 {
      t1 link-number {
        channel-group group-number;
        timeslots time-slot-range;
      }
    }
  }
}
```

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.

Table 17 on page 144 shows the ranges you can specify.

**Table 17: Ranges for Channelized T1 IQ Configuration**

Item	Option	Range
FPC slot	<i>slot-number</i>	0 through 7
PIC slot	<i>pic-number</i>	0 through 3
T1 port	<i>port-number</i>	0 through 9
DS0 channel group	<i>partition</i>	1 through 24
Time slot	<i>time-slot-range</i>	1 through 24

The theoretical maximum number of channel groups possible per PIC is  $10 * 24 = 240$ . This is within the maximum bandwidth available.

## Configuring Channelized T1 Interface Properties

To configure channelized T1 IQ or IQE interface properties, 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 | sf);
idle-cycle-flag (flags | ones);
invert-data;
line-encoding (ami | b8zs);
loopback (local | payload | remote);
start-end-flag (filler | shared);
}

```



**NOTE:** If you configure the line-encoding statement with the ami option and the byte-encoding statement with the nx64 option, excessive zeros in the payload area may bring the interface down. To prevent this, configure the byte-encoding statement with the nx56 option or include the invert-data statement.

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 {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  loopback payload;
  start-end-flag (filler | shared);
}

```

Only a subset of the T1 options is valid for the channelized configuration; you specify the time slots using the **[edit chassis]** configuration described in Examples: Interface Naming. For more information about the T1 and DS0 options, see [“T1 Interfaces Overview” on page 181](#).

Each T1 interface has 24 time slots (DS0s). You can combine one or more of these DS0 time slots (channels) to create a channel group (*N*xDS0). There can be a maximum of 24 channel groups per T1 interface.

## Example: Configuring Channelized T1 IQ and IQE Interfaces

Configure a channelized T1 interface as an unpartitioned, clear channel.

### Configuring a T1 Interface

```

[edit interfaces]
ct1-2/0/0 {
  no-partition interface-type t1; # t1-2/0/0
}

```

Configure a partitioned channel group.

### Configuring a Channel Group

```

[edit interfaces]
ct1-0/0/1 {
  partition 1 interface-type ds0 timeslots 1-10;
  partition 2 interface-type ds0 timeslots 11-20;
}

```

The following configuration is sufficient to get the channelized T1 IQ or IQE interface up and running:

**Configuring Multiple  
Interface Types**

```
[edit]
interfaces {
  ct1-1/2/3 {
    partition 1 timeslots 10 interface-type ds; # ds-1/2/3:1
    partition 2 timeslots 1-9 interface-type ds; # ds-1/2/3:2
  }
  ds-1/2/3:1 {
    unit 0 {
      family inet {
        address 10.25.1.2/24;
      }
    }
  }
  ds-1/2/3:2 {
    unit 0 {
      family inet {
        address 10.25.2.2/24;
      }
    }
  }
}
[edit]
interfaces {
  ct1-1/2/6 {
    no-partition interface-type t1; # t1-1/2/6
  }
  t1-1/2/6 {
    t1-options {
      timeslots 1-2;
    }
    unit 0 {
      family inet {
        address 10.255.126.2/24;
      }
    }
  }
}
```

## CHAPTER 9

# Configuring Channelized E1 Interfaces

- [Channelized E1 IQ and IQE Interfaces Overview on page 147](#)
- [Configuring Channelized E1 IQ and IQE Interfaces on page 147](#)
- [Configuring Channelized E1 Interfaces on page 149](#)
- [Example: Configuring Channelized E1 IQ or IQE Interfaces on page 151](#)
- [Example: Configuring Channelized E1 Interfaces on page 152](#)

## Channelized E1 IQ and IQE Interfaces Overview

---

Each Channelized E1 PIC, Channelized E1 Intelligent Queuing (IQ) PIC and Channelized E1 Enhanced Intelligent Queuing (IQE) PIC has 10 E1 ports that you can channelize to the **NxDS0** level. Each E1 interface has 32 time slots (DS0), in which time slot 0 is reserved. You can combine one or more of these DS0 time slots (channels) to create a channel group **NxDS0**.

## Configuring Channelized E1 IQ and IQE Interfaces

---

- [Configuring E1 IQ and IQE Interfaces on page 147](#)
- [Configuring Fractional E1 IQ and IQE Interfaces on page 148](#)
- [Configuring NxDS0 IQ and IQE Interfaces on page 148](#)



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

## Configuring E1 IQ and IQE Interfaces

To configure an E1 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces ce1-fpc/pic/port]** hierarchy level:

```
[edit interfaces ce1-fpc/pic/port]  
no-partition interface-type e1;
```

This configuration creates interface **e1-fpc/pic/port**.

## Configuring Fractional E1 IQ and IQE Interfaces

By default, all the time slots on a channelized E1 interface are used. To configure a fractional E1 interface on a Channelized E1 IQ PIC, perform the following tasks:

1. Include the **no-partition** statement at the **[edit interfaces ce1-fpc/pic/port]** hierarchy level:

```
[edit interfaces ce1-fpc/pic/port]
no-partition interface-type e1;
```

This configuration creates interface **e1-fpc/pic/port**.

2. Configure the number of time slots allocated to the E1 IQ or IQE interface by including the **timeslots** statement at the **[edit interfaces e1-fpc/pic/port e1-options]** hierarchy level:

```
[edit interfaces e1-fpc/pic/port e1-options]
timeslots time-slot-range;
```

NxDS0 time slots configured on either a channelized STM1 IQ or IQE interface or a channelized E1 IQ or IQE interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots are numbered from 2 to 32 (1 is reserved).

To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

For more information about E1 time slots, see [“Configuring Fractional E1 Time Slots” on page 170](#).

---

### Example: Configuring Fractional E1 IQ and IQE Interfaces

Configure a fractional E1 interface that uses time slots 2 through 10:

```
[edit interfaces ce1-0/0/0]
no-partition interface-type e1;
[edit interfaces e1-0/0/0 e1-options]
timeslots 2-10;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring NxDS0 IQ and IQE Interfaces

By default, all the time slots on a channelized E1 interface are used. To configure an NxDS0 IQ interface on a Channelized E1 IQ or IQE PIC, you must configure the number of time slots allocated to the NxDS0 IQ or IQE interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces ce1-fpc/pic/port]** hierarchy level, specifying the **ds** interface type:

```
[edit interfaces ce1-fpc/pic/port]
partition partition-number timeslots time-slot-range interface-type ds;
```

For channelized E1 IQ and IQE interfaces, the partition number range is from 1 through 31.

For E1 IQ and IQE interfaces (**e1-fpc/pic/port**), the time-slot range is from 2 through 31. For channelized E1 IQ and IQE interfaces (**ce1-fpc/pic/port**), the time-slot range is from



1 through 31. 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 E1 time slots, see [“Configuring Fractional E1 Time Slots” on page 170](#).

### Example: Configuring an NxDS0 IQ or IQE Interface

Configure an NxDS0 interface that uses time slots 2 through 10. This configuration creates the **ds-0/0/0:1** interface.

```
[edit interfaces ce1-0/0/0:1]
partition 1 timeslots 2-10 interface-type ds;
```

For a full configuration example, see the [Junos OS Feature Guides](#).

## Configuring Channelized E1 Interfaces

By default, all the time slots on a channelized E1 interface are used. There can be a maximum of 24 channel groups per channelized E1 interface. Thus, you can configure a maximum of 240 channel groups per PIC.

To specify the DS0 channel group number in the interface name, include a colon (:) as a separator. For example, a Channelized E1 PIC might have the following physical and virtual interfaces:

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

where **x** is a DS0 channel group from 0 through 23 (for more information about ranges, see [Table 18 on page 150](#)).

You can use any of the values within the range available for **x**; 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 **e1-options** statement, you must set channel group **x** to **0**:  

```
ds-0/0/0:0
```
- There are no restrictions on configuring the **ds0-options** statement.
- If you delete a configuration you previously committed for channel group 0, the options return to default values.

To configure the channel groups and time slots for a channelized E1 interface, include the following statements at the **[edit chassis]** hierarchy level:

```
[edit chassis]
fpc slot-number {
  pic pic-number {
    ce1 {
      e1 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 E1 PIC behaves like a standard E1 PIC, and none of the DSO functionality is accessible.

There are 32 time slots on an E1 interface; however, time slot 0 is reserved. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

Table 18 on page 150 shows the ranges you can specify.

**Table 18: Ranges for Channelized E1 Configuration**

Item	Option	Range
FPC slot	<i>slot-number</i>	0 through 7 (see note below)
PIC slot	<i>pic-number</i>	0 through 3
E1 link	<i>link-number</i>	0 through 9
DSO channel group	<i>group-number</i>	0 through 23
Time slot	<i>time-slot-range</i>	0 through 31 (with time slot 0 reserved) (see note below)

The theoretical maximum number of channel groups possible per PIC is  $10 * 24 = 240$ . This is within the maximum bandwidth available.



**NOTE:**  $N \times$ DSO time slots configured on either a channelized STM1 IQ or IQE interface or channelized E1 IQ or IQE interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots range from 2 to 32 (1 is reserved).

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.

## Configuring Channelized E1 Interface Properties

To configure channelized E1 interface properties, include the `e1-options` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
e1-options {
  fcs (16 | 32);
```

```

framing (g704 | g704-no-crc4 | unframed);
idle-cycle-flag (flags | ones);
loopback (local | remote);
start-end-flag (filler | shared);
}

```

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 {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  loopback payload;
  start-end-flag (filler | shared);
}

```

For DS0 channels on a channelized E1 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 E1 interface. The individual DS0 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” on page 32](#).

Only a subset of the E1 options is valid for the channelized configuration; you specify the time slots using the **[edit chassis]** configuration described in Examples: Interface Naming. For more information about the E1 and DS0 options, see [“E1 Interfaces Overview” on page 165](#) and [“T1 Interfaces Overview” on page 181](#).

Each E1 interface has 32 time slots (DS0s), in which time slot 0 is reserved. You can combine one or more of these DS0 time slots (channels) to create a channel group (NxDS0). There can be a maximum of 24 channel groups per E1 interface.

## Example: Configuring Channelized E1 IQ or IQE Interfaces

Configure a channelized E1 interface as an unpartitioned, clear channel:

```

Configuring an E1 Interface [edit interfaces]
                             ce1-2/0/0 {
                               no-partition interface-type e1; # e1-2/0/0
                             }

```

The following configuration is sufficient to get the channelized E1 IQ or IQE interface up and running:

```

Configuring Multiple Interface Types [edit]
                                     interfaces {
                                       ce1-1/2/3 {
                                         partition 1 timeslots 10 interface-type ds; # ds-1/2/3:1
                                         partition 2 timeslots 1-9 interface-type ds; # ds-1/2/3:2
                                       }
                                       ds-1/2/3:1 {

```

```
    unit 0 {
      family inet {
        address 10.25.1.2/24;
      }
    }
  }
  ds-1/2/3:2 {
    unit 0 {
      family inet {
        address 10.25.2.2/24;
      }
    }
  }
}
[edit]
interfaces {
  ce1-1/2/6 {
    no-partition interface-type e1; # e1-1/2/6
  }
  e1-1/2/6 {
    e1-options {
      timeslots 1-2;
    }
    unit 0 {
      family inet {
        address 10.255.126.2/24;
      }
    }
  }
}
```

---

## Example: Configuring Channelized E1 Interfaces

The following configuration is sufficient to get the channelized E1 interface up and running:

### Configuring an E1 Interface, E1 Options, and DS0 Options

```
[edit chassis]
fpc 0 {
  pic 1 {
    ce1 {
      e1 0 {
        channel-group 0 timeslots 1;
        channel-group 1 timeslots 2;
        channel-group 5 timeslots 5-7;
      }
      e1 4 {
        channel-group 10 timeslots 11,17,28-31;
      }
    }
  }
}
[edit interfaces ds-0/1/0:0]
e1-options {
  fcs 32;
  framing g704-non-grc;
  loopback remote;
```

```

}
[edit interfaces ds-0/1/4:10]
ds0-options {
  byte-encoding nx56;
  start-end-flag filler;
}

```

The above configuration results in the following interfaces:

```

ds-0/1/0:1, with time slot 1 allocated
ds-0/1/0:5, with time slots 5 through 7 allocated
ds-0/1/4:10, with time slots 11, 17, and 28 through 31 allocated

```

The remaining ports (other than 0 and 4) remain as regular E1 interfaces (and follow the `e1-0/1/x` naming convention).

```

[edit chassis]
fpc 0 {
  pic 1 {
    ce1 {
      e1 0 {
        channel-group 1 timeslots 1;
        channel-group 5 timeslots 5-7;
      }
      e1 4 {
        channel-group 10 timeslots 11,17, 28-31;
      }
    }
  }
}

```

<b>Use Time Slots 1 Through 10</b>	<pre>[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> ce1 e1 <i>link-number</i>] channel-group <i>group-number</i>; timeslots 1-10;</pre>
--	---

<b>Use Time Slots 1 Through 5, 10, and 24</b>	<pre>[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> ce1 e1 <i>link-number</i>] channel-group <i>group-number</i>; timeslots 1-5,10,24;</pre>
---	--



## CHAPTER 10

# Configuring Channelized E1 PRI and T1 PRI Interfaces

- [Channelized E1 PRI and T1 PRI Overview on page 155](#)
- [Configuring a Clear Channel on a Dual-Port Channelized T1-E1 PIM on page 156](#)
- [Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots on page 156](#)
- [Configuring Primary Rate Interfaces on page 157](#)
- [Allocating B-Channels for Dialout on page 159](#)
- [Configuring PRI Interfaces on page 159](#)
- [Example: Configuring a Channelized T1 Interface as Primary Rate Interface on page 160](#)

## Channelized E1 PRI and T1 PRI Overview

---

J Series Services Routers equipped with a Dual-Port Channelized T1/E1 PIM support Integrated Services Digital Network (ISDN) Primary Rate Interfaces (PRIs). ISDN PRI, referred to as S2M in Europe, is the “primary” extended ISDN network interface. It offers a larger capacity of digital channels utilizing a variety of improved mediums, and is used by large organizations with intensive communication needs. In contrast, the ISDN Basic Rate Interface (BRI), known as SO in Europe, provides a limited number of channels, transmitting over copper wire, and is used by smaller organizations or individuals with less intensive communication needs. For more information about configuring ISDN BRI interfaces, see [Configuring ISDN Physical Interface Properties](#).

Unlike channelized PICs on the M Series and T Series routers, the interface type on the Dual-Port Channelized T1/E1 PIM is configurable. A single interface can operate as either a channelized T1 or channelized E1 interface (or clear channel) or as an ISDN PRI. The ISDN PRI channels can operate on the same interface as T1 or E1 channels. The PIM also supports a “drop-and-insert” feature, allowing you to insert channels from one port on the PIM into the other port on the PIM.

These ISDN channels are delivered to the user in one of two predefined configurations:

- ISDN BRI is configured by specifying properties for a physical (**br-**) interface and a logical (**dlr**) interface.
- For ISDN PRI, you configure:

1. Either a channelized E1 (**ce1-pim/0/port**) or channelized T1 (**ct1-pim/0/port**) interface.
2. Time slots within a **ce1-pim/0/port** interface or **ct1-pim/0/port** interface.
3. A bearer (B) channel **bc-pim/0/port:channel** interface for each time slot that you want to function as an ISDN PRI B-channel. The B-channel is used for data, video, voice, and multimedia. You can create up to 30 B-channels on a channelized E1 interface, and 23 B-channels on a channelized T1 interface.
4. One delta (D) channel, used between switching equipment in the ISDN network and the ISDN equipment at your site for signaling. For channelized E1, the D-channel must be time slot 16. For channelized T1, the D-channel must be time slot 24.



**NOTE:** Time slots can also be shared with **ds-pim/0/port** time slots within the same channelized interface.

Channelized E1 and T1 PIMs on J Series routers provide support for ISDN PRI connectivity for dial-in and callback, and for use as primary or backup network connections.

---

## Configuring a Clear Channel on a Dual-Port Channelized T1-E1 PIM

---

A *clear channel* is an interface that uses the entire bandwidth of the port on a PIM. To configure a clear channel, include the **no-partition** and **interface-type** statements in the configuration. On a Dual-Port Channelized T1-E1 PIM, you can configure two clear-channel interfaces.

To configure an E1 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces ce1-pim/0/port]** hierarchy level:

```
[edit interfaces ce1-pim/0/port]  
no-partition interface-type e1;
```

This configuration creates interface **e1-pim/0/port**.

To configure a T1 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces ct1-pim/0/port]** hierarchy level:

```
[edit interfaces ct1-pim/0/port]  
no-partition interface-type t1;
```

This configuration creates interface **t1-pim/0/port**.

---

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

---

On channelized T1/E1 interfaces configured for channelized operation, you can insert channels (time slots) from one port (for example, channels carrying voice) directly into the other port on the PIM, to replace channels coming through the Routing Engine. This feature, known as drop and insert, allows you to integrate voice and data on a single T1 or E1 link by removing the DS0 time slots of one T1 or E1 port and replacing them by inserting the time slots of another T1 or E1 port. It is not necessary to use the same time



slots on both interfaces, but the time slots count must be same. The channels that are not configured for the drop-and-insert feature are used for normal traffic.

You can configure:

- 30 channelized E1 time slots, with the 16th time slot operating as the signaling channel
- 23 channelized T1 time slots, with the 24th time slot operating as the signaling channel

The signaling channel, or D-channel, must be part of the channels that are being switched through the drop-and-insert functionality. The Junos OS does not support switching of voice and data between ports by default.

Both ports involved in the drop-and-insert configuration must use the same clock source—either the router's internal clock or an external clock.

The following clock source settings are valid:

- When port 0 is set to use the internal clock, port 1 must also be set to use it, and vice versa.
- When port 0 is set to use its external clock, port 1 must be set to run on the same clock—the external clock for port 0.
- When port 1 is set to use its external clock, port 0 must be set to run on the same clock—the external clock for port 1.

For more details about valid clock combinations, see the *Junos OS Interfaces and Routing Configuration Guide*.

To configure drop-and-insert time slots on a channelized T1 interface, include the **partition** statement at the **[edit interfaces ct1-pim/0/port]** hierarchy level with the **timeslots** statement and **interface-type** statements specified:

```
[edit interfaces]
ct1-pim/0/port {
  partition 1 timeslots 1-10 interface-type ds;
  partition 2 timeslots 11-14 interface-type ds;
  partition 3 timeslots 15-32 interface-type ds;
}
```

This configuration creates interfaces **ds-pim/0/port:1**, **ds-pim/0/port:2**, and **ds-pim/0/port:3**.

Use the same configuration to create drop-and insert time slots on a channelized E1 interface by including the **partition** statement and options at the **[edit interfaces ce1-pim/0/port]** hierarchy level.

## Configuring Primary Rate Interfaces

Primary rate interfaces are a combination of B-channels with one controlling D-channel for the group. Configure B-channel interfaces for each time slot that you want to function as an ISDN PRI interface. The B-channel is used for data, video, voice, and multimedia.

You can create:

- 23 B-channels on a channelized T1 interface
- 30 B-channels on a channelized E1 interface

To configure B-channels on a channelized T1 interface, include the **partition** statement at the **[edit interfaces ct1-pim/O/port]** hierarchy level with the **timeslots** statement and **interface-type bc** specified:

```
[edit interfaces]
ct1-pim/O/port {
  partition 1-23 timeslots 1-23 interface-type bc;
}
```

This configuration creates interfaces **bc-pim/O/port:1** through **bc-pim/O/port:1**, and **ds-pim/O/port:3**.

Use the same configuration to create B-channels on a channelized E1 interface by including the **partition** statement and options at the **[edit interfaces ce1-pim/O/port]** hierarchy level.

One D-channel is used between switching equipment in the ISDN network and the ISDN equipment at your site for signaling. For channelized E1, the D-channel must be time slot 16. For channelized T1, the D-channel must be time slot 24.

To configure a D-channel on a channelized T1 interface, include the **partition** statement at the **[edit interfaces ct1-pim/O/port]** hierarchy level with the **timeslots** statement and **interface-type dc** specified:

```
[edit interfaces]
ct1-pim/O/port {
  partition 24 timeslots 24 interface-type dc;
}
```

This configuration creates interfaces **dc-pim/O/port**.

Use the same configuration to create B-channels on a channelized E1 interface by including the **partition** statement and options at the **[edit interfaces ce1-pim/O/port]** hierarchy level.

```
[edit interfaces]
ce1-pim/O/port {
  partition 16 timeslots 16 interface-type dc;
}
```

To view PRI or ISDN options information about interface, use the following operational mode commands supporting BRI interfaces:

- **show interfaces *interface-name* detail**
- **show interface *dln***
- **show isdn calls**
- **show isdn history**
- **show isdn q921 statistics**
- **show isdn q931 statistics**
- **show isdn status**



**NOTE:** You must configure a D-channel and B-channels to complete your ISDN PRI line configuration.



**NOTE:** You can configure dso-options on the B-channel, but you cannot configure parameters for a D-channel. However, when interface statistics are displayed, both B-channel and D-channel interfaces have statistical values.

## Allocating B-Channels for Dialout

You can configure the system to allocate B-channels for dialout from lowest or highest numbered B-channel (ascending or descending order). By configuring this feature, you reduce chances of “glare” on PRI lines carrying a mix of incoming and outgoing calls.

To configure the B-channel allocation, include the **idsn-options** and **bchannel-allocation** statements at the **[edit interfaces ct1-pim/O/port | ce1-pim/O/port]** hierarchy level:

```
[edit interfaces]
(ct1-pim/O/port | ce1-pim/O/port) {
  isdn-options {
    (bchannel-allocation (ascending | descending);
  }
}
```

## Configuring PRI Interfaces

When you create a PRI from a channelized E1 or channelized T1 interface, you can select all the slots for the PRI, or just a few of them, leaving the rest as **ds-** interfaces.

To configure a PRI from a channelized T1 interface, include the **partition** statement at the **[edit interfaces ct1-pim/O/port]** hierarchy level with the **timeslots** statement and **interface-type bc** specified:

```
[edit interfaces]
ct1-pim/O/port {
  partition 1 timeslots 1-10 interface-type ds;
  partition 2 timeslots 11-24 interface-type pr;
}
```

This configuration creates interfaces **ds-pim/O/port:1** through **pr-pim/O/port:2**.

Use the same configuration to create interfaces on a channelized E1 interface by including the **partition** statement and options at the **[edit interfaces ce1-pim/O/port]** hierarchy level.

To configure channelized E1 interface properties, include the **e1-options** statement at the **[edit interfaces interface-name]** hierarchy level:

```
[edit interfaces interface-name]
e1-options {
```

```
fcs (16 | 32);
framing (g704 | g704-no-crc4 | unframed);
idle-cycle-flag (flags | ones);
loopback (local | remote);
start-end-flag (filler | shared);
}
```

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 {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  loopback payload;
  start-end-flag (filler | shared);
}
```

---

## Example: Configuring a Channelized T1 Interface as Primary Rate Interface

---

Configure a channelized T1 interface to operate fully as a PRI:

```
[edit interfaces]
ct1-2/0/0 {
  partition 1-23 timeslots 1-23 interface-type bc;
  partition 24 timeslots 24 interface-type dc;
  t1-options {
    line-encoding b8zs;
    framing esf;
  }
  traceoptions {
    flag q931;
    flag q921;
    file {
      pri_trace_log;
    }
  }
  dialer-options {
    pool 1 priority 25;
  }
  isdn-options {
    switch-type att5e;
    bchannel-allocation descending;
    incoming-called-number 384101;
    incoming-called-number 384102;
    incoming-called-number 384103;
  }
}

[edit interfaces]
d10 {
  unit 0 {
    dialer-options {
      pool 1;
      dial-string 384010;
    }
  }
}
```

```
        incoming-map {
            accept-all;
        }
    }
    family inet {
        filter {
            dialer int-packet;
        }
        address 13.1.1.2/24;
    }
}
[edit firewall]
family inet {
    dialer-filter int-packet {
        term term1 {
            from {
                destination address {
                    13.1.1.1/24;
                }
                protocol icmp;
                then note;
            }
        }
        term term2 {
            then ignore;
        }
    }
}
```



## PART 3

# Configuring E1, E3, T1, and T3 Interfaces

- [Configuring E1 Interfaces on page 165](#)
- [Configuring E3 Interfaces on page 173](#)
- [Configuring T1 Interfaces on page 181](#)
- [Configuring T3 Interfaces on page 191](#)





## CHAPTER 11

# Configuring E1 Interfaces

- [E1 Interfaces Overview on page 165](#)
- [Configuring E1 Physical Interface Properties on page 166](#)
- [Configuring E1 BERT Properties on page 166](#)
- [Configuring the E1 Frame Checksum on page 167](#)
- [Configuring E1 Framing on page 167](#)
- [Configuring the E1 Idle Cycle Flag on page 168](#)
- [Configuring E1 Data Inversion on page 168](#)
- [Configuring E1 Loopback Capability on page 168](#)
- [Configuring E1 Start and End Flags on page 170](#)
- [Configuring Fractional E1 Time Slots on page 170](#)

## E1 Interfaces Overview

---

E1 is a standard WAN digital communication format designed to operate over copper facilities at a rate of 2.048 Mbps. Widely used outside North America, it is a basic time-division multiplexing scheme used to carry digital circuits. The following standards apply to E1 interfaces:

- ITU-T Recommendation G.703, *Physical/electrical characteristics of hierarchical digital interfaces*, describes data rates and multiplexing schemes for the E Series.
- ITU-T Recommendation G.751, *General Aspects of Digital Transmission Systems: Terminal Equipment*, describes framing methods.
- ITU-T Recommendation G.775, *Loss of Signal (LOS) and Alarm Indication Signal (AIS) Defect Detection and Clearance Criteria*, describes alarm reporting methods.



**NOTE:** The Juniper Networks E1 Physical Interface Card (PIC) does not support Channel Associated Signaling (CAS).

---

## Configuring E1 Physical Interface Properties

---

To configure E1-specific physical interface properties, include the **e1-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

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

## Configuring E1 BERT Properties

---

This section discusses BERT properties for the E1 interface specifically. For general information about the Junos implementation of the BERT procedure, see Interface Diagnostics.

You can configure an E1 interface or a CE1 or E1 partition on a channelized PIC to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test and the error rate to include in the bit stream by including the **bert-period** and **bert-error-rate** statements at the **[edit interfaces *interface-name* e1-options]** hierarchy level:

```
[edit interfaces interface-name e1-options]  
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. Standard CE1, standard E1, E1 IQ, and E1 IQE interfaces, and PICs partitioned to CE1 and E1 channels, support an extended BERT period range, up to 86,400 seconds (24 hours), and have a default BERT period value of 240 seconds.



**NOTE:** When configuring E1 and CE1 interfaces on 10-port Channelized E1/T1 IQE PICs, the **bert-period** statement must be included at the **[edit interfaces *ce1-fpc/pic/port*]** hierarchy level.

**rate** is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (0, which corresponds to no errors) to  $10^{-7}$  (1 error per 10 million bits). The default is 0.

Individual concatenated E1 interfaces do not support the **bert-algorithm** configuration statement. For individual concatenated E1 interfaces, the **bert-algorithm** statement at

the `[edit interfaces interface-name e1-options]` hierarchy level is ignored. The algorithm for the E1 BERT procedure is **pseudo-2e15-o151** (pattern is  $2^{15}-1$ , as defined in the CCITT/ITU O.151 standard).

For channelized E1 intelligent queuing (IQ and IQE) interfaces, you can configure the BERT algorithm by including the **bert-algorithm** statement at the `[edit interfaces ce1-fpc/pic/port e1-options]` or `[edit interfaces e1-fpc/pic/port e1-options]` hierarchy level:

```
[edit interfaces ce1-fpc/pic/port e1-options]
bert-algorithm algorithm;
[edit interfaces e1-fpc/pic/port e1-options]
bert-algorithm algorithm;
```

For a list of supported algorithms, enter a `?` after the **bert-algorithm** statement; for example:

```
[edit interfaces ce1-0/0/0 e1-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152 Pattern is 2^11 -1 (per O.152 standard)
pseudo-2e15-o151 Pattern is 2^15 - 1 (per O.151 standard)
pseudo-2e20-o151 Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e20-o153 Pattern is 2^20 - 1 (per O.153 standard)
```

## Configuring the E1 Frame Checksum

By default, the E1 interface supports a 16-bit checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the **fcs 32** statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces e1-fpc/pic/port e1-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs 16** statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
fcs 16;
```

## Configuring E1 Framing

By default, E1 interfaces use the G704 framing mode. You can configure the alternative unframed mode if needed.

To have the interface use the unframed mode, include the **framing** statement at the `[edit interfaces interface-name e1-options]` hierarchy level, specifying the **unframed** option:

```
[edit interfaces interface-name e1-options]  
framing unframed;
```

To explicitly configure G704 framing, include the **framing** statement at the **[edit interfaces *interface-name* e1-options]** hierarchy level, specifying the **g704** option:

```
[edit interfaces interface-name e1-options]  
framing g704;
```

By default, G704 framing uses CRC4. To explicitly configure an interface's G704 framing to not use CRC4, include the **framing** statement at the **[edit interfaces *interface-name* e1-options]** hierarchy level, specifying the **g704-no-crc4** option:

```
[edit interfaces interface-name e1-options]  
framing g704-no-crc4;
```

---

## Configuring the E1 Idle Cycle Flag

By default, an E1 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the **[edit interfaces *interface-name* e1-options]** hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name e1-options]  
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name e1-options]  
idle-cycle-flag flags;
```

---

## Configuring E1 Data Inversion

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the **invert-data** statement at the **[edit interfaces *interface-name* e1-options]** hierarchy level:

```
[edit interfaces interface-name e1-options]  
invert-data;
```

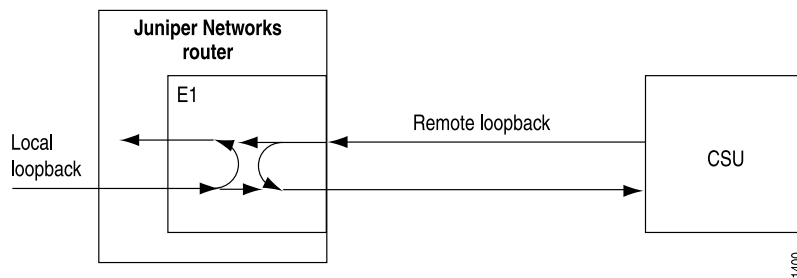
When you enable data inversion, all data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Data inversion is normally used only in AMI mode to guarantee ones density in the transmitted stream.

---

## Configuring E1 Loopback Capability

You can configure loopback capability between the local E1 interface and the remote channel service unit (CSU), as shown in [Figure 29 on page 169](#). You can configure the loopback to be local or remote. With local loopback, the E1 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the E1 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU.

Figure 29: Remote and Local E1 Loopback



To configure loopback capability on an E1 interface, include the **loopback** statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
  loopback (local | remote);
```

Packets can be looped on either the local router or the remote CSU.

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, you issue the **test interface** command.

For more information about configuring BERT, see [Interface Diagnostics](#). For more information about using operational mode commands to test interfaces, see the [Junos OS System Basics and Services Command Reference](#).

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces e1-fpc/port e1-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command:

```
user@host> show interfaces interface-name extensive
```

### Example: Configuring E1 Loopback Capability

To determine whether a problem is internal or external, loop packets on both the local and the remote router. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the `[edit interfaces interface-name]` hierarchy level and the **loopback local** statement at the `[edit interfaces interface-name e1-options]` hierarchy level.

With this configuration, the link stays up, so you can loop ping packets to a remote router. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
e1-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
  e1-options {
    loopback local;
```

```
    }  
    unit 0 {  
        family inet {  
            address 10.100.100.1/24;  
        }  
    }  
}
```

---

## Configuring E1 Start and End Flags

By default, start and end flags are shared.

To configure an E1 interface to wait two idle cycles between the start and end flags, include the **start-end-flag** statement with the **filler** option at the **[edit interfaces *interface-name* e1-options]** hierarchy level:

```
[edit interfaces interface-name e1-options]  
start-end-flag filler;
```

To revert to the default behavior, sharing the transmission of start and end flags, include the **start-end-flag** statement with the **shared** option at the **[edit interfaces *interface-name* e1-options]** hierarchy level:

```
[edit interfaces interface-name e1-options]  
start-end-flag shared;
```

---

## Configuring Fractional E1 Time Slots

By default, all the time slots on an E1 interface are used. To configure the number of time slots allocated to a fractional E1 interface, include the **timeslots** statement at the **[edit interfaces *interface-name* e1-options]** hierarchy level:

```
[edit interfaces interface-name e1-options]  
timeslots time-slot-range;
```

There are 32 time slots on an E1 interface. Time slot 0 is always reserved for framing and cannot be used to configure a fractional E1 interface.

Time slot numbering constraints vary for different E1 PICs, as follows:

- For 4-port E1 PICs, the configurable time slot range is 1 through 31 (time slot 0 is reserved for framing).
- For 10-port Channelized E1 and 10-port Channelized E1 Intelligent Queuing (IQ) PICs, the configurable time slot range is 2 through 32 (time slots 0 and 1 are reserved for framing).
- For Enhanced Intelligent Queuing (IQE) PICs, the configurable time slot range is 2 through 32.

- NxDS0 time slots configured on either a channelized STM1 IQ interface or a channelized E1IQ interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots are numbered from 2 to 32 (0 and 1 are reserved).
- For fractional E1 interfaces only, if you connect a 4-port E1 PIC to a device that uses time slot numbering from 2 through 32, you must subtract 1 from the configured number of time slots. To do this, include the **timeslots** statement at the **[edit interfaces *interface-name* e1-options]** hierarchy level, and offset 1 from the specified slot number.



**NOTE:** When configuring fractional E1 time slots, you also must include the **framing g704** statement at the **[edit interfaces *e1-fpc/port* e1-options]** hierarchy level.

To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

### Example: Configuring Fractional E1 Time Slots

In this example, time slots are offset by 1 to compensate for the fractional E1 interface being connected to a device that uses time slot numbering from 0 through 31.

Use Time Slots 4 Through 6, 11, and 25	[edit interfaces <i>interface-name</i> e1-options] # Fractional E1 interface timeslots 4-6,11,25;
Use Time Slots 1 Through 10	[edit interfaces <i>interface-name</i> e1-options] timeslots 1-10;
Use Time Slots 1 Through 5, 10, and 24	[edit interfaces <i>interface-name</i> e1-options] timeslots 1-5,10,24;





# Configuring E3 Interfaces

- [E3 Interfaces Overview on page 173](#)
- [Configuring E3 Physical Interface Properties on page 174](#)
- [Configuring E3 BERT Properties on page 174](#)
- [Configuring the E3 CSU Compatibility Mode on page 175](#)
- [Configuring the E3 Frame Checksum on page 176](#)
- [Configuring the E3 Idle Cycle Flag on page 177](#)
- [Configuring E3 Data Inversion on page 177](#)
- [Configuring E3 Loopback Capability on page 177](#)
- [Configuring E3 HDLC Payload Scrambling on page 179](#)
- [Configuring the E3 Start and End Flags on page 179](#)
- [Configuring E3 IQ and IQE Unframed Mode on page 179](#)

## E3 Interfaces Overview

---

E3 is a high-speed WAN digital communication technique designed to operate over copper facilities at a rate of 34.368 Mbps. Widely used outside North America, it is the time-division multiplexing scheme used to carry 16 E1 circuits. The following standards apply to E3 interfaces:

- ITU-T Recommendation G.703, *Physical/electrical characteristics of hierarchical digital interfaces*, describes data rates and multiplexing schemes for the E Series.
- ITU-T Recommendation G.751, *General Aspects of Digital Transmission Systems: Terminal Equipment*, describes framing methods.
- ITU-T Recommendation G.775, *Loss of Signal (LOS) and Alarm Indication Signal (AIS) Defect Detection and Clearance Criteria*, describes alarm reporting methods.

The Junos OS supports the E3 Physical Interface Card (PIC) and the E3 Intelligent Queuing (IQ and IQE) PICs. The E3 IQ and E3 IQE PICs supports transmission scheduling on logical interfaces. For more information, see the [Junos OS Class of Service Configuration Guide](#).



**NOTE:** In unframed mode, the E3 IQ and E3 IQE PICs do not detect yellow or loss-of-frame alarms.

## Configuring E3 Physical Interface Properties

---

To configure E3-specific physical interface properties, include the **e3-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
e3-options {  
  bert-algorithm algorithm;  
  bert-error-rate rate;  
  bert-period seconds;  
  compatibility-mode (digital-link | kentrox | larscom) <subrate value>;  
  fcs (16 | 32);  
  idle-cycle-flag value;  
  invert-data;  
  loopback (local | remote);  
  (payload-scrambler | no-payload-scrambler);  
  start-end-flag value;  
  (unframed | no-unframed);  
}
```

## Configuring E3 BERT Properties

---

This section discusses BERT properties for the E3 interface specifically. For general information about the Junos implementation of the BERT procedure, see Interface Diagnostics.

You can configure an E3 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream by including the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```
[edit interfaces interface-name e3-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  $10^{-0}$  (0, which corresponds to no errors) to  $10^{-7}$  (1 error per 10 million bits).

**algorithm** is the pattern to send in the bit stream. On E3 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the **[edit interfaces *interface-name* *interface-options*]** hierarchy level:

```
[edit interfaces interface-name interface-options]  
bert-algorithm algorithm;
```

For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces e3-0/0/0 e3-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152 Pattern is 2^11 - 1 (per O.152 standard)
pseudo-2e15-o151 Pattern is 2^15 - 1 (per O.151 standard)
pseudo-2e20-o151 Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e20-o153 Pattern is 2^20 - 1 (per O.153 standard)
```

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the [Junos OS System Basics and Services Command Reference](#).

## Configuring the E3 CSU Compatibility Mode

Subrating an E3 interface reduces the maximum allowable peak rate by limiting the High-level Data Link Control (HDLC)-encapsulated payload. Subrate modes configure the PIC to connect with channel service units (CSUs) that use proprietary methods of multiplexing.

On M Series and T Series routers, you can configure E3 interfaces to be compatible with a Digital Link, Kentrox, or Larscom CSU. On J Series Services Routers, you can configure E3 interfaces to be compatible with a Digital Link or Kentrox CSU.



**NOTE:** To subrate an E3 interface to be compatible with a Kentrox CSU, you must have an IQ-based PIC. Non-IQ PICs allow a commit of the configuration, but the interfaces remain at the full E3 rate for the Kentrox compatibility mode.

For E3 interfaces on IQE PICs, subrate is not supported and the `E3-options compatibility-mode` and `payload-scrambler` are invalid. Although Junos OS CLI allows a commit of this configuration, the interfaces remain at the full E3 rate and implicitly default to only Kentrox compatibility mode.

To configure an E3 interface so that it is compatible with the CSU at the remote end of the line, include the `compatibility-mode` statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```
[edit interfaces interface-name e3-options]
compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
```

The subrate of an E3 interface must exactly match that of the remote CSU. To specify the subrate, include the `subrate` statement in the configuration:

- For Kentrox CSUs, specify the subrate as a number from 1 through 48 that exactly matches the value configured on the CSU. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.
- For Digital Link CSUs, you can specify the subrate value to match the data rate configured on the CSU in the format `xkb` or `x.xMb`. You can configure the subrate values shown in [Table 19 on page 176](#).
- Larscom CSUs do not support the E3 subrate.

Table 19: Subrate Values for E3 Digital Link Compatibility Mode

358 Kbps	7.2 Mbps	14.0 Mbps	20.8 Mbps	27.6 Mbps
716 Kbps	7.5 Mbps	14.3 Mbps	21.1 Mbps	27.9 Mbps
1.1 Mbps	7.9 Mbps	14.7 Mbps	21.5 Mbps	28.3 Mbps
1.4 Mbps	8.2 Mbps	15.0 Mbps	21.8 Mbps	28.6 Mbps
1.8 Mbps	8.6 Mbps	15.4 Mbps	22.2 Mbps	29.0 Mbps
2.1 Mbps	9.0 Mbps	15.8 Mbps	22.6 Mbps	29.4 Mbps
2.5 Mbps	9.3 Mbps	16.1 Mbps	22.9 Mbps	29.7 Mbps
2.9 Mbps	9.7 Mbps	16.5 Mbps	23.3 Mbps	30.1 Mbps
3.2 Mbps	10.0 Mbps	16.8 Mbps	23.6 Mbps	30.4 Mbps
3.6 Mbps	10.4 Mbps	17.2 Mbps	24.0 Mbps	30.8 Mbps
3.9 Mbps	10.7 Mbps	17.5 Mbps	24.3 Mbps	31.1 Mbps
4.3 Mbps	11.1 Mbps	17.9 Mbps	24.7 Mbps	31.5 Mbps
4.7 Mbps	11.5 Mbps	18.3 Mbps	25.1 Mbps	31.9 Mbps
5.0 Mbps	11.8 Mbps	18.6 Mbps	25.4 Mbps	32.2 Mbps
5.4 Mbps	12.2 Mbps	19.0 Mbps	25.8 Mbps	32.6 Mbps
5.7 Mbps	12.5 Mbps	19.3 Mbps	26.1 Mbps	32.9 Mbps
6.1 Mbps	12.9 Mbps	19.7 Mbps	26.5 Mbps	33.3 Mbps
6.4 Mbps	13.2 Mbps	20.0 Mbps	26.9 Mbps	33.7 Mbps
6.8 Mbps	13.6 Mbps	20.4 Mbps	27.2 Mbps	

For information about subrating a T3 interface, see [“Configuring the T3 CSU Compatibility Mode” on page 194](#).

## Configuring the E3 Frame Checksum

You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

On a channelized OC12 interface, the **fcs** statement is not supported. To configure FCS on each E3 channel, you must include the **e3-options fcs** statement in the configuration for each channel.

To configure a 32-bit checksum, include the **fcs** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```
[edit interfaces interface-name e3-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```
[edit interfaces interface-name e3-options]
fcs 16;
```

## Configuring the E3 Idle Cycle Flag

By default, an E3 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name e3-options]
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name e3-options]
idle-cycle-flag flags;
```

## Configuring E3 Data Inversion

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the **invert-data** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

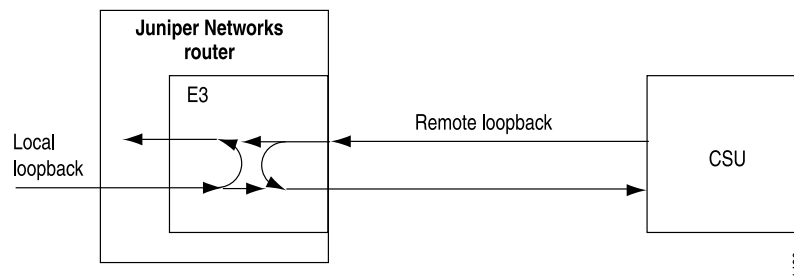
```
[edit interfaces interface-name e3-options]
invert-data;
```

When you enable data inversion, unused data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Enable inversion to be compatible with another vendor's E3 interface.

## Configuring E3 Loopback Capability

You can configure loopback capability between the local E3 interface and the remote CSU. You can configure the loopback to be local or remote. With local loopback, the E3 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the E3 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU (see [Figure 30 on page 178](#)).

Figure 30: Remote and Local E3 Loopback



To configure loopback capability on an E3 interface, include the **loopback** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```
[edit interfaces interface-name e3-options]
  loopback (local | remote);
```

Packets can be looped on either the local router or the remote CSU.

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, you issue the **test interface** command.

For more information about configuring BERT, see Interface Diagnostics. For more information about using operational mode commands to test interfaces, see the [Junos OS System Basics and Services Command Reference](#).

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command:

```
user@host> show interfaces interface-name extensive
```

### Example: Configuring E3 Loopback Capability

To determine whether a problem is internal or external, loop packets on both the local and the remote router. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the **[edit interfaces *interface-name*]** hierarchy level and the **loopback local** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level. With this configuration, the link stays up, so you can loop ping packets to a remote router. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
e3-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
  e3-options {
    loopback local;
  }
}
```

```

unit 0 {
  family inet {
    address 10.100.100.1/24;
  }
}

```

## Configuring E3 HDLC Payload Scrambling

E3 HDLC payload scrambling, which is disabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.

To configure scrambling on the interface, you can include the **payload-scrambler** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```

[edit interfaces interface-name e3-options]
payload-scrambler;

```

To explicitly disable HDLC payload scrambling, include the **no-payload-scrambler** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```

[edit interfaces interface-name e3-options]
no-payload-scrambler;

```

To disable payload scrambling again (return to the default), delete the **payload-scrambler** statement from the configuration:

```

[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options payload-scrambler

```

## Configuring the E3 Start and End Flags

By default, an E3 interface shares the transmission of the start and end flags

To configure an E3 interface to wait two idle cycles between the start and end flags, include the **start-end-flag** statement with the **filler** option at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```

[edit interfaces interface-name e3-options]
start-end-flag filler;

```

To revert to the default behavior, sharing the transmission of start and end flags, include the **start-end-flag** statement with the **shared** option at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```

[edit interfaces interface-name e3-options]
start-end-flag shared;

```

## Configuring E3 IQ and IQE Unframed Mode

For E3 IQ and IQE interfaces only, you can enable or disable unframed mode. In unframed mode, the E3 IQ and IQE interfaces do not detect yellow (**ylw**) or loss-of-frame (**lof**) alarms.

By default, unframed mode is disabled. To enable unframed mode, include the **unframed** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level:

```
[edit interfaces interface-name e3-options]  
unframed;
```

To explicitly configure the default of framed mode, include the **no-unframed** statement:

```
[edit interfaces interface-name e3-options]  
no-unframed;
```



## CHAPTER 13

# Configuring T1 Interfaces

- [T1 Interfaces Overview on page 181](#)
- [Configuring T1 Physical Interface Properties on page 182](#)
- [Configuring T1 BERT Properties on page 182](#)
- [Configuring the T1 Buildout on page 183](#)
- [Configuring T1 Byte Encoding on page 183](#)
- [Configuring T1 CRC Error Major Alarm Thresholds on page 184](#)
- [Configuring T1 CRC Error Minor Alarm Thresholds on page 184](#)
- [Configuring T1 Data Inversion on page 185](#)
- [Configuring the T1 Frame Checksum on page 185](#)
- [Configuring the T1 Remote Loopback Response on page 185](#)
- [Configuring T1 Framing on page 186](#)
- [Configuring T1 Line Encoding on page 186](#)
- [Configuring T1 Loopback Capability on page 186](#)
- [Configuring the T1 Idle Cycle Flag on page 188](#)
- [Configuring T1 Start and End Flags on page 188](#)
- [Configuring Fractional T1 Time Slots on page 189](#)

## T1 Interfaces Overview

---

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

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

## Configuring T1 Physical Interface Properties

---

To configure T1-specific physical interface properties, include the **t1-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

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

## Configuring T1 BERT Properties

---

This section discusses BERT properties for the T1 interface specifically. For general information about the Junos implementation of the BERT procedure, see Interface Diagnostics.

You can configure a T1 interface or partitioned CT1 or T1 channel to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test and the error rate to include in the bit stream by including the **bert-period** and **bert-error-rate** statements at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]  
bert-algorithm algorithm;  
bert-error-rate rate;  
bert-period seconds;
```

**seconds** is the duration of the BERT procedure. The test can last from 1 through 239 seconds; the default is 10 seconds. Standard CT1, standard T1, T1 IQE, and T1 IQE interfaces, and PICs partitioned to CT1 and T1 channels, support an extended BERT period range, up to 86,400 seconds (24 hours), and have a default BERT period value of 240 seconds.



**NOTE:** When configuring T1 and CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the **bert-period** statement must be included at the **[edit interfaces *ct1-fpc/pic/port*]** hierarchy level.

---

**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. On T1 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the **[edit interfaces interface-name interface-options]** hierarchy level:

```
[edit interfaces interface-name interface-options]
bert-algorithm algorithm;
```

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 O.152 standard)
pseudo-2e15-o151 Pattern is 2^15 - 1 (per O.151 standard)
pseudo-2e20-o151 Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e20-o153 Pattern is 2^20 - 1 (per O.153 standard)
```

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the [Junos OS System Basics and Services Command Reference](#).

## Configuring the T1 Buildout

A T1 interface has five possible setting ranges for the T1 line buildout: **0-132**, **133-265**, **266-398**, **399-531**, or **532-655** feet. By default, the T1 interface uses the shortest setting (0-132).

To have the interface drive a line at one of the longer distance ranges, include the **buildout** statement with the appropriate value at the **[edit interfaces interface-name t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]
buildout value;
```

## Configuring T1 Byte Encoding

By default, T1 interfaces use a byte encoding of 8 bits per byte (nx64). You can configure an alternative byte encoding of 7 bits per byte (nx56).

To have the interface use 7 bits per byte encoding, include the **byte-encoding** statement at the **[edit interfaces interface-name t1-options]** hierarchy level, specifying the **nx56** option:

```
[edit interfaces interface-name t1-options]
byte-encoding nx56;
```

To explicitly configure nx64 byte encoding, include the **byte-encoding** statement at the **[edit interfaces interface-name t1-options]** hierarchy level, specifying the **nx64** option:

```
[edit interfaces interface-name t1-options]
```

`byte-encoding nx64;`

## Configuring T1 CRC Error Major Alarm Thresholds

---

Junos OS collects CRC errors from PICs every second. On Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, and Channelized T3 IQ PICs, you can configure major error thresholds for T1 CRC errors.

When the threshold is exceeded for 1 second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared. You can display the CRC error threshold configuration, CRC errors count, and the alarm condition using the **show interfaces extensive** command.

To configure a CRC major error threshold, include the **crc-major-alarm-threshold** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the errors per bits as **1e-3**, **5e-4**, **1e-4**, **5e-5** or **1e-5**:

```
[edit interfaces interface-name t1-options]
  crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
```

To configure a T1 CRC error major alarm for five errors in  $10^{-4}$  bits, include the **crc-major-alarm-threshold** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **5e-4** option:

```
[edit interfaces interface-name t1-options]
  crc-major-alarm-threshold 5e-4;
```

All settings except **1e-5** use a 10-second monitoring period. The **1e-5** value uses a 50-second monitoring period.

## Configuring T1 CRC Error Minor Alarm Thresholds

---

Junos OS collects CRC errors from PICs every second. On Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, and Channelized T3 IQ PICs, you can configure minor error thresholds for T1 CRC errors.

When the threshold is exceeded for 1 second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared. You can display the CRC error threshold configuration, CRC errors count, and the alarm condition using the **show interfaces extensive** command.

To configure a CRC minor error threshold, include the **crc-minor-alarm-threshold** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the errors per bits as **1e-3**, **5e-4**, **1e-4**, **5e-5**, **1e-5**, **5e-6**, or **1e-6**:

```
[edit interfaces interface-name t1-options]
  crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
```

To configure a T1 CRC error minor alarm for five errors in  $10^{-4}$  bits, include the **crc-minor-alarm-threshold** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **5e-4** option:

```
[edit interfaces interface-name t1-options]
  crc-minor-alarm-threshold 5e-4;
```

The 10-second monitoring period is used for values **1e-3**, **5e-4**, **1e-4**, and **5e-5**. The **1e-5** value uses a 50-second monitoring period. The **5e-6** value uses a 100-second monitoring period. The **1e-6** value uses a 500-second monitoring period.

## Configuring T1 Data Inversion

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the **invert-data** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]
invert-data;
```

When you enable data inversion, all data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Data inversion is normally used only in AMI mode to guarantee ones density in the transmitted stream.

## Configuring the T1 Frame Checksum

By default, T1 interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the **fcs 32** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces t1-fpc/pic/port t1-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs 16** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]
fcs 16;
```

## Configuring the T1 Remote Loopback Response

The T1 facilities data-link loop request signal is used to communicate various network information in the form of in-service monitoring and diagnostics. Extended superframe, through the facilities data link (FDL), supports nonintrusive signaling and control, thereby offering clear-channel communication. Remote loopback requests can be over the FDL or inband. To configure the router to respond to remote loopback requests, include the **remote-loopback-respond** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]
remote-loopback-respond;
```

By default, the router does not respond to remote loopback requests.

## Configuring T1 Framing

---

By default, T1 interfaces use extended superframe framing format. You can configure SF (superframe) as an alternative.

To have the interface use the SF framing format, include the **framing** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **sf** option:

```
[edit interfaces interface-name t1-options]  
framing sf;
```

To explicitly configure ESF framing, include the **framing** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **esf** option:

```
[edit interfaces interface-name t1-options]  
framing esf;
```

## Configuring T1 Line Encoding

---

By default, T1 interfaces use B8ZS line encoding. You can configure AMI line encoding if necessary.

To have the interface use AMI line encoding, include the **line-encoding** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **ami** option:

```
[edit interfaces interface-name t1-options]  
line-encoding ami;
```

To explicitly configure B8ZS line encoding, include the **line-encoding** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **b8zs** option:

```
[edit interfaces interface-name t1-options]  
line-encoding b8zs;
```

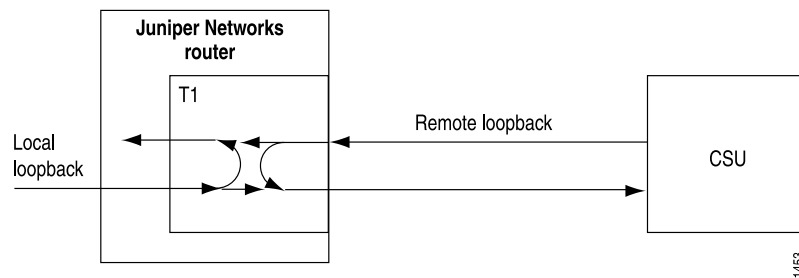
For M Series and T Series routers, you must set the line encoding parameter for paired ports to the same value. Ports 0 and 1 must share the same value, and likewise ports 2 and 3 must share the same value, but ports 0 and 1 can have a different value from that of ports 2 and 3.

## Configuring T1 Loopback Capability

---

You can configure loopback capability between the local T1 interface and the remote channel service unit (CSU), as shown in [Figure 31 on page 187](#). You can configure the loopback to be local or remote. With local loopback, the T1 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the T1 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU.

Figure 31: Remote and Local T1 Loopback



To configure loopback capability on a T1 interface, include the **loopback** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]
  loopback (local | payload | remote);
```

Packets can be looped on either the local router or the remote CSU. Local and remote loopback loop back both data and clocking information.

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.

For more information about configuring BERT, see *Interface Diagnostics*. For more information about using operational mode commands to test interfaces, see the *Junos OS System Basics and Services Command Reference*.

For channelized T3, T1, and NxDS0 intelligent queuing (IQ) interfaces only, you can include the **loopback payload** statement in the configuration to loop back data only (without clocking information) on the remote router's PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the **loopback payload** statement at the **[edit interfaces *ct3-fpc/pic/port*]** and **[edit interfaces *t3-fpc/pic/port:channel*]** hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement in the configuration at the **[edit interfaces *t1-fpc/pic/port:channel*]** hierarchy level; it is ignored if included at the **[edit interfaces *ct1-fpc/pic/port*]** hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote router. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the **[edit interfaces *interface-name*]** hierarchy level and the **loopback local** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, as shown in the following example:

```
[edit interfaces]
t1-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
  t1-options {
    loopback local;
  }
  unit 0 {
```

```
family inet {  
    address 10.100.100.1/24;  
}  
}
```

With this configuration, the link stays up, so you can loop ping packets to a remote router. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]  
user@host# delete interfaces t1-fpc/pic/port t1-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command, for example:

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

---

## Configuring the T1 Idle Cycle Flag

By default, a T1 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name t1-options]  
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name t1-options]  
idle-cycle-flag flags;
```

---

## Configuring T1 Start and End Flags

By default, a T1 interface shares the transmission of the start and end flags.

To configure a T1 interface to wait two idle cycles between the start and end flags, include the **start-end-flag** statement with the **filler** option at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]  
start-end-flag filler;
```

To revert to the default behavior, sharing the transmission of start and end flags, include the **start-end-flag** statement with the **shared** option at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]  
start-end-flag shared;
```



## Configuring Fractional T1 Time Slots

By default, all the time slots on a T1 interface are used. To configure the number of time slots allocated to a fractional T1 interface, include the **timeslots** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level:

```
[edit interfaces interface-name t1-options]  
timeslots time-slot-range;
```

For T1 interfaces, the time-slot range is from 1 through 24. 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.

### Example: Configuring Fractional T1 Time Slots

Use Time Slots 1 Through 10	[edit interfaces <i>interface-name</i> t1-options] timeslots 1-10;
Use Time Slots 1 Through 5, 10, and 24	[edit interfaces <i>interface-name</i> t1-options] timeslots 1-5,10,24;
Use the First Four Odd-Numbered Time Slots	[edit interfaces <i>interface-name</i> t1-options] timeslots 1,3,5,7;



## CHAPTER 14

# Configuring T3 Interfaces

- [T3 Interfaces Overview on page 191](#)
- [Configuring T3 Physical Interface Properties on page 192](#)
- [Configuring T3 BERT Properties on page 192](#)
- [Disabling T3 C-Bit Parity Mode on page 193](#)
- [Configuring the T3 CSU Compatibility Mode on page 194](#)
- [Configuring the T3 Frame Checksum on page 197](#)
- [Configuring the T3 FEAC Response on page 197](#)
- [Configuring the T3 Idle Cycle Flag on page 198](#)
- [Configuring the T3 Line Buildout on page 198](#)
- [Configuring T3 Loopback Capability on page 198](#)
- [Configuring T3 HDLC Payload Scrambling on page 200](#)
- [Configuring T3 Start and End Flags on page 201](#)
- [Examples: Configuring T3 Interfaces on page 201](#)

### T3 Interfaces Overview

---

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

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- Bellcore TR-TSY-000009
- AT&T Pub 5404
- ITU G.751, G.703, G823

## Configuring T3 Physical Interface Properties

---

To configure T3-specific physical interface properties, 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);  
  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);  
  (payload-scrambler | no-payload-scrambler);  
  start-end-flag value;  
}
```

## Configuring T3 BERT Properties

---

This section discusses BERT properties for the T3 interface specifically. For general information about the Junos implementation of the BERT procedure, see Interface Diagnostics.

You can configure a T3 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream by including the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-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. The default algorithm for the DS3 BERT procedure is **pseudo-2e15-o151** (pattern is  $2^{15}-1$ , as defined in the CCITT/ITU O.151 standard).

On T3 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the **[edit interfaces *interface-name* *interface-options*]** hierarchy level:

```
[edit interfaces interface-name interface-options]
bert-algorithm algorithm;
```

For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t3-0/0/0 t3-options]
user@host# set bert-algorithm ?
Possible completions:
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-2e10 Pattern is 2^10 - 1
...
```



**NOTE:** 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**.

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the [Junos OS System Basics and Services Command Reference](#).

#### Related Documentation

- [bert-algorithm on page 229](#)
- [bert-error-rate on page 231](#)
- [bert-period on page 233](#)
- [t3-options on page 295](#)
- Interface Diagnostics

## Disabling T3 C-Bit Parity Mode

C-bit parity mode 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 FEBE, FEAC, terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. When C-bit parity mode is disabled, the basic T3 framing mode (M23) is used.

By default, C-bit parity mode is enabled. To disable C-bit parity mode and use M23 framing for your T3 link, include the **no-cbit-parity** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
no-cbit-parity;
```



**NOTE:** For ATM, ATM2 IQ2, IQ2-E, and T3 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.

To return to the default, enabling C-bit parity mode, delete the **no-cbit-parity** statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options no-cbit-parity
```

To explicitly enable C-bit parity mode, include the **cbit-parity** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
cbit-parity;
```

---

## Configuring the T3 CSU Compatibility Mode

---

Subrating a T3 interface reduces the maximum allowable peak rate by limiting the HDLC-encapsulated payload. Subrate modes configure the PIC to connect with channel service units (CSUs) that use proprietary methods of multiplexing.

You can configure T3 interfaces to be compatible with a Digital Link, Kentrox, or Larscom CSUs. For T3 intelligent queuing (IQ) channels only, you can also configure Adtran or Verilink CSU compatibility.



**NOTE:** To subrate an E3 interface to be compatible with a Kentrox CSU, you must have an IQ or IQE based PIC. Non-IQ or IQE PICs allow a commit of the configuration, but the interfaces remain at the full E3 rate for the Kentrox compatibility mode.

4-port and 2-port channelized DS3(T3) IQ PICs do not support Adtran and Verilink compatibility modes. If configured, the default mode is applied on both the interfaces.

To configure a T3 interface so that it is compatible with the CSU at the remote end of the line, include the **compatibility** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
```

The subrate of a T3 interface must exactly match that of the remote CSU. To specify the subrate, include the **subrate** statement in the configuration:

- For Adtran CSUs, specify the subrate as a number from 1 through 588 that exactly matches the value configured on the CSU. A subrate value of 588 corresponds to 44.2 Mbps, or 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to  $44.2 / 588$ , which is 75.17 Kbps, or 0.17 percent of the HDLC-encapsulated payload.
- For Digital Link CSUs, specify the subrate as the data rate you configured on the CSU in the format xKb or x.xMb. For Digital Link CSUs, you can specify the subrate value to match the data rate configured on the CSU in the format **xkb** or **x.xMb**. You can configure the subrate values shown in [Table 20 on page 195](#).
- For Kentrox CSUs, specify the subrate as a number from 1 through 69 that exactly matches the value configured on the CSU. A subrate value of 69 corresponds to 34.995097 Mbps, or 79.17 percent of the HDLC-encapsulated payload (44.2 Mbps). A subrate value of 1 corresponds to 999.958 Kbps, which is 2.26 percent of the HDLC-encapsulated payload. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.
- For Larscom CSUs, specify the subrate as a number from 1 through 14 that exactly matches the value configured on the CSU. A subrate value of 14 corresponds to 44.2 Mbps, or 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to  $44.2 / 14$ , which is 3.16 Mbps, 7.15 percent of the HDLC-encapsulated payload.
- For Verilink CSUs, specify the subrate as a number from 1 through 28 that exactly matches the value configured on the CSU. To calculate the maximum allowable peak rate, multiply the configured subrate by 1.578 Mbps. For example, a subrate value of 28 corresponds to  $28 \times 1.578$  Mbps, which is 44.2 Mbps, 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to 1.578 Mbps, 3.57 percent of the HDLC-encapsulated payload. A subrate value of 20 corresponds to  $20 \times 1.578$  Mbps, which is 31.56 Mbps, 71.42 percent of the HDLC-encapsulated payload.



**NOTE:** Verilink configuration is not functional if an IQ interface is paired with an IQE interface.

Verilink configuration on an IQE PIC is also not functional when the PIC is connected to any other vendor equipment that operates in Verilink Port B mode. The Verilink configuration on an IQE PIC works only when it is paired with another IQE PIC or any other vendor equipment that operates in Port A mode.

**Table 20: Subrate Values for T3 Digital Link Compatibility Mode**

301 Kbps	9.3 Mbps	18.3 Mbps	27.4 Mbps	36.4 Mbps
601 Kbps	9.6 Mbps	18.6 Mbps	27.7 Mbps	36.7 Mbps
902 Kbps	9.9 Mbps	18.9 Mbps	28.0 Mbps	37.0 Mbps
1.2 Mbps	10.2 Mbps	19.2 Mbps	28.3 Mbps	37.3 Mbps

**Table 20: Subrate Values for T3 Digital Link Compatibility Mode (*continued*)**

1.5 Mbps	10.5 Mbps	19.5 Mbps	28.6 Mbps	37.6 Mbps
1.8 Mbps	10.8 Mbps	19.8 Mbps	28.9 Mbps	37.9 Mbps
2.1 Mbps	11.1 Mbps	20.1 Mbps	29.2 Mbps	38.2 Mbps
2.4 Mbps	11.4 Mbps	20.5 Mbps	29.5 Mbps	38.5 Mbps
2.7 Mbps	11.7 Mbps	20.8 Mbps	29.8 Mbps	38.8 Mbps
3.0 Mbps	12.0 Mbps	21.1 Mbps	30.1 Mbps	39.1 Mbps
3.3 Mbps	12.3 Mbps	21.4 Mbps	30.4 Mbps	39.4 Mbps
3.6 Mbps	12.6 Mbps	21.7 Mbps	30.7 Mbps	39.7 Mbps
3.9 Mbps	12.9 Mbps	22.0 Mbps	31.0 Mbps	40.0 Mbps
4.2 Mbps	13.2 Mbps	22.3 Mbps	31.3 Mbps	40.3 Mbps
4.5 Mbps	13.5 Mbps	22.6 Mbps	31.6 Mbps	40.6 Mbps
4.8 Mbps	13.8 Mbps	22.9 Mbps	31.9 Mbps	40.9 Mbps
5.1 Mbps	14.1 Mbps	23.2 Mbps	32.2 Mbps	41.2 Mbps
5.4 Mbps	14.4 Mbps	23.5 Mbps	32.5 Mbps	41.5 Mbps
5.7 Mbps	14.7 Mbps	23.8 Mbps	32.8 Mbps	41.8 Mbps
6.0 Mbps	15.0 Mbps	24.1 Mbps	33.1 Mbps	42.1 Mbps
6.3 Mbps	15.3 Mbps	24.4 Mbps	33.4 Mbps	42.4 Mbps
6.6 Mbps	15.6 Mbps	24.7 Mbps	33.7 Mbps	42.7 Mbps
6.9 Mbps	15.9 Mbps	25.0 Mbps	34.0 Mbps	43.0 Mbps
7.2 Mbps	16.2 Mbps	25.3 Mbps	34.3 Mbps	43.3 Mbps
7.5 Mbps	16.5 Mbps	25.6 Mbps	34.6 Mbps	43.6 Mbps
7.8 Mbps	16.8 Mbps	25.9 Mbps	34.9 Mbps	43.9 Mbps
8.1 Mbps	17.1 Mbps	26.2 Mbps	35.2 Mbps	44.2 Mbps
8.4 Mbps	17.4 Mbps	26.5 Mbps	35.5 Mbps	



**Table 20: Subrate Values for T3 Digital Link Compatibility Mode (*continued*)**

8.7 Mbps	17.7 Mbps	26.8 Mbps	35.8 Mbps
9.0 Mbps	18.0 Mbps	27.1 Mbps	36.1 Mbps

For information about subrating an E3 interface, see [“Configuring the E3 CSU Compatibility Mode” on page 175](#).

## Configuring the T3 Frame Checksum

By default, T3 interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

On a channelized OC12 interface, the **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.

To configure a 32-bit checksum, include the **fcs** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
fcs 16;
```

## Configuring the T3 FEAC Response

The T3 far-end alarm and control (FEAC) signal 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.

By default, the router does not respond to FEAC requests. To allow the remote CSU to place the local router into loopback, you must configure the router to respond to the CSU's FEAC request by including the **feac-loop-respond** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
feac-loop-respond;
```

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.

To explicitly configure the router not to respond to FEAC requests, include the **no-feac-loop** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]  
no-feac-loop-respond;
```

---

## Configuring the T3 Idle Cycle Flag

By default, a T3 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name t3-options]  
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name t3-options]  
idle-cycle-flag flags;
```

---

## Configuring the T3 Line Buildout

A T3 interface has two settings for the T3 line buildout: a short setting, which is less than 255 feet (about 68 meters), and a long setting, which is greater than 255 feet and less than 450 feet (about 137 meters). By default, the interface uses the short setting.

The **long-buildout** and **no-long-buildout** statements apply only to copper-cable-based T3 interfaces. You cannot configure a line buildout for a DS3 channel on a channelized OC12 interface, which runs over fiber-optic cable. If you configure this statement on a channelized OC12 interface, it is ignored.

To have the interface drive a line that is longer than 255 feet and shorter than 450 feet, include the **long-buildout** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]  
long-buildout;
```

To explicitly configure the default short line buildout, include the **no-long-buildout** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]  
no-long-buildout;
```

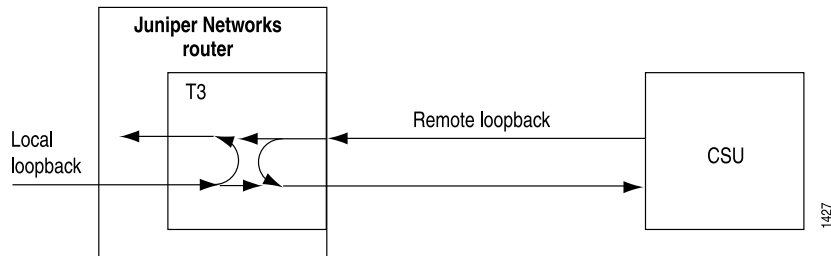
---

## Configuring T3 Loopback Capability

You can configure loopback capability between the local T3 interface and the remote CSU, as shown in [Figure 32 on page 199](#). You can configure the loopback to be local or remote. With local loopback, the T3 interface can transmit packets to the CSU, but

receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the T3 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU.

**Figure 32: Remote and Local T3 Loopback**



To configure loopback capability on a T3 interface, include the **loopback** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
  loopback (local | payload | remote);
```

Packets can be looped on either the local router or the remote CSU. Local and remote loopback loop back both data and clocking information.

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, you issue the **test interface** command.

For more information about configuring BERT, see *Interface Diagnostics*. For more information about using operational mode commands to test interfaces, see the *Junos OS System Basics and Services Command Reference*.

For channelized T3, T1, and NxDS0 IQ interfaces only, you can include the **loopback payload** statement in the configuration to loop back data only (without clocking information) on the remote router's PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the **loopback payload** statement at the **[edit interfaces *ct3-fpc/pic/port*]** and **[edit interfaces *t3-fpc/pic/port:channel*]** hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement in the configuration at the **[edit interfaces *t1-fpc/pic/port:channel*]** hierarchy level; it is ignored if included at the **[edit interfaces *ct1-fpc/pic/port*]** hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote router. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the **[edit interfaces *interface-name*]** hierarchy level and the **loopback local** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level, as shown in the following example:

```
[edit interfaces]
  t3-1/0/0 {
    no-keepalives;
    encapsulation cisco-hdlc;
```

```
t3-options {  
  loopback local;  
}  
unit 0 {  
  family inet {  
    address 10.100.100.1/24;  
  }  
}
```

With this configuration, the link stays up, so you can loop ping packets to a remote router. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]  
user@host# delete interfaces t3-fpc/pic/port t3-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command, for example:

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

For channel 0 on channelized interfaces only, you can include the **loopback** statement at the **[edit interfaces *interface-name* *interface-type-options*]** hierarchy level. The loopback setting configured for channel 0 applies to all channels on the channelized interface. The **loopback** statement is ignored if you include it at this hierarchy level in the configuration of other channels. To configure loopbacks on individual channels, you must include the **channel-type-options loopback** statement in the configuration for each channel. This allows each channel to be put in loopback mode independently.

For example, for DS3 channels on a channelized OC12 interface, the **sonet-options loopback** statement is supported only for channel 0; it is ignored if included in the configuration for channels 1 through 11. The SONET loopback configured for channel 0 applies to all 12 channels equally. To configure loopbacks on the individual DS3 channels, you must include the **t3-options loopback** statement in the configuration for each channel. This allows each DS3 channel can be put in loopback mode independently.

---

## Configuring T3 HDLC Payload Scrambling

T3 HDLC payload scrambling, which is disabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.

On a channelized OC12 interface, the SONET **payload-scrambler** statement is ignored. To configure scrambling on the DS3 channels on the interface, you can include the **t3-options payload-scrambler** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level for each DS3 channel.

If you enable HDLC payload scrambling on a T3 interface, you must also configure the interface to be compatible with the channel service unit (CSU) at the remote end of the

line before you commit the interface configuration. For information about subrating a T3 interface, see [“Configuring the T3 CSU Compatibility Mode” on page 194](#).

```
[edit interfaces interface-name t3-options]
compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
payload-scrambler;
```

To explicitly disable HDLC payload scrambling, include the **no-payload-scrambler** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
no-payload-scrambler;
```

To disable payload scrambling again (return to the default), delete the **payload-scrambler** statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options payload-scrambler
```

## Configuring T3 Start and End Flags

By default, a T3 interface shares the transmission of the start and end flags.

To configure a T3 interface to wait two idle cycles between the start and end flags, include the **start-end-flag** statement with the **filler** option at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
start-end-flag filler;
```

To revert to the default behavior, sharing the transmission of start and end flags, include the **start-end-flag** statement with the **shared** option at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
start-end-flag shared;
```

## Examples: Configuring T3 Interfaces

T3 interfaces can use PPP, Cisco HDLC, or Frame Relay encapsulation.

### PPP Encapsulation on a DS3 PIC

```
[edit]
interfaces {
  t3-0/0/0 {
    encapsulation ppp;
    t3-options {
      no-long-buildout;
      compatibility-mode larscom;
      payload-scrambler;
    }
    unit 0 {
      family inet {
        address 10.0.0.1/32 {
          destination 10.0.0.2;
        }
      }
    }
  }
}
```

```
        family iso;
      }
    }
  }

Cisco HDLC Encapsulation on a DS3 PIC [edit]
interfaces {
  t3-0/0/1 {
    encapsulation cisco-hdlc;
    t3-options {
      no-long-buildout;
      compatibility-mode larscom;
      payload-scrambler;
    }
    unit 0 {
      family inet {
        address 10.0.0.1/32 {
          destination 10.0.0.2;
        }
      }
      family iso;
    }
  }
}
```

Configure Frame Relay encapsulation on two routers, where one router is a DTE device and the other is a DCE device:

```
On DTE Router [edit]
interfaces {
  t3-1/0/1 {
    encapsulation frame-relay;
    t3-options {
      no-long-buildout;
      compatibility-mode larscom;
      payload-scrambler;
    }
    unit 1 {
      dlci 1;
      family inet {
        address 10.0.0.1/32 {
          destination 10.0.0.2;
        }
      }
      family iso;
    }
    unit 2 {
      dlci 2;
      family inet {
        address 10.0.0.3/32 {
          destination 10.0.0.4;
        }
      }
      family iso;
    }
  }
}
```

```
}
```

On DCE Router

```
[edit]
interfaces {
  t3-1/1/1 {
    dce;
    encapsulation frame-relay;
    t3-options {
      no-long-buildout;
      compatibility-mode larscom;
      payload-scrambler;
    }
    unit 1 {
      dlci 1;
      family inet {
        address 10.0.0.2/32 {
          destination 10.0.0.1;
        }
      }
      family iso;
    }
    unit 2 {
      dlci 2;
      family inet {
        address 10.0.0.4/32 {
          destination 10.0.0.3;
        }
      }
      family iso;
    }
  }
}
```





## PART 4

# Configuring Frame Relay

- [Configuring Frame Relay on page 207](#)



## CHAPTER 15

# Configuring Frame Relay

- [Frame Relay Overview on page 207](#)
- [Configuring Frame Relay Interface Encapsulation on page 208](#)
- [Configuring Frame Relay Control Bit Translation on page 212](#)
- [Configuring the Media MTU on Frame Relay Interfaces on page 213](#)
- [Setting the Protocol MTU with Frame Relay Encapsulation on page 214](#)
- [Configuring Frame Relay Keepalives on page 214](#)
- [Configuring Inverse Frame Relay ARP on page 216](#)
- [Configuring the Router as a DCE with Frame Relay Encapsulation on page 217](#)
- [Configuring Frame Relay DLCIs on page 217](#)

### Frame Relay Overview

---

The Frame Relay protocol allows network designers to reduce costs by using shared facilities that are managed by a Frame Relay service provider. Users pay fixed charges for the local connections from each site in the Frame Relay network to the first point of presence (POP) in which the provider maintains a Frame Relay switch. The portion of the network between the endpoint switches is shared by all the customers of the service provider, and individual data-link connection identifiers (DLCIs) are assigned to ensure that each customer receives only their own traffic.

Users contract with their providers for a specific minimum portion of the shared bandwidth committed information rate (CIR) and for a maximum allowable peak rate, burst information rate (BIR). Depending on the terms of the contract, traffic exceeding the CIR can be marked as eligible for discard, in the event of network congestion, or a best-effort term can apply up to the BIR rate.

Frame Relay does not require private and permanently connected wide area network facilities, unlike some older WAN protocols.

Frame Relay was developed as a replacement for the older and much slower X.25 protocol. It scales to much higher data rates because it does not require explicit acknowledgment of each frame of data.

You can configure the Frame Relay protocol on SONET/SDH, E1/E3, and T1/T3 physical router interfaces, and on the channelized DS3, channelized OC12, channelized T3 intelligent queuing (IQ), channelized OC12 IQ, and channelized E1 IQ interfaces.

Starting with Junos OS Release 11.2, multiple DLCIs are supported on a Frame Relay interface for End-to-End Multilink Frame Relay Implementation Agreement (FRF.15) bundles. Each DLCI should be part of a unique bundle and it is not possible to have more than one DLCI from the same Frame Relay interface in the same bundle. This feature enables you to have FRF.12 functionality over multiple DLCIs per Frame Relay interface.



**NOTE:** This capability is available on all M Series and MX Series routers supporting Layer 2 services.

All Multiservices PICs and Multiservices Dense Port Concentrators support this feature. But Adaptive Services PICs (AS PICs) do not support the feature. DLCIs having different bandwidths that are part of the same bundle are also not supported.

---

## Configuring Frame Relay Interface Encapsulation

Point-to-Point Protocol (PPP) encapsulation is the default encapsulation type for physical interfaces. You need not configure encapsulation for any physical interfaces that support PPP encapsulation. If you do not configure encapsulation, PPP is used by default. For physical interfaces that do not support PPP encapsulation, you must configure an encapsulation to use for packets transmitted on the interface. You can optionally configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types.

For more information, see the following sections:

- [Configuring the Frame Relay Encapsulation on a Physical Interface on page 208](#)
- [Configuring the Frame Relay Encapsulation on a Logical Interface on page 211](#)

### Configuring the Frame Relay Encapsulation on a Physical Interface

For Frame Relay interfaces, configure Frame Relay encapsulation on the physical interface. This encapsulation is defined in RFC 1490, *Multiprotocol Interconnect over Frame Relay*. SONET/SDH and T3 interfaces can use Frame Relay encapsulation.

To configure Frame Relay encapsulation on a physical interface, include the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
  encapsulation type;
```

When you configure a multipoint encapsulation (such as Frame Relay), the physical interface can have multiple logical units, and the units can be either point-to-point or multipoint.

The encapsulation type can be one of the following:

- Flexible Frame Relay (**flexible-frame-relay**)—IQ interfaces can use flexible Frame Relay encapsulation. You use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.
- Frame Relay (**frame-relay**)—Defined in RFC 1490. E1, E3, link services, SONET/SDH, T1, T3, and voice services interfaces can use Frame Relay encapsulation. Five related versions are supported:
  - Circuit cross-connect (CCC) version (**frame-relay-ccc**)—The same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. The logical interface must also have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
  - Translational cross-connect (TCC) version (**frame-relay-tcc**)—Similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
  - Extended CCC version (**extended-frame-relay-ccc**)—This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC. The logical interface must have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
  - Extended TCC version (**extended-frame-relay-tcc**)—Similar to extended Frame Relay CCC, this encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC, which is used for circuits with different media on either side of the connection.
  - Port CCC version (**frame-relay-port-ccc**)—Defined in the Internet Engineering Task Force (IETF) document, *Frame Relay Encapsulation over Pseudo-Wires* (expired December 2002). This encapsulation type allows you to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. The connection between the two CE routers can be either user-to-network interface (UNI) or network-to-network interface (NNI); this is completely transparent to the PE routers. The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
- Frame Relay Ether Type (**frame-relay-ether-type**)—Physical interfaces can use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. IETF frame relay encapsulation identifies the payload format using NLPID and SNAP formats. Cisco-compatible Frame Relay encapsulation uses the Ethernet type to identify the type of payload. Two related versions are supported:
  - TCC version (**frame-relay-ether-type-tcc**)—Cisco-compatible Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to TCC. This encapsulation is used for circuits with different media on either side of the connection.
  - Extended TCC version (**extended-frame-relay-ether-type-tcc**)—This encapsulation allows you to dedicate Cisco-compatible Frame Relay TCC for DLCIs 1 through 1022. This encapsulation is used for circuits with different media on either side of the

connection. Extended Frame Relay ether type TCC encapsulation is supported on the same PICs as extended Frame Relay TCC encapsulation.



**NOTE:** When the encapsulation type is set to Cisco-compatible Frame Relay encapsulation, ensure that the LMI type is set to ANSI or Q933-A.

Support for extended Frame Relay and flexible Frame Relay differs by PIC type, as shown in [Table 21 on page 210](#).

**Table 21: PIC Support for Enhanced Frame Relay Encapsulation Types**

PIC Type	Extended Frame Relay CCC	Extended Frame Relay TCC	Flexible Frame Relay
<b>Intelligent Queuing</b>			
1-port Channelized CHOC12 IQ	Yes	Yes	Yes
4-port Channelized DS3 IQ	Yes	Yes	Yes
10-port Channelized E1 IQ	Yes	Yes	Yes
4-port E3 IQ	Yes	Yes	Yes
1-port Channelized STM1 IQ	Yes	Yes	Yes
4-port OC48/STM16 Type 3 PIC	Yes	Yes	Yes
<b>SONET/SDH</b>			
1-port OC12	Yes	Yes	No
2-port OC3	Yes	Yes	No
1-port OC48	Yes	Yes	No
1-port OC192	Yes	Yes	No
1-port STM16 SDH, SMSR	Yes	Yes	No
<b>Others</b>			
4-port E1	No	No	No
4-port T1	No	No	No
4-port T3	No	No	No
10-port Channelized E1	No	No	No

Table 21: PIC Support for Enhanced Frame Relay Encapsulation Types (*continued*)

PIC Type	Extended Frame Relay CCC	Extended Frame Relay TCC	Flexible Frame Relay
2-port Channelized DS3	No	No	No
1-port Channelized OC12, SMIR	No	No	No
4-port Channelized DS3	No	No	No
1-port Channelized STM1, SMIR	No	No	No
2-port Serial	No	No	No

#### Example: Configuring the Encapsulation on a Physical Interface

Configure Frame Relay encapsulation on a SONET/SDH interface. The second and third **family** statements allow Intermediate System-to-Intermediate System (IS-IS) and Multiprotocol Label Switching (MPLS) to run on the interface.

```
[edit interfaces]
so-7/0/0 {
  encapsulation frame-relay;
  unit 0 {
    point-to-point;
    family inet {
      address 192.168.1.113/32 {
        destination 192.168.1.114;
      }
    }
    family iso;
    family mpls;
  }
}
```

#### Configuring the Frame Relay Encapsulation on a Logical Interface

Generally, you configure an interface's encapsulation at the **[edit interfaces *interface-name*]** hierarchy level. However, for Frame Relay encapsulation, you can also configure the encapsulation type that is used inside the Frame Relay packet itself. To do this, include the **encapsulation** statement, specifying the **frame-relay-ccc**, **frame-relay-ppp**, **frame-relay-tcc**, **frame-relay-ether-type**, or **frame-relay-ether-type-tcc** option:

```
encapsulation (frame-relay-ccc | frame-relay-ppp | frame-relay-tcc |
  frame-relay-ether-type | frame-relay-ether-type-tcc);
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number*]**

- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

## Configuring Frame Relay Control Bit Translation

---

On interfaces with Frame Relay CCC encapsulation, you can configure Frame Relay control bit translation, as defined in the IETF documents:

- Internet draft draft-martini-frame-encap-mpls-00.txt, *Frame Relay Encapsulation over Pseudo-Wires* (expired December 2002)
- Internet draft draft-martini-l2circuit-encap-mpls-07.txt, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks* (expired December 2004)

To support Frame Relay services over IP and MPLS backbones using Layer 2 VPNs and Layer 2 circuits, you can configure translation of the Frame Relay control bits. When you configure translation of Frame Relay control bits, the bits are mapped into the Layer 2 circuit control word and preserved across the IP or MPLS backbone.

Junos OS allows you to translate the following Frame Relay control bits:

- Discard eligibility (DE)—A header bit used to identify lower priority traffic that can be dropped during periods of congestion.
- Forward explicit congestion notification (FECN)—A header bit transmitted by the source router requesting that the destination router slow down its requests for data.
- Backward explicit congestion notification (BECN)—A header bit transmitted by the destination router requesting that the source router send data more slowly.

By default, translation of Frame Relay control bits is disabled. If you enable Frame Relay control bit translation, the bits are translated in both directions (CE to PE and PE to CE):

- From CE to PE—At ingress, the DE, FECN, and BECN header bits from the incoming Frame Relay header are mapped to the control word.
- From PE to CE—At egress, the DE, FECN, and BECN header bits from the control word are mapped to the outgoing Frame Relay header.

The Frame Relay control bits do not map to MPLS EXP labels, and do not affect class-of-service (CoS) behavior inside the provider network.

You enable or explicitly disable translation of Frame Relay control bits by including the **translate-discard-eligible** and **translate-fecn-and-becn** statements:

```
(translate-discard-eligible | no-translate-discard-eligible);  
(translate-fecn-and-becn | no-translate-fecn-and-becn);
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family ccc]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family ccc]



If you enable or disable Frame Relay control bit translation on one CE-facing interface, you must configure the same Frame Relay control bit translation settings on the other CE-facing interface.

If you change the Frame Relay control bit translation settings, the circuit goes down and comes back up, which might result in traffic loss for a few seconds.

If you enable Frame Relay control bit translation, the number of supportable Layer 2 virtual private networks (VPNs) and Layer 2 circuits is reduced to one eighth of what the router can support without Frame Relay control bit translation enabled.

You can classify and rewrite the control word DE bit based on the packet loss priority (PLP) by using the **translate-plp-control-word-de** statement at the **[edit interfaces interface-name unit logical-unit-number family ccc]** hierarchy level.

- When you configure the **translate-plp-control-word-de** statement on the ingress PE router, the DE bit in the control word is rewritten based on the PLP.
- When you configure the **translate-plp-control-word-de** statement on the egress PE router, the PLP is derived based on the control word DE bit and the DE bit in the outgoing Frame Relay header is rewritten based on the PLP.
- By default, control word classification and rewrite is disabled.

The mapping of the PLP to the DE bit in the control word and the outgoing Frame Relay packet is fixed. For rewriting, the PLP values **low** and **medium-low** are mapped to the DE bit **0** and the PLP values **high** and **medium-high** are mapped to the DE bit **1**. For classifying, the DE bit **0** is mapped to the PLP value **low** and the DE bit **1** is mapped to the PLP value **high**.



**NOTE:** The **translate-discard-eligible** and **translate-plp-control-word-de** statements are mutually exclusive—that is, you can configure only one of these statements.

For ATM2 IQ interfaces, the control word contains a field to carry ATM cell loss priority (CLP) information by default. For more information, see *Configuring Layer 2 Circuit Transport Mode*.

For more information about Layer 2 circuits, see the *Junos OS VPNs Configuration Guide* and the *Junos OS Routing Protocols Configuration Guide*. For a comprehensive example, see the *Junos OS Feature Guides*.

## Configuring the Media MTU on Frame Relay Interfaces

For Frame Relay interfaces, the default media maximum transmission unit (MTU) is 4482 bytes. (For a complete list of MTU values, see *Configuring the Media MTU*.)

To modify the default media MTU size for a physical interface, include the **mtu** statement at the **[edit interfaces interface-name]** hierarchy level:

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

**mtu** *bytes*;

If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. You can include the **mtu** statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

For more information, see “Setting the Protocol MTU with Frame Relay Encapsulation” on page 214.

---

## Setting the Protocol MTU with Frame Relay Encapsulation

For each interface, you can configure an interface-specific MTU by including the **mtu** statement at the [edit interfaces *interface interface-name*] hierarchy level. If you need to modify this MTU for a particular protocol family, include the **mtu** statement:

**mtu** *mtu*;

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

For Frame Relay encapsulation, the default protocol MTU is 4470 bytes.

If you increase the size of the protocol MTU, you must ensure that the size of the media MTU is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. (You configure the media MTU by including the **mtu** statement at the [edit interfaces *interface-name*] hierarchy level, as discussed in “Configuring the Media MTU on Frame Relay Interfaces” on page 213.)

When the family is **mpls**, the default protocol MTU is 1488 bytes. MPLS packets are 1500 bytes and have 4 to 12 bytes of overhead.

---

## Configuring Frame Relay Keepalives

By default, physical interfaces configured with High-level Data Link Control (HDLC) or Point-to-Point Protocol (PPP) encapsulation send keepalive packets at 10-second intervals. The Frame Relay term for keepalives is Local Management Interface (LMI) packets; note that the Junos OS supports both ANSI T1.617 Annex D LMIs, ITU Q933 Annex A LMIs and Consortium LMI.

Consortium LMI is supported on M320 Routers with Enhanced III FPCs and specific Enhanced Intelligent Queuing PICs.

Junos OS running on MX80, MX240, MX480, and MX960 routers with the following MICs, supports Consortium LMI (C-LMI) based on the "Gang of Four" or "Consortium" standard (Section 6):

- MIC-8OC3OC12-4OC48-SFP—8-port Clear-Channel OC3/OC12/STM-1/STM-4, 4-port Clear-Channel OC48/STM-16
- MIC-4OC3OC12-1OC48-SFP—4-port Clear-Channel OC3/OC12/STM-1/STM-4, 1-port Clear-Channel OC48/STM-16
- MIC-8DS3-E3—8-port Clear-Channel DS3/E3
- MIC-8CHDS3-E3—8-port Channelized DS3/Clear-Channel E3
- MIC-8CHOC3-4CHOC12-SFP—8-port Channelized OC3/STM-1, 4-port Channelized OC12/STM-4
- MIC-4CHOC3-2CHOC12-SFP—4-port Channelized OC3/STM-1, 2-port Channelized OC12/STM-4
- MIC-1CHOC48-SFP—1-port Channelized OC48/STM-16
- MIC-1OC192-HO-VC-XFP—1-port OC192/STM64 with High Order VCAT/LCAS

To disable the sending of keepalives on a physical interface, include the **no-keepalives** statement at the **[edit interfaces interface *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
no-keepalives;
```

For back-to-back Frame Relay connections, either disable the sending of keepalives on both sides of the connection, or configure one side of the connection as a data terminal equipment (DTE) (the default Junos OS configuration) and the other as a data circuit-terminating equipment (DCE).

If keepalives are enabled, the number of possible DLCI configurations on a multipoint or multicast connection is limited by the MTU size selected for the interface. To calculate the available DLCIs, use the formula  $(MTU - 12) / 5$ . To increase the number of possible DLCIs, disable keepalives.

## Configuring Tunable Keepalives for Frame Relay LMI

On interfaces configured with Frame Relay connections, you can tune the keepalive settings by using the **lmi** statement. A Frame Relay interface can be either DCE or DTE (the default Junos OS configuration). DTE acts as a master, requesting status from the DCE part of the link.

By default, Junos OS uses ANSI T1.617 Annex D LMIs. To change to ITU Q933 Annex A LMIs, include the **lmi-type itu** statement at the **[edit interfaces *interface-name* lmi]** hierarchy level:

```
[edit interfaces interface-name lmi]
lmi-type itu;
```

To configure Frame Relay keepalive parameters, include the **lmi** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
lmi {  
  lmi-type (ansi | itu | c-lmi);  
  n391dte number;  
  n392dce number;  
  n392dte number;  
  n393dce number;  
  n393dte number;  
  t391dte seconds;  
  t392dce seconds;  
}
```

You can include the following statements:

- **n391dte**—DTE full status polling interval. The DTE sends a status inquiry to the DCE at the interval specified by **t391dte**. **n391dte** specifies the frequency at which these inquiries expect a full status report; for example, a **n391dte** value of 10 specifies a full status report in response to every tenth inquiry. The intermediate inquiries ask for a keepalive exchange only. The range is from 1 through 255, with a default value of 6.
- **n392dce**—DCE error threshold. The number of errors required to bring down the link, within the event-count specified by **n393dce**. The range is from 1 through 10, with a default value of 3.
- **n392dte**—DTE error threshold. The number of errors required to bring down the link, within the event-count specified by **n393dte**. The range is from 1 through 10, with a default value of 3.
- **n393dce**—DCE monitored event-count. The range is from 1 through 10, with a default value of 4.
- **n393dte**—DTE monitored event-count. The range is from 1 through 10, with a default value of 4.
- **t391dte**—DTE keepalive timer. Period at which the DTE sends out a keepalive response request to the DCE and updates status depending on the DTE error threshold value. The range is from 5 through 30 seconds, with a default value of 10 seconds.
- **t392dce**—DCE keepalive timer. Period at which the DCE checks for keepalive responses from the DTE and updates status depending on the DCE error threshold value. The range is from 5 through 30 seconds, with a default value of 15 seconds.

**Related  
Documentation**

- [lmi-type on page 273](#)
- [mlfr-uni-nni-bundle-options](#)
- [lmi \(Frame Relay\) on page 272](#)

---

## Configuring Inverse Frame Relay ARP

Frame Relay interfaces support inverse Frame Relay ARP, as described in RFC 2390, *Inverse Address Resolution Protocol*. When inverse Frame Relay ARP is enabled, the router responds to received inverse Frame Relay ARP requests by providing IP address

information to the requesting router on the other end of the Frame permanent virtual circuit (PVC).

The router does not initiate inverse Frame Relay ARP requests.

By default, inverse Frame Relay ARP is disabled. To configure a router to respond to inverse Frame Relay ARP requests, include the **inverse-arp** statement:

```
inverse-arp;
```

For a list of hierarchy levels at which you can include this statement, see [inverse-arp](#).

You must configure Frame Relay encapsulation on the logical interface to support inverse ARP. For more information, see “[Configuring Frame Relay Interface Encapsulation](#)” on [page 208](#).

---

## Configuring the Router as a DCE with Frame Relay Encapsulation

By default, when you configure an interface with Frame Relay encapsulation, the routing platform is assumed to be DTE. That is, the routing platform is assumed to be at a terminal point on the network. To configure the routing platform to be DCE, include the **dce** statement at the **[edit interfaces *interface-name*]** hierarchy level:

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

When you configure the router to be a DCE, keepalives are disabled by default.

For back-to-back Frame Relay connections, either disable the sending of keepalives on both sides of the connection, or configure one side of the connection as a DCE and the other as a DTE by removing the **dce** statement from the configuration (the default Junos configuration).

---

## Configuring Frame Relay DLCIs

When you are using Frame Relay encapsulation on an interface, each logical interface corresponds to one or more permanent virtual circuits (PVCs) or switched virtual circuits (SVCs). For each PVC or SVC, you must configure one data-link connection identifier (DLCI).

A Frame Relay interface can be a point-to-point interface or a point-to-multipoint (also called a multipoint non-broadcast multiaccess [NBMA]) connection.

To configure Frame Relay DLCIs, you can do the following:

- [Configuring a Point-to-Point Frame Relay Connection on page 217](#)
- [Configuring a Point-to-Multipoint Frame Relay Connection on page 218](#)
- [Configuring a Multicast-Capable Frame Relay Connection on page 219](#)

---

## Configuring a Point-to-Point Frame Relay Connection

To configure a point-to-point Frame Relay connection, include the **dlci** statement:

**dlci** *dlci-identifier*;

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The DLCI identifier is a value from 16 through 1022. Numbers 1 through 15 are reserved for future use. A point-to-point interface can have one DLCI.



**NOTE:** For information about Frame Relay DLCI limitations for channelized interfaces, see [“Data-Link Connection Identifiers on Channelized Interfaces” on page 30](#).

You configure the router to use DLCI sparse mode by including the **sparse-dlcis** statement at the [edit chassis fpc *slot-number* pic *pic-number*] hierarchy level. For more information about DLCI sparse mode, see the [Junos OS System Basics Configuration Guide](#).

For more information about Frame Relay DLCIs, see [“Configuring a Point-to-Point Frame Relay Connection” on page 217](#).

When you are configuring point-to-point connections, the MTU sizes on both sides of the connection must be the same.

## Configuring a Point-to-Multipoint Frame Relay Connection

To configure a point-to-multipoint Frame Relay connection (also called a multipoint NBMA connection), include the **multipoint-destination** statement:

**multipoint-destination** *address* **dlci** *dlci-identifier*;

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family* address *address*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family* address *address*]

For each destination, include one **multipoint-destination** statement. *address* is the address of the remote side of the connection, and *dlci-identifier* is the DLCI identifier for the connection.

When you are configuring point-to-multipoint connections, all interfaces in the subnet must use the same MTU size.

If keepalives are enabled, causing the interface to send LMI messages during idle times, the number of possible DLCI configurations is limited by the MTU selected for the interface. For more information, see [“Configuring Frame Relay Keepalives” on page 214](#).

## Configuring a Multicast-Capable Frame Relay Connection

By default, Frame Relay connections assume unicast traffic. If your Frame Relay switch performs multicast replication, you can configure the connection to support multicast traffic by including the **multicast-dlci** statement:

```
multicast-dlci dlci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The DLCI identifier is a value from 16 through 1022 that defines the Frame Relay DLCI over which the switch expects to receive multicast packets for replication.

You can configure multicast support only on point-to-multipoint Frame Relay connections.

If keepalives are enabled, causing the interface to send LMI messages during idle times, the number of possible DLCI configurations is limited by the MTU selected for the interface. For more information, see [“Configuring Frame Relay Keepalives” on page 214](#).





## PART 5

# Channelized Interface Configuration Statements

- [Summary of Channelized Interface Configuration Statements on page 223](#)



## CHAPTER 16

# Summary of Channelized Interface Configuration Statements

The following descriptions explain each of the interface configuration statements. The statements are organized alphabetically.

## address

```

Syntax  address address {
        arp ip-address (mac | multicast-mac) mac-address <publish>;
        broadcast address;
        destination address;
        destination-profile name;
        eui-64;
        master-only;
        multipoint-destination address dlcid dlcid-identifier;
        multipoint-destination address {
            epd-threshold cells;
            inverse-arp;
            oam-liveness {
                up-count cells;
                down-count cells;
            }
            oam-period (disable | seconds);
            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;
        }
        primary;
        preferred;
        (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 ];
    }
}

```

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number* family *family*],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*  
 family *family*]

**Release Information** Statement introduced before Junos OS Release 7.4.  
Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** Configure the interface address.



**NOTE:** The `vrrp` High Availability functionality is not available on the QFX Series.

**Options** *address*—Address of the interface.

The remaining statements are explained separately.



**NOTE:** The `edit logical-systems` hierarchy is not available on QFabric switches.

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

**Related Documentation**

- Configuring the Protocol Family
- `negotiate-address`
- `unnumbered-address` (Ethernet)
- [Junos OS System Basics Configuration Guide](#)

## advertise-interval

---

<b>Syntax</b>	<code>advertise-interval <i>milliseconds</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Modify the Automatic Protection Switching (APS) interval at which the protect and working routers send packets to their neighbors to advertise that they are operational. A router considers its neighbor to be operational for a period, called the hold time, that is, by default, three times the advertisement interval.
<b>Options</b>	<b><i>milliseconds</i></b> —Interval between advertisement packets. <b>Range:</b> 1 through 65,534 milliseconds <b>Default:</b> 1000 milliseconds
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring APS Timers</li></ul>

## aps

**Syntax**

```
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;
}
```

**Hierarchy Level** [edit interfaces *interface-name* [sonet-options](#)]

**Release Information** Statement introduced before Junos OS Release 7.4.

**Description** Configure Automatic Protection Switching (APS) on the router.

For DS3 channels on a channelized OC12 interface, configure APS on channel 0 only. If you configure APS on channels 1 through 11, it is ignored.

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**

- Configuring APS and MSP

## authentication-key

---

<b>Syntax</b>	authentication-key <i>key</i> ;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the Automatic Protection Switching (APS) authentication key (password).
<b>Options</b>	<b>key</b> —Authentication password. It can be 1 through 8 characters long. Configure the same key for both the working and protect routers.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring Basic APS Support</li><li>For information about the <b>authentication-key</b> statement at the [edit interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> (vrrp-group   vrrp-inet6-group) <i>group-number</i>] or [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>unit-number</i> family (inet   inet6) address <i>address</i> (vrrp-group   vrrp-inet6-group) <i>group-number</i>] hierarchy level, see the <a href="#">Junos OS High Availability Configuration Guide</a>.</li></ul>

## bchannel-allocation

---

<b>Syntax</b>	bchannel-allocation (ascending   descending);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <a href="#">isdn-options</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.3.
<b>Description</b>	(J Series Services Routers equipped with a Dual-Port Channelized T1/E1 PIM) For Integrated Services Digital Network Primary Rate Interfaces (ISDN PRI), allocate PRI dialout B-channels in ascending or descending order.
<b>Options</b>	( <b>ascending</b>   <b>descending</b> )—Allocate the B-channels in ascending (from low to high) or descending (from high to low) order. <b>Default:</b> Descending order
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li><a href="#">Allocating B-Channels for Dialout on page 159</a></li><li><a href="#">Junos OS Interfaces and Routing Configuration Guide</a></li></ul>



## bert-algorithm

<b>Syntax</b>	<code>bert-algorithm <i>algorithm</i>;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces ce1-<i>fpc/pic/port</i>],</code> <code>[edit interfaces ct1-<i>fpc/pic/port</i>],</code> <code>[edit interfaces <i>interface-name</i> ds0-options],</code> <code>[edit interfaces <i>interface-name</i> e1-options],</code> <code>[edit interfaces <i>interface-name</i> e3-options],</code> <code>[edit interfaces <i>interface-name</i> t1-options],</code> <code>[edit interfaces <i>interface-name</i> t3-options]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	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.

<b>Options</b>	<p><b><i>algorithm</i></b>—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"> <li>• <b>all-ones-repeating</b>—Pattern is all ones.</li> <li>• <b>all-zeros-repeating</b>—Pattern is all zeros.</li> <li>• <b>alternating-double-ones-zeros</b>—Pattern is alternating pairs of ones and zeros.</li> <li>• <b>alternating-ones-zeros</b>—Pattern is alternating ones and zeros.</li> <li>• <b>pseudo-2e3</b>—Pattern is <math>2^3 - 1</math>.</li> <li>• <b>pseudo-2e4</b>—Pattern is <math>2^4 - 1</math>.</li> <li>• <b>pseudo-2e5</b>—Pattern is <math>2^5 - 1</math>.</li> <li>• <b>pseudo-2e6</b>—Pattern is <math>2^6 - 1</math>.</li> <li>• <b>pseudo-2e7</b>—Pattern is <math>2^7 - 1</math>.</li> <li>• <b>pseudo-2e9-o153</b>—Pattern is <math>2^9 - 1</math>, as defined in the O153 standard.</li> <li>• <b>pseudo-2e10</b>—Pattern is <math>2^{10} - 1</math>.</li> <li>• <b>pseudo-2e11-o152</b>—Pattern is <math>2^{11} - 1</math>, as defined in the O152 standard.</li> <li>• <b>pseudo-2e15-o151</b>—Pattern is <math>2^{15} - 1</math>, as defined in the O151 standard.</li> </ul>
----------------	---

- **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

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

<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• Interface Diagnostics</li><li>• <a href="#">Configuring E1 BERT Properties on page 166</a></li><li>• <a href="#">Configuring E3 BERT Properties on page 174</a></li><li>• <a href="#">Configuring T1 BERT Properties on page 182</a></li><li>• <a href="#">Configuring T3 BERT Properties on page 192</a></li><li>• <a href="#">Examples: Configuring T3 Interfaces on page 201</a></li><li>• <a href="#">bert-error-rate on page 231</a></li><li>• <a href="#">bert-period on page 233</a></li></ul>
------------------------------	---

## bert-error-rate

<b>Syntax</b>	<code>bert-error-rate rate;</code>
<b>Hierarchy Level</b>	<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>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	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`.

<b>Options</b>	<b>rate</b> —Bit error rate. <b>Range:</b> 0 through 7, which corresponds to $10^{-1}$ (1 error per bit) to $10^{-7}$ (1 error per 10 million bits) <b>Default:</b> 0
<b>Required Privilege Level</b>	<b>interface</b> —To view this statement in the configuration. <b>interface-control</b> —To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">bert-algorithm on page 229</a></li> <li>• <a href="#">bert-period on page 233</a></li> <li>• <a href="#">ds0-options on page 244</a></li> <li>• <a href="#">e1-options on page 245</a></li> <li>• <a href="#">e3-options on page 246</a></li> <li>• <a href="#">t1-options on page 294</a></li> <li>• <a href="#">t3-options on page 295</a></li> <li>• <a href="#">Interface Diagnostics</a></li> <li>• <a href="#">Configuring E1 BERT Properties on page 166</a></li> </ul>

- [Configuring E3 BERT Properties on page 174](#)
- [Configuring T1 BERT Properties on page 182](#)
- [Configuring T3 BERT Properties on page 192](#)
- [Examples: Configuring T3 Interfaces on page 201](#)

## bert-period


<b>Syntax</b>	<code>bert-period <i>seconds</i>;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces <i>ce1-fpc/pic/port</i>],</code> <code>[edit interfaces <i>ct1-fpc/pic/port</i>],</code> <code>[edit interfaces <i>interface-name ds0-options</i>],</code> <code>[edit interfaces <i>interface-name e1-options</i>],</code> <code>[edit interfaces <i>interface-name e3-options</i>],</code> <code>[edit interfaces <i>interface-name t1-options</i>],</code> <code>[edit interfaces <i>interface-name t3-options</i>]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<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><b>NOTE:</b> 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 <code>[edit interfaces <i>ce1-fpc/pic/port</i>]</code> or <code>[edit interfaces <i>ct1-fpc/pic/port</i>]</code> hierarchy level as appropriate.</p> </div>
<b>Options</b>	<p><b><i>seconds</i></b>—Test duration. Range and default values vary by interface type.</p> <p><b>Range:</b></p> <ul style="list-style-type: none"> <li>PIC-dependent—Normal BERT period: either 1 through 239 seconds or 1 through 240 seconds</li> <li>PIC-dependent—Extended BERT period: from 1 through 86,400 seconds</li> </ul> <p><b>Default:</b></p> <ul style="list-style-type: none"> <li>Normal BERT period: 10 seconds</li> <li>Extended BERT period (on supported E1 interfaces): 10 seconds</li> <li>Extended BERT period (on supported T1 interfaces): 240 seconds</li> </ul>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Interface Diagnostics</li> <li><a href="#">Configuring E1 BERT Properties on page 166</a></li> <li><a href="#">Configuring E3 BERT Properties on page 174</a></li> </ul>

- [Configuring T1 BERT Properties on page 182](#)
- [Configuring T3 BERT Properties on page 192](#)
- [bert-algorithm on page 229](#)
- [bert-error-rate on page 231](#)


---

## buildout (T1 Interfaces)

---

<b>Syntax</b>	<code>buildout value;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces ct1-fpc/pic/port]</code> <code>[edit interfaces interface-name t1-options]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For T1 interfaces, set the buildout value.
	<div><b>NOTE:</b> When configuring CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <code>buildout</code> statement must be included at the hierarchy level.</div>
<b>Default</b>	The default buildout value is 0 through 132 feet.
<b>Options</b>	You can set the buildout value to one of the following: <ul style="list-style-type: none"><li>• <b>0-132</b>—0 through 132 feet (0 through 40 meters)</li><li>• <b>133-265</b>—133 through 265 feet (40 through 81 meters)</li><li>• <b>266-398</b>—266 through 398 feet (81 through 121 meters)</li><li>• <b>399-531</b>—399 through 531 feet (121 through 162 meters)</li><li>• <b>532-655</b>—532 through 655 feet (162 through 200 meters)</li><li>• <b>long-0db</b>—For J Series routers only, long buildout with 0 decibel (dB) transmit attenuation</li><li>• <b>long-7.5db</b>—For J Series routers only, long buildout with 7.5 dB transmit attenuation</li><li>• <b>long-15db</b>—For J Series routers only, long buildout with 15 dB transmit attenuation</li><li>• <b>long-22.5db</b>—For J Series routers only, long buildout with 22.5 dB transmit attenuation</li></ul>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the T1 Buildout on page 183</a></li><li>• <i>Junos OS Interfaces and Routing Configuration Guide</i></li></ul>

## byte-encoding

<b>Syntax</b>	byte-encoding (nx56   nx64);
<b>Hierarchy Level</b>	[edit interfaces <i>t1-fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> <b>ds0-options</b> ], [edit interfaces <i>interface-name</i> <b>t1-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Set the byte encoding on a DS0 or T1 interface to use 7 bits per byte or 8 bits per byte.
	<div>  <p><b>NOTE:</b> When configuring T1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the <b>byte-encoding</b> statement must be included at the [edit interfaces <i>t1-fpc/pic/port</i>] hierarchy level.</p> </div>
<b>Default</b>	The default byte encoding is 8 bits per byte (nx64).
<b>Options</b>	nx56—Use 7 bits per byte.  nx64—Use 8 bits per byte.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring T1 Byte Encoding on page 183</a></li> </ul>

## bytes

---

<b>Syntax</b>	<pre>bytes {     c2 <i>value</i>;     e1-quiet <i>value</i>;     f1 <i>value</i>;     f2 <i>value</i>;     s1 <i>value</i>;     z3 <i>value</i>;     z4 <i>value</i>; }</pre>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>sonet-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Set values in some SONET/SDH header bytes.
<b>Options</b>	<p><b>c2 <i>value</i></b>—Path signal label SONET/SDH overhead byte. SONET/SDH frames use the C2 byte to indicate the contents of the payload inside the frame. SONET/SDH interfaces use the C2 byte to indicate whether the payload is scrambled.</p> <p><b>Range:</b> 0 through 255</p> <p><b>Default:</b> 0xCF</p> <p><b>e1-quiet <i>value</i></b>—Default idle byte sent on the orderwire SONET/SDH overhead bytes. The router does not support the orderwire channel, and hence sends this byte continuously.</p> <p><b>Range:</b> 0 through 255</p> <p><b>Default:</b> 0x7F</p> <p><b>f1 <i>value</i>, f2 <i>value</i>, z3 <i>value</i>, z4 <i>value</i></b>—SONET/SDH overhead bytes.</p> <p><b>Range:</b> 0 through 255</p> <p><b>Default:</b> 0x00</p> <p><b>s1 <i>value</i></b>—Synchronization message SONET overhead byte. This byte is normally controlled as a side effect of the system reference clock configuration and the state of the external clock coming from an interface if the system reference clocks have been configured to use an external reference.</p> <p><b>Range:</b> 0 through 255</p> <p><b>Default:</b> 0xCC</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring SONET/SDH Header Byte Values</li><li>no-concatenate</li></ul>



## cbit-parity

<b>Syntax</b>	(cbit-parity   no-cbit-parity);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	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 <b>no-cbit-parity</b> statement is included. For all other interfaces, M13 framing is used when the <b>no-cbit-parity</b> statement is included.
<b>Default</b>	C-bit parity mode is enabled.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring E3 and T3 Parameters on ATM Interfaces</li> <li><a href="#">Disabling T3 C-Bit Parity Mode on page 193</a></li> </ul>

## channelization



<b>Syntax</b>	channelization;
<b>Hierarchy Level</b>	[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 11.4.
<b>Description</b>	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.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">Configuring the Junos OS to Enable Channelization on DS3/E3 MIC on page 132</a></li> </ul>

## clocking

---

<b>Syntax</b>	clocking (external [interface <i>interface-name</i> ]   internal);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. <b>interface</b> option added in Junos OS Release 8.2.
<b>Description</b>	For interfaces that can use various clock sources, configure the source of the transmit clock on each interface.
<b>Options</b>	<p><b>external</b>—The clock source is provided by the data communication equipment (DCE).</p> <p><b>interface <i>interface-name</i></b>—For interfaces operating on T1/E1 PIMs for J Series Services Routers only, configure clocking for the drop-and insert feature. When configuring this feature, both ports must use the same clock source: either the router's internal clock or an external clock on one of the interfaces. If an external clock source is required, one interface must specify clocking external and the other must specify the same clock.</p> <p><b>internal</b>—Use the internal stratum 3 clock as the reference clock.</p> <p><b>Default:</b> internal</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the Clock Source</a></li><li>• <a href="#">Configuring the Clock Source on SONET/SDH Interfaces</a></li><li>• <a href="#">Clock Sources on Channelized Interfaces on page 32</a></li><li>• <a href="#">Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots on page 156</a></li><li>• <a href="#">loop-timing on page 275</a></li></ul>

## compatibility-mode

<b>Syntax</b>	<code>compatibility-mode (adtran   digital-link   kentrox   larscom   verilink) &lt;subrate value&gt;;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>e3-options</b> ], [edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the E3 or T3 interface to be compatible with the channel service unit (CSU) at the remote end of the line.
	<div>  <p><b>NOTE:</b> The <code>compatibility-mode</code> statement at the [edit interfaces <i>interface-name</i> <b>e3-options</b>] hierarchy level is not valid for IQE PICs.</p> </div>
<b>Default</b>	If you omit this option, the full E3 or T3 rate is used.
<b>Options</b>	<p><b>adtran</b>—For T3 IQ interfaces only, configure compatibility with Adtran CSUs.</p> <p><b>digital-link</b>—Configure compatibility with Digital Link CSUs. If you include this option on an E3 interface, you must also disable payload scrambling.</p> <p><b>kentrox</b>—Configure compatibility with Kentrox CSUs. Kentrox subrate is valid for E3 IQ and T3 IQ interfaces only.</p> <p><b>larscom</b>—For T3 and T3 IQ interfaces only, configure compatibility with Larscom CSUs.</p> <p><b>verilink</b>—For T3 IQ and T3 IQE interfaces only, configure compatibility with Verilink CSUs.</p> <div>  <p><b>NOTE:</b> Verilink configuration is not functional if an IQ interface is paired with an IQE interface.</p> </div> <p><b>subrate value</b>—Subrate of the E3 or T3 line.</p> <p><b>Range:</b> For Kentrox CSUs on E3 IQ interfaces and T3 IQ interfaces the subrate value must match the value configured on the CSU. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring the E3 CSU Compatibility Mode on page 175</a></li> <li>• <a href="#">Configuring the T3 CSU Compatibility Mode on page 194</a></li> <li>• <a href="#">payload-scrambler on page 287</a></li> </ul>

## crc-minor-alarm-threshold

---

<b>Syntax</b>	crc-minor-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5   5e-6   1e-6);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> t1-options]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Minor alarm error thresholds for T1 CRC errors. When the threshold is exceeded for one second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared.
<b>Default</b>	10-second monitoring period for values 1e-3, 5e-4, 1e-4, and 5e-5. The 1e-5 value uses a 50-second monitoring period. The 5e-6 value uses a 100-second monitoring period. The 1e-6 value uses a 500-second monitoring period.
<b>Options</b>	<b>rate</b> —Error rate expressed as the number of errors per number of bits. The value 1e-3 is one error in 10 <sup>-3</sup> bits and 5e-4 is five errors in 10 <sup>-4</sup> bits. <b>Default:</b> 5e-6
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring T1 CRC Error Minor Alarm Thresholds on page 184</a></li></ul>

## data-input

<b>Syntax</b>	<code>data-input (system   interface <i>interface-name</i>);</code>
<b>Hierarchy Level</b>	<code>[edit interfaces <i>ds-pim</i>/0/<i>port:channel</i>]</code>
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	<p>For interfaces operating on T1/E1 PIMs for J Series Services Routers only, configure whether an interface should send and receive data from the Routing Engine or from a given interface name. On channelized T1/E1 interfaces partitioned into channels, you can insert time slots from one port directly into the other port on the same PIM, to replace time slots coming through the Routing Engine.</p> <p>To avoid slips, both ports must use the same clock source: either the router's internal clock or an external clock on one of the interfaces. If an external clock source is required, one interface must specify <code>clocking external</code> and the other must specify the same clock by including the <code>clocking external interface <i>interface-name</i></code> statement at the <code>[edit interfaces <i>interface-name</i>]</code> hierarchy level.</p>
<b>Options</b>	<p><b>system</b>—Interface sends and receives data from the Routing Engine.</p> <p><b>interface <i>interface-name</i></b>—Interface sends and receives data from a specific interface.</p> <p><b>Default:</b> Data is sent and received from the Routing Engine (system).</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots on page 156</a></li> <li>• <i>Junos OS Interfaces and Routing Configuration Guide</i></li> <li>• <a href="#">clocking on page 238</a></li> </ul>

## dce

---

<b>Syntax</b>	dce;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ], [edit interfaces <i>interface-name</i> serial-options clocking-mode]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For Frame Relay only, respond to status enquiry message keepalives.  When you configure the router to be a DCE, keepalives are disabled by default.
<b>Default</b>	The router operates in DTE mode.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the Router as a DCE with Frame Relay Encapsulation on page 217</a></li></ul>

## dlci

<b>Syntax</b>	<code>dlci <i>dlci-identifier</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>For Frame Relay and Multilink Frame Relay (MLFR) user-to-network interface (UNI) network-to-network interface (NNI) encapsulation only, and for link services, voice services and point-to-point interfaces only, configure the data-link connection identifier (DLCI) for a permanent virtual circuit (PVC) or an switched virtual circuit (SVC).</p> <p>To configure a DLCI for a point-to-multipoint interface, use the <b>multipoint-destination</b> statement to specify the DLCI.</p>
<b>Options</b>	<p><b><i>dlci-identifier</i></b>—Data-link connection identifier.</p> <p><b>Range:</b> 16 through 1022.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Data-Link Connection Identifiers on Channelized Interfaces on page 30</a></li> <li>• <a href="#">Configuring Frame Relay DLCIs on page 217</a></li> <li>• <a href="#">Junos OS Services Interfaces Configuration Guide</a></li> <li>• <a href="#">encapsulation (Logical Interface) on page 248</a></li> <li>• <a href="#">multicast-dlci on page 279</a></li> <li>• <a href="#">multipoint-destination on page 280</a></li> </ul>

## ds0-options

---

<b>Syntax</b>	<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>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Configure DS0-specific physical interface properties.</p> <p>The statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Channelized DS3-to-DS0 Interfaces on page 128</a></li></ul>



## e1-options

<b>Syntax</b>	<pre>e1-options {   bert-algorithm <i>algorithm</i>;   bert-error-rate <i>rate</i>;   bert-period <i>seconds</i>;   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 <i>time-slot-range</i>; }</pre>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Configure E1-specific physical interface properties.</p> <p>The statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Channelized E1 IQ and IQE Interfaces Overview on page 147</a></li> <li>• <a href="#">Channelized STM1 Interfaces Overview on page 107</a></li> <li>• <a href="#">E1 Interfaces Overview on page 165</a></li> <li>• <a href="#">T1 Interfaces Overview on page 181</a></li> </ul>

## e3-options

---

**Syntax**    e3-options {  
              atm-encapsulation (direct | plcp);  
              bert-algorithm *algorithm*;  
              bert-error-rate *rate*;  
              bert-period *seconds*;  
              buildout *feet*;  
              compatibility-mode (digital-link | kentrox | larscom) <subrate *value*>;  
              fcs (16 | 32);  
              framing (g.751 | g.832);  
              idle-cycle-flag *value*;  
              invert-data;  
              loopback (local | remote);  
              (payload-scrambler | no-payload-scrambler);  
              start-end-flag *value*;  
              (unframed | no-unframed);  
              }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before Junos OS Release 7.4.

**Description**    Configure E3-specific physical interface properties.

For ATM1 interfaces, you can configure a subset of E3 options statements.

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**

- [E3 Interfaces Overview on page 173](#)
- [T3 Interfaces Overview on page 191](#)
- atm-options

## encapsulation

---

See the following sections:

- [encapsulation \(Logical Interface\) on page 248](#)
- [encapsulation \(Physical Interface\) on page 252](#)

## encapsulation (Logical Interface)

<b>Syntax</b>	<code>encapsulation (atm-ccc-cell-relay   atm-ccc-vc-mux   atm-cisco-nlpid   atm-mlppp-llc   atm-nlpid   atm-ppp-llc   atm-ppp-vc-mux   atm-snap   atm-tcc-snap   atm-tcc-vc-mux   atm-vc-mux   ether-over-atm-llc   ether-vpls-over-atm-llc   ether-vpls-over-fr   ether-vpls-over-ppp   ethernet   frame-relay-ccc   frame-relay-ether-type   frame-relay-ether-type-tcc   frame-relay-ppp   frame-relay-tcc   multilink-frame-relay-end-to-end   multilink-ppp   ppp-over-ether   ppp-over-ether-over-atm-llc   vlan-bridge   vlan-ccc   vlan-vci-ccc   vlan-tcc   vlan-vpls);</code>
<b>Hierarchy Level</b>	<code>[edit interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i>],</code> <code>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i>],</code> <code>[edit interfaces <i>rlsnumber</i> <b>unit</b> <i>logical-unit-number</i>]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1 for PTX Series Packet Transport Switches ( <b>vlan-ccc</b> and <b>vlan-tcc</b> options only).
<b>Description</b>	Configure a logical link-layer encapsulation type.
<b>Options</b>	<p><b>atm-ccc-cell-relay</b>—Use ATM cell-relay encapsulation.</p> <p><b>atm-ccc-vc-mux</b>—Use ATM virtual circuit (VC) multiplex encapsulation on CCC circuits. When you use this encapsulation type, you can configure the <b>ccc</b> family only.</p> <p><b>atm-cisco-nlpid</b>—Use Cisco ATM network layer protocol identifier (NLPID) encapsulation. When you use this encapsulation type, you can configure the <b>inet</b> family only.</p> <p><b>atm-mlppp-llc</b>—For ATM2 IQ interfaces only, use Multilink Point-to-Point (MLPPP) over AAL5 LLC. For this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.</p> <p><b>atm-nlpid</b>—Use ATM NLPID encapsulation. When you use this encapsulation type, you can configure the <b>inet</b> family only.</p> <p><b>atm-ppp-llc</b>—For ATM2 IQ interfaces only, use PPP over AAL5 LLC encapsulation.</p> <p><b>atm-ppp-vc-mux</b>—For ATM2 IQ interfaces only, use PPP over ATM AAL5 multiplex encapsulation.</p> <p><b>atm-snap</b>—Use ATM subnetwork attachment point (SNAP) encapsulation.</p> <p><b>atm-tcc-snap</b>—Use ATM SNAP encapsulation on translational cross-connect (TCC) circuits.</p> <p><b>atm-tcc-vc-mux</b>—Use ATM VC multiplex encapsulation on TCC circuits. When you use this encapsulation type, you can configure the <b>tcc</b> family only.</p> <p><b>atm-vc-mux</b>—Use ATM VC multiplex encapsulation. When you use this encapsulation type, you can configure the <b>inet</b> family only.</p>

**ether-over-atm-llc**—For interfaces that carry IPv4 traffic, use Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces.

**ether-vpls-over-atm-llc**—For ATM2 IQ interfaces only, use the Ethernet virtual private LAN service (VPLS) over ATM LLC encapsulation to bridge Ethernet interfaces and ATM interfaces over a VPLS routing instance (as described in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*). Packets from the ATM interfaces are converted to standard ENET2/802.3 encapsulated Ethernet frames with the frame check sequence (FCS) field removed.

**ether-vpls-over-fr**—For E1, T1, E3, T3, and SONET interfaces only, use the Ethernet virtual private LAN service (VPLS) over Frame Relay encapsulation to support Bridged Ethernet over Frame Relay encapsulated TDM interfaces for VPLS applications, as per RFC 2427 (1490).



**NOTE:** The SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, and the DS3/E3 MIC do not support Ethernet over Frame Relay encapsulation.

**ether-vpls-over-ppp**—For E1, T1, E3, T3 and SONET interfaces only, use the Ethernet virtual private LAN service (VPLS) over point-to-point-protocol (PPP) encapsulation to support Bridged Ethernet over PPP encapsulated TDM interfaces for VPLS applications.

**ethernet**—Use Ethernet II encapsulation (as described in RFC 894, *A Standard for the Transmission of IP Datagrams over Ethernet Networks*).

**ethernet-vpls**—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard Tag Protocol ID (TPID) values.



**NOTE:** The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

**frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**frame-relay-ppp**—Use PPP over Frame Relay circuits. When you use this encapsulation type, you can configure the **ppp** family only. J Series routers do not support frame-relay-ppp encapsulation.

**frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits for connecting different media. When you use this encapsulation type, you can configure the **tcc** family only.

**frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. The physical interface must be configured with flexible-frame-relay encapsulation.

**frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media. The physical interface must be configured with flexible-frame-relay encapsulation.

**multilink-frame-relay-end-to-end**—Use MLFR FRF.15 encapsulation. This encapsulation is used only on multilink, link services, voice services interfaces and their constituent T1 or E1 interfaces, and is supported on LSQ and redundant LSQ interfaces.

**multilink-ppp**—Use MLPPP encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces.

**ppp-over-ether**—For underlying Ethernet interfaces on J Series Services Routers, use PPP over Ethernet encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface. You also use PPP over Ethernet encapsulation to configure an underlying Ethernet interface for a dynamic PPPoE logical interface on M120 and M320 Series routers with Intelligent Queuing 2 (IQ2) PICs, and on MX Series routers with Trio MPC/MIC interfaces.

**ppp-over-ether-over-atm-llc**—For underlying ATM interfaces on J Series Services Routers only, use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface.

**vlan-bridge**—Use Ethernet VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q tagging, flexible-ethernet-services, and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.

**vlan-ccc**—Use Ethernet virtual LAN (VLAN) encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**vlan-tcc**—Use Ethernet VLAN encapsulation on TCC circuits. When you use this encapsulation type, you can configure the **tcc** family only.

**vlan-vpls**—Use Ethernet VLAN encapsulation on VPLS circuits.

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

**Related  
Documentation**

- Configuring Interface Encapsulation on Logical Interfaces
- Circuit and Translational Cross-Connects Overview
- Identifying the Access Concentrator
- Configuring ATM Interface Encapsulation
- Configuring VLAN Encapsulation
- Configuring Extended VLAN Encapsulation
- Configuring ISDN Logical Interface Properties
- Configuring ATM-to-Ethernet Interworking
- Configuring Interface Encapsulation on PTX Series Packet Transport Switches
- [\*Junos OS Services Interfaces Configuration Guide\*](#)

## encapsulation (Physical Interface)

<b>Syntax</b>	<code>encapsulation (atm-ccc-cell-relay   atm-pvc   cisco-hdlc   cisco-hdlc-ccc   cisco-hdlc-tcc   ethernet-bridge   ethernet-ccc   ethernet-over-atm   ethernet-tcc   ethernet-vpls   extended-frame-relay-ccc   extended-frame-relay-ether-type-tcc   extended-frame-relay-tcc   extended-vlan-bridge   extended-vlan-ccc   extended-vlan-tcc   extended-vlan-vpls   flexible-ethernet-services   flexible-frame-relay   frame-relay   frame-relay-ccc   frame-relay-ether-type   frame-relay-ether-type-tcc   frame-relay-port-ccc   frame-relay-tcc   generic-services   multilink-frame-relay-uni-nni   ppp   ppp-ccc   ppp-tcc   vlan-ccc   vlan-vci-ccc   vlan-vpls);</code>
<b>Hierarchy Level</b>	<code>[edit interfaces <i>interface-name</i>],</code> <code>[edit interfaces rlsq <i>number:number</i>]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1 for PTX Series Packet Transport Switches ( <b>flexible-ethernet-services</b> , <b>ethernet-ccc</b> , and <b>ethernet-tcc</b> options only).
<b>Description</b>	Specify the physical link-layer encapsulation type.
<b>Default</b>	<b>ppp</b> —Use serial PPP encapsulation.
<b>Options</b>	<b>atm-ccc-cell-relay</b> —Use ATM cell-relay encapsulation.  <b>atm-pvc</b> —Use ATM PVC encapsulation.  <b>cisco-hdlc</b> —Use Cisco-compatible High-Level Data Link Control (HDLC) framing.  <b>cisco-hdlc-ccc</b> —Use Cisco-compatible HDLC framing on CCC circuits.  <b>cisco-hdlc-tcc</b> —Use Cisco-compatible HDLC framing on TCC circuits for connecting different media.  <b>ethernet-bridge</b> —Use Ethernet bridge encapsulation on Ethernet interfaces that have bridging enabled and that must accept all packets.  <b>ethernet-ccc</b> —Use Ethernet CCC encapsulation on Ethernet interfaces that must accept packets carrying standard Tag Protocol ID (TPID) values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, CCC is not supported  <b>ethernet-over-atm</b> —For interfaces that carry IPv4 traffic, use Ethernet over ATM encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces. As defined in RFC 1483, <i>Multiprotocol Encapsulation over ATM Adaptation Layer 5</i> , this encapsulation type allows ATM interfaces to connect to devices that support only bridge protocol data units (BPDUs). The Junos OS does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet LLC/SNAP frames with IP or ARP in the payload, and drops the rest. For packets destined to the Ethernet LAN, a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and MAC header, and the packet is forwarded to the ATM interface.



**ethernet-tcc**—For interfaces that carry IPv4 traffic, use Ethernet TCC encapsulation on interfaces that must accept packets carrying standard TPID values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, TCC is not supported.

**ethernet-vpls**—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard TPID values.

**extended-frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC.

**extended-frame-relay-ether-type-tcc**—Use extended Frame Relay ether type TCC for Cisco-compatible Frame Relay for DLCIs 1 through 1022. This encapsulation is used for circuits with different media on either side of the connection.

**extended-frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits to connect different media. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC.

**extended-vlan-bridge**—Use extended VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q VLAN tagging and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.

**extended-vlan-ccc**—Use extended VLAN encapsulation on CCC circuits with Gigabit Ethernet and 4-port Fast Ethernet interfaces that must accept packets carrying 802.1Q values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, extended VLAN CCC is not supported. For 4-port Gigabit Ethernet PICs, extended VLAN CCC is not supported.

**extended-vlan-tcc**—For interfaces that carry IPv4 traffic, use extended VLAN encapsulation on TCC circuits with Gigabit Ethernet interfaces on which you want to use 802.1Q tagging. For 4-port Gigabit Ethernet PICs, extended VLAN TCC is not supported.

**extended-vlan-vpls**—Use extended VLAN VPLS encapsulation on Ethernet interfaces that have VLAN 802.1Q tagging and VPLS enabled and that must accept packets carrying TPIDs 0x8100, 0x9100, and 0x9901.



**NOTE:** The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

**flexible-ethernet-services**—For Gigabit Ethernet IQ interfaces and Gigabit Ethernet PICs with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router), use flexible Ethernet services encapsulation when you want to configure multiple per-unit Ethernet encapsulations. Aggregated Ethernet bundles can use this encapsulation type. This encapsulation type allows you to configure any combination of route, TCC, CCC, Layer 2 virtual private networks (VPNs), and VPLS encapsulations on a single physical port. If you configure flexible Ethernet services encapsulation on the physical interface, VLAN IDs from 1 through 511 are no longer reserved for normal VLANs.

**flexible-frame-relay**—For IQ interfaces only, use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.

**frame-relay**—Use Frame Relay encapsulation.

**frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits.

**frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay.

**frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media.

**frame-relay-port-ccc**—Use Frame Relay port CCC encapsulation to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. When you use this encapsulation type, you can configure the **ccc** family only.

**frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits to connect different media.

**generic-services**—Use generic services encapsulation for services with a hierarchical scheduler.

**multilink-frame-relay-uni-nni**—Use MLFR UNI NNI encapsulation. This encapsulation is used on link services, voice services interfaces functioning as FRF.16 bundles, and their constituent T1 or E1 interfaces, and is supported on LSQ and redundant LSQ interfaces.

**ppp**—Use serial PPP encapsulation.

**ppp-ccc**—Use serial PPP encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**ppp-tcc**—Use serial PPP encapsulation on TCC circuits for connecting different media. When you use this encapsulation type, you can configure the **tcc** family only.

**vlan-ccc**—Use Ethernet VLAN encapsulation on CCC circuits.

**vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only. All logical interfaces configured on the Ethernet interface must also have the encapsulation type set to **vlan-vci-ccc**.

**vlan-vpls**—Use VLAN VPLS encapsulation on Ethernet interfaces with VLAN tagging and VPLS enabled. Interfaces with VLAN VPLS encapsulation accept packets carrying standard TPID values only.

<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• Configuring Interface Encapsulation on Physical Interfaces</li><li>• Defining the Encapsulation for Switching Cross-Connects</li><li>• Configuring ATM Interface Encapsulation</li><li>• Configuring VLAN Encapsulation</li><li>• Configuring ATM-to-Ethernet Interworking</li><li>• Configuring Extended VLAN Encapsulation</li><li>• Configuring Encapsulation for Layer 2 Wholesale VLAN Interfaces</li><li>• Configuring Interfaces for Layer 2 Circuits</li><li>• Configuring Interfaces for Layer 2 Circuits</li><li>• Configuring Interface Encapsulation on PTX Series Packet Transport Switches</li></ul>

## family

```

Syntax  family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            (input | output | input output);
        }
    }
    access-concentrator name;
    address address {
        ... the address subhierarchy appears after the main [edit interfaces interface-name unit
            logical-unit-number family family-name] hierarchy ...
    }
    bridge-domain-type (bvlan | svlan);
    bundle interface-name;
    core-facing;
    demux-destination {
        destination-prefix;
    }
    demux-source {
        source-prefix;
    }
    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 ];
    }
    interface-mode (access | trunk);
    ipsec-sa sa-name;
    isid-list all-service-groups;
    keep-address-and-control;
    mac-validate (loose | strict);
    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;
    protocols [inet iso mpls];
    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 {
    input;
    output;
}
service {
    input {
        post-service-filter filter-name;
        service-set service-set-name <service-filter filter-name>;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
service-name-table table-name
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
    maximum-seconds>;
(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;
vlan-id number;
vlan-id-list [number number-number];
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    master-only;
    multipoint-destination address dlci dlci-identifier;
    multipoint-destination address {
        epd-threshold cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period (disable | seconds);
        shaping {
            (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate
                sustained rate);
            queue-length number;
        }
        vci vpi-identifier.vci-identifier;
    }
}
preferred;
primary;
vrrp-group group-id {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-key key;
    authentication-type authentication;
}

```

```
fast-interval milliseconds;  
(preempt | no-preempt) {  
    hold-time seconds;  
}  
priority number;  
track {  
    interface interface-name {  
        bandwidth-threshold bits-per-second priority-cost priority;  
        priority-cost priority;  
    }  
    priority-hold-time seconds;  
    route prefix routing-instance instance-name priority-cost priority;  
}  
}  
virtual-address [ addresses ];  
}  
virtual-link-local-address ipv6-address;  
vrp-inherit-from active-group | active-interface  
}  
}
```

**Hierarchy Level** [edit interfaces *interface-name* [unit](#) *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* [unit](#) *logical-unit-number*]

**Release Information** Statement introduced before Junos OS Release 7.4.  
Option **max-sessions-vs-a-ignore** introduced in Junos OS Release 11.4.

**Description** Configure protocol family information for the logical interface.



.....

**NOTE:** Not all subordinate stanzas are available to every protocol family.  
See the [Junos OS Configuration Statements and Commands](#) for details about  
each protocol family.

.....

**Options** *family*—Protocol family:

- **any**—Protocol-independent family used for Layer 2 packet filtering



**NOTE:** This option is not supported on T4000 Type 5 FPCs.

- **bridge**—(M Series and T Series routers only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation
- **ccc**—Circuit cross-connect protocol suite
- **inet**—Internet Protocol version 4 suite
- **inet6**—Internet Protocol version 6 suite
- **iso**—International Organization for Standardization Open Systems Interconnection (ISO OSI) protocol suite
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16
- **multilink-ppp**—Multilink Point-to-Point Protocol
- **mpls**—Multiprotocol Label Switching (MPLS)
- **pppoe**—Point-to-Point Protocol over Ethernet
- **tcc**—Translational cross-connect protocol suite
- **tnp**—Trivial Network Protocol
- **vpls**—(M Series and T Series routers only) Virtual private LAN service

The remaining 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**

- Configuring the Protocol Family
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers
- [Junos OS Services Interfaces Configuration Guide](#)


## fast-aps-switch

---

<b>Syntax</b>	fast-aps-switch;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <b>aps</b> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 12.1.
<b>Description</b>	(M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.
	<div><p><b>NOTE:</b></p><ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li><li>• 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.</li><li>• The fast-aps-switch statement cannot be configured when the APS annex-b option is configured.</li><li>• The interfaces that have the fast-aps-switch statement configured cannot be used in virtual private LAN service (VPLS) environments.</li></ul></div>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• Reducing APS Switchover Time in Layer 2 Circuits</li></ul>



## fcs

<b>Syntax</b>	fcs (16   32);
<b>Hierarchy Level</b>	[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]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<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 <b>fcs</b> statement is not supported. To configure FCS on each DS3 channel, you must include the <b>t3-options fcs</b> 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>  <p><b>NOTE:</b> When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <b>fcs</b> 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>
<b>Options</b>	<p><b>16</b>—Use a 16-bit frame checksum on the interface.</p> <p><b>32</b>—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><b>Default:</b> 16</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring the E1 Frame Checksum on page 167</a></li> <li>• <a href="#">Configuring the E3 Frame Checksum on page 176</a></li> <li>• <a href="#">Configuring the SONET/SDH Frame Checksum</a></li> <li>• <a href="#">Configuring the T1 Frame Checksum on page 185</a></li> <li>• <a href="#">Configuring the T3 Frame Checksum on page 197</a></li> </ul>

## feac-loop-respond

---


<b>Syntax</b>	(feac-loop-respond   no-feac-loop-respond);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<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 <b>loopback</b> statement, the router does not respond to FEAC requests from the CSU even if you include the <b>feac-loop-respond</b> statement in the configuration. For the router to respond, you must delete the <b>loopback</b> 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>
<b>Default</b>	The router does not respond to FEAC requests.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the T3 FEAC Response on page 197</a></li><li>• <a href="#">loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 276</a></li><li>• <a href="#">remote-loopback-respond on page 288</a></li></ul>

## force

---

<b>Syntax</b>	<code>force (protect   working);</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Perform a forced switch between the protect and working circuits. This statement is honored only if there are no higher-priority reasons to switch. It can be overridden by a signal failure on the protect circuit, thus causing a switch to the working circuit.
<b>Options</b>	<b>protect</b> —Request the circuit to become the protect circuit. <b>working</b> —Request the circuit to become the working circuit.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring Switching Between the Working and Protect Circuits</li><li><a href="#">request on page 289</a></li></ul>

## framing (E1, E3, and T1 Interfaces)

<b>Syntax</b>	framing (g704   g704-no-crc4   g.751   g.832   unframed   sf   esf);
<b>Hierarchy Level</b>	[edit interfaces ce1- <i>fpc/pic/port</i> ], [edit interfaces ct1- <i>fpc/pic/port</i> ], [edit interfaces at- <i>fpc/pic/port</i> e3-options], [edit interfaces e1- <i>fpc/pic/port</i> e1-options], [edit interfaces t1- <i>fpc/pic/port</i> t1-options]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the framing format.
	<div>  <p><b>NOTE:</b> 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-<i>fpc/pic/port</i>] or [edit interfaces ct1-<i>fpc/pic/port</i>] hierarchy level as appropriate.</p> </div>
<b>Default</b>	<b>esf</b> for T1 interfaces; <b>g704</b> for E1 interfaces. There is no default value for E3 over ATM interfaces.
<b>Options</b>	<p><b>esf</b>—Extended superframe (ESF) mode for T1 interfaces.</p> <p><b>g704</b>—G.704 framing format for E1 interfaces.</p> <p><b>g704-no-crc4</b>—G.704 framing with no cyclic redundancy check 4 (CRC4) for E1 interfaces.</p> <p><b>g.751</b>—G.751 framing format for E3 over ATM interfaces.</p> <p><b>g.832</b>—G.832 framing format for E3 over ATM interfaces.</p> <p><b>sf</b>—Superframe (SF) mode for T1 interfaces.</p> <p><b>unframed</b>—Unframed mode for E1 interfaces.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring E1 Framing on page 167</a></li> <li>• <a href="#">Configuring E3 and T3 Parameters on ATM Interfaces</a></li> <li>• <a href="#">Configuring T1 Framing on page 186</a></li> </ul>


## hold-time (APS)

---

<b>Syntax</b>	hold-time <i>milliseconds</i> ;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Hold-time value to use to determine whether a neighbor APS router is operational.
<b>Options</b>	<i>milliseconds</i> —Hold-time value. <b>Range:</b> 1 through 65,534 milliseconds <b>Default:</b> 3000 milliseconds (3 times the advertisement interval)
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring APS Timers</li><li><a href="#">advertise-interval on page 226</a></li></ul>

## idle-cycle-flag

---

<b>Syntax</b>	<code>idle-cycle-flag <i>value</i>;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces <i>e1-fpc/pic/port</i>],</code> <code>[edit interfaces <i>t1-fpc/pic/port</i>],</code> <code>[edit interfaces <i>interface-name</i> <b>ds0-options</b>],</code> <code>[edit interfaces <i>interface-name</i> <b>e1-options</b>],</code> <code>[edit interfaces <i>interface-name</i> <b>e3-options</b>],</code> <code>[edit interfaces <i>interface-name</i> serial-options],</code> <code>[edit interfaces <i>interface-name</i> <b>t1-options</b>],</code> <code>[edit interfaces <i>interface-name</i> <b>t3-options</b>]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the value that the DS0, E1, E3, T1, or T3 interface transmits during idle cycles.
	<div> <b>NOTE:</b> 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 <code>[edit interfaces <i>e1-fpc/pic/port</i>]</code> or <code>[edit interfaces <i>t1-fpc/pic/port</i>]</code> hierarchy level as appropriate.</div>
<b>Options</b>	<p><b><i>value</i></b>—Value to transmit in the idle cycles:</p> <ul style="list-style-type: none"><li><b>flags</b>—Transmit the value 0x7E.</li><li><b>ones</b>—Transmit the value 0xFF (all ones).</li></ul> <p><b>Default:</b> <code>Flags</code></p>
<b>Required Privilege Level</b>	<p><b>interface</b>—To view this statement in the configuration.</p> <p><b>interface-control</b>—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li><a href="#">Configuring the E1 Idle Cycle Flag on page 168</a></li><li><a href="#">Configuring the E3 Idle Cycle Flag on page 177</a></li><li><a href="#">Configuring the T1 Idle Cycle Flag on page 188</a></li><li><a href="#">Configuring the T3 Idle Cycle Flag on page 198</a></li></ul>

## interface-type

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

<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Channelized E1 IQ and IQE Interfaces Overview on page 147</a></li><li>• <a href="#">Channelized OC12/STM4 IQ and IQE Interfaces Overview on page 67</a></li><li>• <a href="#">Configuring Channelized T3 IQ Interfaces on page 125</a></li></ul>

---

## inverse-arp

---

<b>Syntax</b>	inverse-arp;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ], [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> multipoint-destination <i>destination</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet <b>address</b> <i>address</i> multipoint-destination <i>destination</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	For ATM encapsulation, enable responses to receive inverse ATM ARP requests. For Frame Relay encapsulation, enable responses to receive inverse Frame Relay ARP requests.
<b>Default</b>	Inverse ARP is disabled on all ATM and Frame Relay interfaces.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Inverse ATM1 or ATM2 ARP</a></li><li>• <a href="#">Configuring Inverse Frame Relay ARP on page 216</a></li></ul>



## invert-data

<b>Syntax</b>	invert-data;
<b>Hierarchy Level</b>	[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> t1-options], [edit interfaces <i>interface-name</i> e3-options]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	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.


<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring E1 Data Inversion on page 168</a></li> <li>• <a href="#">Configuring E3 Data Inversion on page 177</a></li> <li>• <a href="#">Configuring T1 Data Inversion on page 185</a></li> </ul>

## isdn-options

---

<b>Syntax</b>	<pre>isdn-options {     bchannel-allocation (ascending   descending);     calling-number <i>number</i>;     incoming-called-number <i>number</i> &lt;reject&gt;;     spid1 <i>spid-string</i>;     spid2 <i>spid-string</i>;     static-tei-val <i>value</i>;     switch-type (att5e   etsi   nil   ntdms100   ntt);     t310 <i>seconds</i>;     tei-option (first-call   power-up); }</pre>
<b>Hierarchy Level</b>	<pre>[edit interfaces br-<i>pim</i>/0/<i>port</i>], [edit interfaces ct1-<i>pim</i>/0/<i>port</i>], [edit interfaces ce1-<i>pim</i>/0/<i>port</i>]</pre>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. <b>bchannel-allocation</b> option added in Junos OS Release 8.3.
<b>Description</b>	<p>For J Series Services Routers only. Specify the ISDN options for configuring ISDN interfaces for group and user sessions.</p> <p>The statements are explained separately.</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring ISDN Physical Interface Properties</li><li><a href="#">Allocating B-Channels for Dialout on page 159</a></li><li><i>Junos OS Interfaces and Routing Configuration Guide</i></li></ul>

## line-encoding

<b>Syntax</b>	line-encoding (ami   b8zs);
<b>Hierarchy Level</b>	[edit interfaces ct1- <i>fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> t1- <b>options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Set the line encoding format on the T1 interface.
	<div>  <p><b>NOTE:</b> When configuring CT1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the line-encoding statement must be included at the [edit interfaces ct1-<i>fpc/pic/port</i>] hierarchy level.</p> </div>
<b>Default</b>	The default line encoding is B8ZS.
<b>Options</b>	<b>ami</b> —Use Alternate Mark Inversion (AMI) line encoding.  <b>b8zs</b> —Use bipolar with 8-zeros substitution (B8ZS) line encoding.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring T1 Line Encoding on page 186</a></li> </ul>

## lmi (Frame Relay)

---

**Syntax**    lmi {  
              **lmi-type** (ansi | itu | c-lmi);  
              n391dte *number*;  
              n392dce *seconds*;  
              n392dte *number*;  
              n393dce *number*;  
              n393dte *number*;  
              t391dte *number*;  
              t392dce *seconds*;  
              }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before Junos OS Release 7.4.

**Description**    Set Frame Relay keepalive parameters.

**Options**    n391dte—DTE full status polling interval.

**Range:** 1 through 255

**Default:** 6

n392dce—DCE error threshold, in number of errors.

**Range:** 1 through 10

**Default:** 3

n392dte—DTE error threshold, in number of errors.

**Range:** 1 through 10

**Default:** 3

n393dce—DCE monitored event-count.

**Range:** 1 through 10

**Default:** 4

n393dte—DTE monitored event-count.

**Range:** 1 through 10

**Default:** 4

t391dte—DTE polling timer.

**Range:** 5 through 30 seconds

**Default:** 10 seconds

t392dce—DCE polling timer.


**Range:** 5 through 30 seconds

**Default:** 15 seconds

The remaining statements are explained separately.

<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Tunable Keepalives for Frame Relay LMI on page 215</a></li> <li>• <a href="#">lmi-type on page 273</a></li> <li>• mlfr-uni-nni-bundle-options</li> </ul>

## lmi-type

<b>Syntax</b>	lmi-type (ansi   itu   c-lmi);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> lmi], [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Set Frame Relay Local Management Interface (LMI) type.
	<div>  <p><b>NOTE:</b> Consortium LMI is supported only on M320 routers with Enhanced III FPCs and specific IQE PICs and on MX80, MX240, MX480, and MX960 routers with MICs specified in “<a href="#">Configuring Tunable Keepalives for Frame Relay LMI</a>” on page 215.</p> </div>
<b>Options</b>	<p>ansi—Use ANSI T1.167 Annex D LMIs.</p> <p>itu—Use ITU Q933 Annex A LMIs.</p> <p>c-lmi—Use Consortium LMI.</p> <p><b>Default:</b> ansi</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Frame Relay Keepalives on page 214</a></li> <li>• mlfr-uni-nni-bundle-options</li> <li>• <a href="#">lmi (Frame Relay) on page 272</a></li> <li>• <a href="#">Junos OS Services Interfaces Configuration Guide</a></li> </ul>

## lockout

---


<b>Syntax</b>	lockout;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure a lockout of protection, forcing the use of the working circuit and locking out the protect circuit regardless of anything else.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Switching Between the Working and Protect Circuits</a></li></ul>

## long-buildout


---

<b>Syntax</b>	(long-buildout   no-long-buildout);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <a href="#">t3-options</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<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>
<b>Default</b>	A T3 interface uses the short line buildout setting ( <b>no-long-buildout</b> ) for wires shorter than 255 feet (68 meters).
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the T3 Line Buildout on page 198</a></li></ul>

## loop-timing

<b>Syntax</b>	(loop-timing   no-loop-timing);
<b>Hierarchy Level</b>	[edit interfaces ct3- <i>fpc/pic/port</i> <a href="#">t3-options</a> ], [edit interfaces e1- <i>fpc/pic/port:0</i> <a href="#">sonet-options</a> ], [edit interfaces stm1- <i>fpc/pic/port</i> <a href="#">sonet-options</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For channelized IQ interfaces and non-IQ channelized STM1 interfaces only, configure the SONET/SDH or DS3-level clocking source.
	<div>  <p><b>NOTE:</b> On M Series, MX Series, and T Series routers, under E1 channels, loop timing can be configured only at channel 0. When you configure on channel 0, it is applicable on all channels as internal by default.</p> </div>
<b>Options</b>	<p><b>loop-timing</b>—Configure loop timing (external) clocking.</p> <p><b>no-loop-timing</b>—Configure line timing (internal) clocking.</p> <p><b>Default:</b> no-loop-timing</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring Channelized IQ and IQE SONET/SDH Loop Timing</li> <li>Configuring the Channelized T3 Loop Timing</li> <li><a href="#">clocking on page 238</a></li> </ul>

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

<b>Syntax</b>	loopback (local   payload   remote);
<b>Hierarchy Level</b>	[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]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure a loopback connection. To turn off the loopback capability, remove the <b>loopback</b> statement from the configuration.
<div>  <p><b>NOTE:</b> When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the loopback statement must be included with the <b>local</b> or <b>remote</b> 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 <b>payload</b> option at the [edit interfaces t1-<i>fpc/pic/port</i>] hierarchy level.</p> </div>	
<p>To configure loopback on channelized IQ and IQE PICs, SONET/SDH level, use the <b>sonet-options loopback</b> statement <b>local</b> and <b>remote</b> options at the controller interface (coc48, cstm16, coc12, cstm4, coc3, cstm1). It is ignored for path-level interfaces <b>so-fpc/pic/port</b> or <b>so-fpc/pic/port:channel</b>.</p>	
<b>Options</b>	<p><b>local</b>—Loop packets, including both data and timing information, back on the local router's PIC. NxDS0 IQ interfaces do not support local loopback.</p> <p><b>payload</b>—For channelized T3, T1, and NxDS0 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.</p> <p><b>remote</b>—Loop packets, including both data and timing information, back on the remote router's interface card. NxDS0 IQ interfaces do not support remote loopback.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>





- Related Documentation**
- Configuring E3 and T3 Parameters on ATM Interfaces
  - [Configuring E1 Loopback Capability on page 168](#)
  - [Configuring E3 Loopback Capability on page 177](#)
  - Configuring Channelized IQ and IQE SONET/SDH Loop Timing
  - Configuring SHDSL Operating Mode on an ATM Physical Interface
  - [Configuring T1 Loopback Capability on page 186](#)
  - [Configuring T3 Loopback Capability on page 198](#)
  - [feac-loop-respond on page 262](#)

## loopback-clear-timer

<b>Syntax</b>	<code>loopback-clear-timer <i>seconds</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> ppp-options], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> ppp-options]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	For interfaces with PPP, PPP TCC, PPP over Ethernet, PPP over ATM, and PPP over Frame Relay encapsulations, configure a loop detection clear timer for the Link Control Protocol (LCP) component of a PPP session.
<b>Options</b>	<p><b><i>seconds</i></b>—The time in seconds to wait before the loop detection flag is cleared if it is not cleared by the protocol.</p> <p><b>Range:</b> 1 through 60 seconds</p> <p><b>Default:</b> 9 seconds</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• Configuring the PPP Clear Loop Detected Timer</li> </ul>

## mtu

<b>Syntax</b>	<code>mtu bytes;</code>
<b>Hierarchy Level</b>	<p>[edit interfaces <i>interface-name</i>],</p> <p>[edit interfaces <i>interface-name</i> <i>unit</i> <i>logical-unit-number</i> <i>family</i> <i>family</i>],</p> <p>[edit interfaces <i>interface-range name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> <i>unit</i> <i>logical-unit-number</i> <i>family</i> <i>family</i>]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p>
<b>Description</b>	Specify the maximum transmission unit (MTU) size for the media or protocol. The default MTU size depends on the device type. Changing the media MTU or protocol MTU causes an interface to be deleted and added again.
	<p> <b>NOTE:</b> If a packet whose size is larger than the configured MTU size is received on the receiving interface, the packet is eventually dropped. The value considered for MRU (maximum receive unit) size is also the same as the MTU size configured on that interface.</p> <p> <b>NOTE:</b> Not all devices allow you to set an MTU value, and some devices have restrictions on the range of allowable MTU values. You cannot configure an MTU for management Ethernet interfaces (<i>fxp0</i>, <i>em0</i>, or <i>me0</i>) or for loopback, multilink, and multicast tunnel devices.</p> <p>For more information on configuring MTU for specific interfaces and router or switch combinations, see <i>Configuring the Media MTU</i>.</p>
<b>Options</b>	<p><i>bytes</i>—MTU size.</p> <p><b>Range:</b> 256 through 9192 bytes</p> <p><b>Default:</b> 1500 bytes (INET, INET6, and ISO families), 1448 bytes (MPLS)</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring the Media MTU</li> <li>Setting the Protocol MTU</li> </ul>

## multicast-dlci

---

<b>Syntax</b>	<code>multicast-dlci <i>dlci-identifier</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For point-to-multipoint Frame Relay, link services, and voice services interfaces only, enable multicast support on the interface. You can configure multicast support on the interface if the Frame Relay switch performs multicast replication.
<b>Options</b>	<i>dlci-identifier</i> —DLCI identifier, a number from 16 through 1022 that defines the Frame Relay DLCI over which the switch expects to receive multicast packets for replication.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring a Multicast-Capable Frame Relay Connection on page 219</a></li> <li>• <a href="#">dlci on page 243</a></li> <li>• <a href="#">multipoint-destination on page 280</a></li> <li>• <a href="#">Junos OS Services Interfaces Configuration Guide</a></li> </ul>

## multipoint-destination

<b>Syntax</b>	<pre> multipoint-destination address dlcidlcid-identifier; multipoint-destination address {   epd-threshold cells;   inverse-arp;   oam-liveness {     down-count cells;     up-count cells;   }   oam-period (disable   seconds);   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; } </pre>
<b>Hierarchy Level</b>	<p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i>]</p>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For point-to-multipoint Frame Relay or ATM interfaces only, enable the support of multicast on the interface. You can configure multicast support on the interface if the Frame Relay or ATM switch performs multicast replication.
<b>Options</b>	<p><b>address</b>—Address of the remote side of the point-to-multipoint connection.</p> <p><b>dlci-identifier</b>—For Frame Relay interfaces, the data-link connection identifier.  <b>Range:</b> 0 through 0xFFFFFFF (24 bits)</p> <p><b>vci-identifier</b>—For ATM interfaces, the virtual circuit identifier.  <b>Range:</b> 0 through 16,384</p> <p><b>vpi-identifier</b>—For ATM interfaces, the virtual path identifier.  <b>Range:</b> 0 through 255  <b>Default:</b> 0</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring a Point-to-Point ATM1 or ATM2 IQ Connection</li> <li><a href="#">Configuring a Point-to-Multipoint Frame Relay Connection on page 218</a></li> <li><a href="#">dlci on page 243</a></li> <li><a href="#">encapsulation (Logical Interface) on page 248</a></li> </ul>

## neighbor

---

<b>Syntax</b>	<code>neighbor <i>address</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>If you are configuring one router to be the working router and a second to be the protect router, configure the address of the remote interface. You configure this on one or both of the interfaces.</p> <p>The address you specify for the neighbor must never be routed through the interface on which APS is configured, or instability will result. We strongly recommend that you directly connect the working and protect routers and that you configure the interface address of this shared network as the neighbor address.</p>
<b>Options</b>	<i>address</i> —Neighbor's address.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring Basic APS Support</li></ul>

## no-keepalives

---

<b>Syntax</b>	no-keepalives;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ], [edit interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Disable the sending of keepalives on a physical interface configured with PPP, Frame Relay, or Cisco HDLC encapsulation. The default keepalive interval is 10 seconds.</p> <p>For ATM2 IQ interfaces only, you can disable keepalives on a logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"><li>• <b>atm-ppp-llc</b>—PPP over AAL5 LLC encapsulation.</li><li>• <b>atm-ppp-vc-mux</b>—PPP over AAL5 multiplex encapsulation.</li></ul>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Keepalives</a></li><li>• <a href="#">Disabling the Sending of PPPoE Keepalive Messages</a></li><li>• <a href="#">Configuring Frame Relay Keepalives on page 214</a></li></ul>

## no-partition

<b>Syntax</b>	no-partition <b>interface-type</b> (e1   (cau4   so)   (ct3   t3)   so   t3);
<b>Hierarchy Level</b>	<pre>[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]</pre>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<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>
<b>Default</b>	If you do not include either this statement or the <b>partition</b> statement, the Channelized IQ PIC is not partitioned, and no data channels are configured.
<b>Options</b>	<p>The option used must correspond to the physical interface type:</p> <p><b>e1</b>—E1 interface type.</p> <p><b>coc12 so</b>—Channelized OC12 interface type, in SONET mode.</p> <p><b>cau4</b>—Channelized AU-4 interface type.</p> <p><b>cstm1</b>—SONET/SDH STM1 interface type, in SDH mode.</p> <p><b>ct3</b>—Channelized T3 interface type.</p> <p><b>t3</b>—T3 interface type.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Channelized E1 IQ and IQE Interfaces Overview on page 147</a></li> <li>• <a href="#">Channelized OC12/STM4 IQ and IQE Interfaces Overview on page 67</a></li> <li>• <a href="#">Configuring an OC12/STM4 Interface on page 71</a></li> </ul>

- [Configuring Channelized STM1 IQ and IQE Interfaces on page 107](#)
- [Configuring T3 IQ Interfaces on page 125](#)
- [partition on page 286](#)

---

## no-termination-request

---

<b>Syntax</b>	no-termination-request;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ppp-options], [edit interfaces lsq- <i>fpc/pic/port</i> lsq-failure-options]
<b>Release Information</b>	Statement introduced in Junos OS Release 7.4. Support at the [edit interfaces <i>interface-name</i> ppp-options] hierarchy level added in Junos OS Release 8.3.
<b>Description</b>	For LSQ PICs or link PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the PIC fails.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Link PIC Failover on Channelized OC3 IQ and IQE Interfaces on page 106</a></li><li>• <a href="#">Configuring Link PIC Failover on Channelized OC12/STM4 IQ and IQE Interfaces on page 92</a></li><li>• <a href="#">Configuring Link PIC Failover on Channelized STM1 Interfaces on page 121</a></li><li>• <a href="#">Junos OS Services Interfaces Configuration Guide</a></li></ul>



## oc-slice

<b>Syntax</b>	<code>oc-slice <i>oc-slice-range</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>partition</b> <i>partition-number</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For channelized OC12 IQ interfaces only, configure the range of SONET/SDH slices.
<b>Default</b>	If you do not include either this statement or the <b>no-partition</b> statement, the Channelized OC12 IQ PICs not partitioned, and no data channels are configured.
<b>Options</b>	<p><b><i>oc-slice-range</i></b>—Range of SONET/SDH slices. OC3 interfaces must occupy three consecutive OC slices per interface, in the form 1–3, 4–6, 7–9, or 10–12. The T3, T1, and DS0 interface types each occupy one OC slice per interface.</p> <p><b>Range:</b> For OC3 interfaces, 1–3, 4–6, 7–9, or 10–12; for SONET/SDH and T3 interfaces, 1–12</p> <p>The remaining statement is explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Channelized OC12/STM4 IQ and IQE Interfaces Overview on page 67</a></li> </ul>

## paired-group


<b>Syntax</b>	<code>paired-group <i>group-name</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <b>aps</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure load sharing between two working protect circuit pairs.
<b>Options</b>	<b><i>group-name</i></b> —Circuit's group name, as configured with the <b>protect-circuit</b> or <b>working-circuit</b> statement.
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• Configuring APS Load Sharing Between Circuit Pairs</li> <li>• <a href="#">working-circuit on page 305</a></li> </ul>

## partition

---

<b>Syntax</b>	<code>partition <i>partition-number</i> <b>oc-slice</b> <i>oc-slice-range</i> <b>interface-type</b> <i>type</i> <b>timeslots</b> <i>time-slot-range</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	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.
<b>Default</b>	If you omit this statement, the channelized PIC or PIM is not partitioned, and no data channels are configured.
<b>Options</b>	<p><b><i>partition-number</i></b>—Sublevel interface partition index.</p> <p><b>Range:</b></p> <ul style="list-style-type: none"><li>• 1 through 4 for an OC3 interface on a channelized OC12 IQ interface.</li><li>• 1 through 12 for a T3 interface on a channelized OC12 IQ interface.</li><li>• 1 through 4 for a T3 interface on a channelized T3 IQ interface.</li><li>• 1 through 28 for a T1 IQ interface on a channelized OC12 IQ or channelized T3 IQ interface.</li><li>• 1 through 10 for an E1 interface on a channelized E1 IQ interface.</li><li>• 1 through 30 on a channelized E1 interface.</li><li>• 1 through 23 on a channelized T1 interface.</li><li>• 1 through 24 for NxDS0 interfaces on either channelized OC12 IQ or channelized DS3 IQ interfaces.</li><li>• 0 through 31 (with 0 reserved for framing) for NxDS0 interfaces on channelized E1 IQ interfaces.</li></ul> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Channelized E1 IQ and IQE Interfaces Overview on page 147</a></li><li>• <a href="#">Channelized OC12/STM4 IQ and IQE Interfaces Overview on page 67</a></li><li>• <a href="#">Configuring Channelized T3 IQ Interfaces on page 125</a></li><li>• <a href="#">no-partition on page 283</a></li></ul>

## payload-scrambler

<b>Syntax</b>	(payload-scrambler   no-payload-scrambler);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <a href="#">e3-options</a> ], [edit interfaces <i>interface-name</i> <a href="#">sonet-options</a> ], [edit interfaces <i>interface-name</i> <a href="#">t3-options</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Enable or disable HDLC scrambling on an E3, a SONET/SDH, or a T3 interface. This type of scrambling provides better link stability. Both sides of a connection must either use or not use scrambling.</p> <p>If you commit a T3 interface configuration that has HDLC payload scrambling enabled, the interface must also be configured to be compatible with the channel service unit (CSU) at the remote end of the line.</p> <p>Disable payload scrambling on an E3 interface if Digital Link compatibility mode is used.</p> <p>On a channelized OC12 interface, the <b>sonet payload-scrambler</b> statement is ignored. To configure scrambling on the DS3 channels on the interface, you can include the <b>t3-options payload-scrambler</b> statement in the configuration for each DS3 channel.</p>
	<div>  <p><b>NOTE:</b> The <b>payload-scrambler</b> statement at the [edit interfaces <i>interface-name</i> <a href="#">e3-options</a>] hierarchy level is not valid for IQE PICs.</p> </div>
<b>Default</b>	Payload scrambling is disabled on all E3 and T3 interfaces; it is enabled by default on E3/T3 over ATM interfaces and on SONET/SDH interfaces.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring E3 and T3 Parameters on ATM Interfaces</li> <li><a href="#">Configuring E3 HDLC Payload Scrambling on page 179</a></li> <li>Configuring SONET/SDH HDLC Payload Scrambling</li> <li><a href="#">Configuring T3 HDLC Payload Scrambling on page 200</a></li> <li><a href="#">Examples: Configuring T3 Interfaces on page 201</a></li> <li><a href="#">compatibility-mode on page 239</a></li> </ul>

## protect-circuit

---

<b>Syntax</b>	<code>protect-circuit <i>group-name</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the protect router in an APS circuit pair. When the working interface fails, APS brings up the protection circuit and the traffic is moved to the protection circuit.
<b>Options</b>	<i>group-name</i> —Circuit's group name.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring Basic APS Support</li><li><a href="#">working-circuit on page 305</a></li></ul>

## remote-loopback-respond

---

<b>Syntax</b>	<code>remote-loopback-respond;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>ct1-fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> <a href="#">t1-options</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For T1 interfaces only, configure the router to respond to remote loopback requests. Remote loopback requests can be from the facilities data link or inband.



NOTE: When configuring CT1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the `remote-loopback-respond` statement must be included at the [edit interfaces *ct1-fpc/pic/port*] hierarchy level.

<b>Default</b>	The router does not respond to remote loop requests.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li><a href="#">Configuring the T1 Remote Loopback Response on page 185</a></li><li><a href="#">feac-loop-respond on page 262</a></li><li><a href="#">loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 276</a></li></ul>

## request

---

<b>Syntax</b>	<code>request (protect   working);</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Perform a manual switch between the protect and working circuits. This statement is honored only if there are no higher-priority reasons to switch.
<b>Options</b>	<p><b>protect</b>—Request that the circuit become the protect circuit.</p> <p><b>working</b>—Request that the circuit become the working circuit.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring Switching Between the Working and Protect Circuits</li> <li><a href="#">force on page 263</a></li> </ul>

## revert-time

---

<b>Syntax</b>	<code>revert-time <i>seconds</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure APS revertive mode.
<b>Default</b>	APS operates in nonrevertive mode.
<b>Options</b>	<p><b>seconds</b>—Amount of time to wait after the working circuit has again become functional before making the working circuit active again.</p> <p><b>Range:</b> 1 through 65,535 seconds</p> <p><b>Default:</b> None (APS operates in nonrevertive mode)</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring Revertive Mode</li> </ul>

## sonet-options

```
Syntax  sonet-options {
        aps {
            advertise-interval milliseconds;
            annex-b
            authentication-key key;
            fast-aps-switch;
            force;
            hold-time milliseconds;
            lockout;
            neighbor address;
            paired-group group-name;
            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;
            defect hold-time up milliseconds down milliseconds;
        }
    }
    vtmapping (itu-t | klm);
    (z0-increment | no-z0-increment);
```

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before Junos OS Release 7.4.

**Description** Configure SONET/SDH-specific interface properties.

On SONET/SDH OC48 interfaces that you configure for channelized (multiplexed) mode (by including the **no-concatenate** statement at the [edit chassis fpc *slot-number* pic

*pic-number*] hierarchy level), the **bytes e1-quiet** and **bytes f1** options have no effect. The **bytes f2**, **bytes z3**, **bytes z4**, and **path-trace** options work correctly on channel 0 and work in the transmit direction only on channels 1, 2, and 3.

On a channelized OC12 interface, the **bytes e1-quiet**, **bytes f1**, **bytes f2**, **bytes z3**, and **bytes z4** options are not supported. The **fcs** and **payload-scrambler** statements are also not supported; you must configure these for each DS3 channel using the **t3-options fcs** and **t3-options payload-scrambler** statements. The **aps** and **loopback** statements are supported only on channel 0 and are ignored if included in the configurations for channels 1 through 11. You can configure loopbacks for each DS3 channel with the **t3-options loopback** statement. The **path-trace** statement can be included in the configuration for each DS3 channel, thereby configuring a unique path trace for each channel.

To configure loopback on channelized IQ and IQE PICs, SONET/SDH level, use the **loopback** statement **local** and **remote** options at the controller interface (coc48, cstm16, coc12, cstm4, coc3, and cstm1). It is ignored for path-level interfaces **so-fpc/pic/port** or **so-fpc/pic/port:channel**.


If you are running Intermediate System-to-Intermediate System (IS-IS) over SONET/SDH interfaces, use PPP if you are running Cisco IOS Release 12.0 or later. If you need to run HDLC, configure an ISO family MTU of 4469 on the router.

The statements are explained separately.

<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring SONET/SDH Parameters on ATM Interfaces</a></li> <li>• <a href="#">Channelized OC12/STM4 IQ and IQE Interfaces Overview on page 67</a></li> <li>• <a href="#">Channelized STM1 Interfaces Overview on page 107</a></li> <li>• <a href="#">Configuring SONET/SDH Physical Interface Properties</a></li> <li>• <a href="#">no-concatenate</a></li> </ul>

## start-end-flag

---

<b>Syntax</b>	start-end-flag (filler   shared);
<b>Hierarchy Level</b>	[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]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For DS0, E1, E3, T1, and T3 interfaces, configure the interface to share the transmission of start and end flags.
<div> <b>NOTE:</b> 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.</div>	
<b>Options</b>	<b>filler</b> —Wait two idle cycles between the start and end flags.  <b>shared</b> —Share the transmission of the start and end flags. This is the default.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring E1 Start and End Flags on page 170</a></li><li>• <a href="#">Configuring the E3 Start and End Flags on page 179</a></li><li>• <a href="#">Configuring T1 Start and End Flags on page 188</a></li><li>• <a href="#">Configuring T3 Start and End Flags on page 201</a></li></ul>



## switching-mode

---

<b>Syntax</b>	<code>switching-mode (bidirectional   unidirectional);</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For unchannelized OC3, OC12, and OC48 SONET/SDH interfaces on T Series routers only, configure the interface to interoperate with SONET/SDH line-terminating equipment (LTE) that is provisioned for unidirectional linear APS in 1+1 architecture.
<b>Default</b>	If the <b>switching-mode</b> statement is not configured, the mode is bidirectional, and the interface does not interoperate with a unidirectional SONET/SDH LTE.
<b>Options</b>	<b>bidirectional</b> —Support bidirectional mode only.  <b>unidirectional</b> —Interoperate with a SONET/SDH LTE provisioned for unidirectional mode.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>Configuring Unidirectional Switching Mode Support</li> </ul>

## t1-options

---

**Syntax**    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*;  
              }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before Junos OS Release 7.4.

**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**    • [T1 Interfaces Overview on page 181](#)

## t3-options

<b>Syntax</b>	<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) &lt;subrate <i>value</i>&gt;;   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>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Configure T3-specific physical interface properties, including the properties of DS3 channels on a channelized OC12 interface. The <b>long-buildout</b> 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>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">T3 Interfaces Overview on page 191</a></li> </ul>

## timeslots

<b>Syntax</b>	<code>timeslots <i>time-slot-range</i>;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces <i>e1-fpc/pic/port</i>],</code> <code>[edit interfaces <i>t1-fpc/pic/port</i>],</code> <code>[edit interfaces <i>interface-name</i> <b>e1-options</b>],</code> <code>[edit interfaces <i>interface-name</i> <b>partition</b> <i>partition-number</i>],</code> <code>[edit interfaces <i>interface-name</i> <b>t1-options</b>]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For E1 and T1 interfaces, allocate the specific time slots by number.



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

<b>Options</b>	<p><b><i>time-slot-range</i></b>—Actual time slot numbers allocated:</p> <p><b>Range:</b> Ranges vary by interface type and configuration option as follows:</p> <ul style="list-style-type: none"> <li>• 1 through 24 for T1 interfaces (0 is reserved)</li> <li>• 1 through 31 for 4-port E1 PICs (0 is reserved)</li> <li>• 1 through 31 for NxDS0 interfaces (0 is reserved)</li> <li>• 2 through 32 for 10-port Channelized E1 and 10-port Channelized E1 IQ PICs (1 is reserved)</li> <li>• 2 through 32 for the setting under <b>e1-options</b> with IQE PICs (1 is reserved) (when creating fractional E1)</li> <li>• 1 through 31 for the setting under <b>partition</b> with IQE PICs (0 is reserved) (when creating NxDS0)</li> </ul>
----------------	--



**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.

<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Fractional E1 IQ and IQE Interfaces on page 148</a></li> <li>• <a href="#">Configuring Fractional T1 IQ and IQE Interfaces on page 126</a></li> </ul>

- [Configuring Fractional E1 Time Slots on page 170](#)
- [Configuring Fractional T1 Time Slots on page 189](#)
- [Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots on page 156](#)

## translate-discard-eligible

<b>Syntax</b>	(translate-discard-eligible   no-translate-discard-eligible);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> <b>family</b> <i>ccc</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> <b>unit</b> <i>logical-unit-number</i> <b>family</b> <i>ccc</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For interfaces with encapsulation type Frame Relay CCC, enable or disable translation of Frame Relay discard eligible (DE) control bits.
<b>Default</b>	DE bit translation is disabled.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Frame Relay Control Bit Translation on page 212</a></li> </ul>

## unframed

<b>Syntax</b>	(unframed   no-unframed);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>e3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For E3 IQ interfaces only, enable or disable unframed mode. In unframed mode, the E3 IQ interface do not detect yellow ( <b>ylw</b> ) or loss-of-frame ( <b>lof</b> ) alarms.
<b>Default</b>	Unframed mode is disabled.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring E3 IQ and IQE Unframed Mode on page 179</a></li> </ul>

## unit

```

Syntax  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 | 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 {
            maximum-contexts number <force>;
            f-max-period number;
            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;
family family-name {
    ... the family subhierarchy appears after the main [edit interfaces interface-name unit
        logical-unit-number] hierarchy ...
}
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 {
    up-count cells;
    down-count cells;
}
oam-period (disable | seconds);
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;  
    }  
    dynamic-profile profile-name;  
    lcp-restart-timer milliseconds;  
    loopback-clear-timer seconds;  
    ncp-restart-timer milliseconds;  
    pap {  
      access-profile name;  
      default-pap-password password;  
      local-name name;  
      local-password password;  
      passive;  
    }  
  }  
  pppoe-options {  
    access-concentrator name;  
    auto-reconnect seconds;  
    (client | server);  
    service-name name;  
    underlying-interface interface-name;  
  }  
  pppoe-underlying-options {  
    access-concentrator name;  
    dynamic-profile profile-name;  
    max-sessions number;  
  }  
  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;  
  targeted-distribution;  
  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-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            (input | output | input output);
        }
    }
    access-concentrator name;
    address address {
        ... the address subhierarchy appears after the main [edit interfaces interface-name unit
            logical-unit-number family family-name] hierarchy ...
    }
    bridge-domain-type (bvlan | svlan);
    bundle interface-name;
    core-facing;
    demux-destination {
        destination-prefix;
    }
    demux-source {
        source-prefix;
    }
    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 ];
    }
    interface-mode (access | trunk);
    ipsec-sa sa-name;
    isid-list all-service-groups;
    keep-address-and-control;
    mac-validate (loose | strict);
    max-sessions number;
    mtu bytes;
    multicast-only;
    no-redirects;

```

```

    policer {
        arp policer-template-name;
        input policer-template-name;
        output policer-template-name;
    }
    primary;
    protocols [inet iso mpls];
    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 {
        input;
        output;
    }
    service {
        input {
            post-service-filter filter-name;
            service-set service-set-name <service-filter filter-name>;
        }
        output {
            service-set service-set-name <service-filter filter-name>;
        }
    }
    service-name-table table-name
    (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;
    vlan-id number;
    vlan-id-list [number number-number];
    address address {
        arp ip-address (mac | multicast-mac) mac-address <publish>;
        broadcast address;
        destination address;
        destination-profile name;
        eui-64;
        master-only;
        multipoint-destination address {
            dlc dlci-identifier;
            epd-threshold cells <plp1 cells>;
            inverse-arp;
            oam-liveness {
                up-count cells;
                down-count cells;
            }
            oam-period (disable | seconds);
            shaping {
                (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate
                sustained rate);
                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;
    track {
      interface interface-name {
        bandwidth-threshold bits-per-second priority-cost number;
      }
      priority-hold-time seconds;
      route ip-address/prefix-length routing-instance instance-name priority-cost cost;
    }
    virtual-address [ addresses ];
    virtual-link-local-address ipv6-address;
    vrrp-inherit-from {
      active-interface interface-name;
      active-group group-number;
    }
  }
}
}
}

```

Hierarchy Level	[edit interfaces <i>interface-name</i> ], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> ], [edit interfaces interface-set <i>interface-set-name</i> interface <i>interface-name</i> ]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.
Options	<i>logical-unit-number</i> —Number of the logical unit. <b>Range:</b> 0 through 1,073,741,823 for demux and PPPoE static interfaces only. 0 through 16,385 for all other static interface types.  The remaining 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**
- [Configuring Logical Interface Properties](#)
  - [Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers](#)
  - [Junos OS Services Interfaces Configuration Guide](#)

---

## vtmapping

---

- Syntax** `vtmapping (itu-t | klm);`
- Hierarchy Level** `[edit interfaces interface-name sonet-options];`  
`[edit chassis fpc number pic number]`
- Release Information** Statement introduced before Junos OS Release 7.4.
- Description** For the Channelized STM1 IQ PIC or Channelized STM1 PIC, configure virtual tributary mapping.
- For the Channelized STM1 PIC, you configure virtual tributary mapping at the `[edit chassis fpc number pic number]` hierarchy level.
- Options** `itu-t`—International Telephony Union standard.
- `klm`—KLM standard.
- Default:** `klm`
- Required Privilege Level** `interface`—To view this statement in the configuration.  
`interface-control`—To add this statement to the configuration.
- Related Documentation**
- [Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces on page 114](#)
  - [Junos OS System Basics Configuration Guide](#)

## working-circuit

---

<b>Syntax</b>	<code>working-circuit <i>group-name</i>;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options <a href="#">aps</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the working router in an APS circuit pair.
<b>Options</b>	<i>group-name</i> —Circuit's group name.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>Configuring Basic APS Support</li><li><a href="#">protect-circuit on page 288</a></li></ul>



## PART 6

# Troubleshooting

- [Investigate Channelized DS3 Interfaces on page 309](#)
- [Investigate Multichannel DS3 Interfaces on page 341](#)
- [Investigate Channelized OC12 Interfaces on page 373](#)





## CHAPTER 17

# Investigate Channelized DS3 Interfaces

- [Investigate Interface Steps and Commands on page 309](#)
- [Monitor Channelized DS3 Interfaces on page 312](#)
- [Use Loopback Testing For Channelized DS3 Interfaces on page 325](#)
- [Locate Channelized DS3 Alarms and Errors on page 335](#)

## Investigate Interface Steps and Commands

---

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

- [Investigate Interface Steps and Commands Overview on page 309](#)
- [Monitor Interfaces on page 309](#)
- [Perform a Loopback Test on an Interface on page 310](#)
- [Locate Interface Alarms on page 312](#)

## Investigate Interface Steps and Commands Overview

The “[Monitor Interfaces](#)” on [page 309](#) section helps you determine the nature of the interface problem. The “[Perform a Loopback Test on an Interface](#)” on [page 310](#) section provides information to help you isolate the source of the problem. The “[Locate Interface Alarms](#)” on [page 312](#) section explains some of the alarms and errors for the media.

## Monitor Interfaces

**Problem** The following steps are a general outline of how you monitor interfaces to determine the nature of interface problems. For more detailed information on a specific interface, see the corresponding monitor interfaces 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 “*Commands Used to Monitor Interfaces*” table lists and describes the operational mode commands you use to monitor interfaces.

**Table 22: Commands Used to Monitor Interfaces**

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

## Perform a Loopback Test on an Interface

**Problem** The following steps are a general outline of how you use loopback testing to isolate the source of the interface problem. For more detailed information on a specific interface, see the corresponding loopback 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 “*Commands Used to Perform Loopback Testing on Interfaces*” table 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 23: Commands Used to Perform Loopback Testing on Interfaces**

CLI Statement or Command	Interface Type	Description
<code>[edit interfaces <i>interface-name</i> <i>interface-</i> options] set loopback (local   remote)</code>	All interfaces	The <b>loopback</b> 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 <b>loopback</b> statement from the configuration.
<code>show</code>	All interfaces	Verify the configuration before you commit it.
<code>commit</code>	All interfaces	Save the set of changes to the database and cause the changes to take operational effect.  Use after you have verified a configuration in all configuration steps.
<code>[edit interfaces <i>interface-name</i>] set clocking internal</code>	T1, T3, ATM, and SONET interfaces	The <b>clocking</b> statement at this hierarchy level configures the clock source of the interface to internal.
<code>show interfaces <i>interface-name</i></code>	Used for all interfaces	Display static status information about a specific interface.
<code>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address address] arp <i>ip-address</i> mac <i>mac-address</i></code>	Fast Ethernet and Gigabit Ethernet interfaces	The <b>arp</b> statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses.
<code>show arp no-resolve</code>	Fast Ethernet and Gigabit Ethernet interfaces	Display the entries in the ARP table without attempting to determine the hostname that corresponds to the IP address (the <b>no-resolve</b> option).
<code>clear interfaces statistics <i>interface-name</i></code>	All interfaces	Reset the statistics for an interface to zero.
<code>[edit interfaces <i>interface-name</i> ] set encapsulation cisco-hdlc</code>	T1, T3, SONET, and Multichannel DS3 interfaces	The <b>encapsulation</b> statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
<code>[edit interfaces <i>interface-name</i>] set no-keepalives</code>	T1, T3, SONET, and Multichannel DS3 interfaces	The <b>no-keepalives</b> statement at this level disables the sending of keepalives on the physical interface.

Table 23: Commands Used to Perform Loopback Testing on Interfaces (*continued*)

CLI Statement or Command	Interface Type	Description
<b>show interfaces <i>interface-name</i> terse</b>	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
<b>ping interface t1- <i>x/x/x</i> local-IP-address bypass-routing count 1000 rapid</b>	All interfaces	<p>Check the reachability of network hosts by sending <b>ICMP ECHO_REQUEST</b> messages to elicit <b>ICMP ECHO_RESPONSE</b> messages from the specified host.</p> <p>Use the <b>bypass-routing</b> option to ping a local system through an interface that has no route through it.</p> <p>The <b>count</b> option sends 1000 ping requests through the system.</p> <p>Type <b>Ctrl+C</b> to interrupt a <b>ping</b> command.</p>
<b>show interfaces <i>interface-name</i> extensive</b>	All interfaces	Display very detailed interface information about a specific interface.

## Locate Interface Alarms

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

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

## Monitor Channelized DS3 Interfaces

- [Checklist for Monitoring Channelized DS3 Interfaces on page 312](#)
- [Monitor Channelized DS3 Interfaces on page 313](#)

### 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 24 on page 312](#) provides the links and commands for monitoring Channelized DS3 interfaces.

Table 24: Checklist for Monitoring Channelized DS3 Interfaces

Tasks	Command or Action
<b>“Monitor Channelized DS3 Interfaces” on page 313</b>	
1. <a href="#">Display the Status of Channelized DS3 Interfaces on page 313</a>	<b>show interfaces terse t1*</b>

Table 24: Checklist for Monitoring Channelized DS3 Interfaces (*continued*)

Tasks	Command or Action
2. <a href="#">Display the Status of a Specific Channelized DS3 Interface on page 314</a>	<code>show interfaces t1-fpc/pic/port:channel</code>
3. <a href="#">Display Extensive Status Information for a Specific Channelized DS3 Interface on page 317</a>	<code>show interfaces t1-fpc/pic/port:channel extensive</code>
4. <a href="#">Monitor Statistics for a Channelized DS3 Interface on page 322</a>	<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 313](#)
2. [Display the Status of a Specific Channelized DS3 Interface on page 314](#)
3. [Display Extensive Status Information for a Specific Channelized DS3 Interface on page 317](#)
4. [Monitor Statistics for a Channelized DS3 Interface on page 322](#)

### 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 tl-0/3/3:2.0 (Index 132) (SNMP ifIndex 236) (Generation 69)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Traffic statistics:
  Input bytes :      5789719245
  Output bytes :    19909405752
  Input packets:    33897585
  Output packets:   40673646
Local statistics:
  Input bytes :      2930724407
  Output bytes :    9983871242
  Input packets:    17011460
  Output packets:   20390813
Transit statistics:
  Input bytes :      2858994838      14784 bps
  Output bytes :    9925534510      286584 bps
  Input packets:    16886125      25 pps
  Output packets:   20282833      38 pps
Protocol inet, MTU: 1500, Generation: 80, Route table: 0
  Flags: No-Redirects, uRPF, uRPF-loose
  RPF Failures: Packets: 0, Bytes: 0
  Addresses, Flags: Primary Is-Preferred Is-Primary
    Destination: 10.10.10.52/30, Local: 10.10.10.53,
    Broadcast: 10.10.10.55, Generation: 159

```

### Sample Output 3

```

user@host> show interfaces tl-1/2/0:19 extensive
Physical interface: tl-1/2/0:19, Enabled, Physical link is Down
Interface index: 148, SNMP ifIndex: 224, Generation: 110

```

```

Description: T1 to Rock City - Circuit # 987654321
Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
FCS: 16, Framing: ESF,
Parent: ct3-1/2/0 Interface index 173
Device flags   : Present Running Down
Interface flags: Hardware-Down Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 0 (last seen: never)
  Output: 0 (last sent: never)
LCP state: Conf-req-sent
NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : 2004-05-14 15:56:43 EDT (2d 03:01 ago)
Statistics last cleared: 2004-04-09 13:30:02 EDT (5w2d 05:28 ago)
Traffic statistics:
  Input bytes   :          89198          0 bps
  Output bytes  :          90532          0 bps
  Input packets:          6371          0 pps
  Output packets:         6448          0 pps
Input errors:
  Errors: 271124, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed
discards: 266254, L3 incompletes: 0,
  L2 channel errors: 2, L2 mismatch timeouts: 2, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 32, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort              0              0              0
  1 expedited-fo             0              0              0
  2 assured-forw             0              0              0
  3 network-cont            6448            6448              0

DS1 alarms : AIS, LOF
DS1 defects : AIS, LOF
T1 media:
Seconds      Count  State
SEF          33     31  OK
BEE          53     47  OK
AIS    3201537  15 Defect Active
LOF    3202041  16 Defect Active
LOS           0           0  OK
YELLOW    1023435           0  OK
BPV         0           0
EXZ         0           0
LCV         53          72
PCV         0           0
CS          0           0
LES    3202041
ES    3202041
SES    3202060
SEFS    3202102
BES         0
UAS    3202160

```

```

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

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

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

```

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

- DS1 alarms
- DS1 defects
- T1 media

Both sample output 1 and 2 show no DS1 alarms or defects. Sample output 3 shows AIS and LOF alarms and defects. For more information about AIS and LOF alarms and defects, see 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 325](#)
- [Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface on page 326](#)
- [Create a Loopback on page 327](#)
- [Verify That the Interface Is Up on page 328](#)
- [Clear Interface Statistics on page 329](#)
- [Force the Link Layer to Stay Up on page 329](#)
- [Verify the Status of the Logical Interface on page 331](#)
- [Ping the Channelized Interface on page 332](#)
- [Check for Interface Error Statistics on page 332](#)
- [Diagnose a Suspected Circuit Problem on page 334](#)

### Checklist for Using Loopback Testing for Channelized DS3 Interfaces

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

**Action** [Table 25 on page 325](#) provides the links and commands for using loopback testing for Channelized DS3 interfaces.

**Table 25: Checklist for Using Loopback Testing for Channelized DS3 Interfaces**

Tasks	Command or Action
<b>“Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 326</b>	
1. <a href="#">Create a Loopback on page 327</a>	
a. <a href="#">Create a Physical Loopback on page 327</a>	Connect the TX port to the RX port.
b. <a href="#">Configure a Local Loopback on page 327</a>	<code>[edit interfaces <i>interface name</i> (t3-options   t1-options)]</code> <code>set loopback local</code> <code>show</code> <code>commit</code>
2. <a href="#">Verify That the Interface Is Up on page 328</a>	<code>show interfaces t1-<i>fpc/pic/port:channel</i></code> <code>show interfaces t3-<i>fpc/pic/port:channel</i></code>
3. <a href="#">Clear Interface Statistics on page 329</a>	<code>clear interfaces statistics t1-<i>fpc/pic/port:channel</i></code>
4. <a href="#">Force the Link Layer to Stay Up on page 329</a>	

**Table 25: Checklist for Using Loopback Testing for Channelized DS3 Interfaces (*continued*)**

Tasks	Command or Action
a. Configure Encapsulation to Cisco-HDLC on page 329	<code>[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc show commit</code>
b. Configure No-Keepalives on page 330	<code>[edit interfaces <i>interface-name</i>] set no-keepalives show commit</code>
5. Verify the Status of the Logical Interface on page 331	<code>show interfaces t1-<i>fpc/pic/port:channel</i></code>
6. Ping the Channelized Interface on page 332	<code>ping interface t1-<i>fpc/pic/port:channel</i> local-IP-address bypass-routing count 1000 rapid</code>
7. Check for Interface Error Statistics on page 332	<code>show interfaces t1-<i>fpc/pic/port:channel</i> extensive</code>
<b>“Diagnose a Suspected Circuit Problem” on page 334</b>	
8. “Create a Loop from the Router to the Network” on page 334	<code>[edit interfaces t1-<i>fpc/pic/port:channel</i> t1-options] set loopback remote show commit</code>
9. Create a Loop to the Router from Various Points in the Network on page 335	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 326.

## 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 327](#)
  - [Verify That the Interface Is Up on page 328](#)
  - [Clear Interface Statistics on page 329](#)
  - [Force the Link Layer to Stay Up on page 329](#)
  - [Verify the Status of the Logical Interface on page 331](#)
  - [Ping the Channelized Interface on page 332](#)
  - [Check for Interface Error Statistics on page 332](#)

## 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 327](#)
2. [Configure a Local Loopback on page 327](#)

### 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 335](#) for more information on Channelized DS3 alarms and errors.

## Clear Interface Statistics

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

**Action**

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

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

**Sample Output**

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

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

## Force the Link Layer to Stay Up

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

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

1. [Configure Encapsulation to Cisco-HDLC on page 329](#)
2. [Configure No-Keepalives on page 330](#)

### 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 -i t1-fpc/pic/port:channel local-IP-address -c bypass-routing -n count
1000 -t
```

## Sample Output

[illegible]

<b>Meaning</b>	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 <a href="mailto:support@juniper.net">support@juniper.net</a> , or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).
----------------	---

## Check for Interface Error Statistics

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

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

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

## Sample Output

```
user@host# show interfaces t1-2/1/0:20 extensive
Physical interface: t1-2/1/0:20, Enabled, Physical link is Up
  Interface index: 210, SNMP ifIndex: 173, Generation: 93
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
Local, FCS: 16,
  Mode: C/Bit parity, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2004-05-20 21:46:27 UTC (00:26:47 ago)
  Statistics last cleared: 2004-05-20 22:12:03 UTC (00:01:11 ago)
```



## Traffic statistics:

Input bytes :	88680	27640 bps
Output bytes :	88680	27640 bps
Input packets:	1010	39 pps
Output packets:	1010	39 pps

## Input errors:

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

## Output errors:

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

DS1 alarms :None

DS3 alarms :None

DS1 defects :None

DS3 defects :None

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

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

## Interface transmit queues:

	B/W	WRR	Packets	Bytes	Drops	Errors
Queue0	95	95	0	0	0	0
Queue1	5	5	1010	88680	0	0

## HDLC configuration:

Giant threshold: 1514, Runt threshold: 3  
 Timeslots : All active  
 Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled, Idle

```

cycle flag: flags,
  Start end flag: shared
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 2, PLP byte: 2 (0x14)
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                           bps              bytes
  0 best-effort            95      1459200 95      0      low  none
  3 network-control        5       76800  5       0      low  none
Logical interface tl-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](mailto: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 334](#)
2. [Create a Loop to the Router from Various Points in the Network on page 335](#)

### 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 tl-fpc/pic/port:channel tl-options
```
2. Configure the loopback:  

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

3. Verify the configuration:

```
user@host# show
```

For example:

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

4. Commit the configuration:

```
user@host# commit
```

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

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

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

**Action** After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 7 in [“Diagnose a Suspected Hardware Problem with a Channelized DS3 Interface” on page 326](#). 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 335](#)
- [Display Alarms and Errors for Channelized DS3 Interfaces on page 336](#)

### 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 26 on page 335](#) provides links and commands for Channelized DS3 alarms and errors.

**Table 26: Checklist for Channelized DS3 Alarms and Errors**

Tasks	Command or Action
<a href="#">“Display Alarms and Errors for Channelized DS3 Interfaces” on page 336</a>	<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          0
EXZ          0          0
LCV          246       538
PCV          0          0
CS           0          0
LES          0
ES           0
SES          8
SEFS         12
BES          0
UAS          0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 1, PLP byte: 4 (0x01)
Logical interface t1-1/2/0:5.0 (Index 86) (SNMP ifIndex 238) (Generation 111)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 117, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 68.71.141.32/30, Local: 68.71.141.33, Broadcast: 68.71.141.35,
  Generation: 169

```

## Sample Output 2

```

user@host> show interfaces t1-1/2/0:19 extensive
Physical interface: t1-1/2/0:19, Enabled, Physical link is Down
  Interface index: 148, SNMP ifIndex: 224, Generation: 110
  Description: T1 to Rock City - Circuit # 987654321
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
  FCS: 16, Framing: ESF,
  Parent: ct3-1/2/0 Interface index 173
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 60 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Conf-req-sent
  NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported
  Last flapped : 2004-05-14 15:56:43 EDT (2d 03:01 ago)
  Statistics last cleared: 2004-04-09 13:30:02 EDT (5w2d 05:28 ago)
  Traffic statistics:
    Input bytes :          89198          0 bps
    Output bytes:          90532          0 bps

```

```

Input packets:          6371          0 pps
Output packets:         6448          0 pps
Input errors:
  Errors: 271124, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed
discards: 266254, L3 incompletes: 0,
  L2 channel errors: 2, L2 mismatch timeouts: 2, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 32, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort              0              0              0
  1 expedited-fo             0              0              0
  2 assured-forw             0              0              0
  3 network-cont            6448            6448            0

```

DS1 alarms : AIS, LOF

DS1 defects : AIS, LOF

TL media:	Seconds	Count	State
SEF	33	31	OK
BEE	53	47	OK
AIS	3201537	15	Defect Active
LOF	3202041	16	Defect Active
LOS	0	0	OK
YELLOW	1023435	0	OK
BPV	0	0	
EXZ	0	0	
LCV	53	72	
PCV	0	0	
CS	0	0	
LES	3202041		
ES	3202041		
SES	3202060		
SEFS	3202102		
BES	0		
UAS	3202160		

HDLC configuration:

  Policing bucket: Disabled

  Shaping bucket : Disabled

  Giant threshold: 1514, Runt threshold: 0

  Timeslots : All active

  Line encoding: B8ZS, Byte encoding: Nx64K

  Buildout : 0 to 132 feet

  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared

DS1 BERT configuration:

  BERT time period: 10 seconds, Elapsed: 0 seconds

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

Packet Forwarding Engine configuration:

  Destination slot: 1, PLP byte: 4 (0x04)

Logical interface tl-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 27 on page 339](#) shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

**Table 27: T1 Media Alarms and Error Definitions**

T1 Media Alarm or Error	Definitions
<b>AIS</b>	Alarm indication signal (blue alarm)
<b>BEE</b>	Block error event
<b>BES</b>	Bursty errored seconds
<b>BPV</b>	Bipolar violation
<b>CS</b>	Controlled slip
<b>ES</b>	Errored seconds
<b>EXZ</b>	Excessive zeros
<b>LCV</b>	Line code violation
<b>LES</b>	Line errored seconds
<b>LOF</b>	Loss of frame
<b>LOS</b>	Loss of signal
<b>PCV</b>	Path code violation
<b>SEF</b>	Severely errored frame

**Table 27: T1 Media Alarms and Error Definitions** *(continued)*

T1 Media Alarm or Error	Definitions
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 18

# Investigate Multichannel DS3 Interfaces

- [Investigate Interface Steps and Commands on page 341](#)
- [Monitor Multichannel DS3 Interfaces on page 344](#)
- [Use Loopback Testing for Multichannel DS3 Interfaces on page 352](#)
- [Locate Multichannel DS3 Alarms and Errors on page 366](#)

## Investigate Interface Steps and Commands

---

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

- [Investigate Interface Steps and Commands Overview on page 341](#)
- [Monitor Interfaces on page 341](#)
- [Perform a Loopback Test on an Interface on page 342](#)
- [Locate Interface Alarms on page 344](#)

## Investigate Interface Steps and Commands Overview

The “[Monitor Interfaces](#)” on [page 309](#) section helps you determine the nature of the interface problem. The “[Perform a Loopback Test on an Interface](#)” on [page 310](#) section provides information to help you isolate the source of the problem. The “[Locate Interface Alarms](#)” on [page 312](#) section explains some of the alarms and errors for the media.

## Monitor Interfaces

**Problem** The following steps are a general outline of how you monitor interfaces to determine the nature of interface problems. For more detailed information on a specific interface, see the corresponding monitor interfaces 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 “*Commands Used to Monitor Interfaces*” table lists and describes the operational mode commands you use to monitor interfaces.

**Table 28: Commands Used to Monitor Interfaces**

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

## Perform a Loopback Test on an Interface

**Problem** The following steps are a general outline of how you use loopback testing to isolate the source of the interface problem. For more detailed information on a specific interface, see the corresponding loopback 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 “*Commands Used to Perform Loopback Testing on Interfaces*” table 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 29: 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 <b>loopback</b> 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 <b>loopback</b> 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 <b>clocking</b> 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 <b>arp</b> 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 <b>no-resolve</b> 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 <b>encapsulation</b> 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 <b>no-keepalives</b> statement at this level disables the sending of keepalives on the physical interface.

Table 29: Commands Used to Perform Loopback Testing on Interfaces (*continued*)

CLI Statement or Command	Interface Type	Description
<b>show interfaces <i>interface-name</i> terse</b>	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
<b>ping interface t1- <i>x/x/x</i> <i>local-IP-address</i> bypass-routing count 1000 rapid</b>	All interfaces	<p>Check the reachability of network hosts by sending <b>ICMP ECHO_REQUEST</b> messages to elicit <b>ICMP ECHO_RESPONSE</b> messages from the specified host.</p> <p>Use the <b>bypass-routing</b> option to ping a local system through an interface that has no route through it.</p> <p>The <b>count</b> option sends 1000 ping requests through the system.</p> <p>Type <b>Ctrl+C</b> to interrupt a <b>ping</b> command.</p>
<b>show interfaces <i>interface-name</i> extensive</b>	All interfaces	Display very detailed interface information about a specific interface.

## Locate Interface Alarms

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

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

## Monitor Multichannel DS3 Interfaces

- [Checklist for Monitoring Multichannel DS3 Interfaces on page 344](#)
- [Monitor Multichannel DS3 Interfaces on page 345](#)

### 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 30 on page 344](#) provides the links and commands for monitoring Multichannel DS3 interfaces.

Table 30: Checklist for Monitoring Multichannel DS3 Interfaces

Tasks	Command or Action
<a href="#">“Monitor Multichannel DS3 Interfaces” on page 345</a>	

**Table 30: Checklist for Monitoring Multichannel DS3 Interfaces**  
(continued)

Tasks	Command or Action
1. <a href="#">Display the Status of Channelized Interfaces on page 345</a>	<b>show interfaces terse ds*</b> <b>show interfaces terse t1*</b>
2. <a href="#">Display the Status of a Specific Channelized Interface on page 346</a>	<b>show interfaces ds-fpc/pic/port:channel:channel</b> <b>show interfaces t1-fpc/pic/port:channel</b>
3. <a href="#">Display Extensive Status Information for a Specific T3 Interface on page 347</a>	<b>show interfaces ds-fpc/pic/port:channel:channel extensive</b> <b>show interfaces t1-fpc/pic/port:channel extensive</b>
4. <a href="#">Monitor Statistics for a Channelized Interface on page 351</a>	<b>monitor interfaces ds-fpc/pic/port:channel:channel</b> <b>monitor interfaces t1-fpc/pic/port:channel</b>

## 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 345](#)
2. [Display the Status of a Specific Channelized Interface on page 346](#)
3. [Display Extensive Status Information for a Specific T3 Interface on page 347](#)
4. [Monitor Statistics for a Channelized Interface on page 351](#)

### 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 367](#) 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:             0Active 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 31 on page 352 lists additional problem situations and actions to help you further understand an interface problem.

**Table 31: 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 353](#)
- [Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface on page 354](#)
- [Create a Loopback on page 355](#)

- [Verify That the Interface Is Up on page 356](#)
- [Clear Interface Statistics on page 357](#)
- [Force the Link Layer to Stay Up on page 358](#)
- [Verify the Status of the Logical Interface on page 359](#)
- [Ping the Channelized Interface on page 360](#)
- [Check for Interface Error Statistics on page 361](#)
- [Diagnose a Suspected Circuit Problem on page 364](#)
- [Create a Loop from the Router to the Network on page 365](#)
- [Create a Loop to the Router from Various Points in the Network on page 366](#)

## Checklist for Using Loopback Testing for Multichannel DS3 Interfaces

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

**Action** [Table 32 on page 353](#) provides links and commands for using loopback testing for Multichannel DS3 interfaces.

**Table 32: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces**

Tasks	Command or Action
<a href="#">“Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface” on page 354</a>	
1. <a href="#">Create a Loopback on page 355</a>	
a. <a href="#">Create a Physical Loopback on page 355</a>	Connect the TX port to the RX port.
b. <a href="#">Configure a Local Loopback on page 355</a>	<code>[edit interfaces <i>interface name</i> (t3-options   t1-options)]</code> <code>set loopback local</code> <code>show</code> <code>commit</code>
2. <a href="#">Verify That the Interface Is Up on page 356</a>	<code>show interfaces (ds-<i>fpc/pic/port:channel:channel</i>   t1-<i>fpc/pic/port:channel</i>)</code>
3. <a href="#">Clear Interface Statistics on page 357</a>	<code>clear interfaces statistics (t1-<i>fpc/pic/port:channel</i>   ds-<i>fpc/pic/port:channel:channel</i>)</code>
4. <a href="#">Force the Link Layer to Stay Up on page 358</a>	
a. <a href="#">Configure Encapsulation to Cisco-HDLC on page 358</a>	<code>[edit interfaces <i>interface-name</i>]</code> <code>set encapsulation cisco-hdlc</code> <code>show</code> <code>commit</code>
b. <a href="#">Configure No-Keepalives on page 358</a>	<code>[edit interfaces <i>interface-name</i>]</code> <code>set no-keepalives</code> <code>show</code> <code>commit</code>

**Table 32: Checklist for Using Loopback Testing for Multichannel DS3 Interfaces (*continued*)**

Tasks	Command or Action
5. <a href="#">Verify the Status of the Logical Interface on page 359</a>	<code>show interfaces (ds-fpc/pic/port:channel:channel   t1-fpc/pic/port:channel)</code>
6. <a href="#">Ping the Channelized Interface on page 360</a>	<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. <a href="#">Check for Interface Error Statistics on page 361</a>	<code>show interfaces (ds-fpc/pic/port:channel:channel   t1-fpc/pic/port:channel) extensive</code>
<b>“Diagnose a Suspected Circuit Problem” on page 364</b>	
1. <a href="#">Create a Loop from the Router to the Network on page 365</a>	
a. <a href="#">Loop the Entire T3 Interface Toward the Network on page 365</a>	<code>[edit interfaces interface-name t3-options]</code> <code>set loopback remote</code> <code>show</code> <code>commit</code>
b. <a href="#">Loop a Particular T1 Channel Toward the Network on page 365</a>	<code>[edit interfaces interface-name t1-options]</code> <code>set loopback remote</code> <code>show</code> <code>commit</code>
2. <a href="#">Create a Loop to the Router from Various Points in the Network on page 366</a>	Perform Steps 2 through 8 from “ <a href="#">Diagnose a Suspected Hardware Problem with a Multichannel DS3 Interface</a> ” on page 354.

## 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 355](#)
  - [Verify That the Interface Is Up on page 356](#)
  - [Clear Interface Statistics on page 357](#)
  - [Force the Link Layer to Stay Up on page 358](#)
  - [Verify the Status of the Logical Interface on page 359](#)
  - [Ping the Channelized Interface on page 360](#)
  - [Check for Interface Error Statistics on page 361](#)

## 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 355](#)
2. [Configure a Local Loopback on page 355](#)

### Create a Physical Loopback

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

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

### Configure a Local Loopback

**Action** To configure a local loopback, follow these steps:

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

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

2. Configure the local loopback:

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

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

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



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

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

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

3. Verify the configuration:

```
user@host# show
```

For example:

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

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

4. Commit the configuration:

```
user@host# commit
```

For example:

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

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



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

## Verify That the Interface Is Up

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

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

```
user@host> show interfaces (ds-fpc/pic/port:channel:channel | t1-fpc/pic/port:channel
)
```

## Sample Output

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

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



```
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.168.140.196/30, Local: 192.168.140.197
```

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

```
user@host> show interfaces t1-2/1/0:19
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 11 (00:00:06 ago), Output: 13 (00:00:04 ago)
  Input rate      : 741512 bps (224 pps)
  Output rate     : 1266528 bps (224 pps)
  DS1  alarms    : None
  DS3  alarms    : None
  DS1  defects   : None
  DS3  defects   : None
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 192.168.140.196/30, Local: 192.168.140.197
```

**Meaning** The sample output shows that the physical link is up and there are no DS1 or DS3 alarms or defects. You should not see any DS1 or DS3 alarms. You can check any interface on the Multichannel DS3 port.

## Clear Interface Statistics

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

### Action

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

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

**Sample Output**

```
user@host> clear interfaces statistics DS1/1/0:0:0
user@host>
user@host> clear interfaces statistics t1-1/1/0:0
user@host>
```

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

## Force the Link Layer to Stay Up

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

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

1. [Configure Encapsulation to Cisco-HDLC on page 358](#)
2. [Configure No-Keepalives on page 358](#)

---

### 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

```

<b>Meaning</b>	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

[illegible]

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](mailto: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 | tl-fpc/pic/port:channel)
extensive
```

## Sample Output

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

```
user@host> show interfaces ds-2/1/0:5:1 extensive
Physical interface: ds-2/1/0:5:1, Enabled, Physical link is Up
  Interface index: 36, SNMP ifIndex: 133, Generation: 35
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 64kbps, FCS:
  16, Mode: M23,
  Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 2 (last seen 00:00:05 ago)
    Output: 2 (last sent 00:00:05 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:00:16 ago)
  Traffic statistics:
    Input bytes :          524          304 bps
    Output bytes :          528          304 bps
    Input packets:           8           0 pps
    Output packets:          8           0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 10, L3 incompletes:
  0,
    L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1  alarms : None
  DS3  alarms : None
  DS1  defects: None
  DS3  defects: None
  T1 media:      Seconds      Count  State
    SEF          0           0    OK
```

```

BEE                0          0 OK
AIS                0          0 OK
LOF                0          0 OK
LOS                0          0 OK
YELLOW             0          0 OK
BPV                0          0
EXZ                0          0
LCV                0          0
PCV                0          0
CS                 0          0
LES                0
ES                 0
SES                0
SEFS               0
BES                0
UAS                0
DS3 media:         Seconds      Count  State
PLL Lock           0          0 OK
Reframing          0          0 OK
AIS                0          0 OK
LOF                0          0 OK
LOS                0          0 OK
IDLE               0          0 OK
YELLOW             0          0 OK
BPV                0          0
EXZ                0          0
LCV                0          0
PCV                0          0
LES                0
PES                0
PSES               0
SEFS               0
UAS                0
Interface transmit queues:
      B/W  WRR      Packets      Bytes      Drops      Errors
Queue0   95  95          4        336          0          0
Queue1    5   5          1         22          0          0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots       : 1
  Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0x2f)
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      bytes
0 best-effort             0          0  0          0      low  none
1 expedited-forwarding    0          0  0          0      low  none
2 assured-forwarding      0          0  0          0      low  none
3 network-control         0          0  0          0      low  none
Logical interface ds-2/1/0:5:1.0 (Index 14) (SNMP ifIndex 134) (Generation 13)

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

```

Unspecified,  
Generation: 22

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

```
user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
  Interface index: 50, SNMP ifIndex: 59, Generation: 49
  Description: Customer
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
  None, FCS: 16,
  Mode: M23, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 117 (last seen 00:00:08 ago)
    Output: 121 (last sent 00:00:01 ago)
  Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
  Traffic statistics:
    Input bytes :          22459734          236888 bps
    Output bytes :         162288645         1322208 bps
    Input packets:          201233           214 pps
    Output packets:         236341           227 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:
    0,
    L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM
    errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1  alarms : None
  DS3  alarms : None
  DS1  defects : None
  DS3  defects : None
  T1 media:
    Seconds      Count  State
    SEF          0        0 OK
    BEE          0        0 OK
    AIS          0        0 OK
    LOF          0        0 OK
    LOS          0        0 OK
    YELLOW       0        0 OK
    BPV          0        0
    EXZ          0        0
    LCV          0        0
    PCV          0        0
    CS           0        0
    LES          0
    ES           0
    SES          0
    SEFS         0
    BES          0
    UAS          0
  DS3 media:
    Seconds      Count  State
    PLL Lock     0        0 OK
    Reframing    0        0 OK
    AIS          0        0 OK
    LOF          0        0 OK
    LOS          0        0 OK
```

```

IDLE                                0          0 OK
YELLOW                              0          0 OK
BPV                                 0          0
EXZ                                 0          0
LCV                                 0          0
PCV                                 0          0
LES                                 0
PES                                 0
PSES                               0
SEFS                               0
UAS                                 0
Interface transmit queues:
      B/W  WRR  Packets      Bytes      Drops      Errors
Queue0   95  95    234494    162020375      0          0
Queue1    5   5       164       5808        0          0
HDLC configuration:
  Giant threshold: 1514, Runt threshold: 3
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
DS3 BERT configuration:
  BERT time period: 0 seconds, Elapsed: 0 seconds
  Algorithm: Unknown (0), Induced Error rate: 10e-0
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
PFE configuration:
  Destination slot: 2, PLP byte: 2 (0xab)
  CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                           %      bps      %      bytes
0 best-effort             0          0  0          0      low      none
1 expedited-forwarding    0          0  0          0      low      none
2 assured-forwarding      0          0  0          0      low      none
3 network-control         0          0  0          0      low      none
Logical interface t1-2/1/0:19.0 (Index 27) (SNMP ifIndex 125) (Generation 26)
  Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 1500, Flags: None, Generation: 34 Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.168.140.196/30, Local: 192.168.140.197, Broadcast:
  Unspecified, Generation: 44

```

**Meaning** Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with JTAC at [support@juniper.net](mailto: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 365](#)
- [Create a Loop to the Router from Various Points in the Network on page 366](#)



## 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 365](#)
2. [Loop a Particular T1 Channel Toward the Network on page 365](#)

### 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 354](#). 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 367](#)
- [Display Alarms and Errors for Channelized DS3 to DS1 Interfaces on page 367](#)
- [Display Alarms and Errors for Channelized DS3 to DS0 Interfaces on page 370](#)

## 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 33 on page 367](#) provides links and commands for Multichannel DS3 alarms and errors.

**Table 33: Checklist for Multichannel DS3 Alarms and Errors**

Tasks	Command or Action
<a href="#">“Display Alarms and Errors for Channelized DS3 to DS1 Interfaces” on page 367</a>	<code>show interfaces t1-fpc/pic/port:channel extensive</code>
<a href="#">“Display Alarms and Errors for Channelized DS3 to DS0 Interfaces” on page 370</a>	<code>show interfaces ds-fpc/pic/port:channel:channel extensive</code>

## Display Alarms and Errors for Channelized DS3 to DS1 Interfaces

**Purpose** To display channelized DS3 to DS1 alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

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

**Sample Output**

```

user@host> show interfaces t1-2/1/0:19 extensive
Physical interface: t1-2/1/0:19, Enabled, Physical link is Up
Interface index: 50, SNMP ifIndex: 59, Generation: 49
Description: Customer
Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
None, FCS: 16,
Mode: M23, Framing: ESF
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 117 (last seen 00:00:08 ago)
  Output: 121 (last sent 00:00:01 ago)
Statistics last cleared: 2002-08-01 10:14:45 UTC (00:19:38 ago)
Traffic statistics:
  Input bytes   :          22459734          236888 bps
  Output bytes  :          162288645         1322208 bps
  Input packets :           201233           214 pps
  Output packets:           236341           227 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 377, L3 incompletes:
0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM
errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
DS1 alarms :None
DS3 alarms :None
DS1 defects:None
DS3 defects:None

```

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

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

Interface transmit queues:							
	B/W	WRR	Packets	Bytes	Drops	Errors	
Queue0	95	95	234494	162020375	0	0	
Queue1	5	5	164	5808	0	0	

#### HDLC configuration:

Giant threshold: 1514, Runt threshold: 3  
Timeslots : All active  
Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled

#### DS3 BERT configuration:

BERT time period: 0 seconds, Elapsed: 0 seconds  
Algorithm: Unknown (0), Induced Error rate: 10e-0

#### DS1 BERT configuration:

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

#### PFE configuration:

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

CoS transmit queue	Bandwidth		Buffer	Priority	Limit
	%	bps	% bytes		
0 best-effort	0	0	0	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 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 34 on page 369](#) shows T1 media-specific alarms or defects that can render the interface unable to pass packets.

**Table 34: T1 Media Alarms and Error Definitions**

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

Table 34: T1 Media Alarms and Error Definitions (*continued*)

T1 Media Alarm or Error	Definitions
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 367](#) shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

**Table 35: 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.



## CHAPTER 19

# Investigate Channelized OC12 Interfaces

- [Investigate Interface Steps and Commands on page 373](#)
- [Monitor Channelized OC12 Interfaces on page 376](#)
- [Use Loopback Testing for Channelized OC12 Interfaces on page 395](#)
- [Locate Channelized OC12 Alarms and Errors on page 408](#)

## Investigate Interface Steps and Commands

---

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

- [Investigate Interface Steps and Commands Overview on page 373](#)
- [Monitor Interfaces on page 373](#)
- [Perform a Loopback Test on an Interface on page 374](#)
- [Locate Interface Alarms on page 376](#)

## Investigate Interface Steps and Commands Overview

The “[Monitor Interfaces](#)” on [page 309](#) section helps you determine the nature of the interface problem. The “[Perform a Loopback Test on an Interface](#)” on [page 310](#) section provides information to help you isolate the source of the problem. The “[Locate Interface Alarms](#)” on [page 312](#) section explains some of the alarms and errors for the media.

## Monitor Interfaces

**Problem** The following steps are a general outline of how you monitor interfaces to determine the nature of interface problems. For more detailed information on a specific interface, see the corresponding monitor interfaces 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 “*Commands Used to Monitor Interfaces*” table lists and describes the operational mode commands you use to monitor interfaces.

**Table 36: Commands Used to Monitor Interfaces**

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

## Perform a Loopback Test on an Interface

**Problem** The following steps are a general outline of how you use loopback testing to isolate the source of the interface problem. For more detailed information on a specific interface, see the corresponding loopback 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 “*Commands Used to Perform Loopback Testing on Interfaces*” table 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 37: 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 <b>loopback</b> 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 <b>loopback</b> 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 <b>clocking</b> 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 <b>arp</b> 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 <b>no-resolve</b> 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 <b>encapsulation</b> 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 <b>no-keepalives</b> statement at this level disables the sending of keepalives on the physical interface.

Table 37: Commands Used to Perform Loopback Testing on Interfaces (*continued*)

CLI Statement or Command	Interface Type	Description
<b>show interfaces <i>interface-name</i> terse</b>	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
<b>ping interface t1- x/x/x local-IP-address bypass-routing count 1000 rapid</b>	All interfaces	<p>Check the reachability of network hosts by sending <b>ICMP ECHO_REQUEST</b> messages to elicit <b>ICMP ECHO_RESPONSE</b> messages from the specified host.</p> <p>Use the <b>bypass-routing</b> option to ping a local system through an interface that has no route through it.</p> <p>The <b>count</b> option sends 1000 ping requests through the system.</p> <p>Type <b>Ctrl+C</b> to interrupt a <b>ping</b> command.</p>
<b>show interfaces <i>interface-name</i> extensive</b>	All interfaces	Display very detailed interface information about a specific interface.

## Locate Interface Alarms

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

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

## Monitor Channelized OC12 Interfaces

- [Checklist for Monitoring Channelized OC12 Interfaces on page 376](#)
- [Monitor Channelized OC12 Interfaces on page 377](#)
- [Monitor Channelized OC12 IQ Interfaces on page 382](#)

### Checklist for Monitoring Channelized OC12 Interfaces

**Purpose** To monitor Channelized OC12 interfaces and begin the process of isolating Channelized OC12 interface problems when they occur.

**Action** [Table 38 on page 376](#) provides links and commands for monitoring Channelized OC12 interfaces.

Table 38: Checklist for Monitoring Channelized OC12 Interfaces

Tasks	Command or Action
<a href="#">“Monitor Channelized OC12 Interfaces” on page 377</a>	

**Table 38: Checklist for Monitoring Channelized OC12 Interfaces**  
(continued)

Tasks	Command or Action
1. <a href="#">Display the Status of Channelized OC12 Interfaces on page 378</a>	<code>show interfaces terse t3-interface-name*</code>
2. <a href="#">Display the Status of a Specific Channelized OC12 Interface on page 378</a>	<code>show interfaces terse t3-fpc/pic/port:channel</code>
3. <a href="#">Display Extensive Status Information for a Specific Channelized OC12 Interface on page 379</a>	<code>show interfaces t3-fpc/pic/port:channel extensive</code>
4. <a href="#">Monitor Statistics for a Channelized OC12 Interface on page 381</a>	<code>monitor interfaces t3-fpc/pic/port:channel</code>
<b>“Monitor Channelized OC12 IQ Interfaces” on page 382</b>	
1. <a href="#">Display the Status of a Channelized OC12 IQ Interface on page 382</a>	<code>show interfaces terse coc*</code> <code>show interfaces controller</code> <code>show interfaces terse</code>
2. <a href="#">Display the Status of the Controller Channelized OC12 IQ Interface on page 386</a>	<code>show interfaces interface-type-fpc/pic/port</code> <code>show interfaces interface-type-fpc/pic/port</code> <code>show interfaces interface-type-fpc/pic/port:channel</code> <code>show interfaces interface-type-fpc/pic/port:channel:channel</code> <code>show interfaces interface-type-fpc/pic/port:channel:channel:channel</code>
3. <a href="#">Display the Status of a Specific Channel of a Channelized OC12 IQ Interface on page 388</a>	<code>show interfaces interface-type-fpc/pic/port:channel</code> <code>show interfaces interface-type-fpc/pic/port:channel:channel</code> <code>show interfaces interface-type-fpc/pic/port:channel:channel:channel</code>
4. <a href="#">Display Extensive Status Information for a Channelized OC12 IQ Interface on page 390</a>	<code>show interfaces interface-type-interface-name extensive</code>
5. <a href="#">Monitor Statistics for a Channelized OC12 IQ Interface on page 393</a>	<code>monitor interfaces interface-type-fpc/pic/port:channel</code>

## Monitor Channelized OC12 Interfaces

**Purpose** By monitoring Channelized OC12 interfaces, you begin the process of isolating Channelized OC12 interface problems when they occur.

To monitor your Channelized OC12 interfaces, follow these steps:

1. [Display the Status of Channelized OC12 Interfaces on page 378](#)
2. [Display the Status of a Specific Channelized OC12 Interface on page 378](#)
3. [Display Extensive Status Information for a Specific Channelized OC12 Interface on page 379](#)
4. [Monitor Statistics for a Channelized OC12 Interface on page 381](#)

### Display the Status of Channelized OC12 Interfaces

**Purpose** To display the status of Channelized OC12 interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

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

**Sample Output 1** The following sample output is for a Channelized OC12 interface:

```
user@host> show interfaces terse t3-0/3/0:*
Interface          Admin Link Proto Local          Remote
t3-0/3/0:0         up    up
t3-0/3/0:1         up    up
t3-0/3/0:2         up    up
t3-0/3/0:3         up    up
t3-0/3/0:4         up    up
t3-0/3/0:5         up    up
t3-0/3/0:6         up    up
t3-0/3/0:7         up    up
t3-0/3/0:8         up    up
t3-0/3/0:9         up    up
t3-0/3/0:10        up    up
t3-0/3/0:11        up    down
```

**Meaning** The sample output shows the status of both the physical and logical interfaces. In this example, all of the Channelized OC12 interfaces are up except the channel interface `t3-0/3/0:11`.

When only one or some individual T3 channels are down, you must troubleshoot the T3 channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the T3 channels are down, you must work with this as a T3 or OC12 SONET link, or a Physical Interface Card (PIC) problem. For more information on monitoring SONET interfaces, see [“Checklist for Monitoring Channelized OC12 Interfaces” on page 376](#).

### Display the Status of a Specific Channelized OC12 Interface

**Purpose** To display the status of specific Channelized OC12 interface, use the following Junos OS CLI operational mode command:

**Action** `user@host> show interfaces terse t3-fpc/pic/port:channel`

```
user@host> show interfaces terse t3-0/3/0:0
Interface          Admin Link Proto Local          Remote
t3-0/3/0:0         up    up

user@host> show interfaces terse t3-0/3/0:11
Interface          Admin Link Proto Local          Remote
t3-0/3/0:11        up    down
```

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

When only one or some individual T3 channels are down, you must troubleshoot the T3 channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the T3 channels are down, you must work with this as an OC12 SONET link or PIC problem. For more information on monitoring SONET interfaces, see [“Checklist for Monitoring Channelized OC12 Interfaces” on page 376](#).

### Display Extensive Status Information for a Specific Channelized OC12 Interface

**Purpose** To display extensive status information for a Channelized OC12 interface, use the following Junos OS CLI operational mode command:

**Action** `user@host> show interfacet3-fpc/pic/port:channel extensive`

**Sample Output**

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

```

UAS                                0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 3
  Idle cycle flag: flags, Start end flag: shared
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
Interface transmit queues:

```

	B/W	WRR	Packets	Bytes
Queue0	0	0		
Transmitted:			0	0
Drops:			0	0
Errors:			0	
Queue1	0	0		
Transmitted:			0	0
Drops:			0	0
Errors:			0	
Queue2	0	0		
Transmitted:			0	0
Drops:			0	0
Errors:			0	
Queue3	0	0		
Transmitted:			0	0
Drops:			0	0
Errors:			0	

```

SONET PHY:
  PLL Lock          0      0 OK
  PHY Light         0      0 OK
SONET section:
  BIP-B1            1      22
  SEF               0      0 OK
  LOS               0      0 OK
  LOF               0      0 OK
  ES-S              1
  SES-S             0
  SEFS-S            0
SONET line:
  BIP-B2            1      307
  REI-L             0      0
  RDI-L             3      1 OK
  AIS-L             0      0 OK
  BERR-SF           0      0 OK
  BERR-SD           0      0 OK
  ES-L              1
  SES-L             0
  UAS-L             0
  ES-LFE            3
  SES-LFE           3
  UAS-LFE           0
SONET path:
  BIP-B3            1      35
  REI-P             1      7
  LOP-P             0      0 OK
  AIS-P             0      0 OK
  RDI-P             0      0 OK
  UNEQ-P            0      0 OK

```



```

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

```

**Meaning** The sample output shows where the errors might be occurring, either with the T3 media or the SONET layer. In this example, there are no SONET or DS3 alarms or defects. However, if errors occur, you must troubleshoot the T3 media or the SONET layer.

### Monitor Statistics for a Channelized OC12 Interface

**Purpose** To monitor statistics for a Channelized OC12 interface, use the following Junos OS CLI operational mode command:

**Action** `user@host> monitor interfaces t3-fpc/pic/port:channel`

```

Sample Output user@host> monitor interfaces t3-0/3/0:11
host          Seconds: 12          Time: 17:27:15          Delay: 32/0/32

Interface: t3-0/3/0:11, Enabled, Link is Down
Encapsulation: Cisco-HDLC, Keepalives, Speed: T3
Traffic statistics:
Input bytes:          109846 (176 bps)          [44]
Output bytes:         110308 (176 bps)          [44]
Input packets:         1687 (1 pps)             [2]
Output packets:        1693 (1 pps)             [2]
Encapsulation statistics:
Input keepalives:      8                       [2]
Output keepalives:     7                       [2]
Error statistics:
Input errors:          0                       [0]
Input drops:           0                       [0]
Input framing errors:  1066                    [0]
Input runs:            0                       [0]
Input giants:          0                       [0]
Policed discards:      0                       [0]
L3 incompletes:        0                       [0]
L2 channel errors:     3                       [0]

```

```

L2 mismatch timeouts:          0          [0]
Carrier transitions:           7          [0]
Output errors:                 0  Output drops:  [0]
Interface warnings:
  o Loopback detected while not in test mode

```

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



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



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

## Monitor Channelized OC12 IQ Interfaces

**Purpose** By monitoring Channelized OC12 intelligent queuing (IQ) interfaces, you begin the process of isolating Channelized OC12 IQ interface problems when they occur.

To monitor your Channelized OC12 IQ interface, follow these steps:

1. [Display the Status of a Channelized OC12 IQ Interface on page 382](#)
2. [Display the Status of the Controller Channelized OC12 IQ Interface on page 386](#)
3. [Display the Status of a Specific Channel of a Channelized OC12 IQ Interface on page 388](#)
4. [Display Extensive Status Information for a Channelized OC12 IQ Interface on page 390](#)
5. [Monitor Statistics for a Channelized OC12 IQ Interface on page 393](#)

### Display the Status of a Channelized OC12 IQ Interface

**Purpose** To display the status of Channelized OC12 IQ interfaces, use one or all of the following Junos OS CLI operational mode commands:

**Action**

```

user@host> show interfaces terse coc*
user@host> show interfaces controller
user@host> show interfaces terse

```

**Sample Output 1**

```

user@host> show interfaces terse coc*
Interface           Admin Link Proto Local           Remote
coc12-0/0/0         up    up
coc1-0/0/0:2        up    up
coc1-0/0/0:3        up    up
coc1-0/0/0:4        up    up

```

```

coc1-0/0/0:5    up up
coc1-0/0/0:6    up up

```

**Sample Output 2**

```

user@host> show interfaces controller
Controller
coc12-0/0/0
so-0/0/0:1      up up
coc1-0/0/0:2    up up
  t1-0/0/0:2:1  up up
  t1-0/0/0:2:2  up up
  t1-0/0/0:2:3  up up
  t1-0/0/0:2:4  up up
  t1-0/0/0:2:5  up up
  t1-0/0/0:2:6  up up
  t1-0/0/0:2:7  up up
  t1-0/0/0:2:8  up up
  t1-0/0/0:2:9  up up
  t1-0/0/0:2:10 up up
  t1-0/0/0:2:11 up up
  t1-0/0/0:2:12 up up
  t1-0/0/0:2:13 up up
  t1-0/0/0:2:14 up up
  t1-0/0/0:2:15 up up
  t1-0/0/0:2:16 up up
  t1-0/0/0:2:17 up up
  t1-0/0/0:2:18 up up
  t1-0/0/0:2:19 up up
  t1-0/0/0:2:20 up up
  t1-0/0/0:2:21 up up
  t1-0/0/0:2:22 up up
  t1-0/0/0:2:23 up up
  t1-0/0/0:2:24 up up
  t1-0/0/0:2:25 up up
  t1-0/0/0:2:26 up up
  t1-0/0/0:2:27 up up
  t1-0/0/0:2:28 up up
coc1-0/0/0:3    up up
t3-0/0/0:3      up up
coc1-0/0/0:4    up up
  ct1-0/0/0:4:1 up up
    ds-0/0/0:4:1:1 up up
coc1-0/0/0:5    up up
ct3-0/0/0:5     up up
  t1-0/0/0:5:1  up up
coc1-0/0/0:6    up up
ct3-0/0/0:6     up up
  ct1-0/0/0:6:1 up up
    ds-0/0/0:6:1:1 up up

```

**Sample Output 3**

```

user@host> show interfaces terse
Interface      Admin Link Proto Local Remote
coc12-0/0/0    up    up
so-0/0/0:1     up    up
so-0/0/0:1.0   up up inet 20.20.20.1/30
coc1-0/0/0:2   up    up
t1-0/0/0:2:1   up    up
t1-0/0/0:2:1.0 up    up inet 20.20.20.5/30
t1-0/0/0:2:2   up    up
[...Output Truncated...]
t1-0/0/0:2:27  up    up

```

```

t1-0/0/0:2:28      up    up
coc1-0/0/0:3       up    up
t3-0/0/0:3         up    up
coc1-0/0/0:4       up    up
ct1-0/0/0:4:1      up    up
ds-0/0/0:4:1:1     up    up
ds-0/0/0:4:1:1.0   up    up    inet  20.20.20.13/30
coc1-0/0/0:5       up    up
ct3-0/0/0:5        up    up
t1-0/0/0:5:1       up    up
t1-0/0/0:5:1.0     up    up    inet  20.20.20.17/30
coc1-0/0/0:6       up    up
ct3-0/0/0:6        up    up
ct1-0/0/0:6:1      up    up
ds-0/0/0:6:1:1     up    up
ds-0/0/0:6:1:1.0   up    up    inet  20.20.20.21/30

```

### Meaning

The sample output shows the status of both the physical and logical interfaces. In this example, all of the channelized OC12 IQ interfaces are up.

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

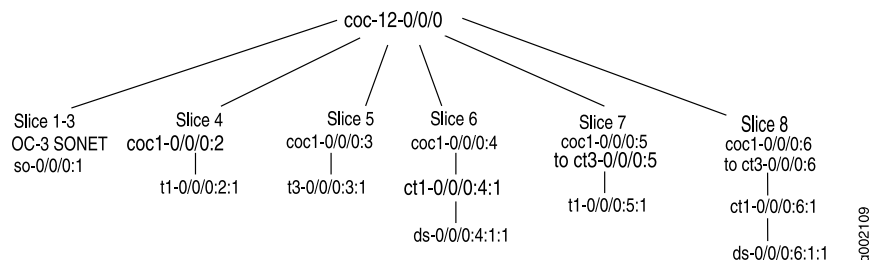
Sample output 2 shows the channels for the channelized interfaces that are configured and the hierarchy, but not the interface address information. At the top, the hierarchy includes the controller interface **coc12-0/0/0**.

Sample output 3 shows all channelized interfaces and their configured channels and the address information.

When only one or some individual channels are down, you must troubleshoot the channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the channels are down, you must work with this as a T1, T3, DS0, or OC12 SONET link or PIC problem. For more information on monitoring these types of interfaces, see the respective sections in this guide.

The interface configuration of the OC12 IQ interface used for all **show** commands in this section is shown in [Figure 33 on page 384](#).

**Figure 33: Sample Configuration of Channelized OC12 IQ Interface**



In addition, the configuration is shown in the following output:

```

interfaces {
  coc12-0/0/0 {

```

```

    partition 1 oc-slice 1-3 interface-type so;
    partition 2 oc-slice 4 interface-type coc1;
    partition 3 oc-slice 5 interface-type coc1;
    partition 4 oc-slice 6 interface-type coc1;
    partition 5 oc-slice 7 interface-type coc1;
    partition 6 oc-slice 8 interface-type coc1;
}
so-0/0/0:1 {
    description "oc-slice 1-3 of coc12-0/0/0. COC12 > OC3.";
    unit 0 {
        family inet {
            address 20.20.20.2/30;
        }
    }
}
coc1-0/0/0:2 {
    description "oc-slice 4 of coc12-0/0/0. COC12 to COC1 VT-mapped to T1s.";
    partition 1-28 interface-type t1;
}
t1-0/0/0:2:1 {
    unit 0 {
        family inet {
            address 20.20.20.6/30;
        }
    }
}
coc1-0/0/0:3 {
    description " oc-slice 5 of coc12-0/0/0. COC12 to COC1 converted to a T3.";
    no-partition interface-type t3;
}
t3-0/0/0:3:1 {
    unit 0 {
        family inet {
            address 20.20.20.10/30;
        }
    }
}
coc1-0/0/0:4 {
    description " oc-slice 6 of coc12-0/0/0. CT1 to NxDS-Os.";
    partition 1 interface-type ct1;
}
ct1-0/0/0:4:1 {
    partition 1 timeslots 1-10 interface-type ds;
}
ds-0/0/0:4:1:1 {
    unit 0 {
        family inet {
            address 20.20.20.14/30;
        }
    }
}
coc1-0/0/0:5 {
    description " oc-slice 7 of coc12-0/0/0. COC12 to COC1 converted to a CT3 to T1s.";
    no-partition interface-type ct3;
}
ct3-0/0/0:5 {

```

```

    partition 1 interface-type t1;
  }
  t1-0/0/0:5:1 {
    unit 0 {
      family inet {
        address 20.20.20.18/30;
      }
    }
  }
  coc1-0/0/0:6 {
    description " oc-slice 8 of coc12-0/0/0. COC12 to COC1 converted to a CT3 to CT1 to
    NxDS-0s.";
    no-partition interface-type ct3;
  }
  ct3-0/0/0:6 {
    partition 1 interface-type ct1;
  }
  ct1-0/0/0:6:1 {
    partition 1 timeslots 1 interface-type ds;
  }
  ds-0/0/0:6:1:1 {
    unit 0 {
      family inet {
        address 20.20.20.22/30;
      }
    }
  }
}

```

The above configuration shows the OC12 IQ interface configured into eight channels or slices as shown in [Figure 33 on page 384](#). A summary of the channels follows:

- Channels 1 through 3 are for SONET interfaces
- Channel 4 is for T1 interfaces
- Channel 5 is for T3 interfaces
- Channel 6 is for DS0 interfaces
- Channels 7 is for T1 interfaces
- Channel 8 is for DS0 interfaces

### Display the Status of the Controller Channelized OC12 IQ Interface

**Purpose** To display the status of the controller OC12 IQ interface, use one or all of the following Junos OS CLI operational mode commands, depending on the level of channelization:

**Action**

```

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

```

**Sample Output 1**

```

user@host> show interfaces coc12-0/0/0
Physical interface: coc12-0/0/0, Enabled, Physical link is Up
Interface index: 195, SNMP ifIndex: 82
Link-level type: Controller , Clocking: Internal, SONET mode, Speed: OC12,

```

```

Loopback: None, Parent: None
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags   : None
CoS queues   : 4 supported
Last flapped : 2004-05-26 21:37:18 UTC (00:44:19 ago)
SONET alarms : None
SONET defects : None

```

**Sample Output 2** user@host> show interfaces coc1-0/0/0:2

```

Physical interface: coc1-0/0/0:2, Enabled, Physical link is Up
Interface index: 198, SNMP ifIndex: 88
Link-level type: Controller , Clocking: Internal, SONET mode, Speed: 51840kbps,
Loopback: None, Parent: coc12-0/0/0 Interface index 195
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags   : None
CoS queues   : 4 supported
Last flapped : 2004-05-26 22:19:18 UTC (00:07:06 ago)
SONET alarms : None
SONET defects : None

```

**Sample Output 3** user@host> show interfaces ct3-0/0/0:5

```

Physical interface: ct3-0/0/0:5, Enabled, Physical link is Up
Interface index: 233, SNMP ifIndex: 169
Link-level type: Controller , Clocking: Internal, Speed: T3, Loopback: None,
Mode: C/Bit parity, Parent: coc1-0/0/0:5 Interface index 232
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags   : None
CoS queues   : 4 supported
Last flapped : Never
Active alarms : None
Active defects : None
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0

```

**Sample Output 4** user@host> show interfaces ct1-0/0/0:4:1

```

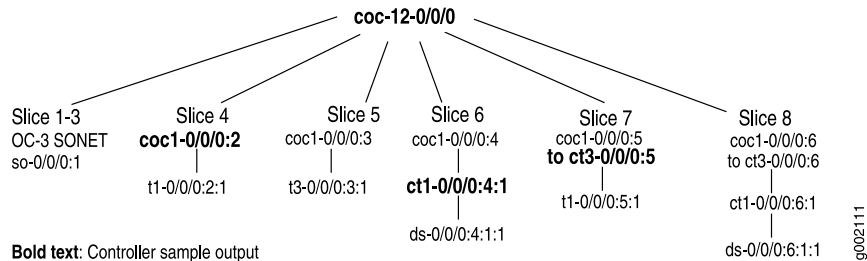
Physical interface: ct1-0/0/0:4:1, Enabled, Physical link is Up
Interface index: 230, SNMP ifIndex: 167
Link-level type: Controller , Clocking: Internal, Speed: T1, Loopback: None,
Framing: ESF, Parent: coc1-0/0/0:4 Interface index 229
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags   : None
CoS queues   : 4 supported
Last flapped : Never
DS1 alarms   : None
DS1 defects  : None
SONET alarms : None
SONET defects : None

```

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

The controller interface is partitioned into other interface types and appears at the top of a specific level of channelization. For a visual representation of the controller interface at different levels of channelization, see [Figure 34 on page 388](#).

**Figure 34: Controller Interfaces at Different Levels of Channelization**



Each of the four examples of controller output is for a different level of channelization.

Sample output 1 for interface **coc12-0/0/0** shows **Parent: None**, which indicates the top-most level of channelization.

Sample output 2 for interface **coc1-0/0/0:2** shows **Parent: coc12-0/0/0**, which indicates that this interface is one level down from the top-most level, and is the OC1 controller for a first level of channelization.

Sample output 3 for interface **ct3-0/0/0:5** shows **Parent: coc1-0/0/0:5**, which indicates that this interface is at the second level of channelization, and is a CT3 controller.

Sample output 4 for interface **ct1-0/0/0:4:1** shows **Parent: coc1-0/0/0:4:1**, which indicates that this interface is at the third level of channelization, and is a CT1 controller.

### Display the Status of a Specific Channel of a Channelized OC12 IQ Interface

**Purpose** To display the status of a specific channel of an OC12 IQ interface, use the following Junos OS CLI operational mode command:

**Action**

```

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

```

**Sample Output 1**

```

user@host> show interfaces so-0/0/0:1
Physical interface: so-0/0/0:1, Enabled, Physical link is Up
  Interface index: 197, SNMP ifIndex: 131
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 16, Payload scrambler: Enabled,
  Parent: coc12-0/0/0  Interface index 195
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 17 (00:00:01 ago), Output: 17 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported

```



```

Last flapped   : 2004-05-26 22:19:18 UTC (00:02:59 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
SONET alarms   : None
SONET defects  : None
Logical interface so-0/0/0:1.0 (Index 70) (SNMP ifIndex 132)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 20.20.20.0/30, Local: 20.20.20.1, Broadcast: 20.20.20.3

```

**Sample Output 2**

```

user@host> show interfaces tl-0/0/0:2:1
Physical interface: tl-0/0/0:2:1, Enabled, Physical link is Up
  Interface index: 199, SNMP ifIndex: 133
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Framing: ESF,
  Parent: coc1-0/0/0:2 Interface index 198
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 44 (00:00:07 ago), Output: 46 (00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues    : 4 supported
  Last flapped  : Never
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  DS1 alarms   : None
  DS1 defects  : None
  SONET alarms  : None
  SONET defects : None
Logical interface tl-0/0/0:2:1.0 (Index 71) (SNMP ifIndex 134)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 20.20.20.4/30, Local: 20.20.20.5, Broadcast: 20.20.20.7

```

**Sample Output 3**

```

user@host> show interfaces ds-0/0/0:4:1:1
Physical interface: ds-0/0/0:4:1:1, Enabled, Physical link is Up
  Interface index: 231, SNMP ifIndex: 168
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps,
  Loopback: None, FCS: 16, Parent: ct1-0/0/0:4:1 Interface index 230
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 58 (00:00:06 ago), Output: 59 (00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues    : 4 supported
  Last flapped  : Never
  Input rate    : 48 bps (0 pps)
  Output rate   : 48 bps (0 pps)
  DS0 BERT configuration:

```

```

BERT time period: 10 seconds, Elapsed: 0 seconds
Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
Logical interface ds-0/0/0:4:1:1.0 (Index 75) (SNMP ifIndex 173)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 20.20.20.12/30, Local: 20.20.20.13, Broadcast: 20.20.20.15

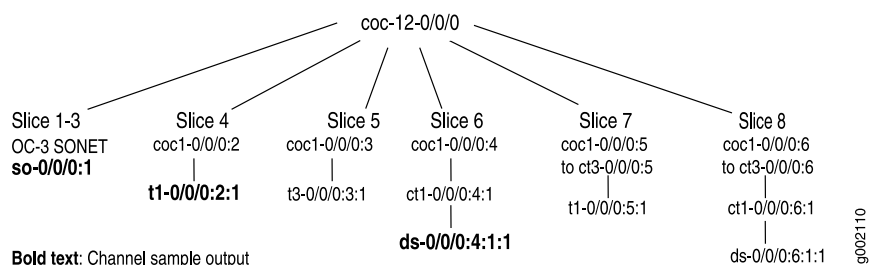
```

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

Sample output 1 shows an OC3 SONET interface. Sample output 2 shows a T1 interface that is the result of a partitioned OC1 interface, and sample output 3 shows a DS0 interface that is the result of an OC1 interface partitioned into a T1 interface, which is further partitioned into the DS0 interface.

Figure 35 on page 390 shows a visual representation of the different channel levels.

**Figure 35: Specific Channels of a Channelized OC12 IQ Interface**



When only one or some individual channels are down, you must troubleshoot the channel by checking the configuration, transmission network, and equipment. If all of the physical layers for the channels are down, you must work with this as a T1, T3, DS0, or OC12 SONET link or PIC problem. For more information on monitoring these types of interfaces, see the respective sections in this guide.

### Display Extensive Status Information for a Channelized OC12 IQ Interface

**Purpose** To display extensive status information for a Channelized OC12 IQ interface, use the following Junos OS CLI operational mode command:

**Action** `user@host> show interfaces interface-type-interface-name extensive`

**Sample Output 1** The following sample output is for a controller interface:

```

user@host> show interfaces coc12-0/0/0 extensive
Physical interface: coc12-0/0/0, Enabled, Physical link is Up
Interface index: 138, SNMP ifIndex: 82, Generation: 21
Link-level type: Controller, Clocking: Internal, SONET mode, Speed: OC12,
Loopback: None, Parent: None
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : None

```

```

Hold-times      : Up 0 ms, Down 0 ms
CoS queues      : 4 supported
Last flapped    : 2004-05-18 21:25:45 UTC (2d 00:04 ago)
Statistics last cleared: Never
SONET alarms :None
SONET defects :None
SONET PHY:
Seconds          Count  State
  PLL Lock        0        0  OK
  PHY Light        0        0  OK
SONET section:
BIP-B1            0        0
SEF               77        1  OK
LOS               77        1  OK
LOF               77        1  OK
ES-S              77
SES-S             77
SEFS-S            77
SONET line:
BIP-B2            0        0
REI-L            82584    1274876
RDI-L             5        1  OK
AIS-L             0        0  OK
BERR-SF          77        1  OK
BERR-SD           2        1  OK
ES-L              77
SES-L             77
UAS-L             67
ES-LFE           82589
SES-LFE           5
UAS-LFE           0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00

```

**Sample Output 2** The following sample output is for a channel on a Channelized OC12 IQ interface:

```

user@host> show interfaces tl-0/0/0:2:1 extensive
Physical interface: tl-0/0/0:2:1, Enabled, Physical link is Up
  Interface index: 186, SNMP ifIndex: 133, Generation: 69
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Framing: ESF,
  Parent: coc1-0/0/0:2 Interface index 185
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 444 (last seen 00:00:05 ago)
    Output: 442 (last sent 00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported
  Last flapped : Never
  Statistics last cleared: Never
  Traffic statistics:

```

```

Input bytes :          10948          0 bps
Output bytes :          11792          0 bps
Input packets:           892          0 pps
Output packets:          940          0 pps
Input errors:
  Errors: 2, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
  Policed discards: 2, L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:      Queued packets  Transmitted packets  Dropped packets

  0 best-effort          3              3              0
  1 expedited-fo         0              0              0
  2 assured-forw         0              0              0
  3 network-cont        937            937             0

DS1 alarms :None
DS1 defects :None
TI media:
Seconds      Count  State
SEF           1      1 OK
BEE           2      2 OK
AIS           0      0 OK
LOF          108      1 OK
LOS           0      0 OK
YELLOW        0      0 OK
BPV           0      0
EXZ           0      0
LCV           1      1
PCV           0      0
CS            0      0
LES          108
ES           108
SES          108
SEFS         108
BES           0
UAS          116

HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots      : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout       : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)

SONET alarms :None
SONET defects :None
SONET vt:
BIP-BIP2          0      0
REI-V            25     25
LOP-V            93      1 OK
AIS-V            0      0 OK
RDI-V            0      0 OK
UNEQ-V           0      0 OK
PLM-V            93      1 OK

```

```

ES-V          93
SES-V         93
UAS-V         83
ES-VFE       25
SES-VFE       25
UAS-VFE       0
Received SONET overhead:
V5           : 0x02, V5(cmp) : 0x02
Transmitted SONET overhead:
V5           : 0x02
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 4 (0x00)
Logical interface t1-0/0/0:2:1.0 (Index 70) (SNMP ifIndex 134)
(Generation 15)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 1500, Generation: 24, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 20.20.20.4/30, Local: 20.20.20.5, Broadcast: 20.20.20.7,
Generation: 29

```

**Meaning** The sample output shows where the errors might be occurring: either with the channel media or the SONET layer. In this example, there are no errors. However, if errors occur, you must troubleshoot the channel media or the SONET layer. For more information, see the sections of this guide that correspond to the media with which you are working.

### Monitor Statistics for a Channelized OC12 IQ Interface

**Purpose** To monitor statistics for a Channelized OC12 interface, use the following Junos OS CLI operational mode command:

**Action** `user@host> monitor interfaces interface-type-fpc/pic/port:channel`

**Sample Output**

```

user@host> monitor interfaces so-0/0/0:1.0
host          Seconds: 10          Time: 00:23:13          Delay: 0/0/32

Interface: so-0/0/0:1.0, Enabled, Link is Up
Flags: Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
Input bytes:          431244          [0]
Output bytes:         432268          [0]
Input packets:        35933          [0]
Output packets:       36019          [0]
Remote statistics:
Input bytes:          0 (0 bps)       [0]
Output bytes:         0 (0 bps)       [0]
Input packets:        0 (1 pps)       [0]
Output packets:       0 (0 pps)       [0]
Traffic statistics:
Input bytes:          431244          [0]
Output bytes:         432268          [0]
Input packets:        35933          [0]
Output packets:       36019          [0]
Protocol: inet, MTU: 4470

user@host> monitor interfaces t1-0/0/0:2:1.0
host          Seconds: 1          Time: 00:32:07

```

```

Interface: t1-0/0/0:2:1.0, Enabled, Link is Up
Flags: Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
  Input bytes:          432028
  Output bytes:         433076
  Input packets:        35954
  Output packets:       36041
Remote statistics:
  Input bytes:          0 (0 bps)
  Output bytes:         0 (0 bps)
  Input packets:        0 (0 pps)
  Output packets:       0 (0 pps)
Traffic statistics:
  Input bytes:          432028
  Output bytes:         433076
  Input packets:        35954
  Output packets:       36041
Protocol: inet, MTU: 1500

```

Delay: 0/0/26

Current delta

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

```

user@host> monitor interfaces ds-0/0/0:4:1:1.0
host          Seconds: 3          Time: 00:36:59

```

Delay: 0/0/0

```

Interface: ds-0/0/0:4:1:1.0, Enabled, Link is Up
Flags: Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:
  Input bytes:          432836
  Output bytes:         433882
  Input packets:        36065
  Output packets:       36152
Remote statistics:
  Input bytes:          0 (0 bps)
  Output bytes:         0 (0 bps)
  Input packets:        0 (0 pps)
  Output packets:       0 (0 pps)
Traffic statistics:
  Input bytes:          432836
  Output bytes:         433882
  Input packets:        36065
  Output packets:       36152
Protocol: inet, MTU: 1500

```

Current delta

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

[0]

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



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



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

## Use Loopback Testing for Channelized OC12 Interfaces

- [Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces on page 395](#)
- [Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface on page 396](#)
- [Create a Loopback on page 397](#)
- [Verify That the Interface Is Up on page 398](#)
- [Clear Interface Statistics on page 401](#)
- [Force the Link Layer to Stay Up on page 401](#)
- [Verify the Status of the Logical Interface on page 403](#)
- [Ping the Channelized Interface on page 403](#)
- [Check for Interface Error Statistics on page 404](#)
- [Diagnose a Suspected Circuit Problem on page 407](#)

### Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces

**Purpose** To use loopback testing to isolate Channelized OC12 and Channelized OC12 IQ interface problems. The naming convention for the Channelized OC12 IQ interface varies depending on the type of interface.

**Action** [Table 39 on page 395](#) provides links and commands for using loopback testing to isolate Channelized OC12 and Channelized OC12 IQ interface problems.

**Table 39: Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces**

Tasks	Command or Action
<a href="#">“Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface” on page 396</a>	
1. <a href="#">Create a Loopback on page 397</a>	
a. <a href="#">Create a Physical Loopback on page 397</a>	Connect the TX port to the RX port.
b. <a href="#">Configure a Local Loopback on page 397</a>	<code>[edit interfaces t3-fpc/pic/port:channel t3 options] set loopback local show commit</code>
2. <a href="#">Verify That the Interface Is Up on page 398</a>	<code>show interfaces t3-fpc/pic/port:channel extensive</code>
3. <a href="#">Clear Interface Statistics on page 401</a>	<code>clear interfaces statistics t3-fpc/pic/port:channel</code>
4. <a href="#">Force the Link Layer to Stay Up on page 401</a>	

**Table 39: Checklist for Using Loopback Testing for Channelized OC12 and Channelized OC12 IQ Interfaces (*continued*)**

Tasks	Command or Action
a. <a href="#">Configure Encapsulation to Cisco-HDLC on page 401</a>	<code>[edit interfaces t3-fpc/pic/port:channel] set encapsulation cisco-hdlc show commit</code>
b. <a href="#">Configure No-Keepalives on page 402</a>	<code>[edit interfaces t3-fpc/pic/port:channel] set no-keepalives show commit</code>
5. <a href="#">Verify the Status of the Logical Interface on page 403</a>	<code>show interfaces t3-fpc/pic/port:channel</code>
6. <a href="#">Ping the Channelized Interface on page 403</a>	<code>ping interface t3-fpc/pic/port:channel local-IP-address bypass-routing count 1000 rapid</code>
7. <a href="#">Check for Interface Error Statistics on page 404</a>	<code>show interfaces t3-fpc/pic/port:channel extensive</code>
<b>"Diagnose a Suspected Circuit Problem" on page 407</b>	
1. <a href="#">Loop the Entire T3 Interface Toward the Network on page 407</a>	<code>[edit interfaces t3-fpc/pic/port:channel t3-options] set loopback remote show commit</code>
2. <a href="#">Create a Loop to the Router from Various Points in the Network on page 408</a>	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface" on page 396.

## Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface

**Problem** To diagnose a suspected hardware problem with a Channelized OC12 or Channelized OC12 IQ interface, follow these steps:

- Solution**
- [Create a Loopback on page 397](#)
  - [Verify That the Interface Is Up on page 398](#)
  - [Clear Interface Statistics on page 401](#)
  - [Force the Link Layer to Stay Up on page 401](#)
  - [Verify the Status of the Logical Interface on page 403](#)
  - [Ping the Channelized Interface on page 403](#)
  - [Check for Interface Error Statistics on page 404](#)



## Create a Loopback

**Purpose** You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the Channelized OC12 or Channelized OC12 IQ port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos OS Network Interfaces Configuration Guide*.

1. [Create a Physical Loopback on page 397](#)
2. [Configure a Local Loopback on page 397](#)

### Create a Physical Loopback

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

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

### Configure a Local Loopback

**Action** To configure a local loopback, follow these steps:



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

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

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel t3-options
```
2. Configure the local loopback:  

```
[edit interfaces t3-fpc/pic/port:channel t3-options]
user@host# set loopback local
```

The following is an example of the name for a T3 channel on a channelized DS3 interface:

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

3. Verify the configuration:  

```
user@host# show
```

For example:

```
[edit interfaces t3-2/1/0:2 t3-options]
user@host# show
loopback local;
```

4. Commit the configuration:

```
user@host# commit
```

For example:

```
[edit interfaces t3-2/1/1:2 t3-options]
user@host# commit
commit complete
```

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



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

## Verify That the Interface Is Up

**Purpose** Display the status of a Channelized OC12 or Channelized OC12 IQ interface to determine whether the physical link is up or down.

**Action** To verify that the status of the Channelized OC12 or Channelized OC12 IQ interface is up, use the following Junos OS command-line interface (CLI) operational mode command:

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



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see *Junos Network Interfaces Configuration Guide*.

**Sample Output**

```
user@host> show interfaces t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 118, Generation: 122
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
  Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2004-05-21 15:23:34 UTC (00:05:00 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes :                0                0 bps
    Output bytes:                0                0 bps
    Input packets:              0                0 pps
    Output packets:             0                0 pps
  Input errors:
```

```

Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
HS link CRC errors: 0, SRAM errors: 0
Output errors:
Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
DS3 alarms :None
SONET alarms :None
DS3 defects :None
SONET defects :None
DS3 media:
Seconds      Count  State
AIS          0      0 OK
LOF          0      0 OK
LOS          0      0 OK
IDLE         0      0 OK
YELLOW       0      0 OK
BPV          0      0
EXZ          0      0
LCV          0      0
PCV          0      0
CCV          0      0
LES          0
PES          0
PSES         0
CES          0
CSES         0
SEFS         0
UAS          0
HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 4484, Runt threshold: 3
Idle cycle flag: flags, Start end flag: shared
DSU configuration:
Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
BERT time period: 10 seconds, Elapsed: 0 seconds
Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
Interface transmit queues:
B/W  WRR      Packets      Bytes
Queue0    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
Queue1    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
Queue2    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
Queue3    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
SONET PHY:
Seconds      Count  State
PLL Lock     0      0 OK
PHY Light    0      0 OK
SONET section:

```

```

BIP-B1          1          22
SEF             0          0 OK
LOS             0          0 OK
LOF             0          0 OK
ES-S            1
SES-S           0
SEFS-S          0
SONET line:
BIP-B2          1          307
REI-L           0          0
RDI-L           3          1 OK
AIS-L           0          0 OK
BERR-SF         0          0 OK
BERR-SD         0          0 OK
ES-L            1
SES-L           0
UAS-L           0
ES-LFE         3
SES-LFE         3
UAS-LFE         0
SONET path:
BIP-B3          1          35
REI-P           1          7
LOP-P           0          0 OK
AIS-P           0          0 OK
RDI-P           0          0 OK
UNEQ-P          0          0 OK
PLM-P           1          1 OK
ES-P            1
SES-P           0
UAS-P           0
ES-PFE          1
SES-PFE         0
UAS-PFE         0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
Received path trace: t3-0/1/0:0
74 33 2d 30 2f 31 2f 30 3a 30 00 00 00 00 0d 0a   t3-0/1/0:0:0.....
Transmitted path trace: t3-0/3/0:0
74 33 2d 30 2f 33 2f 30 3a 30 00 00 00 00 00 00   t3-0/3/0:0:0.....
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort           95      42499200 95          0      low      none
3 network-control        5       2236800  5          0      low      none

```

**Meaning** The sample output shows that the physical link is up and there are no OC12 alarms or defects. You should not see any OC12 alarms.

## Clear Interface Statistics

- Purpose** You must reset the Channelized OC12 or Channelized OC12 IQ interface statistics before initiating the ping test. Resetting the statistics provides a clean start so that previous input or output errors and packet statistics do not interfere with the current efforts to diagnose the problem.
- Action** To clear all statistics for the interface, use the following Junos OS CLI operational mode command:
- ```
user@host> clear interfaces statistics t3-fpc/pic/port:channel.
```
- Sample Output**
- ```
user@host> clear interfaces statistics t3-1/1/0:0
user@host>
```
- Meaning** This command clears the interface statistics counters for the Channelized OC12 interface only.

## Force the Link Layer to Stay Up

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

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

1. [Configure Encapsulation to Cisco-HDLC on page 401](#)
2. [Configure No-Keepalives on page 402](#)

---

### Configure Encapsulation to Cisco-HDLC

**Action**

To set the encapsulation on a T3 physical interface, follow these steps:

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

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel
```

2. Configure Cisco-HDLC:

```
[edit interfaces t3-fpc/pic /port:channel ]
user@host# set encapsulation cisco-hdlc
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# show
encapsulation hdlc;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# commit
commit complete
```

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

---

### Configure No-Keepalives

**Action** To disable the sending of link-layer keepalives on a Channelized OC12 or Channelized OC12 IQ interface, follow these steps:



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see *Junos Network Interfaces Configuration Guide*.

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

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel
```

2. Configure no-keepalives:

```
[edit interfaces t3-fpc/pic/port:channel]
user@host# set no-keepalives
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# show
no-keepalives;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-0/1/1:8]
user@host# commit
commit complete
```

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

## Verify the Status of the Logical Interface

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

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



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see *Junos Network Interfaces Configuration Guide*.

**Sample Output**

```
user@host> show interfaces t3-0/3/0:11
Physical interface: t3-0/3/0:11, Enabled, Physical link is Up
  Interface index: 204, SNMP ifIndex: 129
  Link-level type: Cisco-HDLC, MTU: 4474, SONET mode, Speed: T3, Loopback: Local,

  SONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  CoS queues     : 4 supported
  Last flapped   : 2004-05-21 15:23:34 UTC (01:34:24 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS3 alarms    : None
  SONET alarms   : None
  DS3 defects    : None
  SONET defects  : None
  DS-3 BERT configuration:
    BERT time period: 0 seconds, Elapsed: 0 seconds
    Algorithm: Unknown (0), Induced error rate: 10e-0
  Logical interface t3-0/3/0:11.0 (Index 71) (SNMP ifIndex 130)
    Flags: Point-To-Point  SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.0.0.0/30, Local: 10.0.0.1, Broadcast: 10.0.0.3
```

**Meaning** The sample output shows that the channelized interface has the physical and logical links up. There are no alarms or defects.

## Ping the Channelized Interface

**Purpose** Use the ping command to verify the loopback connection.

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

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



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

**Sample Output**

```

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

```

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

## Check for Interface Error Statistics

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

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

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



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

**Sample Output**

```

user@host> show interfaces t3-0/3/0:11 extensive
Physical interface: t3-0/3/0:11, Enabled, Physical link is Up
  Interface index: 204, SNMP ifIndex: 129, Generation: 133
  Link-level type: Cisco-HDLC, MTU: 4474, SONET mode, Speed: T3, Loopback: Local,
  SSONET Loopback: None, FCS: 16, Mode: C/Bit parity
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : No-Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  CoS queues    : 4 supported
  Last flapped  : 2004-05-21 15:23:34 UTC (01:36:27 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input  bytes :           109318           0 bps
    Output bytes :           109318           0 bps
    Input packets:             1669           0 pps
    Output packets:           1669           0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,

```



```

HS link CRC errors: 0, SRAM errors: 0
Output errors:
Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0
DS3 alarms :None
SONET alarms :None
DS3 defects :None
SONET defects :None
DS3 media:
Seconds      Count  State
AIS          0      0 OK
LOF          0      0 OK
LOS          0      0 OK
IDLE         0      0 OK
YELLOW       0      0 OK
BPV          0      0
EXZ          0      0
LCV          0      0
PCV          0      0
CCV          0      0
LES          0
PES          0
PSES         0
CES          0
CES          0
SEFS         0
UAS          0
HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 4484, Runt threshold: 3
Idle cycle flag: flags, Start end flag: shared
DSU configuration:
Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
BERT time period: 0 seconds, Elapsed: 0 seconds
Algorithm: Unknown (0), Induced error rate: 10e-0
Interface transmit queues:
B/W  WRR      Packets      Bytes
Queue0    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
Queue1    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
Queue2    0    0
Transmitted:      0      0
Drops:            0      0
Errors:           0
Queue3    0    0
Transmitted:    1669    109318
Drops:          0      0
Errors:          0
SONET PHY:
Seconds      Count  State
PLL Lock    0      0 OK
PHY Light   0      0 OK
SONET section:
BIP-B1      1      22
SEF         0      0 OK
LOS         0      0 OK

```

```

LOF                                0                0 OK
ES-S                               1
SES-S                              0
SEFS-S                             0
SONET line:
BIP-B2                             1                307
REI-L                              0                0
RDI-L                              3                1 OK
AIS-L                              0                0 OK
BERR-SF                            0                0 OK
BERR-SD                            0                0 OK
ES-L                               1
SES-L                              0
UAS-L                              0
ES-LFE                             3
SES-LFE                             3
UAS-LFE                             0
SONET path:
BIP-B3                             1                37
REI-P                              1                23
LOP-P                              0                0 OK
AIS-P                              0                0 OK
RDI-P                              0                0 OK
UNEQ-P                             0                0 OK
PLM-P                              1                1 OK
ES-P                               1
SES-P                              0
UAS-P                              0
ES-PFE                             1
SES-PFE                             0
UAS-PFE                             0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
Received path trace: t3-0/1/0:11
74 33 2d 30 2f 31 2f 30 3a 31 31 00 00 00 0d 0a  t3-0/1/0:11.....
Transmitted path trace: t3-0/3/0:11
74 33 2d 30 2f 33 2f 30 3a 31 31 00 00 00 00 00  t3-0/3/0:11.....
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x02)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort           95      42499200 95      0      low      none
3 network-control       5      2236800 5      0      low      none
Logical interface t3-0/3/0:11.0 (Index 71) (SNMP ifIndex 130) (Generation 22)
Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
Protocol inet, MTU: 4470, Generation: 31, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.0.0.0/30, Local: 10.0.0.1, Broadcast: 10.0.0.3, Generation:
43

```

**Meaning** Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with

JTAC at [support@juniper.net](mailto:support@juniper.net), or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

## Diagnose a Suspected Circuit Problem

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

To diagnose a suspected circuit problem, follow these steps:

1. [Loop the Entire T3 Interface Toward the Network on page 407](#)
2. [Create a Loop to the Router from Various Points in the Network on page 408](#)

### 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..



**NOTE:** For a list of interface types associated with the Channelized OC12 IQ interface, see the *Junos Network Interfaces Configuration Guide*.

**Action** To create a loop from the entire T3 interface to the network, follow these steps:

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

```
[edit]
user@host# edit interfaces t3-fpc/pic/port:channel t3-options
```
2. Configure the loopback:  

```
[edit interfaces t3-fpc/pic/port:channel t3-options]
user@host# set loopback remote
```
3. Verify the configuration:  

```
user@host# show
```

For example:

```
[edit interfaces t3-2/1/1:0 t3-options]
user@host# show
loopback remote;
```
4. Commit the configuration:  

```
user@host# commit
```

**Meaning** The `loopback remote` command loops any traffic from the network back into the network.

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

- Purpose** The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.
- Action** After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 7 in [“Diagnose a Suspected Hardware Problem with a Channelized OC12 or Channelized OC12 IQ Interface” on page 396](#). Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.
- By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.

### Locate Channelized OC12 Alarms and Errors

- [Checklist for Channelized OC12 Alarms and Errors on page 408](#)
- [Display Channelized OC12 Alarms and Errors on page 408](#)
- [Display Channelized OC12 IQ Alarms and Errors on page 412](#)

### Checklist for Channelized OC12 Alarms and Errors

- Purpose** To check the most common Channelized OC12 alarms and errors encountered when investigating line problems on a Juniper Networks router.
- Action** [Table 40 on page 408](#) provides links and commands for Channelized OC12 alarms and errors.

Table 40: Checklist for Channelized OC12 Alarms and Errors

Tasks	Command or Action
<a href="#">“Display Channelized OC12 Alarms and Errors” on page 408</a>	<code>show interfaces t3-fpc/pic/port:channel extensive</code>
<a href="#">“Display Channelized OC12 IQ Alarms and Errors” on page 412</a>	<code>show interfaces interface-type-interface-name extensive</code>

### Display Channelized OC12 Alarms and Errors

- Purpose** To display Channelized OC12 interface alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:
- Action** `user@host> show interface t3-fpc/pic/port:channel extensive`
- Sample Output 1**
- ```
user@host> show interfaces t3-0/3/0:0 extensive
Physical interface: t3-0/3/0:0, Enabled, Physical link is Up
Interface index: 193, SNMP ifIndex: 118, Generation: 122
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: T3,
```

```

Loopback: Local, SONET Loopback: None, FCS: 16, Mode: C/Bit parity
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags : Keepalives
Hold-times : Up 0 ms, Down 0 ms
CoS queues : 4 supported
Last flapped : 2004-05-21 15:23:34 UTC (01:59:02 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes : 0 0 bps
  Output bytes : 0 0 bps
  Input packets: 0 0 pps
  Output packets: 0 0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards:
0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
DS3 alarms :None
SONET alarms :None
DS3 defects :None
SONET defects :None
DS3 media:
  Seconds Count State
  AIS 0 0 OK
  LOF 0 0 OK
  LOS 0 0 OK
  IDLE 0 0 OK
  YELLOW 0 0 OK
  BPV 0 0
  EXZ 0 0
  LCV 0 0
  PCV 0 0
  CCV 0 0
  LES 0
  PES 0
  PSES 0
  CES 0
  CSES 0
  SEFS 0
  UAS 0
HDLc configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 3
  Idle cycle flag: flags, Start end flag: shared
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
Interface transmit queues:
  B/W WRR Packets Bytes
Queue0 0 0
  Transmitted: 0 0
  Drops: 0 0
  Errors: 0
Queue1 0 0
  Transmitted: 0 0

```

```

        Drops:                                0            0
        Errors:                                0
Queue2      0      0
        Transmitted:                          0            0
        Drops:                                0            0
        Errors:                                0
Queue3      0      0
        Transmitted:                          0            0
        Drops:                                0            0
        Errors:                                0
SONET PHY:      Seconds      Count      State
  PLL Lock      0            0      OK
  PHY Light      0            0      OK
SONET section:
  BIP-B1          1            22
  SEF              0            0      OK
  LOS              0            0      OK
  LOF              0            0      OK
  ES-S            1
  SES-S           0
  SEFS-S          0
SONET line:
  BIP-B2          1            307
  REI-L           0            0
  RDI-L           3            1      OK
  AIS-L           0            0      OK
  BERR-SF         0            0      OK
  BERR-SD         0            0      OK
  ES-L            1
  SES-L           0
  UAS-L           0
  ES-LFE          3
  SES-LFE         3
  UAS-LFE         0
SONET path:
  BIP-B3          1            35
  REI-P           1            7
  LOP-P           0            0      OK
  AIS-P           0            0      OK
  RDI-P           0            0      OK
  UNEQ-P          0            0      OK
  PLM-P           1            1      OK
  ES-P            1
  SES-P           0
  UAS-P           0
  ES-PFE          1
  SES-PFE         0
  UAS-PFE         0
Received SONET overhead:
  F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
  Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
  F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
  Z4      : 0x00
Received path trace: t3-0/1/0:0
  74 33 2d 30 2f 31 2f 30 3a 30 00 00 00 00 0d 0a   t3-0/1/0:0:.....
Transmitted path trace: t3-0/3/0:0
  74 33 2d 30 2f 33 2f 30 3a 30 00 00 00 00 00 00   t3-0/3/0:0:.....
Packet Forwarding Engine configuration:

```

```

Destination slot: 0, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer Priority  Limit
                        %      bps      %      bytes
0 best-effort           95      42499200  95      0      low    none
3 network-control       5       2236800   5      0      low    none

```

**Meaning** The sample output shows that there are no active alarms or active defects, either with the T3 media or the SONET layer. If alarms or errors occur, you must troubleshoot the T3 media or the SONET layer. For more information on diagnosing a T3 media problem or a SONET layer problem, see the topics in the Related Topics section.

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

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



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

Table 41 on page 411 shows T3 media-specific alarms or errors that can render the interface unable to pass packets.

**Table 41: 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) |

Table 41: T3 Interface Error Counter Definitions (*continued*)

| T3 Alarm or Error | Definition        |
|-------------------|-------------------|
| PLL               | Phase locked loop |

For more details on T3 alarms and statistics, see Checklist of Common T3 Alarms and Errors.

## Display Channelized OC12 IQ Alarms and Errors

**Purpose** To display Channelized OC12 IQ interface alarms and errors, use the following Junos OS CLI operational mode command:

**Action** `user@host> show interfaces interface-type-interface-name extensive`

**Sample Output 1** The following sample output is for a controller interface:

```
user@host> show interfaces coc12-0/0/0 extensive
Physical interface: coc12-0/0/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 82, Generation: 21
  Link-level type: Controller, Clocking: Internal, SONET mode, Speed: OC12,
  Loopback: None, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times    : Up 0 ms, Down 0 ms
  CoS queues    : 4 supported
  Last flapped  : 2004-05-18 21:25:45 UTC (2d 00:04 ago)
  Statistics last cleared: Never
  SONET alarms : None
  SONET defects: None
  SONET PHY:
    Seconds      Count  State
    PLL Lock     0       0 OK
    PHY Light    0       0 OK
  SONET section:
    BIP-B1       0       0
    SEF          77       1 OK
    LOS          77       1 OK
    LOF          77       1 OK
    ES-S         77
    SES-S        77
    SEFS-S       77
  SONET line:
    BIP-B2       0       0
    REI-L       82584    1274876
    RDI-L        5       1 OK
    AIS-L        0       0 OK
    BERR-SF      77       1 OK
    BERR-SD      2       1 OK
    ES-L         77
    SES-L        77
    UAS-L        67
    ES-LFE      82589
    SES-LFE      5
    UAS-LFE      0
  Received SONET overhead:
```



```

F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00

```

**Sample Output 2** The following sample output is for a T1 channel on a Channelized OC12 IQ interface:

```

user@host> show interfaces t1-0/0/0:2:1 extensive
Physical interface: t1-0/0/0:2:1, Enabled, Physical link is Up
  Interface index: 186, SNMP ifIndex: 133, Generation: 69
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Framing: ESF,
  Parent: coc1-0/0/0:2 Interface index 185
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 444 (last seen 00:00:05 ago)
    Output: 442 (last sent 00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported
  Last flapped : Never
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes :           10948           0 bps
    Output bytes:           11792           0 bps
    Input packets:             892           0 pps
    Output packets:            940           0 pps
  Input errors:
    Errors: 2, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
    Policed discards: 2, L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:

```

|                | Queued packets | Transmitted packets | Dropped packets |
|----------------|----------------|---------------------|-----------------|
| 0 best-effort  | 3              | 3                   | 0               |
| 1 expedited-fo | 0              | 0                   | 0               |
| 2 assured-forw | 0              | 0                   | 0               |
| 3 network-cont | 937            | 937                 | 0               |

```

DS1 alarms : None
DS1 defects : None
T1 media:

```

|        | Seconds | Count | State |
|--------|---------|-------|-------|
| SEF    | 1       | 1     | OK    |
| BEE    | 2       | 2     | OK    |
| AIS    | 0       | 0     | OK    |
| LOF    | 108     | 1     | OK    |
| LOS    | 0       | 0     | OK    |
| YELLOW | 0       | 0     | OK    |
| BPV    | 0       | 0     |       |
| EXZ    | 0       | 0     |       |

```

LCV                1          1
PCV                0          0
CS                 0          0
LES                108
ES                 108
SES                108
SEFS               108
BES                0
UAS                116
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 1514, Runt threshold: 0
  Timeslots       : All active
  Line encoding: B8ZS, Byte encoding: Nx64K
  Buildout        : 0 to 132 feet
  Data inversion: Disabled, Idle cycle flag: flags, Start end flag: shared
DS1 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
SONET alarms :None
SONET defects :None
SONET vt:
  BIP-BIP2         0          0
  REI-V            25         25
  LOP-V            93         1 OK
  AIS-V            0          0 OK
  RDI-V            0          0 OK
  UNEQ-V           0          0 OK
  PLM-V            93         1 OK
  ES-V             93
  SES-V            93
  UAS-V            83
  ES-VFE           25
  SES-VFE          25
  UAS-VFE          0
Received SONET overhead:
  V5               : 0x02, V5(cmp) : 0x02
Transmitted SONET overhead:
  V5               : 0x02
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 4 (0x00)
Logical interface t1-0/0/0:2:1.0 (Index 70) (SNMP ifIndex 134)
(Generation 15)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 24, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 20.20.20.4/30, Local: 20.20.20.5, Broadcast: 20.20.20.7,
    Generation: 29

```

**Meaning** The sample output shows that there are no active alarms or active defects. If alarms or errors occur, you must troubleshoot the channel media or the SONET layer. For more information, see the topics that correspond to the media with which you are working.

When a major error (such as an AIS) is seen for a few consecutive frames, a defect is declared within 1 second from detection. At the defect level, the interface is taken down and routing protocols are immediately notified (this is the default). In most cases, when a defect persists for 2.5 seconds plus or minus 0.5 seconds, an alarm is declared.

## PART 7

# Index

- [Index on page 417](#)
- [Index of Statements and Commands on page 427](#)



# Index

## Symbols

|                                              |      |
|----------------------------------------------|------|
| #, comments in configuration statements..... | xxvi |
| ( ), in syntax descriptions.....             | xxvi |
| < >, in syntax descriptions.....             | xxv  |
| [ ], in configuration statements.....        | xxvi |
| { }, in configuration statements.....        | xxvi |
| (pipe), in syntax descriptions.....          | xxvi |

## A

|                                                 |     |
|-------------------------------------------------|-----|
| address statement.....                          | 224 |
| advertise-interval statement.....               | 226 |
| alarms                                          |     |
| Channelized DS3 interfaces, checklist .....     | 335 |
| Channelized OC12 interfaces, checklist .....    | 408 |
| Channelized OC12 IQ interfaces, checklist ..... | 408 |
| Multichannel DS3 interfaces, checklist .....    | 367 |
| aps statement.....                              | 227 |
| authentication-key statement.....               | 228 |

## B

|                                          |               |
|------------------------------------------|---------------|
| bchannel-allocation statement.....       | 228           |
| bert-algorithm statement.....            | 229           |
| usage guidelines.....                    | 174, 182, 192 |
| bert-error-rate statement.....           | 231           |
| bert-period statement.....               | 233           |
| braces, in configuration statements..... | xxvi          |
| brackets                                 |               |
| angle, in syntax descriptions.....       | xxv           |
| square, in configuration statements..... | xxvi          |
| buildout statement                       |               |
| T1 interfaces.....                       | 234           |
| byte encoding.....                       | 235           |
| byte-encoding statement.....             | 235           |
| bytes statement.....                     | 236           |

## C

|                            |     |
|----------------------------|-----|
| C-bit parity mode.....     | 237 |
| cbit-parity statement..... | 237 |

|                                                   |               |
|---------------------------------------------------|---------------|
| channel scaling numbers                           |               |
| channelized sonet/sdh oc3/stm1 (multi-rate)       |               |
| mics with sfp.....                                | 36            |
| ds3/e3 mic.....                                   | 37            |
| channel, Channelized OC12 IQ interfaces .....     | 388           |
| channelization                                    |               |
| configuring.....                                  | 132           |
| channelization levels, controller interface ..... | 388           |
| channelization statement.....                     | 237           |
| channelized AU-4 interfaces.....                  | 60, 80, 86    |
| example configuration.....                        | 60, 81, 86    |
| Channelized DS3 interfaces                        |               |
| alarms and errors.....                            | 336           |
| circuit problem .....                             | 334           |
| clear interfaces statistics command.....          | 329           |
| edit interfaces command.....                      | 329, 330      |
| edit interfaces t1-options command .....          | 327, 334      |
| edit interfaces t3-options command.....           | 327           |
| encapsulation, configuring.....                   | 329           |
| errors .....                                      | 322           |
| link layer, forcing up.....                       | 329           |
| local loopback, configuring.....                  | 327           |
| logical interface .....                           | 331           |
| loopback, configuring                             |               |
| from specific T1 interface.....                   | 334           |
| monitor interface command .....                   | 322           |
| monitor, checklist.....                           | 312           |
| no keepalives, configuring.....                   | 330           |
| notification messages.....                        | 339           |
| physical link status.....                         | 314, 328      |
| physical loopback, creating .....                 | 327           |
| ping interface command.....                       | 332           |
| set encapsulation command.....                    | 329           |
| set loopback local command.....                   | 327           |
| set loopback remote command.....                  | 334           |
| set no-keepalives command.....                    | 330           |
| show interfaces command.....                      | 314, 328, 331 |
| show interfaces extensive                         |               |
| command.....                                      | 317, 332, 336 |
| show interfaces terse command.....                | 313           |
| statistics                                        |               |
| checking error.....                               | 332           |
| monitoring .....                                  | 322           |
| resetting.....                                    | 329           |
| status                                            |               |
| displaying .....                                  | 313, 328      |
| displaying specific .....                         | 314, 317      |
| extensive .....                                   | 317           |
| logical interface, verifying.....                 | 331           |

|                                           |                       |
|-------------------------------------------|-----------------------|
| t1-options statement.....                 | 327, 334              |
| t3-options statement.....                 | 327                   |
| channelized DS3 to DS0 interfaces         |                       |
| alarms and errors .....                   | 370                   |
| clear interfaces statistics command.....  | 357                   |
| logical interface .....                   | 359                   |
| monitor interfaces command .....          | 351                   |
| ping interface command.....               | 360                   |
| show interfaces command.....              | 356, 359              |
| show interfaces extensive command.....    | 361, 370              |
| channelized DS3 to DS1 interfaces         |                       |
| alarms and errors .....                   | 367                   |
| show interfaces command.....              | 328, 357, 359         |
| show interfaces extensive command.....    | 367                   |
| channelized E1 interfaces                 |                       |
| example configuration.....                | 62, 83, 112, 149, 152 |
| interface naming.....                     | 112, 149              |
| channelized E1 IQ and IQE interfaces      |                       |
| time slots.....                           | 109                   |
| channelized E1 IQ interfaces              |                       |
| example configuration.....                | 151                   |
| time slots.....                           | 148                   |
| channelized E1 IQE interfaces             |                       |
| example configuration.....                | 151                   |
| time slots.....                           | 148                   |
| channelized E3 (COC48/STM16) interfaces   |                       |
| example configuration.....                | 61                    |
| channelized interfaces.....               | 344                   |
| Channelized DS3, status, displaying.....  | 313                   |
| clock sources.....                        | 32                    |
| errors.....                               | 322, 350, 381         |
| Multichannel DS3, status, displaying..... | 345                   |
| notification messages.....                | 369                   |
| OC12 IQ status, displaying.....           | 382                   |
| OC12 status, displaying.....              | 378                   |
| physical link down .....                  | 378                   |
| statistics monitoring .....               | 351                   |
| status.....                               | 328, 356, 398         |
| extensive.....                            | 317, 347, 390         |
| channelized IQ interfaces                 |                       |
| supported options.....                    | 38                    |
| channelized NxDS0 IQ interfaces           |                       |
| example configuration.....                | 63, 143, 149          |
| channelized NxDS0 IQE interfaces          |                       |
| example configuration.....                | 149                   |
| channelized OC12 (COC48/STM16 IQE)        |                       |
| interfaces.....                           | 51                    |
| example configuration.....                | 52                    |
| channelized OC12 interfaces               |                       |
| example configuration.....                | 89, 90, 96            |
| Channelized OC12 interfaces               |                       |
| alarms .....                              | 411                   |
| alarms and errors .....                   | 408                   |
| checklist for alarms.....                 | 408                   |
| circuit problem .....                     | 407                   |
| clear interfaces statistics command.....  | 401                   |
| defects.....                              | 411                   |
| edit interfaces command .....             | 401, 402              |
| edit interfaces t3-options command .....  | 407                   |
| encapsulation, configuring .....          | 401                   |
| errors.....                               | 381, 411              |
| link layer, forcing up .....              | 401                   |
| local loopback, configuring .....         | 397                   |
| logical interface .....                   | 403                   |
| loopback, configuring                     |                       |
| for entire T3 interface .....             | 407                   |
| monitor                                   |                       |
| checklist.....                            | 376                   |
| statistics.....                           | 381                   |
| monitor interface command.....            | 393                   |
| no keepalives, configuring .....          | 402                   |
| physical link status.....                 | 378, 398              |
| physical loopback, creating .....         | 397                   |
| ping interface command .....              | 403                   |
| set cli terminal command.....             | 382                   |
| set encapsulation command .....           | 401                   |
| set loopback local command .....          | 397                   |
| set loopback remote command .....         | 407                   |
| set no-keepalives command .....           | 402                   |
| show command .....                        | 397                   |
| show interfaces coc1 command.....         | 387                   |
| show interfaces coc12 command.....        | 386                   |
| show interfaces command.....              | 378, 398              |
| show interfaces ct1 command.....          | 387                   |
| show interfaces ct3 command.....          | 387                   |
| show interfaces extensive                 |                       |
| command.....                              | 379, 404, 408         |
| show interfaces terse command.....        | 378                   |
| statistics                                |                       |
| checking error .....                      | 404                   |
| monitoring .....                          | 381                   |
| resetting .....                           | 401                   |
| status                                    |                       |
| displaying .....                          | 398                   |
| displaying for specific.....              | 378                   |

|                                         |               |                                               |          |
|-----------------------------------------|---------------|-----------------------------------------------|----------|
| extensive.....                          | 379           | status                                        |          |
| logical interface, verifying .....      | 403           | displaying.....                               | 398      |
| t3-options statement .....              | 397, 407      | displaying for specific.....                  | 388      |
| channelized OC12 IQ interfaces          |               | extensive.....                                | 390      |
| example configuration.....              | 92            | logical interface, verifying.....             | 403      |
| Channelized OC12 IQ interfaces          |               | t3-options statement.....                     | 407      |
| alarms and errors .....                 | 412           | channelized OC3 (COC48/STM16 IQE)             |          |
| checklist for alarms .....              | 408           | interfaces.....                               | 52       |
| circuit problem .....                   | 407           | example configuration.....                    | 53       |
| configuration.....                      | 384           | channelized OC3 interfaces.....               | 73       |
| figure .....                            | 384           | example configuration.....                    | 73       |
| controller interface.....               | 384           | channelized OC48 IQE interfaces               |          |
| channelization levels.....              | 388           | example configuration.....                    | 64       |
| status, displaying.....                 | 386, 387      | channelized STM1 interfaces                   |          |
| edit interfaces command.....            | 401, 402      | example configuration.....                    | 121      |
| edit interfaces t3-options command..... | 407           | time slots.....                               | 110, 148 |
| encapsulation, configuring .....        | 401           | channelized STM1 IQ interfaces                |          |
| errors.....                             | 393           | example configuration.....                    | 111      |
| hierarchy.....                          | 384           | channelized T1 (COC48/STM16 IQE) interfaces   |          |
| individual channels down.....           | 384           | VT mapping.....                               | 55       |
| link layer, forcing up.....             | 401           | channelized T1 interfaces                     |          |
| local loopback, configuring .....       | 397           | example configuration.....                    | 88, 160  |
| logical interface .....                 | 403           | VT mapping.....                               | 75, 83   |
| loopback, configuring                   |               | channelized T1 IQ and IQE interfaces          |          |
| for entire T3 interface.....            | 407           | example configuration.....                    | 88       |
| monitor checklist .....                 | 376           | channelized T1 IQ interfaces                  |          |
| no keepalives, configuring.....         | 402           | VT mapping.....                               | 89, 104  |
| physical link status.....               | 384, 398      | channelized T1 IQE interfaces                 |          |
| physical loopback, creating .....       | 397           | VT mapping.....                               | 62       |
| ping interface command .....            | 403           | channelized T1 or CT1 (COC48/STM16, SDH mode) |          |
| set encapsulation command.....          | 401           | IQE interfaces                                |          |
| set loopback local command.....         | 397           | example configuration.....                    | 63       |
| set loopback remote command.....        | 407           | channelized T3 (COC48/STM16 IQE) interfaces   |          |
| set no-keepalives command.....          | 402           | example configuration.....                    | 54       |
| show command .....                      | 397           | channelized T3 interfaces                     |          |
| show interfaces command .....           | 386, 388, 398 | example configuration.....                    | 72       |
| show interfaces controller command..... | 383           | channelized T3 IQ and IQE interfaces          |          |
| show interfaces extensive .....         | 404           | example configuration.....                    | 87       |
| show interfaces extensive command.....  | 412           | channelized T3 IQ interfaces                  |          |
| show interfaces terse coc command.....  | 382           | example configuration.....                    | 102      |
| show interfaces terse command.....      | 383           | channelized T3 IQE interfaces                 |          |
| specific                                |               | example configuration.....                    | 102      |
| channel, displaying status.....         | 388           | checklist for alarms                          |          |
| figure.....                             | 390           | Channelized DS3 alarms .....                  | 335      |
| statistics                              |               | Channelized OC12 interfaces .....             | 408      |
| checking error.....                     | 404           | Channelized OC12 IQ interfaces .....          | 408      |
| monitoring .....                        | 393           | Multichannel DS3 alarms.....                  | 367      |
| resetting.....                          | 401           |                                               |          |

|                                                   |                              |
|---------------------------------------------------|------------------------------|
| checklist for monitoring                          |                              |
| Channelized DS3 interfaces .....                  | 312                          |
| Channelized OC12 interfaces .....                 | 376                          |
| Channelized OC12 IQ interfaces .....              | 376                          |
| Multichannel DS3 interfaces .....                 | 344                          |
| circuit problems                                  |                              |
| Channelized DS3 interfaces.....                   | 334                          |
| Channelized OC12 interfaces .....                 | 407                          |
| Channelized OC12 IQ interfaces.....               | 407                          |
| Cisco HDLC encapsulation                          |                              |
| example configuration.....                        | 201                          |
| clear interfaces statistics command               |                              |
| Channelized DS3 interfaces.....                   | 329                          |
| channelized DS3 to DS0 interfaces .....           | 357                          |
| Channelized OC12 interfaces.....                  | 401                          |
| clock sources.....                                | 238                          |
| channelized interfaces.....                       | 32                           |
| clocking statement.....                           | 238                          |
| commands for router management,                   |                              |
| interfaces.....                                   | 310, 311, 342, 343, 374, 375 |
| comments, in configuration statements.....        | xxvi                         |
| compatibility-mode statement.....                 | 239                          |
| configuration, interfaces                         |                              |
| Channelized OC12 IQ .....                         | 384                          |
| controller interface                              |                              |
| Channelized OC12 IQ interfaces .....              | 384, 386                     |
| levels of channelization, figure .....            | 388                          |
| show interfaces command.....                      | 386                          |
| conventions                                       |                              |
| text and syntax.....                              | xxv                          |
| crc-minor-alarm-threshold statement.....          | 240                          |
| curly braces, in configuration statements.....    | xxvi                         |
| customer support.....                             | xxvi                         |
| contacting JTAC.....                              | xxvi                         |
| <b>D</b>                                          |                              |
| data circuit-terminating equipment <i>See</i> DCE |                              |
| data terminal equipment <i>See</i> DTE            |                              |
| data-input statement.....                         | 241                          |
| DCE.....                                          | 201, 217, 242                |
| dce statement.....                                | 242                          |
| usage guidelines.....                             | 217                          |
| dlci statement.....                               | 243                          |
| documentation                                     |                              |
| comments on.....                                  | xxvi                         |
| DS0 interface.....                                | 390                          |
| ds0-options statement.....                        | 244                          |
| usage guidelines.....                             | 112, 149                     |
| DTE.....                                          | 201                          |

## E

|                                      |               |
|--------------------------------------|---------------|
| E1 interfaces                        |               |
| configuration statements.....        | 165           |
| example configuration.....           | 112, 149      |
| ITU-T standards.....                 | 165           |
| physical interface properties.....   | 165           |
| time slots                           |               |
| example configuration.....           | 171           |
| E1 IQ interfaces                     |               |
| example configuration.....           | 108           |
| E1 IQE interfaces                    |               |
| example configuration.....           | 108           |
| e1-options statement.....            | 245           |
| usage guidelines.....                | 112, 149, 165 |
| E3 interfaces                        |               |
| configuration statements.....        | 173           |
| ITU-T standards.....                 | 173           |
| e3-options statement.....            | 246           |
| usage guidelines.....                | 173           |
| edit interfaces command.....         | 311, 343, 375 |
| Channelized DS3 interfaces .....     | 329, 330      |
| Channelized OC12 interfaces .....    | 401, 402      |
| Channelized OC12 IQ interfaces ..... | 401, 402      |
| Multichannel DS3 interfaces .....    | 358, 359      |
| edit interfaces t1-options command   |               |
| Channelized DS3 interfaces .....     | 327, 334      |
| Multichannel DS3 interfaces .....    | 355, 366      |
| edit interfaces t3-options command   |               |
| Channelized DS3 interfaces .....     | 327           |
| Channelized OC12 interfaces .....    | 397, 407      |
| Channelized OC12 IQ interfaces.....  | 397, 407      |
| Multichannel DS3 interfaces .....    | 355, 365      |
| encapsulation                        |               |
| media MTU size and.....              | 214           |
| encapsulation statement.....         | 247           |
| logical interface.....               | 248           |
| physical interface.....              | 252           |
| encoding                             |               |
| byte.....                            | 235           |
| Enhanced IQ (IQE) interfaces         |               |
| channelized OC3.....                 | 99            |
| errors                               |               |
| Channelized DS3 interfaces .....     | 322           |
| channelized interfaces .....         | 350           |
| Channelized OC12 interfaces .....    | 381           |
| Channelized OC12 IQ interfaces ..... | 393           |
| external clock sources.....          | 238           |



**F**

|                                            |               |
|--------------------------------------------|---------------|
| family statement.....                      | 256           |
| fast-aps-switch statement.....             | 260           |
| fcs statement.....                         | 261           |
| feac-loop-respond statement.....           | 262           |
| font conventions.....                      | xxv           |
| force statement.....                       | 263           |
| fractional E1 IQ and IQE interfaces        |               |
| time slots.....                            | 109           |
| fractional E1 IQ interfaces                |               |
| example configuration.....                 | 110, 148      |
| time slots.....                            | 148           |
| fractional E1 IQE interfaces               |               |
| example configuration.....                 | 148           |
| fractional T1 (COC48/STM16 IQE) interfaces |               |
| example configuration.....                 | 56            |
| time slots.....                            | 56            |
| fractional T1 interfaces                   |               |
| example configuration.....                 | 77            |
| time slots.....                            | 77            |
| fractional T1 IQ interfaces                |               |
| example configuration.....                 | 106, 127, 142 |
| frame relay control bit translation        |               |
| interface, configuring.....                | 212           |
| Frame Relay encapsulation                  |               |
| DCE.....                                   | 217, 242      |
| example configuration.....                 | 201, 211      |
| Frame Relay protocol.....                  | 207           |
| Frame Relay Ether Type encapsulation.....  | 211           |
| framing statement                          |               |
| channelized OC12 IQ interfaces             |               |
| usage guidelines.....                      | 84            |
| channelized OC12 IQE interfaces            |               |
| usage guidelines.....                      | 78            |
| channelized OC48 IQE interfaces            |               |
| usage guidelines.....                      | 59            |
| E1, E3, and T1 interfaces.....             | 264           |

**H**

|                                      |     |
|--------------------------------------|-----|
| hierarchy                            |     |
| Channelized OC12 IQ interfaces ..... | 384 |
| hold-time statement                  |     |
| APS.....                             | 265 |

**I**

|                                |      |
|--------------------------------|------|
| icons defined, notice.....     | xxiv |
| idle-cycle-flag statement..... | 266  |

|                                             |               |
|---------------------------------------------|---------------|
| interface-type statement.....               | 267           |
| channelized (COC48/STM16 IQE) interfaces    |               |
| usage guidelines.....                       | 51, 52        |
| channelized E1 (COC48/STM16) IQE interfaces |               |
| usage guidelines.....                       | 61            |
| channelized E1 IQE interfaces               |               |
| usage guidelines.....                       | 82            |
| channelized E3 (COC48/STM16) IQE interfaces |               |
| usage guidelines.....                       | 60            |
| channelized E3 interfaces                   |               |
| usage guidelines.....                       | 81            |
| channelized OC3 interfaces                  |               |
| usage guidelines.....                       | 80            |
| channelized OC3 IQ interfaces               |               |
| usage guidelines.....                       | 73, 86        |
| channelized OC48 IQE interfaces             |               |
| usage guidelines.....                       | 60            |
| channelized T1 (COC48/STM16 IQE) interfaces |               |
| usage guidelines.....                       | 54            |
| channelized T1 (COC48/STM16, SDH mode)      |               |
| IQE interfaces                              |               |
| usage guidelines.....                       | 63            |
| channelized T1 interfaces                   |               |
| usage guidelines.....                       | 73            |
| channelized T1 IQ interfaces                |               |
| usage guidelines.....                       | 88, 108       |
| channelized T1 IQE interfaces               |               |
| usage guidelines.....                       | 87            |
| channelized T3 (COC48/STM16, SDH mode)      |               |
| IQE interfaces                              |               |
| usage guidelines.....                       | 62            |
| channelized T3 IQ and IQE interfaces        |               |
| usage guidelines.....                       | 87            |
| E1 (COC48/STM16) IQE interfaces             |               |
| usage guidelines.....                       | 61            |
| NxDS0 (COC48/STM16 IQE) interfaces          |               |
| usage guidelines.....                       | 56            |
| NxDS0 interfaces                            |               |
| usage guidelines.....                       | 75            |
| T1 (COC48/STM16, SDH mode) IQE interfaces   |               |
| usage guidelines.....                       | 63            |
| T3 (COC48/STM16, SDH mode) IQE interfaces   |               |
| usage guidelines.....                       | 62            |
| T3 IQ and IQE interfaces                    |               |
| usage guidelines.....                       | 87            |
| interfaces                                  |               |
| alarms .....                                | 312, 344, 376 |
| channelized E1 PRI.....                     | 155           |
| channelized T1 PRI.....                     | 155           |

|                                        |               |                                         |          |
|----------------------------------------|---------------|-----------------------------------------|----------|
| clock sources.....                     | 238           | long-buildout statement.....            | 274      |
| configuration statements.....          | 4, 223        | loop-timing statement.....              | 275      |
| investigation process .....            | 312, 344, 376 | loopback capability                     |          |
| locating alarms.....                   | 312, 344, 376 | E1 interfaces                           |          |
| loopback test commands, table.....     | 311, 343, 375 | example configuration.....              | 169      |
| monitoring commands, table.....        | 310, 342, 374 | E3 interfaces                           |          |
| monitoring, general steps.....         | 309, 341, 373 | example configuration.....              | 178      |
| troubleshooting overview, (monitoring, |               | loopback statement                      |          |
| loopback testing, and locating         |               | ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and |          |
| alarms).....                           | 309, 341, 373 | T1/T3.....                              | 276      |
| internal clock sources.....            | 238           | loopback, configuring local             |          |
| inverse-arp statement.....             | 268           | Channelized DS3 interfaces.....         | 327      |
| invert-data statement.....             | 269           | Channelized OC12 interfaces .....       | 397      |
| investigation process                  |               | Channelized OC12 IQ interfaces.....     | 397      |
| interfaces.....                        | 312, 344, 376 | Multichannel DS3 interfaces.....        | 355      |
| IQ interfaces.....                     | 27            | loopback, creating physical             |          |
| channelized.....                       | 27            | Channelized DS3 interfaces.....         | 327      |
| channelized E1.....                    | 147           | Channelized OC12 interfaces .....       | 397      |
| channelized OC12.....                  | 67            | Channelized OC12 IQ interfaces.....     | 397      |
| channelized OC3.....                   | 99            | Multichannel DS3 interfaces.....        | 355      |
| channelized STM4.....                  | 67            | loopback-clear-timer statement.....     | 277      |
| channelized T1.....                    | 141           |                                         |          |
| channelized T3.....                    | 125           | <b>M</b>                                |          |
| IQE interfaces.....                    | 27            | manuals                                 |          |
| channelized.....                       | 27            | comments on.....                        | xxvi     |
| channelized E1.....                    | 147           | monitor interface command               |          |
| channelized OC12.....                  | 67            | Channelized DS3 interfaces .....        | 322      |
| channelized OC48.....                  | 49            | channelized DS3 to DS0 interfaces.....  | 351      |
| channelized OC48/STM16.....            | 49            | Channelized OC12 interfaces.....        | 381      |
| channelized STM16.....                 | 49            | Channelized OC12 IQ interfaces .....    | 393      |
| channelized STM4.....                  | 67            | mtu statement.....                      | 278      |
| channelized T1.....                    | 141           | multicast-dlci statement.....           | 279      |
| isdn-options statement.....            | 270           | Multichannel DS3 interfaces             |          |
| ITU-T standards                        |               | alarms and errors.....                  | 367, 370 |
| E1 interfaces.....                     | 165           | checklist for alarms.....               | 367      |
| E3 interfaces.....                     | 173           | clear interface statistics command..... | 357      |
| <b>L</b>                               |               | edit interfaces command.....            | 358, 359 |
| line-encoding statement.....           | 271           | edit interfaces t1-options command      |          |
| link PIC failover                      |               | .....                                   | 355, 366 |
| channelized OC12 IQ interfaces.....    | 92            | edit interfaces t3-options              |          |
| channelized OC48 IQE interfaces.....   | 64            | command.....                            | 355, 365 |
| channelized STM1 IQ and IQE PICs.....  | 121           | encapsulation, configuring.....         | 358      |
| lmi statement                          |               | errors.....                             | 350      |
| Frame Relay keepalives.....            | 272           | link layer, forcing up.....             | 358      |
| lmi-type statement.....                | 273           | local loopback, configuring.....        | 355      |
| lockout statement.....                 | 274           | loopback, configuring                   |          |
| logical systems                        |               | for entire T3 interface.....            | 365      |
| configuration statements.....          | 20            | from specific T1 interface.....         | 365      |

- monitor
    - channelized.....351
    - checklist.....344
    - monitor interfaces command.....351
    - no keepalives, configuring.....358
    - physical link status.....346, 352, 356
    - physical loopback, creating .....355
    - ping interface command.....360
    - problems, table.....352
    - set cli terminal command.....352
    - set encapsulation command.....358
    - set loopback local command.....355
    - set loopback remote command.....365, 366
    - set no-keepalives command.....359
    - show command.....355
    - show interfaces command.....356, 357
    - show interfaces extensive command.....361, 370
    - statistics
      - checking error.....361
      - monitoring.....351
      - resetting.....357
    - status
      - displaying.....345, 356
      - displaying specific.....346
      - extensive.....347
      - logical interface, verifying.....359
    - t1-options statement.....355, 366
    - t3-options statement.....355, 365
  - multipoint-destination statement.....280
- N**
- neighbor statement.....281
  - network.....334, 364, 407
  - no-cbit-parity statement.....237
  - no-feac-loop-respond statement.....262
  - no-keepalives statement.....282
  - no-long-buildout statement.....274
  - no-loop-timing statement.....275
  - no-partition statement.....283
    - channelized E1 IQ interfaces
      - usage guidelines.....147
    - channelized E1 IQE interfaces
      - usage guidelines.....147
    - channelized OC12 IQ interfaces
      - usage guidelines.....79, 85
    - channelized OC12/STM4 interfaces
      - usage guidelines.....71
    - channelized OC3 IQ interfaces
      - usage guidelines.....101, 156
    - channelized T3 (COC48/STM16 IQE) interfaces
      - usage guidelines.....53
    - channelized T3 interfaces
      - usage guidelines.....71
    - channelized T3 IQ interfaces
      - usage guidelines.....107
    - no-payload-scrambler statement.....287
    - no-termination-request statement.....284
    - no-translate-discard-eligible statement.....297
    - no-unframed statement.....297
    - notice icons defined.....xxiv
    - notification messages, logging for.....339, 369
    - NxDSO (COC48/STM16) IQE interfaces
      - usage guidelines.....62
    - NxDSO interfaces
      - usage guidelines.....83
    - NxDSO IQ interfaces
      - example configuration.....111, 128
      - usage guidelines.....89
- O**
- oc-slice statement.....285
    - usage guidelines.....53, 71, 79, 85
  - OC1 interface.....390
  - OC12 interfaces
    - example configuration.....89
  - OC3 SONET interface.....390
- P**
- paired-group statement.....285
  - parentheses, in syntax descriptions.....xxvi
  - partition statement.....286
    - channelized AU-4 (on OC48 IQE) interfaces
      - usage guidelines.....60
    - channelized AU-4 interfaces
      - usage guidelines.....80, 86
    - channelized E1 (COC48/STM16) IQE interfaces
      - usage guidelines.....61
    - channelized E1 IQE interfaces
      - usage guidelines.....82
    - channelized E3 (COC48/STM16) IQE interfaces
      - usage guidelines.....60
    - channelized E3 interfaces
      - usage guidelines.....81
    - channelized OC12 (COC48/STM16 IQE)
      - interfaces
        - usage guidelines.....51

|                                                       |          |
|-------------------------------------------------------|----------|
| channelized OC3 (COC48/STM16 IQE) interfaces          |          |
| usage guidelines.....                                 | 52       |
| channelized OC3 interfaces                            |          |
| usage guidelines.....                                 | 73       |
| channelized T1 (COC48/STM16 IQE) interfaces           |          |
| usage guidelines.....                                 | 54       |
| channelized T1 (COC48/STM16, SDH mode) IQE interfaces |          |
| usage guidelines.....                                 | 63       |
| channelized T1 interfaces                             |          |
| usage guidelines.....                                 | 73       |
| channelized T1 IQ interfaces                          |          |
| usage guidelines.....                                 | 88, 108  |
| channelized T1 IQE interfaces                         |          |
| usage guidelines.....                                 | 87       |
| channelized T3 (COC48/STM16, SDH mode) IQE interfaces |          |
| usage guidelines.....                                 | 62       |
| channelized T3 IQ and IQE interfaces                  |          |
| usage guidelines.....                                 | 87       |
| clear channel STM1, STM4, and STM16 interface         |          |
| usage guide.....                                      | 59       |
| E1 (COC48/STM16) IQE interfaces                       |          |
| usage guidelines.....                                 | 61       |
| NxDS0 (COC48/STM16 IQE) interfaces                    |          |
| usage guidelines.....                                 | 56       |
| NxDS0 (COC48/STM16) IQE interfaces                    |          |
| usage guidelines.....                                 | 62       |
| NxDS0 interfaces                                      |          |
| usage guidelines.....                                 | 75, 83   |
| NxDS0 IQ interfaces                                   |          |
| usage guidelines.....                                 | 89       |
| SDH (VC-4) interfaces                                 |          |
| usage guidelines.....                                 | 79, 85   |
| T1 (COC48/STM16, SDH mode) IQE interfaces             |          |
| usage guidelines.....                                 | 63       |
| T3 (COC48/STM16, SDH mode) IQE interfaces             |          |
| usage guidelines.....                                 | 62       |
| T3 IQ and IQE interfaces                              |          |
| usage guidelines.....                                 | 87       |
| payload-scrambler statement.....                      | 287      |
| physical interfaces                                   |          |
| byte encoding.....                                    | 235      |
| C-bit parity mode.....                                | 237      |
| clock sources.....                                    | 238      |
| DCE.....                                              | 217, 242 |
| time slots.....                                       | 110      |
| fractional E1 IQ and IQE interfaces.....              | 109      |
| fractional E1 IQ interfaces.....                      | 148      |
| fractional T1 interfaces.....                         | 77       |
| fractional T1 IQE interfaces.....                     | 56       |
| NxDS0 IQ interfaces.....                              | 148      |
| physical link down                                    |          |
| Channelized DS3 interfaces.....                       | 317      |
| channelized interfaces.....                           | 347, 378 |
| Multichannel DS3 interfaces, table .....              | 352      |
| physical link up                                      |          |
| Channelized DS3 interfaces.....                       | 316      |
| channelized interfaces.....                           | 347      |
| Channelized OC12 IQ interfaces.....                   | 384      |
| physical loopback                                     |          |
| Channelized DS3 interfaces .....                      | 327      |
| channelized interfaces .....                          | 355, 397 |
| ping interface command                                |          |
| Channelized DS3 interfaces .....                      | 332      |
| channelized interfaces .....                          | 360, 403 |
| problems                                              |          |
| channelized interfaces, table.....                    | 352      |
| T1 interfaces, table .....                            | 352      |
| protect-circuit statement.....                        | 288      |
| <b>R</b>                                              |          |
| remote-loopback-respond statement.....                | 288      |
| request statement.....                                | 289      |
| revert-time statement.....                            | 289      |
| <b>S</b>                                              |          |
| SDH (VC-4) interfaces                                 |          |
| example configuration.....                            | 80, 86   |
| SDH (VC-4-4C) interface                               |          |
| example configuration.....                            | 79, 85   |
| set cli terminal command                              |          |
| Channelized OC12 interfaces .....                     | 382      |
| Multichannel DS3 interfaces .....                     | 352      |
| set encapsulation command                             |          |
| Channelized DS3 interfaces .....                      | 329      |
| Channelized OC12 interfaces .....                     | 401      |
| Channelized OC12 IQ interfaces .....                  | 401      |
| Multichannel DS3 interfaces .....                     | 358      |
| set loopback local command                            |          |
| Channelized DS3 interfaces .....                      | 327      |
| Channelized OC12 interfaces .....                     | 397      |
| Channelized OC12 IQ interfaces .....                  | 397      |
| Multichannel DS3 interfaces .....                     | 355      |

- set loopback remote command
    - Channelized DS3 interfaces .....334
    - Channelized OC12 interfaces .....407
    - Channelized OC12 IQ interfaces .....407
    - Multichannel DS3 interfaces .....365, 366
  - set no-keepalives command
    - Channelized DS3 interfaces .....330
    - Channelized OC12 interfaces .....402
    - Channelized OC12 IQ interfaces .....402
    - Multichannel DS3 interfaces .....359
  - show command .....355, 397
  - show interfaces coc1 command .....387
  - show interfaces coc12 command .....386
  - show interfaces command
    - Channelized DS3 interfaces .....314, 328, 331
    - channelized DS3 to DS0 interfaces .....356, 359
    - Channelized OC12 interfaces .....378, 398, 403
    - Channelized OC12 IQ interfaces .....386, 388, 398, 403
    - controller interface .....386
    - DS3 to DS1 interfaces .....328, 357
  - show interfaces controller command .....383
  - show interfaces ct1 command .....387
  - show interfaces ct3 command .....387
  - show interfaces extensive command
    - Channelized DS3 interfaces .....317, 332, 336
    - channelized DS3 to DS0 interfaces .....361, 370
    - channelized DS3 to DS1 interfaces .....367
    - Channelized OC12 interfaces .....379, 404, 408
    - Channelized OC12 IQ interfaces .....404, 412
  - show interfaces terse coc command .....382
  - show interfaces terse command
    - Channelized DS3 interfaces .....313
    - Channelized OC12 interfaces .....378
    - Channelized OC12 IQ interfaces .....383
  - SONET parameters
    - on channelized OC12 interfaces .....89
  - sonet-options statement .....290
    - usage guidelines .....89
  - start-end-flag statement .....292
  - statistics
    - channelized interfaces .....322, 351
    - Channelized OC12 interfaces .....381
    - Channelized OC12 IQ interfaces .....393
  - status
    - Channelized DS3 interfaces .....313, 328
    - channelized interfaces .....356, 398
    - Channelized OC12 interfaces .....378
    - Channelized OC12 IQ interfaces .....382
    - controller interface .....387
    - Multichannel DS3 interfaces .....345
  - status extensive
    - Channelized DS3 interfaces .....317
    - channelized interfaces .....347
    - Channelized OC12 interfaces .....379
    - Channelized OC12 IQ interfaces .....390
  - status for specific interface
    - Channelized OC12 .....378
    - Channelized OC12 IQ .....388
  - support, technical See technical support
  - switching-mode statement .....293
  - syntax conventions .....xxv
- ## T
- T1 interfaces
    - byte encoding .....235
    - clear statistics command .....329, 357, 401
    - configuration statements .....181
    - overview .....181
    - time slots
      - example configuration .....189
  - T1 IQ and IQE interfaces
    - example configuration .....88
  - T1 IQ interfaces
    - example configuration .....126
  - T1 media alarms, table .....339, 369
  - t1-options statement .....294, 327, 334, 355, 366
    - usage guidelines .....181
  - T3 interfaces
    - C-bit parity mode .....237
    - configuration statements .....192
    - overview .....191
  - T3 IQ and IQE interfaces
    - example configuration .....87
  - t3-options
    - statement .....295, 327, 334, 355, 365, 366, 397, 407
    - usage guidelines .....192
  - technical support
    - contacting JTAC .....xxvi
  - time slots
    - channelized E1 IQ and IQE interfaces .....109
    - channelized E1 IQE interfaces .....148
    - channelized NxDS0 IQ interfaces .....110, 148
    - E1 interfaces
      - example configuration .....171
    - fractional E1 IQ and IQE interfaces .....109
    - fractional E1 IQ interfaces .....148

|                                            |          |
|--------------------------------------------|----------|
| fractional T1 (COC48/STM16 IQE)            |          |
| interfaces.....                            | 56       |
| fractional T1 interfaces.....              | 77       |
| T1 interfaces                              |          |
| example configuration.....                 | 189      |
| timeslots statement.....                   | 296      |
| channelized E1 IQ and IQE interfaces       |          |
| usage guidelines.....                      | 109      |
| channelized E1 IQ interfaces               |          |
| usage guidelines.....                      | 148      |
| channelized E1 IQE interfaces              |          |
| usage guidelines.....                      | 148      |
| channelized NxDSO IQ interfaces            |          |
| usage guidelines.....                      | 110, 148 |
| fractional E1 IQ and IQE interfaces        |          |
| usage guidelines.....                      | 109      |
| fractional E1 IQ interfaces                |          |
| usage guidelines.....                      | 148      |
| fractional E1 IQE interfaces               |          |
| usage guidelines.....                      | 148      |
| fractional T1 (COC48/STM16 IQE) interfaces |          |
| usage guidelines.....                      | 56       |
| fractional T1 interfaces                   |          |
| usage guidelines.....                      | 77       |
| NxDSO (COC48/STM16 IQE) interfaces         |          |
| usage guidelines.....                      | 56       |
| NxDSO interfaces                           |          |
| usage guidelines.....                      | 75       |
| translate-discard-eligible statement.....  | 297      |

## U

|                         |     |
|-------------------------|-----|
| unframed statement..... | 297 |
| unit statement.....     | 298 |

## V

|                                    |         |
|------------------------------------|---------|
| VT mapping                         |         |
| channelized T1 (COC48/STM16 IQE)   |         |
| interfaces.....                    | 55      |
| channelized T1 interfaces.....     | 75, 83  |
| channelized T1 IQ interfaces.....  | 89, 104 |
| channelized T1 IQE interfaces..... | 62      |
| vtmapping statement.....           | 304     |
| usage guidelines.....              | 114     |

## W

|                                |     |
|--------------------------------|-----|
| working-circuit statement..... | 305 |
|--------------------------------|-----|

# Index of Statements and Commands

## A

|                                   |     |
|-----------------------------------|-----|
| address statement.....            | 224 |
| advertise-interval statement..... | 226 |
| aps statement.....                | 227 |
| authentication-key statement..... | 228 |

## B

|                                    |     |
|------------------------------------|-----|
| bchannel-allocation statement..... | 228 |
| bert-algorithm statement.....      | 229 |
| bert-error-rate statement.....     | 231 |
| bert-period statement.....         | 233 |
| buildout statement                 |     |
| T1 interfaces.....                 | 234 |
| byte-encoding statement.....       | 235 |
| bytes statement.....               | 236 |

## C

|                                          |     |
|------------------------------------------|-----|
| cbit-parity statement.....               | 237 |
| channelization statement.....            | 237 |
| clocking statement.....                  | 238 |
| compatibility-mode statement.....        | 239 |
| crc-minor-alarm-threshold statement..... | 240 |

## D

|                            |     |
|----------------------------|-----|
| data-input statement.....  | 241 |
| dce statement.....         | 242 |
| dlci statement.....        | 243 |
| ds0-options statement..... | 244 |

## E

|                              |     |
|------------------------------|-----|
| e1-options statement.....    | 245 |
| e3-options statement.....    | 246 |
| encapsulation statement..... | 247 |
| logical interface.....       | 248 |
| physical interface.....      | 252 |

## F

|                                  |     |
|----------------------------------|-----|
| family statement.....            | 256 |
| fast-aps-switch statement.....   | 260 |
| fcs statement.....               | 261 |
| feac-loop-respond statement..... | 262 |
| force statement.....             | 263 |
| framing statement                |     |
| E1, E3, and T1 interfaces.....   | 264 |

## H

|                     |     |
|---------------------|-----|
| hold-time statement |     |
| APS.....            | 265 |

## I

|                                |     |
|--------------------------------|-----|
| idle-cycle-flag statement..... | 266 |
| interface-type statement.....  | 267 |
| inverse-arp statement.....     | 268 |
| invert-data statement.....     | 269 |
| isdn-options statement.....    | 270 |

## L

|                                         |     |
|-----------------------------------------|-----|
| line-encoding statement.....            | 271 |
| lmi statement                           |     |
| Frame Relay keepalives.....             | 272 |
| lmi-type statement.....                 | 273 |
| lockout statement.....                  | 274 |
| long-buildout statement.....            | 274 |
| loop-timing statement.....              | 275 |
| loopback statement                      |     |
| ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and |     |
| T1/T3.....                              | 276 |
| loopback-clear-timer statement.....     | 277 |

## M

|                                       |     |
|---------------------------------------|-----|
| mtu statement.....                    | 278 |
| multicast-dlci statement.....         | 279 |
| multipoint-destination statement..... | 280 |

## N

|                                              |     |
|----------------------------------------------|-----|
| neighbor statement.....                      | 281 |
| no-cbit-parity statement.....                | 237 |
| no-feac-loop-respond statement.....          | 262 |
| no-keepalives statement.....                 | 282 |
| no-long-buildout statement.....              | 274 |
| no-loop-timing statement.....                | 275 |
| no-partition statement.....                  | 283 |
| no-payload-scrambler statement.....          | 287 |
| no-termination-request statement.....        | 284 |
| no-translate-discard-eligible statement..... | 297 |

no-unframed statement.....297

## O

oc-slice statement.....285

## P

paired-group statement.....285

partition statement.....286

payload-scrambler statement.....287

protect-circuit statement.....288

## R

remote-loopback-respond statement.....288

request statement.....289

revert-time statement.....289

## S

sonet-options statement.....290

start-end-flag statement.....292

switching-mode statement.....293

## T

t1-options statement.....294, 327, 334, 355, 366

t3-options

statement.....295, 327, 334, 355, 365, 366, 397, 407

timeslots statement.....296

translate-discard-eligible statement.....297

## U

unframed statement.....297

unit statement.....298

## V

vtmapping statement.....304

## W

working-circuit statement.....305