JUNIPER NETWORKS

Junos® OS

E1/E3/T1/T3 Interfaces Configuration Guide

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

Junos® OS E1/E3/T1/T3 Interfaces Configuration Guide
Release 13.1

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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.

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About This Guide

This preface provides the following guidelines for using the *Junos® OS E1/E3/T1/T3 Interfaces Configuration Guide*:

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® 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.xsl;
        }
    }
}
interfaces {
    fxp0 {
        disable;
```

```
        unit 0 {
          family inet {
            address 10.0.0.1/24;
          }
        }
      }
    }
```

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

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

Documentation Conventions

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the**configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies book names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS System Basics Configuration Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the**[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Enclose optional keywords or variables.	**stub <default-metric** ***metric*****>;**

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.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identify a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

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

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

Requesting Technical Support

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

or are covered under warranty, and need 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

E1/E3/T1/T3 Interfaces Configuration Statements Overview

CHAPTER 1

E1/E3/T1/T3 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 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;
          }
          premium {
            bandwidth-limit bps;
            burst-size-limit bytes;
          }
        }
      }
    }
  }
  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  hold-time up milliseconds down milliseconds;
```

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

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

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

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

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

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

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

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

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

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

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

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

Related Documentation

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

[edit logical-systems] Hierarchy Level

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

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

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



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

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

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

Related Documentation

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

PART 2

Configuring E1, E3, T1, and T3 Interfaces

CHAPTER 2

Configuring E1 Interfaces

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 topic discusses BERT properties for the E1 interface specifically. For general information about the Junos OS 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, you must include the **bert-period** statement at the **[edit interfaces ce1-*fpc/pic/port*]** hierarchy level.

NOTE: When configuring CE1 interfaces on the 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE), you must include BERT configuration options 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.

NOTE: The **bit-error-rate** statement in BERT procedure is not supported on the 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE).

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)
```

Related Documentation

- Configuring T1 BERT Properties on page 44
- Interface Diagnostics
- Interface Diagnostics Operational Mode Commands

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:

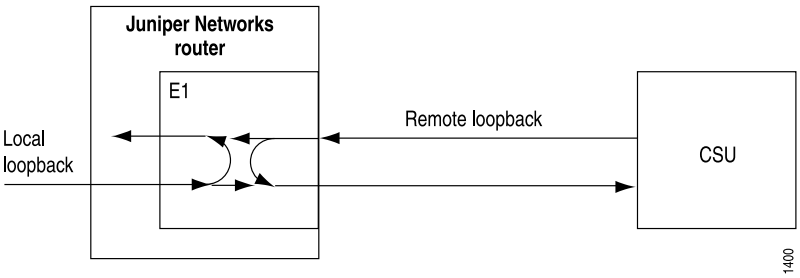
```
[edit interfaces interface-name e1-options]
invert-data;
```

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 1 on page 31. 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 1: 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 Operational Mode Commands.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces e1-fpc/pic/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;
      }
   }
}
```

NOTE: To configure the CE1 loopback capability on the 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE), include the **loopback** statement at the **[edit interfaces ce1-*fpc/pic/port*]** hierarchy level.

Related Documentation

- Configuring T1 Loopback Capability on page 49
- Performing a Loopback Test on an Interface on page 104

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/pic/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 interface-name e1-options] # Fractional E1 interface timeslots 4-6,11,25;
Use Time Slots 1 Through 10	[edit interfaces *interface-name* e1-options] timeslots 1-10;
Use Time Slots 1 Through 5, 10, and 24	[edit interfaces *interface-name* e1-options] timeslots 1-5,10,24;

CHAPTER 3

Configuring E3 Interfaces

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 Operational Mode Commands.

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 ***x*kb** or ***x.x*Mb**. You can configure the subrate values shown in Table 3 on page 38.
- Larscom CSUs do not support the E3 subrate.

Table 3: 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 56.

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:

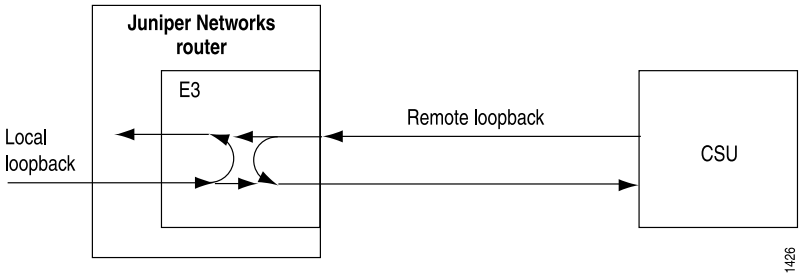
```
[edit interfaces interface-name e3-options]
invert-data;
```

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 2 on page 40).

Figure 2: 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 Operational Mode Commands.

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 4

Configuring T1 Interfaces

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 TI.107, TI.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 IQ, 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.

NOTE: When configuring CT1 interfaces on the 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE), you must include BERT configuration options 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)
```

NOTE: The **bit-error-rate** statement in BERT procedure is not supported on the 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE).

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the Junos OS System Basics Configuration Guide.

Related Documentation

- Configuring E1 BERT Properties on page 28
- Interface Diagnostics
- Interface Diagnostics Operational Mode Commands

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:

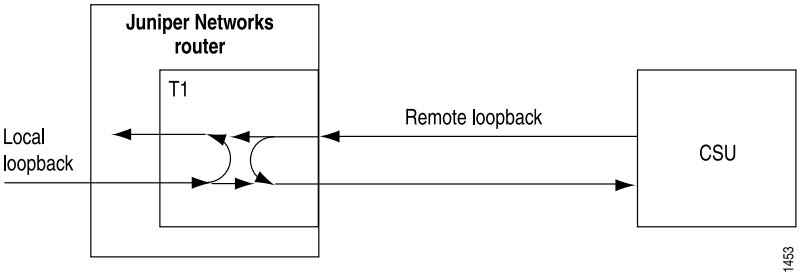
```
[edit interfaces interface-name t1-options]
line-encoding b8zs;
```

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 3 on page 49. 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 3: 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 Operational Mode Commands.

For channelized T3, T1, and *N*xDS0 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 *N*xDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. *N*xDS0 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;
      }
   }
}
```

NOTE: To configure the CT1 loopback capability on the 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE), use the **loopback** statement at the **[edit interfaces ct1-*fpc/pic/port*]** 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.

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
```

Related Documentation

- Configuring E1 Loopback Capability on page 31
- Performing a Loopback Test on an Interface on page 104

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 interface-name t1-options]
timeslots 1-10;
```

Use Time Slots 1 Through 5, 10, and 24

```
[edit interfaces interface-name t1-options]
timeslots 1-5,10,24;
```

Use the First Four Odd-Numbered Time Slots

```
[edit interfaces interface-name t1-options]
timeslots 1,3,5,7;
```

CHAPTER 5

Configuring T3 Interfaces

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 TI.107, TI.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-namet3-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 Operational Mode Commands.

Related Documentation

- bert-algorithm on page 70
- bert-error-rate on page 72
- bert-period on page 74
- t3-options on page 98
- 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 ***x*kb** or ***x.x*Mb**. You can configure the subrate values shown in Table 4 on page 57.

- 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 x 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 x 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 4: 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
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

Table 4: Subrate Values for T3 Digital Link Compatibility Mode *(continued)*

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	
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 37.

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;
```

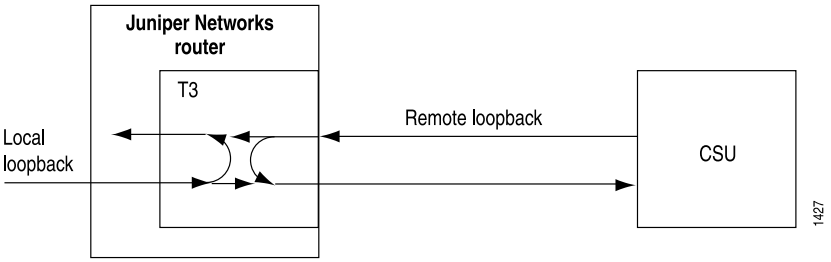
To explicitly configure the default short line buildout, include the **no-long-buildout** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[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 4 on page 61. 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 4: 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 Operational Mode Commands.

For channelized T3, T1, and *N*xDS0 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 *N*xDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. *N*xDS0 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 56.

```
[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 3

E1/E3/T1/T3 Configuration Statements

CHAPTER 6

Summary of E1/E3/T1/T3 Interfaces Configuration Statements

The following descriptions explain each of the interface configuration statements. The statements are organized alphabetically.

bert-algorithm

Syntax bert-algorithm *algorithm*;

Hierarchy Level [edit interfaces ce1-*fpc/pic/port*],
[edit interfaces ct1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description Configure the pattern to send in the bit stream during a bit error rate test (BERT). Applies to T1, E3, T3, and multichannel DS3 interfaces, the channelized interfaces (DS3, OC12, STM1), and channelized IQ and IQE interfaces (E1, E3 and DS3).

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

Options ***algorithm***—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:

- **all-ones-repeating**—Pattern is all ones.
- **all-zeros-repeating**—Pattern is all zeros.
- **alternating-double-ones-zeros**—Pattern is alternating pairs of ones and zeros.
- **alternating-ones-zeros**—Pattern is alternating ones and zeros.
- **pseudo-2e3**—Pattern is $2^3 - 1$.
- **pseudo-2e4**—Pattern is $2^4 - 1$.
- **pseudo-2e5**—Pattern is $2^5 - 1$.
- **pseudo-2e6**—Pattern is $2^6 - 1$.
- **pseudo-2e7**—Pattern is $2^7 - 1$.
- **pseudo-2e9-o153**—Pattern is $2^9 - 1$, as defined in the O153 standard.
- **pseudo-2e10**—Pattern is $2^{10} - 1$.
- **pseudo-2e11-o152**—Pattern is $2^{11} - 1$, as defined in the O152 standard.

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

Default: **pseudo-2e3**

Required Privilege Level

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

Related Documentation

- Interface Diagnostics
- Configuring E1 BERT Properties on page 28
- Configuring E3 BERT Properties on page 36
- Configuring T1 BERT Properties on page 44
- Configuring T3 BERT Properties on page 54
- Examples: Configuring T3 Interfaces on page 63
- **bert-error-rate on page 72**
- **bert-period on page 74**

bert-error-rate

Syntax bert-error-rate *rate*;

Hierarchy Level
[edit interfaces ce1-*fpc/pic/port*],
[edit interfaces ct1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description Configure the bit error rate to use in a BERT procedure. Applies to E1, E3, T1, or T3 interfaces, and to the channelized interfaces (DS3, OC3, OC12, and STM1).

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

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

Options ***rate***—Bit error rate.

Range: 0 through 7, which corresponds to 10^{-1} (1 error per bit) to 10^{-7} (1 error per 10 million bits)

Default: 0

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

Related Documentation

- bert-algorithm on page 70
- bert-period on page 74
- ds0-options
- e1-options on page 82
- e3-options on page 83
- t1-options on page 97
- t3-options on page 98

- Interface Diagnostics
- Configuring E1 BERT Properties on page 28
- Configuring E3 BERT Properties on page 36
- Configuring T1 BERT Properties on page 44
- Configuring T3 BERT Properties on page 54
- Examples: Configuring T3 Interfaces on page 63

bert-period

Syntax bert-period *seconds*;

Hierarchy Level
[edit interfaces ce1-*fpc/pic/port*],
[edit interfaces ct1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description
Configure 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).

E1 and T1 IQ, IQE, and standard interfaces support an extended BERT period range, up to 86,400 seconds (24 hours).

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

Options
seconds—Test duration. Range and default values vary by interface type.

Range:

- PIC-dependent—Normal BERT period: either 1 through 239 seconds or 1 through 240 seconds
- PIC-dependent—Extended BERT period: from 1 through 86,400 seconds

Default:

- Normal BERT period: 10 seconds
- Extended BERT period (on supported E1 interfaces): 10 seconds
- Extended BERT period (on supported T1 interfaces): 240 seconds

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

Related Documentation

- Interface Diagnostics
- Configuring E1 BERT Properties on page 28

- Configuring E3 BERT Properties on page 36
- Configuring T1 BERT Properties on page 44
- Configuring T3 BERT Properties on page 54
- **bert-algorithm on page 70**
- **bert-error-rate on page 72**

buildout (T1 Interfaces)

Syntax buildout *value*;

Hierarchy Level [edit interfaces ct1-*fpc/pic/port*]
[edit interfaces *interface-name* t1-options]

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

Description For T1 interfaces, set the buildout value.

NOTE: When configuring CT1 interfaces on 10-port Channelized E1/T1 IQE PICs and 16-Port Channelized E1/T1 Circuit Emulation MICs, the buildout statement must be included at the hierarchy level.

Default The default buildout value is 0 through 132 feet.

Options You can set the buildout value to one of the following:

- **0-132**—0 through 132 feet (0 through 40 meters)
- **133-265**—133 through 265 feet (40 through 81 meters)
- **266-398**—266 through 398 feet (81 through 121 meters)
- **399-531**—399 through 531 feet (121 through 162 meters)
- **532-655**—532 through 655 feet (162 through 200 meters)
- **long-0db**—For J Series routers only, long buildout with 0 decibel (dB) transmit attenuation
- **long-7.5db**—For MX Series and J Series routers only, long buildout with 7.5 dB transmit attenuation
- **long-15db**—For MX Series and J Series routers only, long buildout with 15 dB transmit attenuation
- **long-22.5db**—For MX Series and J Series routers only, long buildout with 22.5 dB transmit attenuation

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

Related Documentation

- Configuring the T1 Buildout on page 45
- *Junos OS Interfaces and Routing Configuration Guide*

byte-encoding

Syntax byte-encoding (nx56 | nx64);

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

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

Description Set the byte encoding on a DS0 or T1 interface to use 7 bits per byte or 8 bits per byte.

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

Default The default byte encoding is 8 bits per byte (nx64).

Options **nx56**—Use 7 bits per byte.

nx64—Use 8 bits per byte.

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

Related Documentation

- Configuring T1 Byte Encoding on page 46

cbit-parity

Syntax (cbit-parity | no-cbit-parity);

Hierarchy Level [edit interfaces *interface-name* t3-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description For T3 interfaces only, enable or disable C-bit parity mode, which controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the far-end block error (FEBE), far-end alarm and control (FEAC), terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. For ATM and ATM2 IQ2 and IQ2-E interfaces, M23 framing is used when the **no-cbit-parity** statement is included. For all other interfaces, M13 framing is used when the **no-cbit-parity** statement is included.

Default C-bit parity mode is enabled.

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

Related Documentation

- Configuring E3 and T3 Parameters on ATM Interfaces
- Disabling T3 C-Bit Parity Mode on page 55

compatibility-mode

Syntax compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate *value*>;

Hierarchy Level [edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* t3-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure the E3 or T3 interface to be compatible with the channel service unit (CSU) at the remote end of the line.

NOTE: The compatibility-mode statement at the [edit interfaces *interface-name* e3-options] hierarchy level is not valid for IQE PICs.

Default If you omit this option, the full E3 or T3 rate is used.

Options **adtran**—For T3 IQ interfaces only, configure compatibility with Adtran CSUs.

digital-link—Configure compatibility with Digital Link CSUs. If you include this option on an E3 interface, you must also disable payload scrambling.

kentrox—Configure compatibility with Kentrox CSUs. Kentrox subrate is valid for E3 IQ and T3 IQ interfaces only.

larscom—For T3 and T3 IQ interfaces only, configure compatibility with Larscom CSUs.

verilink—For T3 IQ and T3 IQE interfaces only, configure compatibility with Verilink CSUs.

NOTE: Verilink configuration is not functional if an IQ interface is paired with an IQE interface.

subrate *value*—Subrate of the E3 or T3 line.

Range: 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.

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

Related Documentation

- Configuring the E3 CSU Compatibility Mode on page 37
- Configuring the T3 CSU Compatibility Mode on page 56
- payload-scrambler on page 94

crc-major-alarm-threshold

Syntax crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);

Hierarchy Level [edit interfaces *interface-name* t1-options]

Release Information Statement introduced in Junos OS Release 8.5.
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.

Description Major 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.

Default 10-second monitoring period for all settings except **1e-5**. The **1e-5** value uses a 50-second monitoring period.

Options **rate**—Error rate expressed as the number of errors per number of bits. The value **1e-3** is one error in 10^{-3} bits and **5e-4** is five errors in 10^{-4} bits.

Default: 5e-5

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

Related Documentation

- Configuring T1 CRC Error Major Alarm Thresholds on page 46

crc-minor-alarm-threshold

Syntax crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);

Hierarchy Level [edit interfaces *interface-name* t1-options]

Release Information Statement introduced in Junos OS Release 8.5.
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.

Description 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.

Default 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.

Options **rate**—Error rate expressed as the number of errors per number of bits. The value **1e-3** is one error in 10^{-3} bits and **5e-4** is five errors in 10^{-4} bits.

Default: 5e-6

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

Related Documentation

- Configuring T1 CRC Error Minor Alarm Thresholds on page 46

e1-options

Syntax

```
e1-options {
  bert-algorithm algorithm;
  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;
}
```

Hierarchy Level [edit interfaces *interface-name*]

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

Description Configure E1-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

- Channelized E1 IQ and IQE Interfaces Overview
- Channelized STM1 Interfaces Overview
- E1 Interfaces Overview on page 27
- T1 Interfaces Overview on page 43

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 35
- T3 Interfaces Overview on page 53
- atm-options

fast-aps-switch

Syntax fast-aps-switch;

Hierarchy Level [edit interfaces *interface-name* sonet-options aps]

Release Information Statement introduced in Junos OS Release 12.1.

Description (M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.

NOTE:

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

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

Related Documentation
- Reducing APS Switchover Time in Layer 2 Circuits

fcs

Syntax fcs (16 | 32);

Hierarchy Level
[edit interfaces e1-*fpc/pic/port*],
[edit interfaces t1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* sonet-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description For 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.

On a channelized OC12 interface, the SONET/SDH **fcs** statement is not supported. To configure FCS on each DS3 channel, you must include the **t3-options fcs** statement in the configuration for each channel. For SONET/SDH, the channelized OC12 interface supports DS3 to STS-1 to OC12. For SDH, the channelized OC12 interface supports *N*xDS3 to *N*xVC3 to AU3 to STM.

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

Options
16—Use a 16-bit frame checksum on the interface.

32—Use a 32-bit frame checksum on the interface. Using a 32-bit checksum provides more reliable packet verification, but some older equipment might not support 32-bit checksums.

Default: 16

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

Related Documentation
- Configuring the E1 Frame Checksum on page 29
- Configuring the E3 Frame Checksum on page 38
- Configuring the SONET/SDH Frame Checksum
- Configuring the T1 Frame Checksum on page 47
- Configuring the T3 Frame Checksum on page 59

feac-loop-respond

Syntax (feac-loop-respond | no-feac-loop-respond);

Hierarchy Level [edit interfaces *interface-name* t3-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description For T3 interfaces only, configure the router so a remote CSU can place the local router into loopback.

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.

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.

Default The router does not respond to FEAC requests.

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

Related Documentation

- Configuring the T3 FEAC Response on page 59
- loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 92
- remote-loopback-respond on page 95

framing (E1, E3, and T1 Interfaces)

Syntax framing (g704 | g704-no-crc4 | g.751 | g.832 | unframed | sf | esf);

Hierarchy Level [edit interfaces ce1-*fpc/pic/port*],
[edit interfaces ct1-*fpc/pic/port*],
[edit interfaces at-*fpc/pic/port* e3-options],
[edit interfaces e1-*fpc/pic/port* e1-options],
[edit interfaces t1-*fpc/pic/port* t1-options]

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

Description Configure the framing format.

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

Default **esf** for T1 interfaces; **g704** for E1 interfaces. There is no default value for E3 over ATM interfaces.

Options **esf**—Extended superframe (ESF) mode for T1 interfaces.

g704—G.704 framing format for E1 interfaces.

g704-no-crc4—G.704 framing with no cyclic redundancy check 4 (CRC4) for E1 interfaces.

g.751—G.751 framing format for E3 over ATM interfaces.

g.832—G.832 framing format for E3 over ATM interfaces.

sf—Superframe (SF) mode for T1 interfaces.

unframed—Unframed mode for E1 interfaces.

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

Related Documentation

- Configuring E1 Framing on page 30
- Configuring E3 and T3 Parameters on ATM Interfaces
- Configuring T1 Framing on page 48

idle-cycle-flag

Syntax idle-cycle-flag *value*;

Hierarchy Level
[edit interfaces e1-*fpc/pic/port*],
[edit interfaces t1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* serial-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description Configure the value that the DS0, E1, E3, T1, or T3 interface transmits during idle cycles.

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

Options ***value***—Value to transmit in the idle cycles:

- **flags**—Transmit the value 0x7E.
- **ones**—Transmit the value 0xFF (all ones).

Default: Flags

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

Related Documentation

- Configuring the E1 Idle Cycle Flag on page 30
- Configuring the E3 Idle Cycle Flag on page 39
- Configuring the T1 Idle Cycle Flag on page 50
- Configuring the T3 Idle Cycle Flag on page 60

invert-data

Syntax invert-data;

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

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

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

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

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

Related Documentation

- Configuring E1 Data Inversion on page 31
- Configuring E3 Data Inversion on page 39
- Configuring T1 Data Inversion on page 47

line-encoding

Syntax line-encoding (ami | b8zs);

Hierarchy Level [edit interfaces ct1-*fpc/pic/port*],
[edit interfaces *interface-name* t1-options]

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

Description Set the line encoding format on the T1 interface.

NOTE: 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-*fpc/pic/port*]** hierarchy level.

Default The default line encoding is B8ZS.

Options **ami**—Use Alternate Mark Inversion (AMI) line encoding.

b8zs—Use bipolar with 8-zeros substitution (B8ZS) line encoding.

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

Related Documentation

- Configuring T1 Line Encoding on page 48

long-buildout

Syntax (long-buildout | no-long-buildout);

Hierarchy Level [edit interfaces *interface-name* t3-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description 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).

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.

Default A T3 interface uses the short line buildout setting (**no-long-buildout**) for wires shorter than 255 feet (68 meters).

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

Related Documentation

- Configuring the T3 Line Buildout on page 60

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

Syntax loopback (local | payload | remote);

Hierarchy Level
[edit interfaces ce1-*fpc/pic/port*],
[edit interfaces ct1-*fpc/pic/port*],
[edit interfaces t1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* dsl-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* shdsl-options},
[edit interfaces *interface-name* sonet-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description Configure a loopback connection. To turn off the loopback capability, remove the **loopback** statement from the configuration.

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

When configuring T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the **loopback** statement must be included with the **payload** option at the **[edit interfaces t1-*fpc/pic/port*]** hierarchy level.

NOTE: When configuring CE1 or CT1 interfaces on the 16-port Channelized E1/T1 MIC (MIC-3D-16CHE1-T1-CE), you must include the **loopback** statement at the **[edit interfaces ce1-*fpc/pic/port*]** hierarchy level, or **[edit interfaces ct1-*fpc/pic/port*]**

To configure loopback on channelized IQ and IQE PICs, SONET/SDH level, use the **sonet-options loopback** statement **local** and **remote** options at the controller interface (coc48, cstm16, coc12, cstm4, coc3, cstm1). It is ignored for path-level interfaces **so-*fpc/pic/port*** or **so-*fpc/pic/port*:*channel***.

Options **local**—Loop packets, including both data and timing information, back on the local router's PIC. *N*xDS0 IQ interfaces do not support local loopback.

payload—For channelized T3, T1, and *N*xDS0 IQ interfaces only, loop back data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated. Neither ATM-over-asymmetrical digital subscriber line (ADSL) interfaces nor ATM-over-SHDSL interfaces support payload loopback.

remote—Loop packets, including both data and timing information, back on the remote router's interface card. *N*xDS0 IQ interfaces do not support remote loopback.

Required Privilege Level

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

Related Documentation

- Configuring E3 and T3 Parameters on ATM Interfaces
- Configuring E1 Loopback Capability on page 31
- Configuring E3 Loopback Capability on page 39
- Configuring SONET/SDH Loopback Capability
- Configuring SHDSL Operating Mode on an ATM Physical Interface
- Configuring T1 Loopback Capability on page 49
- Configuring T3 Loopback Capability on page 60
- **feac-loop-respond on page 86**

payload-scrambler

Syntax (payload-scrambler | no-payload-scrambler);

Hierarchy Level [edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* sonet-options],
[edit interfaces *interface-name* t3-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description 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.

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.

Disable payload scrambling on an E3 interface if Digital Link compatibility mode is used.

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 in the configuration for each DS3 channel.

NOTE: The **payload-scrambler** statement at the **[edit interfaces** *interface-name* **e3-options]** hierarchy level is not valid for IQE PICs.

Default 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.

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

Related Documentation

- Configuring E3 and T3 Parameters on ATM Interfaces
- Configuring E3 HDLC Payload Scrambling on page 41
- Configuring SONET/SDH HDLC Payload Scrambling
- Configuring T3 HDLC Payload Scrambling on page 62
- Examples: Configuring T3 Interfaces on page 63
- **compatibility-mode on page 79**

remote-loopback-respond

Syntax remote-loopback-respond;

Hierarchy Level [edit interfaces ct1-*fpc/pic/port*],
[edit interfaces *interface-name* t1-options]

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

Description 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.

Default The router does not respond to remote loop requests.

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

Related Documentation

- Configuring the T1 Remote Loopback Response on page 48
- feac-loop-respond on page 86
- loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 92

start-end-flag

Syntax start-end-flag (filler | shared);

Hierarchy Level
[edit interfaces e1-*fpc/pic/port*],
[edit interfaces t1-*fpc/pic/port*],
[edit interfaces *interface-name* ds0-options],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* e3-options],
[edit interfaces *interface-name* t1-options],
[edit interfaces *interface-name* t3-options]

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

Description For DS0, E1, E3, T1, and T3 interfaces, configure the interface to share the transmission of start and end flags.

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

Options
filler—Wait two idle cycles between the start and end flags.

shared—Share the transmission of the start and end flags. This is the default.

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

Related Documentation
- Configuring E1 Start and End Flags on page 32
- Configuring the E3 Start and End Flags on page 41
- Configuring T1 Start and End Flags on page 51
- Configuring T3 Start and End Flags on page 63

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

Description Configure T1-specific physical interface properties.

The statements are explained separately.

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

Related Documentation

- T1 Interfaces Overview on page 43

t3-options

Syntax

```
t3-options {
  atm-encapsulation (direct | plcp);
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  (cbit-parity | no-cbit-parity);
  compatibility-mode (digital-link | kentrox | larscom) <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);
  start-end-flag value;
}
```

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure T3-specific physical interface properties, including the properties of DS3 channels on a channelized OC12 interface. The **long-buildout** statement is not supported for DS3 channels on a channelized OC12 interface.

On T3 interfaces, the default encapsulation is PPP.

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

- T3 Interfaces Overview on page 53

timeslots

Syntax timeslots *time-slot-range*;

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

Release Information Statement introduced before Junos OS Release 7.4.

Description For E1 and T1interfaces, 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.

Options ***time-slot-range***—Actual time slot numbers allocated:

Range: Ranges vary by interface type and configuration option as follows:

- 1 through 24 for T1 interfaces (0 is reserved)
- 1 through 31 for 4-port E1 PICs (0 is reserved)
- 1 through 31 for *Nx*DS0 interfaces (0 is reserved)
- 2 through 32 for 10-port Channelized E1 and 10-port Channelized E1 IQ PICs (1 is reserved)
- 2 through 32 for the setting under **e1-options** with IQE PICs (1 is reserved) (when creating fractional E1)
- 1 through 31 for the setting under **partition** with IQE PICs (0 is reserved) (when creating *Nx*DS0)

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.

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

Related Documentation

- Configuring Fractional E1 IQ and IQE Interfaces
- Configuring Fractional T1 IQ and IQE Interfaces

- Configuring Fractional E1 Time Slots on page 33
- Configuring Fractional T1 Time Slots on page 51
- Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots

unframed

Syntax (unframed | no-unframed);

Hierarchy Level [edit interfaces *interface-name* e3-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description For E3 IQ interfaces only, enable or disable unframed mode. In unframed mode, the E3 IQ interface do not detect yellow (**ylw**) or loss-of-frame (**lof**) alarms.

Default Unframed mode is disabled.

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

Related Documentation
- Configuring E3 IQ and IQE Unframed Mode on page 41

PART 4

Troubleshooting

CHAPTER 7

Investigate T1 Interfaces

Investigating Interface Steps and Commands

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

Investigating Interface Steps and Commands Overview

The "Monitoring Interfaces" on page 103 section helps you determine the nature of the interface problem. The "Performing a Loopback Test on an Interface" on page 104 section provides information to help you isolate the source of the problem. The "Locating Interface Alarms" on page 106 section explains some of the alarms and errors for the media.

Monitoring Interfaces

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

Solution To monitor interfaces, follow these steps:

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

The Table 5 on page 104 lists and describes the operational mode commands you use to monitor interfaces.

Table 5: Commands Used to Monitor Interfaces

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

Performing a Loopback Test on an Interface

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

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

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

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

The Table 6 on page 105 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 6: Commands Used to Perform Loopback Testing on Interfaces

CLI Statement or Command	Interface Type	Description
[edit interfaces *interface-name interface-* options] set loopback (local | remote)	All interfaces	The **loopback** statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU). To turn off loopback, remove the **loopback** statement from the configuration.
show	All interfaces	Verify the configuration before you commit it.
commit	All interfaces	Save the set of changes to the database and cause the changes to take operational effect. Use after you have verified a configuration in all configuration steps.
[edit interfaces *interface-name*] set clocking internal	T1, T3, ATM, and SONET interfaces	The **clocking** statement at this hierarchy level configures the clock source of the interface to internal.
show interfaces *interface-name*	Used for all interfaces	Display static status information about a specific interface.
[edit interfaces *interface-name* unit *logical-unit-number* family inet *address* address] arp *ip-address* mac *mac-address*	Fast Ethernet and Gigabit Ethernet interfaces	The **arp** statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses.
show arp no-resolve	Fast Ethernet and Gigabit Ethernet interfaces	Display the entries in the ARP table without attempting to determine the hostname that corresponds to the IP address (the **no-resolve** option).
clear interfaces statistics *interface-name*	All interfaces	Reset the statistics for an interface to zero.
[edit interfaces *interface-name*] set encapsulation cisco-hdlc	T1, T3, SONET, and Multichannel DS3 interfaces	The **encapsulation** statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces *interface-name*] set no-keepalives	T1, T3, SONET, and Multichannel DS3 interfaces	The **no-keepalives** statement at this level disables the sending of keepalives on the physical interface.

Table 6: Commands Used to Perform Loopback Testing on Interfaces *(continued)*

CLI Statement or Command	Interface Type	Description
show interfaces *interface-name* terse	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
ping interface t1-*x/x/x local-IP-address* bypass-routing count 1000 rapid	All interfaces	Check the reachability of network hosts by sending **ICMP ECHO_REQUEST** messages to elicit **ICMP ECHO_RESPONSE** messages from the specified host. Use the **bypass-routing** option to ping a local system through an interface that has no route through it. The **count** option sends 1000 ping requests through the system. Type **Ctrl+C** to interrupt a **ping** command.
show interfaces *interface-name* extensive	All interfaces	Display very detailed interface information about a specific interface.

Locating Interface Alarms

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

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

Monitor T1 Interfaces

This section includes the following information to assist you when troubleshooting T1 interfaces:

Checklist for Monitoring T1 Interfaces

Purpose To monitor T1 interfaces and beginning the process of isolating T1 interface problems when they occur.

Action Table 7 on page 107 provides the links and commands for monitoring T1 interfaces.

Table 7: Checklist for Monitoring T1 Interfaces

Tasks	Command or Action
Monitor T1 Interfaces	
1. Display the Status of T1 Interfaces on page 107	**show interfaces terse t1***
2. Display the Status of a Specific T1 Interface on page 108	**show interfaces t1-*fpc/pic/port***
3. Display Extensive Status Information for a Specific T1 Interface on page 108	**show interfaces t1-*fpc/pic/port* extensive**
4. Monitor Statistics for a T1 Interface on page 111	**monitor interface t1-*fpc/pic/port***

Display the Status of T1 Interfaces

Purpose To display the status of T1 interfaces.

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

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

Sample Output

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

Meaning This sample output shows the status of both the physical and logical interfaces. See Table 8 on page 107 for a description of what the output means.

Table 8: Status of T1 Interfaces

Physical Interface	Logical Interface	Status Description
t1-1/0/0 **AdminDown** **Link Up**	t1-**1/0/0.0** **Admin Up** **Link Down**	This interface is administratively disabled and the physical link is healthy (**Link Up**), but the logical interface is not established. The logical interface is administratively enabled (**Admin Up**), but is down because the physical link is disabled.
t1-1/0/1 **Admin Up** **Link Down**	**t1-1/0/1.0** **Admin Up** **Link Down**	This interface is not functioning between the local router and the remote router because both the physical and logical links are down (**Link Down**). The interface is not administratively disabled because both the physical and logical links are up (**Admin Up**).

Table 8: Status of T1 Interfaces *(continued)*

Physical Interface	Logical Interface	Status Description
t1-1/0/2 Admin Up Link Up	t1-1/0/2.0 Admin Up Link Up	This interface has both the physical and logical links up and running.
t1-1/0/3 Admin Up Link Down		The physical interfaces is added to the configuration, but the logical link is not configured.

Display the Status of a Specific T1 Interface

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

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

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

Sample Output

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
 FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Last flapped   : 2002-01-01 00:00:35 UTC (00:00:59 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1 alarms : LOF, LOS
  DS1 defects : LOF, LOS
```

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

Display Extensive Status Information for a Specific T1 Interface

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

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

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

Sample Output

```
user@host> show interfaces t1-1/1/0 extensive
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20, Generation: 27
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
 FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-01-01 00:00:35 UTC (00:01:00 ago)
  Statistics last cleared: 2002-01-01 00:01:03 UTC (00:00:32 ago)
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
   Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0, L3 incompletes:
 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
   Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
   DS1 alarms : LOF, LOS
  DS1   defects  : LOF, LOS
   T1 media:             Seconds        Count  State
    SEF                       32            0  Defect Active
    BEE                        0            0  OK
    AIS                        0            0  OK
    LOF                       32            0  Defect Active
    LOS                       32            0  Defect Active
    YELLOW                     0            0  OK
    BPV                        0            0
    EXZ                        0            0
    LCV                        0            0
    PCV                       32        10667
    CS                         0            0
    LES                        0
    ES                        32
    SES                       32
    SEFS                      32
    BES                        0
    UAS                       32
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 3
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
    Buildout       : 0 to 132 feet
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: Unknown (0)
  Packet Forwarding Engine configuration:
    Destination slot: 1, PLP byte: 1 (0x00)
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %          bps   %        bytes
    0 best-effort             0            0   0            0      low    none
    1 expedited-forwarding    0            0   0            0      low    none
    2 assured-forwarding      0            0   0            0      low    none
    3 network-control         0            0   0            0      low    none
```

Meaning The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the T1 interface and investigate the T1 media accordingly. See "Checklist for T1 Alarms and Errors" on page 125 for an explanation of T1 alarms.

Monitor Statistics for a T1 Interface

Purpose To monitor statistics for a T1 interface.

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

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

Sample Output

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

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

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

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

Table 9 on page 112 lists additional problem situations and actions to help you further diagnose a problem.

Table 9: 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 T1 Interfaces

This section includes the following information to assist you when troubleshooting T1 interfaces:

Checklist for Using Loopback Testing for T1 Interfaces

Purpose To use loopback testing for T1 interfaces.

Action Table 10 on page 113 provides commands for using loopback testing for T1 interfaces.

Table 10: Checklist for Using Loopback Testing for T1 Interfaces

Tasks	Command or Action
"Diagnose a Suspected Hardware Problem with a T1 Interface" on page 114	
1. Create a Loopback on page 114	
a. Create a Physical Loopback on page 115	Connect a T1 loopback plug.
b. Configure a Local Loopback on page 115	[edit interfaces *interface-name* t1-options] set loopback local show commit
2. Set Clocking to Internal on page 116	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the T1 Interface Is Up on page 116	show interfaces t1-*fpc/pic/port*
4. Clear T1 Interface Statistics on page 118	clear interfaces statistics t1-*fpc/pic/port*
5. Force the Link Layer To Stay Up on page 118	
a. Configure Encapsulation to Cisco-HDLC on page 118	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives on page 119	[edit interfaces *interface-name*] set no-keepalives show commit
6. Verify the Status of the Logical Interface on page 120	show interfaces t1-*fpc/pic/port* show interfaces t1-*fpc/pic/port* terse
7. Ping the T1 Interface on page 122	ping interface t1-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
8. Check for T1 Interface Error Statistics on page 122	show interfaces t1-*fpc/pic/port* extensive
"Diagnose a Suspected Circuit Problem" on page 124	

Table 10: Checklist for Using Loopback Testing for T1 Interfaces *(continued)*

Tasks	Command or Action
1. Create a Loop from the Router to the Network on page 124	**[edit interfaces *interface-name* t1-options]** **set loopback remote** **show** **commit**
2. Create a Loop to the Router from Various Points in the Network on page 125	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a T1 Interface" on page 114.

Diagnose a Suspected Hardware Problem with a T1 Interface

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

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

1. Create a Loopback on page 114
2. Set Clocking to Internal on page 116
3. Verify That the T1 Interface Is Up on page 116
4. Clear T1 Interface Statistics on page 118
5. Force the Link Layer To Stay Up on page 118
6. Verify the Status of the Logical Interface on page 120
7. Ping the T1 Interface on page 122
8. Check for T1 Interface Error Statistics on page 122

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 T1 port. If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

1. Create a Physical Loopback on page 115
2. Configure a Local Loopback on page 115

Create a Physical Loopback

Action

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

Meaning

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

Configure a Local Loopback

Action

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

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

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

2. Configure the loopback:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

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

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

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

Meaning

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

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

Set Clocking to Internal

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

Action To configure clocking to internal, follow these steps:

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

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

2. Configure the clocking to internal:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

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

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

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

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

Verify That the T1 Interface Is Up

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

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

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

Sample Output

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

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

Meaning

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

Sample Output

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

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
 None, FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 32 (00:00:23 ago), Output: 35 (00:00:04 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
   DS1 alarms : LOF, LOS
  DS1   defects  : LOF, LOS
  Logical interface t1-0/0/0.0 (Index 9) (SNMP ifIndex 34)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1
```

Meaning

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

Clear T1 Interface Statistics

Purpose

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

Action

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

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

Sample Output

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

Meaning

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

Force the Link Layer To Stay Up

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

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

1. Configure Encapsulation to Cisco-HDLC on page 118
2. Configure No-Keepalives on page 119

Configure Encapsulation to Cisco-HDLC

Action

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

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

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

2. Configure encapsulation to Cisco-HDLC:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

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

4. Commit the change:

   user@host# commit

   For example:

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

Meaning

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

Configure No-Keepalives

Action

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

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

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

2. Configure no-keepalives:

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

   For example:

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

3. Verify the configuration:

   user@host# show

   For example:

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

4. Commit the change:

   user@host# commit

   For example:

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

Meaning

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

Verify the Status of the Logical Interface

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

Action

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

Sample Output

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

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

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

Meaning

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

Sample Output

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

```
user@host> show interfaces t1-1/1/0
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
 None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 14 (00:01:01 ago), Output: 9 (00:00:05 ago)
  Last flapped   : 2002-01-06 01:09:00 UTC (00:03:39 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None
  Logical interface t1-1/1/0.0 (Index 9) (SNMP ifIndex 34)
    Flags:  Device-Down  Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Bandwidth: 0
    Protocol inet, MTU: 1500, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1

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

```
t1-1/1/0.0      up    down inet  1.1.1.1/30
```

Meaning

The sample output for both commands shows that the logical interface is down. The first command shows that the link layer, device, and destination route are all down. The second command shows that logical interface **t1-1/1/0.0** is down.

Ping the T1 Interface

Purpose Use the **ping** command to verify the loopback connection.

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

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

Sample Output

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

Meaning

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

Check for T1 Interface Error Statistics

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

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

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

Sample Output

```
user@host> show interfaces t1-1/1/0 extensive
Physical interface: t1-1/1/0, Enabled, Physical link is Up
  Interface index: 29, SNMP ifIndex: 20, Generation: 32
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1, Loopback:
 None, FCS: 16, Framing: ESF
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 28 (last seen 00:00:02 ago)
    Output: 32 (last sent 00:00:06 ago)
  Last flapped   : 2002-01-06 01:09:00 UTC (00:07:19 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                84682                   80 bps
   Output bytes  :                92685                    0 bps
   Input  packets:                 1031                    0 pps
   Output packets:                 1077                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 70, L3 incompletes:
 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  DS1   alarms   : None
  DS1   defects  : None
  T1  media:            Seconds        Count  State
    SEF                       1            1  OK
    BEE                       0            0  OK
    AIS                       0            0  OK
    LOF                       1            1  OK
    LOS                       0            0  OK
    YELLOW                    1            2  OK
    BPV                       1            1
    EXZ                       1            1
    LCV                       1            2
    PCV                       1            6
    CS                        0            0
    LES                       1
    ES                        1
    SES                       1
    SEFS                      1
    BES                       1
    UAS                       0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 3
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
    Buildout       : 0 to 132 feet
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: Unknown (0)
  Packet Forwarding Engine configuration:
    Destination slot: 1, PLP byte: 1 (0x00)
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %          bps   %        bytes
    0 best-effort             0            0   0            0      low    none
```

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

Meaning

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

Diagnose a Suspected Circuit Problem

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

To diagnose a suspected circuit problem, follow these steps:

1. Create a Loop from the Router to the Network on page 124
2. Create a Loop to the Router from Various Points in the Network on page 125

Create a Loop from the Router to the Network

Purpose

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

Action

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

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

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

2. Configure remote loopback:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

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

```
loopback remote;
```

4. Commit the change:

```
user@host# commit
```

For example:

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

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

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

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

Action After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Step 2 through Step 8 in "Diagnose a Suspected Hardware Problem with a T1 Interface" on page 114. 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 T1 Alarms and Errors

This section includes the following information to assist you when troubleshooting T1 interfaces:

Checklist for T1 Alarms and Errors

Purpose To checkT1 alarms and errors.

Action Table 11 on page 125 provides the links and commands for checking T1 alarms and errors.

Table 11: Checklist for T1 Alarms and Errors

Tasks	Command or Action
"Display T1 Alarms and Errors" on page 126	show interfaces t1-*fpc/pic/port* extensive

Table 11: Checklist for T1 Alarms and Errors *(continued)*

Tasks	Command or Action
"Locate Most Common T1 Alarms and Errors" on page 129	
1. Locate Loss of Signal and Loss of Frame Alarms on page 129	Check the connection between the router port and the first T1 network element.
2. Locate Alarm Indication Signal Alarms on page 130	Check the T1 network element connected to the T1 interface.
3. Locate an Incoming Yellow Alarm on page 131	Check the cable between the T1 interface and the directly connected T1 network element.

Display T1 Alarms and Errors

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

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

Sample Output

```
user@host> show interfaces t1-1/1/0 extensive
Physical interface: t1-1/1/0, Enabled, Physical link is Down
  Interface index: 24, SNMP ifIndex: 20, Generation: 27
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None,
 FCS: 16, Framing: ESF
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-01-01 00:00:35 UTC (00:01:00 ago)
  Statistics last cleared: 2002-01-01 00:01:03 UTC (00:00:32 ago)
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0, L3 incompletes:
 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1   alarms   : LOF, LOS
  DS1   defects  : LOF, LOS
  T1  media:            Seconds        Count  State
    SEF                      32            0  Defect Active
    BEE                       0            0  OK
    AIS                       0            0  OK
    LOF                      32            0  Defect Active
    LOS                      32            0  Defect Active
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                      32        10667
    CS                        0            0
    LES                       0
    ES                       32
    SES                      32
    SEFS                     32
    BES                       0
    UAS                      32
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 3
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K, Data inversion: Disabled
    Buildout       : 0 to 132 feet
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: Unknown (0)
  Packet Forwarding Engine configuration:
    Destination slot: 1, PLP byte: 1 (0x00)
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %          bps   %        bytes
    0 best-effort             0            0   0            0      low    none
    1 expedited-forwarding    0            0   0            0      low    none
    2 assured-forwarding      0            0   0            0      low    none
    3 network-control         0            0   0            0      low    none
```

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

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

Table 12 on page 128 lists the T1 media-specific alarms or defects that can render the interface unable to pass packets.

Table 12: T1 Interface Alarms and Error Definitions

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

Table 12: T1 Interface Alarms and Error Definitions *(continued)*

T1 Alarm or Error	Definitions
UAS	Unavailable seconds

Locate Most Common T1 Alarms and Errors

To locate common alarms and errors, follow these steps:

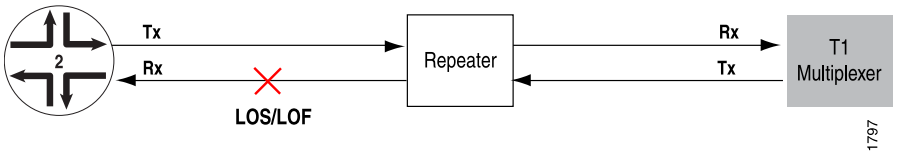
1. Locate Loss of Signal and Loss of Frame Alarms on page 129
2. Locate Alarm Indication Signal Alarms on page 130
3. Locate an Incoming Yellow Alarm on page 131

Locate Loss of Signal and Loss of Frame Alarms

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

Solution To locate the LOS or LOF alarm, check the connection between the router port and the first T1 network element. In the example network in Figure 5 on page 129, the X indicates that there is a connection problem between Router2 and the nearest T1 network element.

Figure 5: Location of an LOS or LOF Alarm in a T1 Network



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

Sample Output

```
user@router2> show interfaces t1-1/1/1 extensive
[... Output truncated...]
DS1   alarms   : LOF, LOS
  DS1   defects  : LOF, LOS
   T1  media :            Seconds        Count  State
    SEF                      32            0  Defect Active
    BEE                       0            0  OK
    AIS                       0            0  OK
    LOF                      32            0  Defect Active
    LOS                      32            0  Defect Active
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                      32        10667
    CS                        0            0
    LES                       0
    ES                       32
    SES                      32
    SEFS                     32
    BES                       0
    UAS                      32
[...Output truncated...]
```

Meaning

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

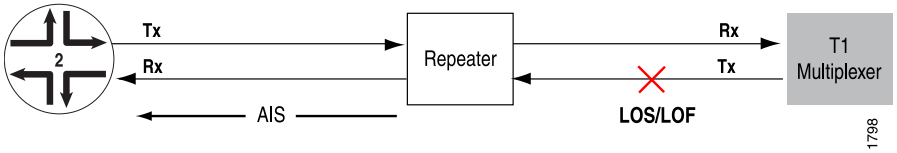
Locate Alarm Indication Signal Alarms

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

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

All diagnostics are from the perspective of Router 2 (the Juniper Networks router). Figure 6 on page 130 illustrates the location of an AIS alarm in a T1 network.

Figure 6: Location of an AIS Alarm in a T1 Network



Meaning

In Figure 6 on page 130, the X indicates that there is an LOS or LOF alarm between the repeater and the Tx T1 multiplexer. An AIS alarm is sent from the repeater to Router 2.

Locate an Incoming Yellow Alarm

Problem

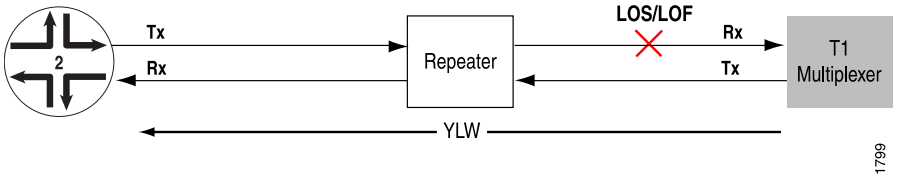
An incoming yellow alarm indicates that the T1 network element connected to the T1 interface has a problem with the signal it is receiving from the T1 interface.

Solution

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

All diagnostics are from the perspective of Router 2. Figure 7 on page 131 illustrates the location of a yellow alarm in a T1 network.

Figure 7: Location of a Yellow Alarm in a T1 Network



Meaning

In Figure 7 on page 131, the T1 multiplexer detects an LOS or LOF alarm on its connection from Router 2 and sends a yellow (YLW) alarm to Router 2.

CHAPTER 8

Investigate T3 Interfaces

Investigating Interface Steps and Commands

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

Investigating Interface Steps and Commands Overview

The "Monitoring Interfaces" on page 103 section helps you determine the nature of the interface problem. The "Performing a Loopback Test on an Interface" on page 104 section provides information to help you isolate the source of the problem. The "Locating Interface Alarms" on page 106 section explains some of the alarms and errors for the media.

Monitoring Interfaces

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

Solution To monitor interfaces, follow these steps:

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

The Table 5 on page 104 lists and describes the operational mode commands you use to monitor interfaces.

Table 13: Commands Used to Monitor Interfaces

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

Performing a Loopback Test on an Interface

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

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

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

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

The Table 6 on page 105 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 14: Commands Used to Perform Loopback Testing on Interfaces

CLI Statement or Command	Interface Type	Description
[edit interfaces *interface-name interface-* options] set loopback (local | remote)	All interfaces	The **loopback** statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU). To turn off loopback, remove the **loopback** statement from the configuration.
show	All interfaces	Verify the configuration before you commit it.
commit	All interfaces	Save the set of changes to the database and cause the changes to take operational effect. Use after you have verified a configuration in all configuration steps.
[edit interfaces *interface-name*] set clocking internal	T1, T3, ATM, and SONET interfaces	The **clocking** statement at this hierarchy level configures the clock source of the interface to internal.
show interfaces *interface-name*	Used for all interfaces	Display static status information about a specific interface.
[edit interfaces *interface-name* unit *logical-unit-number* family inet *address* address] arp *ip-address* mac *mac-address*	Fast Ethernet and Gigabit Ethernet interfaces	The **arp** statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses.
show arp no-resolve	Fast Ethernet and Gigabit Ethernet interfaces	Display the entries in the ARP table without attempting to determine the hostname that corresponds to the IP address (the **no-resolve** option).
clear interfaces statistics *interface-name*	All interfaces	Reset the statistics for an interface to zero.
[edit interfaces *interface-name*] set encapsulation cisco-hdlc	T1, T3, SONET, and Multichannel DS3 interfaces	The **encapsulation** statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces *interface-name*] set no-keepalives	T1, T3, SONET, and Multichannel DS3 interfaces	The **no-keepalives** statement at this level disables the sending of keepalives on the physical interface.

Table 14: Commands Used to Perform Loopback Testing on Interfaces *(continued)*

CLI Statement or Command	Interface Type	Description
show interfaces *interface-name* terse	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
ping interface t1- *x/x/x local-IP-address* bypass-routing count 1000 rapid	All interfaces	Check the reachability of network hosts by sending **ICMP ECHO_REQUEST** messages to elicit **ICMP ECHO_RESPONSE** messages from the specified host. Use the **bypass-routing** option to ping a local system through an interface that has no route through it. The **count** option sends 1000 ping requests through the system. Type **Ctrl+C** to interrupt a **ping** command.
show interfaces *interface-name* extensive	All interfaces	Display very detailed interface information about a specific interface.

Locating Interface Alarms

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

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

Monitor T3 Interfaces

This section includes the following information to assist you when troubleshooting T3 interfaces:

Checklist for Monitoring T3 Interfaces

Purpose To monitor T3 interfaces and begin the process of isolating T3 interface problems when they occur.

Action Table 15 on page 137 provides the links and commands for monitoring T3 interfaces.

Table 15: Checklist for Monitoring T3 Interfaces

Tasks	Command or Action
"Monitor T3 Interfaces" on page 137	
1. Display the Status of T3 Interfaces on page 137	**show interfaces terse t3***
2. Display the Status of a Specific T3 Interface on page 138	**show interfaces t3-*fpc/pic/port***
3. Display Extensive Status Information for a Specific T3 Interface on page 139	**show interfaces t3-*fpc/pic/port* extensive**
4. Monitor Statistics for a T3 Interface on page 141	**monitor interface t3-*fpc/pic/port***

Monitor T3 Interfaces

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

To monitor T3 interfaces, follow these steps:

1. Display the Status of T3 Interfaces on page 137
2. Display the Status of a Specific T3 Interface on page 138
3. Display Extensive Status Information for a Specific T3 Interface on page 139
4. Monitor Statistics for a T3 Interface on page 141

Display the Status of T3 Interfaces

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

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

Sample Output

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

Meaning The sample output shows the status of both the physical and logical interfaces. See Table 16 on page 138 for a description of what the output means.

Table 16: Status of T3 Interfaces

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

Display the Status of a Specific T3 Interface

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

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

Sample Output

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

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

Display Extensive Status Information for a Specific T3 Interface

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

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

Sample Output

```
user@router> show interfaces t3-1/0/0 extensive
Physical interface: t3-1/0/0, Enabled, Physical link is Down
  Interface index: 9, SNMP ifIndex: 10
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal
  Speed: T3, Loopback: None, CRC: 16, Mode: C/Bit parity
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Link-Layer-Down Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive statistics:
    Input : 116 (last seen 00:02:59 ago)
    Output: 187 (last seen 00:00:09 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 2552                    0 bps
   Output bytes  :                 3703                    0 bps
   Input  packets:                  116                    0 pps
   Output packets:                  161                    0 pps
  Input errors: - Input errors
    Errors: 0, Drops: 0, Framing errors: 229, Policed discards: 1
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0
    SRAM errors: 0, HS link CRC errors: 0
  Output errors: - Output errors
    Carrier transitions: 4, Errors: 0, Drops: 0, Aged packets: 0
  Active alarms  : LOF, LOS - DS3 active alarms and defects
  Active defects : LOF, LOS
  DS3 Media:            Seconds        Count  State  - T3 media-specific errors
    PLL Lock                  0            0  OK
    Reframing               273            2  Defect Active
    AIS                       0            0  OK
    LOF                     273            2  Defect Active
    LOS                     273            2  Defect Active
    IDLE                      0            0  OK
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                     275     18022125
    PCV                       0            0
    CCV                       0            0
    LES                     275
    PES                     273
    PSES                    273
    CES                     273
    CSES                    273
    SEFS                    273
    UAS                     277
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 4484, Runt threshold: 3
  DSU configuration:
    Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
    FEAC loopback: Inactive, Response: Disabled, Count: 0
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^3 - 1, Pseudorandom (1), Error rate: 10e-0
  PFE configuration:
    Destination slot: 1, Stream number: 0, PLP byte: 1 (0x00)
    COS transmit queue bandwidth:
      Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
    COS weighted round robin:
      Queue0: 95, Queue1: 0, Queue2: 0, Queue3: 5
  Logical interface t3-1/0/0.0 (Index 12) (SNMP ifIndex 32)
```

```
    Flags: Device-down Point-To-Point SNMP-Traps, Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1.0/30, Local: 1.1.1.1, Broadcast: Unspecified
```

Meaning The sample output shows where the errors might be occurring. Look at the active alarms and active defects for the T3 interface and investigate the T3 media accordingly. See "Checklist of Common T3 Alarms and Errors" on page 148 for an explanation of T3 alarms.

Monitor Statistics for a T3 Interface

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

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

Sample Output

```
user@host> monitor interface t3-1/0/0
router                       Seconds: 78                  Time: 21:44:15
Interface: t3-1/0/0, Enabled, Link is Down
Encapsulation: Cisco-HDLC, Keepalives, Speed: T3
Traffic statistics:                                Current Delta
  Input bytes:              0 (0 bps)                      [0]
  Output bytes:           207 (184 bps)                  [184]
  Input packets:            0 (0 pps)                      [0]
  Output packets:           9 (1 pps)                      [8]
Encapsulation statistics:
  Input keepalives:         0                              [0]
  Output keepalives:        9                              [8]
Error statistics:
  Input errors:             0                              [0]
  Input drops:              0                              [0]
   Input framing errors :     9                           [8]
  CCV                       0                              [0]
Interface warnings:
  o Received keepalive count is zero
  o Framing errors, check FCS, scrambling and subrate configuration
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

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

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

Table 17 on page 142 presents problem situations and actions to help you further understand the problem.

Table 17: Problem Situations and Actions

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

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

Use Loopback Testing for T3 Interfaces

This section includes the following information to assist you when troubleshooting T3 interfaces:

Checklist for Using Loopback Testing for T3 Interfaces

Purpose To use loopback testing to isolate T3 interface problems.

Action Table 18 on page 142 provides links and commands for using loopback testing for T3 interfaces.

Table 18: Checklist for Using Loopback Testing for T3 Interfaces

"Diagnose a Suspected Hardware Problem with a T3 Interface" on page 144	Command or Action
1. Create a Loopback on page 144	
a. Create a Physical Loopback on page 144	Connect the transmit port to the receive port.

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

"Diagnose a Suspected Hardware Problem with a T3 Interface" on page 144	Command or Action
b. Configure a Local Loopback on page 144	[edit interfaces *interface-name* t3-options] set loopback local show commit
2. Set Clocking to Internal on page 145	[edit interfaces *interface-name*] set clocking internal show commit
3. Verify That the T3 Interface Is Up on page 146	show interfaces t3-*fpc/pic/port*
4. Clear T3 Interface Statistics	clear interfaces statistics t3-*fpc/pic/port*
5. Force the Link Layer To Stay Up	
a. Configure Encapsulation to Cisco-HDLC	[edit interfaces *interface-name*] set encapsulation cisco-hdlc show commit
b. Configure No-Keepalives	[edit interfaces *interface-name*] set no-keepalives show commit
6. Verify the Status of the Logical Interface	show interfaces t3-*fpc/pic/port* show interfaces *t3-fpc/pic/port* terse
7. Ping the T3 Interface	ping interface t3-*fpc/pic/port local-IP-address* bypass-routing count 1000 rapid
8. Check for T3 Interface Error Statistics	show interfaces t3-*fpc/pic/port* extensive
Diagnose a Suspected Circuit Problem	
1. Create a Loop from the Router to the Network	[edit interfaces *interface-name* t3-options] set loopback remote show commit
2. Create a Loop to the Router from Various Points in the Network	Perform Steps 2 through 8 from "Diagnose a Suspected Hardware Problem with a T3 Interface" on page 144.

Diagnose a Suspected Hardware Problem with a T3 Interface

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

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

- Create a Loopback on page 144
- Set Clocking to Internal on page 145
- Verify That the T3 Interface Is Up on page 146
- Clear T3 Interface Statistics
- Force the Link Layer To Stay Up
- Verify the Status of the Logical Interface
- Ping the T3 Interface
- Check for T3 Interface Error Statistics

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

1. Create a Physical Loopback on page 144
2. Configure a Local Loopback on page 144

Create a Physical Loopback

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

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

Configure a Local Loopback

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

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

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

2. Configure the loopback:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

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

4. Commit the change:

   ```
   user@host# commit
   ```

   For example:

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

Meaning

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

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

Set Clocking to Internal

Purpose

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

Action

To configure clocking to internal, follow these steps:

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

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

2. Configure clocking to internal:

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

3. Verify the configuration:

   ```
   user@host# show
   ```

   For example:

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

```
user@host# show
clocking internal;
```

4. Commit the change:

```
user@host# commit
```

For example:

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

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

Verify That the T3 Interface Is Up

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

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

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

Sample Output

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

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

Meaning

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

Sample Output

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

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

Meaning

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

Locate T3 Alarms and Errors

This section includes the following information to assist you when troubleshooting T1 interfaces:

Checklist of Common T3 Alarms and Errors

Purpose To check T3 alarms and errors,

Action Table 19 on page 148 provides the links and commands for checking T3 alarms and errors.

Table 19: Checklist of Common T3 Alarms and Errors

Tasks	Command or Action
"Display T3 Alarms and Errors" on page 148	**show interfaces t3-*fpc/pic/port* extensive**
"Locate Most Common T3 Alarms and Errors" on page 150	
1. Locate Loss of Signal and Loss of Frame Alarms on page 150	Check the connection between the router port and the first T3 network element.
2. Locate Alarm Indication Signal Alarms on page 151	Check the T3 network element connected to the T3 interface.
3. Locate an Incoming Yellow Alarm on page 152	Check the cable between the T3 interface and the directly connected T3 network element.
4. Locate IDLE on a T3 Interface on page 152	Check that the line is provisioned for service.

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

Display T3 Alarms and Errors

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

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

Sample Output

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

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

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

Table 20 on page 150 lists the T3 media-specific alarms or errors that can render the interface unable to pass packets.

Table 20: T3 Interface Error Counter Definitions

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

Locate Most Common T3 Alarms and Errors

The following alarms and errors are described in this chapter:

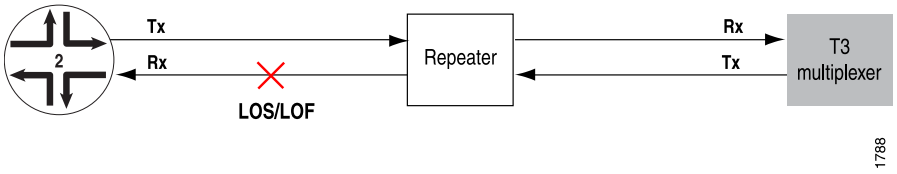
1. Locate Loss of Signal and Loss of Frame Alarms on page 150
2. Locate Alarm Indication Signal Alarms on page 151
3. Locate an Incoming Yellow Alarm on page 152
4. Locate IDLE on a T3 Interface on page 152

Locate Loss of Signal and Loss of Frame Alarms

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

Solution To locate the LOS or LOF alarm, check the connection between the router port and the first T3 network element. In the example network in Figure 8 on page 151, the X indicates that there is a connection problem between Router 2 and the nearest T3 network element.

Figure 8: Location of an LOS or LOF Alarm in a T3 Network



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

Sample Output

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

Meaning

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

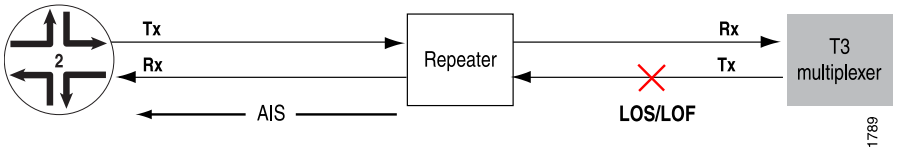
Locate Alarm Indication Signal Alarms

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

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

All diagnostics are from the perspective of Router 2 (the Juniper Networks router). Figure 9 on page 151 illustrates the location of an AIS alarm in a T3 network.

Figure 9: Location of an AIS Alarm in a T3 Network



Meaning

In Figure 9 on page 151, the X indicates that there is an LOS or LOF alarm between the repeater and the Tx T3 multiplexer. An AIS alarm is sent from the repeater to Router 2.

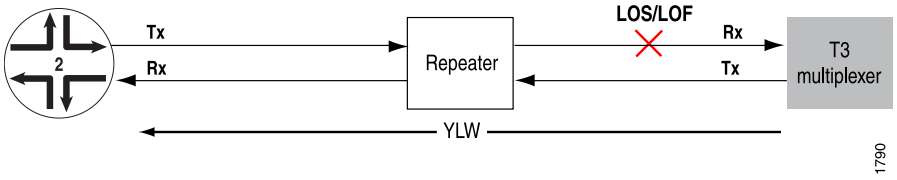
Locate an Incoming Yellow Alarm

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

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

All diagnostics are from the perspective of Router 2. Figure 10 on page 152 illustrates the location of a yellow alarm in a T3 network.

Figure 10: Location of a Yellow Alarm in a T3 Network



Meaning

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

Locate IDLE on a T3 Interface

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

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

Sample Output

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

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