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## Junos OS

### E1/E3/T1/T3 Interfaces for Routing Devices

Release  
13.2



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Published: 2013-08-19

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#### *Junos OS E1/E3/T1/T3 Interfaces for Routing Devices*

Release 13.2

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#### Revision History

July 2013—R1 Junos OS 13.2

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# About This Guide

This preface provides the following guidelines for using the *Junos OS E1/E3/T1/T3 Interfaces for Routing Devices*:

- [Documentation and Release Notes on page xiii](#)
- [Supported Routing Platforms on page xiii](#)
- [Using the Examples in This Manual on page xiv](#)
- [Documentation Conventions on page xv](#)
- [Documentation Feedback on page xvii](#)
- [Requesting Technical Support on page xvii](#)

## Documentation and Release Notes

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

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## Supported Routing Platforms

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

- J Series
- M Series
- MX Series
- T Series
- ACX Series
- PTX Series

## Using the Examples in This Manual

---

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

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

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

### Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

## Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

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

## Documentation Conventions

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies book names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS System Basics Configuration Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>
<b>Text like this</b>	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols <b>ospf area area-id</b>] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Enclose optional keywords or variables.	<b>stub &lt;default-metric metric&gt;;</b>
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast   multicast</b>  <b>(string1   string2   string3)</b>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	<b>community name members [</b> <i>community-ids</i> <b>]</b>
Indentation and braces ( { } )	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

---

#### GUI Conventions

---



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

Convention	Description	Examples
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
<b>&gt;</b> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

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

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- 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>.
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- 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

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- 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

- [E1/E3/T1/T3 Interfaces Configuration Statements and Hierarchy on page 3](#)



## 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 on page 3](#)
- [\[edit logical-systems\] Hierarchy Level on page 19](#)

### [\[edit interfaces\] 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 {
    account-layer2-overhead (Interface Level) {
      value;
      egress bytes;
      ingress bytes;
    }
  }
}
```

```
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);
}
shared-scheduler;
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 {
        interface interface-name;
    }
}
multiservice-options {
    (core-dump | no-core-dump);
    (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
    interface-type type;
}
no-vpivci-swapping;
optics-options {
    alarm low-light-alarm {
        (link-down | syslog);
    }
    tx-power dbm;
    warning low-light-warning {
        (link-down | syslog);
    }
}

```

```

    }
    wavelength nm;
}
otn-options {
    bytes transmit-payload-type value;
    fec (efec | gfec | gfec-sdfec | none);
    (is-ma | no-is-ma);
    (laser-enable | no-laser-enable);
    (line-loopback | no-line-loopback);
    (local-loopback | no-local-loopback);
    (odu-ttim-action-enable | no-odu-ttim-action-enable);
    (otu-ttim-action-enable | no-otu-ttim-action-enable);
    odu-delay-management {
        (bypass | no-bypass);
        (monitor-end-point | no-monitor-end-point);
        (number-of-frames | no-number-of-frames);
        (start-measurement | no-start-measurement);
    }
    (prbs | no-prbs);
    preemptive-fast-reroute {
        (backward-frr-enable | no-backward-frr-enable);
        (signal-degrade-monitor-enable | no-signal-degrade-monitor-enable);
    }
    rate {
        (fixed-stuff-bytes | no-fixed-stuff-bytes);
        otu4;
        (pass-through | no-pass-through);
    }
    signal-degrade {
        ber-threshold-clear value;
        ber-threshold-signal-degrade value;
        interval value;
    }
    trigger trigger-identifier;
    tti tti-identifier;
}
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-vcip psn-vci-identifier;
psn-vpip psn-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;
            }
        }
    }
}
account-layer2-overhead {
    value;
    egress bytes;
    ingress bytes;
}
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-vs-a-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](#)
- [Ethernet Interfaces](#)
- [Junos OS Network Interfaces Library for Routing Devices](#)

## [\[edit logical-systems\] 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 Feature Guide for Routing Devices*.

```

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](#)
- [Ethernet Interfaces](#)
- [Junos OS Network Interfaces Library for Routing Devices](#)

## PART 2

# Configuring E1, E3, T1, and T3 Interfaces

- [Configuring E1 Interfaces on page 27](#)
- [Configuring E3 Interfaces on page 35](#)
- [Configuring T1 Interfaces on page 45](#)
- [Configuring T3 Interfaces on page 55](#)



## CHAPTER 2

# Configuring E1 Interfaces

- [E1 Interfaces Overview on page 27](#)
- [Configuring E1 Physical Interface Properties on page 28](#)
- [Configuring E1 BERT Properties on page 28](#)
- [Configuring the E1 Frame Checksum on page 29](#)
- [Configuring E1 Framing on page 30](#)
- [Configuring the E1 Idle Cycle Flag on page 30](#)
- [Configuring E1 Data Inversion on page 31](#)
- [Configuring E1 Loopback Capability on page 31](#)
- [Configuring E1 Start and End Flags on page 33](#)
- [Configuring Fractional E1 Time Slots on page 33](#)

## 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).

**Related Documentation**

- [Physical Interfaces](#)

## 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;  
}
```

Related Documentation

- [E1 Interfaces Overview on page 27](#)

## 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 *cel-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 46](#)
- [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;
```

Related Documentation

- [fcs on page 87](#)

---

## 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;
```

Related Documentation

- [framing on page 89](#)

---

## 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;
```

Related Documentation

- [idle-cycle-flag on page 90](#)

## 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.

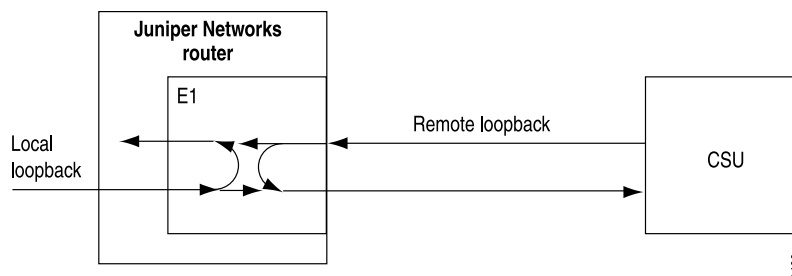
Related Documentation

- [invert-data on page 91](#)

## 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 51](#)
- [Performing a Loopback Test on an Interface on page 106](#)

## 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;
```

Related Documentation

- [start-end-flag on page 98](#)

## 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 <i>interface-name</i> e1-options] timeslots 1-10;
--------------------------------	---

Use Time Slots 1 Through 5, 10, and 24	[edit interfaces <i>interface-name</i> e1-options] timeslots 1-5,10,24;
---	--

Related Documentation	<ul style="list-style-type: none"><li>• <a href="#">timeslots on page 101</a></li></ul>
--------------------------	---

## CHAPTER 3

# Configuring E3 Interfaces

- [E3 Interfaces Overview on page 35](#)
- [Configuring E3 Physical Interface Properties on page 36](#)
- [Configuring E3 BERT Properties on page 36](#)
- [Configuring the E3 CSU Compatibility Mode on page 37](#)
- [Configuring the E3 Frame Checksum on page 39](#)
- [Configuring the E3 Idle Cycle Flag on page 39](#)
- [Configuring E3 Data Inversion on page 40](#)
- [Configuring E3 Loopback Capability on page 40](#)
- [Configuring E3 HDLC Payload Scrambling on page 41](#)
- [Configuring the E3 Start and End Flags on page 42](#)
- [Configuring E3 IQ and IQE Unframed Mode on page 42](#)

## 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 Library for Routing Devices*.



**NOTE:** In unframed mode, the E3 IQ and E3 IQE PICs do not detect yellow or loss-of-frame alarms.

**Related Documentation**

- *Physical Interfaces*

---

## 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);  
}
```

**Related Documentation**

- *Physical Interfaces*

---

## 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*.

#### Related Documentation

- [Configuring T3 BERT Properties on page 56](#)
- [Interface Diagnostics](#)
- [Interface Diagnostics 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 **xkb** or **x.xMb**. 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



**Table 3: Subrate Values for E3 Digital Link Compatibility Mode (*continued*)**

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 58](#).

**Related Documentation**

- [Configuring the T3 CSU Compatibility Mode on page 58](#)

## 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;
```

**Related Documentation**

- [fcs on page 87](#)

## 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;
```

Related Documentation • [idle-cycle-flag on page 90](#)

## 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;
```

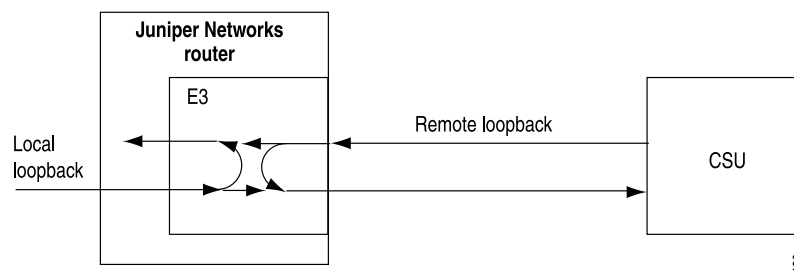
When you enable data inversion, unused data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Enable inversion to be compatible with another vendor's E3 interface.

Related Documentation • [invert-data on page 91](#)

## 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;
    }
  }
}
```

Related Documentation

- [loopback on page 94](#)

### 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
```

Related  
Documentation

- [payload-scrambler on page 96](#)

---

## 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;
```

Related  
Documentation

- [start-end-flag on page 98](#)

---

## 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;
```

Related Documentation • [unframed on page 102](#)



## CHAPTER 4

# Configuring T1 Interfaces

- [T1 Interfaces Overview on page 45](#)
- [Configuring T1 Physical Interface Properties on page 46](#)
- [Configuring T1 BERT Properties on page 46](#)
- [Configuring the T1 Buildout on page 47](#)
- [Configuring T1 Byte Encoding on page 48](#)
- [Configuring T1 CRC Error Major Alarm Thresholds on page 48](#)
- [Configuring T1 CRC Error Minor Alarm Thresholds on page 49](#)
- [Configuring T1 Data Inversion on page 49](#)
- [Configuring the T1 Frame Checksum on page 50](#)
- [Configuring the T1 Remote Loopback Response on page 50](#)
- [Configuring T1 Framing on page 50](#)
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- [Configuring the T1 Idle Cycle Flag on page 53](#)
- [Configuring T1 Start and End Flags on page 53](#)
- [Configuring Fractional T1 Time Slots on page 54](#)

## T1 Interfaces Overview

---

T1 is the basic physical layer protocol used by the Digital Signal level 1 (DS1) multiplexing method in North America. A T1 interface operates at a bit rate of 1.544 Mbps and can support 24 DS0 channels. Supported DS1 standards include:

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- AT&T Pub 54014
- ITU G.751, G.703

### Related Documentation

- *Physical Interfaces*

## 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;  
}
```

Related Documentation

- [T1 Interfaces Overview on page 45](#)

## 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 Administration Library for Routing Devices*.

#### 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;
```

Related Documentation

- [buildout on page 78](#)

---

## 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;
```

Related Documentation

- [byte-encoding on page 79](#)

---

## 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.

Related Documentation • [crc-major-alarm-threshold on page 82](#)

## 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.

Related Documentation • [crc-minor-alarm-threshold on page 83](#)

## 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.

Related Documentation • [invert-data on page 91](#)

---

## 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;
```

Related Documentation • [fcs on page 87](#)

---

## 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.

Related Documentation • [remote-loopback-respond on page 97](#)

---

## 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;
```

Related  
Documentation

- [framing on page 89](#)

---

## 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.

Related  
Documentation

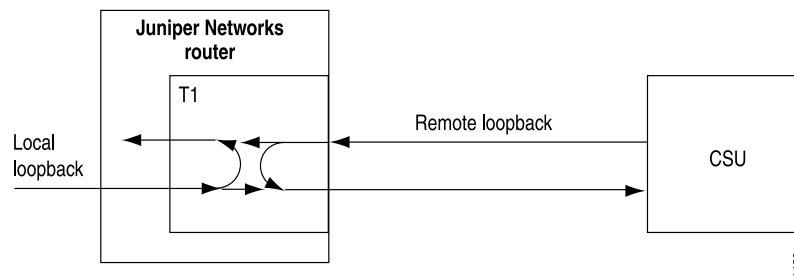
- [line-encoding on page 92](#)

---

## 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 52](#). 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 NxDS0 intelligent queuing (IQ) interfaces only, you can include the **loopback payload** statement in the configuration to loop back data only (without clocking information) on the remote router's PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the **loopback payload** statement at the **[edit interfaces *ct3-fpc/pic/port*]** and **[edit interfaces *t3-fpc/pic/port:channel*]** hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement in the configuration at the **[edit interfaces *t1-fpc/pic/port:channel*]** hierarchy level; it is ignored if included at the **[edit interfaces *ct1-fpc/pic/port*]** hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote router. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the **[edit interfaces *interface-name*]** hierarchy level and the **loopback local** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, as shown in the following example:

```
[edit interfaces]
  t1-1/0/0 {
    no-keepalives;
    encapsulation cisco-hdlc;
    t1-options {
      loopback local;
    }
  }
  unit 0 {
```

```

family inet {
    address 10.100.100.1/24;
}
}
}

```



**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 106](#)

## 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;

```

#### Related Documentation

- [idle-cycle-flag on page 90](#)

## 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;
```

Related  
Documentation

- [start-end-flag on page 98](#)

---

## 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.

### Configuring Different Time Slots On a T1 Interface

The following examples show how to configure different time slots on a T1 interface:

- To configure time slots 1 through 10, set the **timeslots 1-10** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level.
- To configure time slots 1 through 5, 10, and 24, set the **timeslots 1-5,10,24** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level.
- To configure the first four odd-numbered time slots, set the **timeslots 1,3,5,7** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level.

Related  
Documentation

- [timeslots on page 101](#)



## CHAPTER 5

# Configuring T3 Interfaces

- [T3 Interfaces Overview on page 55](#)
- [Configuring T3 Physical Interface Properties on page 56](#)
- [Configuring T3 BERT Properties on page 56](#)
- [Disabling T3 C-Bit Parity Mode on page 57](#)
- [Configuring the T3 CSU Compatibility Mode on page 58](#)
- [Configuring the T3 Frame Checksum on page 61](#)
- [Configuring the T3 FEAC Response on page 61](#)
- [Configuring the T3 Idle Cycle Flag on page 62](#)
- [Configuring the T3 Line Buildout on page 62](#)
- [Configuring T3 Loopback Capability on page 63](#)
- [Configuring T3 HDLC Payload Scrambling on page 65](#)
- [Configuring T3 Start and End Flags on page 65](#)
- [Examples: Configuring T3 Interfaces on page 66](#)

### T3 Interfaces Overview

---

T3 is the physical layer protocol used by the Digital Signal level 3 (DS3) multiplexing method in North America. A T3 interface operates at a bit rate of 44.736 Mbps. The Junos OS supports payload scrambling and subrate operation on each physical T3 interface. One encapsulation format—Point-to-Point Protocol (PPP), Frame Relay, or High-level Data Link Control (HDLC)—must be configured for the interface. DS3 standards supported include:

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- Bellcore TR-TSY-000009
- AT&T Pub 5404
- ITU G.751, G.703, G823

#### Related Documentation

- *Physical Interfaces*

## 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;  
}
```

Related Documentation

- [T3 Interfaces Overview on page 55](#)

## Configuring T3 BERT Properties

---

This section discusses BERT properties for the T3 interface specifically. For general information about the Junos implementation of the BERT procedure, see *Interface Diagnostics*.

You can configure a T3 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream by including the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]  
bert-algorithm algorithm;  
bert-error-rate rate;  
bert-period seconds;
```

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

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

**algorithm** is the pattern to send in the bit stream. The default algorithm for the DS3 BERT procedure is **pseudo-2e15-o151** (pattern is  $2^{15}-1$ , as defined in the CCITT/ITU O.151 standard).

On T3 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the **[edit interfaces *interface-name* *interface-options*]** hierarchy level:

```
[edit interfaces interface-name interface-options]
  bert-algorithm algorithm;
```

For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t3-0/0/0 t3-options]
user@host# set bert-algorithm ?
Possible completions:
all-ones-repeating Repeating one bits
all-zeros-repeating Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e10 Pattern is 2^10 - 1
...
```



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

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the *Junos OS Operational Mode Commands*.

- Related Documentation**
- [bert-algorithm on page 72](#)
  - [bert-error-rate on page 74](#)
  - [bert-period on page 76](#)
  - [t3-options on page 100](#)
  - *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;
```

Related Documentation

- [cbit-parity on page 80](#)

## Configuring the T3 CSU Compatibility Mode

Subrating a T3 interface reduces the maximum allowable peak rate by limiting the HDLC-encapsulated payload. Subrate modes configure the PIC to connect with channel service units (CSUs) that use proprietary methods of multiplexing.

You can configure T3 interfaces to be compatible with a Digital Link, Kentrox, or Larscom CSUs. For T3 intelligent queuing (IQ) channels only, you can also configure Adtran or Verilink CSU compatibility.



**NOTE:** To subrate an E3 interface to be compatible with a Kentrox CSU, you must have an IQ or IQE based PIC. Non-IQ or IQE PICs allow a commit of the configuration, but the interfaces remain at the full E3 rate for the Kentrox compatibility mode.

4-port and 2-port channelized DS3(T3) IQ PICs do not support Adtran and Verilink compatibility modes. If configured, the default mode is applied on both the interfaces.

To configure a T3 interface so that it is compatible with the CSU at the remote end of the line, include the **compatibility** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level:

```
[edit interfaces interface-name t3-options]
compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
```

The subrate of a T3 interface must exactly match that of the remote CSU. To specify the subrate, include the **subrate** statement in the configuration:

- For Adtran CSUs, specify the subrate as a number from 1 through 588 that exactly matches the value configured on the CSU. A subrate value of 588 corresponds to 44.2 Mbps, or 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to  $44.2 / 588$ , which is 75.17 Kbps, or 0.17 percent of the HDLC-encapsulated payload.
- For Digital Link CSUs, specify the subrate as the data rate you configured on the CSU in the format xKb or x.xMb. For Digital Link CSUs, you can specify the subrate value to match the data rate configured on the CSU in the format **xkb** or **x.xMb**. You can configure the subrate values shown in [Table 4 on page 59](#).
- For Kentrox CSUs, specify the subrate as a number from 1 through 69 that exactly matches the value configured on the CSU. A subrate value of 69 corresponds to 34.995097 Mbps, or 79.17 percent of the HDLC-encapsulated payload (44.2 Mbps). A subrate value of 1 corresponds to 999.958 Kbps, which is 2.26 percent of the HDLC-encapsulated payload. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.
- For Larscom CSUs, specify the subrate as a number from 1 through 14 that exactly matches the value configured on the CSU. A subrate value of 14 corresponds to 44.2 Mbps, or 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to  $44.2 / 14$ , which is 3.16 Mbps, 7.15 percent of the HDLC-encapsulated payload.
- For Verilink CSUs, specify the subrate as a number from 1 through 28 that exactly matches the value configured on the CSU. To calculate the maximum allowable peak rate, multiply the configured subrate by 1.578 Mbps. For example, a subrate value of 28 corresponds to  $28 \times 1.578$  Mbps, which is 44.2 Mbps, 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to 1.578 Mbps, 3.57 percent of the HDLC-encapsulated payload. A subrate value of 20 corresponds to  $20 \times 1.578$  Mbps, which is 31.56 Mbps, 71.42 percent of the HDLC-encapsulated payload.



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

Verilink configuration on an IQE PIC is also not functional when the PIC is connected to any other vendor equipment that operates in Verilink Port B mode. The Verilink configuration on an IQE PIC works only when it is paired with another IQE PIC or any other vendor equipment that operates in Port A mode.

**Table 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

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

1.5 Mbps	10.5 Mbps	19.5 Mbps	28.6 Mbps	37.6 Mbps
1.8 Mbps	10.8 Mbps	19.8 Mbps	28.9 Mbps	37.9 Mbps
2.1 Mbps	11.1 Mbps	20.1 Mbps	29.2 Mbps	38.2 Mbps
2.4 Mbps	11.4 Mbps	20.5 Mbps	29.5 Mbps	38.5 Mbps
2.7 Mbps	11.7 Mbps	20.8 Mbps	29.8 Mbps	38.8 Mbps
3.0 Mbps	12.0 Mbps	21.1 Mbps	30.1 Mbps	39.1 Mbps
3.3 Mbps	12.3 Mbps	21.4 Mbps	30.4 Mbps	39.4 Mbps
3.6 Mbps	12.6 Mbps	21.7 Mbps	30.7 Mbps	39.7 Mbps
3.9 Mbps	12.9 Mbps	22.0 Mbps	31.0 Mbps	40.0 Mbps
4.2 Mbps	13.2 Mbps	22.3 Mbps	31.3 Mbps	40.3 Mbps
4.5 Mbps	13.5 Mbps	22.6 Mbps	31.6 Mbps	40.6 Mbps
4.8 Mbps	13.8 Mbps	22.9 Mbps	31.9 Mbps	40.9 Mbps
5.1 Mbps	14.1 Mbps	23.2 Mbps	32.2 Mbps	41.2 Mbps
5.4 Mbps	14.4 Mbps	23.5 Mbps	32.5 Mbps	41.5 Mbps
5.7 Mbps	14.7 Mbps	23.8 Mbps	32.8 Mbps	41.8 Mbps
6.0 Mbps	15.0 Mbps	24.1 Mbps	33.1 Mbps	42.1 Mbps
6.3 Mbps	15.3 Mbps	24.4 Mbps	33.4 Mbps	42.4 Mbps
6.6 Mbps	15.6 Mbps	24.7 Mbps	33.7 Mbps	42.7 Mbps
6.9 Mbps	15.9 Mbps	25.0 Mbps	34.0 Mbps	43.0 Mbps
7.2 Mbps	16.2 Mbps	25.3 Mbps	34.3 Mbps	43.3 Mbps
7.5 Mbps	16.5 Mbps	25.6 Mbps	34.6 Mbps	43.6 Mbps
7.8 Mbps	16.8 Mbps	25.9 Mbps	34.9 Mbps	43.9 Mbps
8.1 Mbps	17.1 Mbps	26.2 Mbps	35.2 Mbps	44.2 Mbps
8.4 Mbps	17.4 Mbps	26.5 Mbps	35.5 Mbps	
8.7 Mbps	17.7 Mbps	26.8 Mbps	35.8 Mbps	

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

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](#).

**Related Documentation**

- [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;
```

**Related Documentation**

- [fcs on page 87](#)

## 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;
```

Related Documentation

- [feac-loop-respond on page 88](#)

---

## 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;
```

Related Documentation

- [idle-cycle-flag on page 90](#)

---

## 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;
```

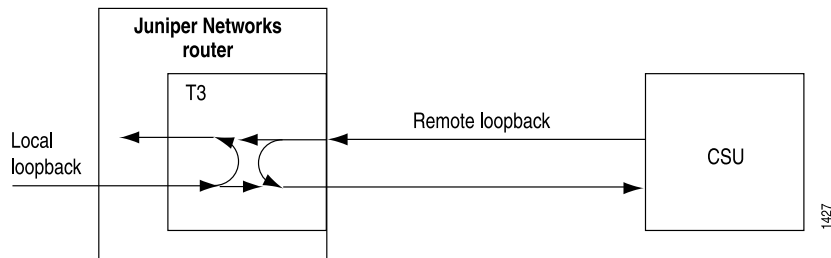
Related Documentation

- [long-buildout on page 93](#)

## 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 63](#). 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 NxDS0 IQ interfaces only, you can include the **loopback payload** statement in the configuration to loop back data only (without clocking information) on the remote router's PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the **loopback payload** statement at the `[edit interfaces ct3-fpc/pic/port]` and `[edit interfaces t3-fpc/pic/port:channel]` hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement in the configuration at the `[edit interfaces t1-fpc/pic/port:channel]` hierarchy level; it is ignored if included at the `[edit interfaces ct1-fpc/pic/port]` hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote router. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the **[edit interfaces *interface-name*]** hierarchy level and the **loopback local** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level, as shown in the following example:

```
[edit interfaces]
t3-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
  t3-options {
    loopback local;
  }
  unit 0 {
    family inet {
      address 10.100.100.1/24;
    }
  }
}
```

With this configuration, the link stays up, so you can loop ping packets to a remote router. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

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

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command, for example:

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

For channel 0 on channelized interfaces only, you can include the **loopback** statement at the **[edit interfaces *interface-name* *interface-type-options*]** hierarchy level. The loopback setting configured for channel 0 applies to all channels on the channelized interface. The **loopback** statement is ignored if you include it at this hierarchy level in the configuration of other channels. To configure loopbacks on individual channels, you must include the **channel-type-options loopback** statement in the configuration for each channel. This allows each channel to be put in loopback mode independently.

For example, for DS3 channels on a channelized OC12 interface, the **sonet-options loopback** statement is supported only for channel 0; it is ignored if included in the configuration for channels 1 through 11. The SONET loopback configured for channel 0 applies to all 12 channels equally. To configure loopbacks on the individual DS3 channels, you must include the **t3-options loopback** statement in the configuration for each channel. This allows each DS3 channel can be put in loopback mode independently.

Related  
Documentation

- [loopback on page 94](#)

## 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 58](#).

```
[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
```

Related Documentation

- [payload-scrambler on page 96](#)

## 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;
```

Related • [start-end-flag on page 98](#)  
Documentation

## 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;
        }
    }
}

```

**Related**    • *Physical Interfaces*  
**Documentation**

## PART 3

# E1/E3/T1/T3 Configuration Statements

- [Summary of E1/E3/T1/T3 Interfaces Configuration Statements on page 71](#)





## 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

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



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

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

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

**Default:** pseudo-2e3

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

**Related Documentation**

- *Interface Diagnostics*
- [Configuring E1 BERT Properties on page 28](#)
- [Configuring E3 BERT Properties on page 36](#)
- [Configuring T1 BERT Properties on page 46](#)
- [Configuring T3 BERT Properties on page 56](#)
- [Examples: Configuring T3 Interfaces on page 66](#)
- [bert-error-rate on page 74](#)
- [bert-period on page 76](#)

## bert-error-rate

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



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


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

<b>Options</b>	<p><b>rate</b>—Bit error rate.</p> <p><b>Range:</b> 0 through 7, which corresponds to <math>10^{-1}</math> (1 error per bit) to <math>10^{-7}</math> (1 error per 10 million bits)</p> <p><b>Default:</b> 0</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">bert-algorithm on page 72</a></li> <li>• <a href="#">bert-period on page 76</a></li> <li>• <a href="#">ds0-options</a></li> <li>• <a href="#">e1-options on page 84</a></li> <li>• <a href="#">e3-options on page 85</a></li> <li>• <a href="#">t1-options on page 99</a></li> <li>• <a href="#">t3-options on page 100</a></li> </ul>

- *Interface Diagnostics*
- [Configuring E1 BERT Properties on page 28](#)
- [Configuring E3 BERT Properties on page 36](#)
- [Configuring T1 BERT Properties on page 46](#)
- [Configuring T3 BERT Properties on page 56](#)
- [Examples: Configuring T3 Interfaces on page 66](#)

## bert-period


---

<b>Syntax</b>	<code>bert-period seconds;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces ce1-fpc/pic/port],</code> <code>[edit interfaces ct1-fpc/pic/port],</code> <code>[edit interfaces interface-name ds0-options],</code> <code>[edit interfaces interface-name e1-options],</code> <code>[edit interfaces interface-name e3-options],</code> <code>[edit interfaces interface-name t1-options],</code> <code>[edit interfaces interface-name t3-options]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	<p>Configure the duration of a BERT test. Applies to E1, E3, T1, and T3 interfaces, and to E1, E3, T1, and T3 partitions on the channelized interfaces (CE1, CT1, DS3, OC3, OC12, OC48, STM1, STM4, and STM16).</p> <p>E1 and T1 IQ, IQE, and standard interfaces support an extended BERT period range, up to 86,400 seconds (24 hours).</p> <div><p><b>NOTE:</b> When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <code>bert-period</code> statement must be included at the <code>[edit interfaces ce1-fpc/pic/port]</code> or <code>[edit interfaces ct1-fpc/pic/port]</code> hierarchy level as appropriate.</p></div>
<b>Options</b>	<p><b>seconds</b>—Test duration. Range and default values vary by interface type.</p> <p><b>Range:</b></p> <ul style="list-style-type: none"><li>• PIC-dependent—Normal BERT period: either 1 through 239 seconds or 1 through 240 seconds</li><li>• PIC-dependent—Extended BERT period: from 1 through 86,400 seconds</li></ul> <p><b>Default:</b></p> <ul style="list-style-type: none"><li>• Normal BERT period: 10 seconds</li><li>• Extended BERT period (on supported E1 interfaces): 10 seconds</li><li>• Extended BERT period (on supported T1 interfaces): 240 seconds</li></ul>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <i>Interface Diagnostics</i></li><li>• <a href="#">Configuring E1 BERT Properties on page 28</a></li></ul>

- [Configuring E3 BERT Properties on page 36](#)
- [Configuring T1 BERT Properties on page 46](#)
- [Configuring T3 BERT Properties on page 56](#)
- [bert-algorithm on page 72](#)
- [bert-error-rate on page 74](#)

## buildout (T1 Interfaces)

---

<b>Syntax</b>	<code>buildout value;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>ct1-fpc/pic/port</i> ] [edit interfaces <i>interface-name</i> <b>t1-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	For T1 interfaces, set the buildout value. <div><p><b>NOTE:</b> When configuring CT1 interfaces on 10-port Channelized E1/T1 IQE PICs and 16-Port Channelized E1/T1 Circuit Emulation MICs, the <b>buildout</b> statement must be included at the hierarchy level.</p></div>
<b>Default</b>	The default buildout value is 0 through 132 feet.
<b>Options</b>	You can set the buildout value to one of the following: <ul style="list-style-type: none"><li>• <b>0-132</b>—0 through 132 feet (0 through 40 meters)</li><li>• <b>133-265</b>—133 through 265 feet (40 through 81 meters)</li><li>• <b>266-398</b>—266 through 398 feet (81 through 121 meters)</li><li>• <b>399-531</b>—399 through 531 feet (121 through 162 meters)</li><li>• <b>532-655</b>—532 through 655 feet (162 through 200 meters)</li><li>• <b>long-0db</b>—For J Series routers only, long buildout with 0 decibel (dB) transmit attenuation</li><li>• <b>long-7.5db</b>—For MX Series and J Series routers only, long buildout with 7.5 dB transmit attenuation</li><li>• <b>long-15db</b>—For MX Series and J Series routers only, long buildout with 15 dB transmit attenuation</li><li>• <b>long-22.5db</b>—For MX Series and J Series routers only, long buildout with 22.5 dB transmit attenuation</li></ul>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the T1 Buildout on page 47</a></li><li>• <i>Junos OS Interfaces and Routing Configuration Guide</i></li></ul>



## byte-encoding

<b>Syntax</b>	byte-encoding (nx56   nx64);
<b>Hierarchy Level</b>	[edit interfaces t1- <i>fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> t1-options]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	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.



<b>Default</b>	The default byte encoding is 8 bits per byte (nx64).
<b>Options</b>	nx56—Use 7 bits per byte.  nx64—Use 8 bits per byte.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring T1 Byte Encoding on page 48</a></li> </ul>

## cbit-parity

---

<b>Syntax</b>	(cbit-parity   no-cbit-parity);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For T3 interfaces only, enable or disable C-bit parity mode, which controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the far-end block error (FEBE), far-end alarm and control (FEAC), terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. For ATM and ATM2 IQ2 and IQ2-E interfaces, M23 framing is used when the <b>no-cbit-parity</b> statement is included. For all other interfaces, M13 framing is used when the <b>no-cbit-parity</b> statement is included.
<b>Default</b>	C-bit parity mode is enabled.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <i>Configuring E3 and T3 Parameters on ATM Interfaces</i></li><li>• <a href="#">Disabling T3 C-Bit Parity Mode on page 57</a></li></ul>

## compatibility-mode

<b>Syntax</b>	<code>compatibility-mode (adtran   digital-link   kentrox   larscom   verilink) &lt;subrate value&gt;;</code>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>e3-options</b> ], [edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	Configure the E3 or T3 interface to be compatible with the channel service unit (CSU) at the remote end of the line.
	<div>  <p><b>NOTE:</b> The <code>compatibility-mode</code> statement at the [edit interfaces <i>interface-name</i> <b>e3-options</b>] hierarchy level is not valid for IQE PICs.</p> </div>
<b>Default</b>	If you omit this option, the full E3 or T3 rate is used.
<b>Options</b>	<p><b>adtran</b>—For T3 IQ interfaces only, configure compatibility with Adtran CSUs.</p> <p><b>digital-link</b>—Configure compatibility with Digital Link CSUs. If you include this option on an E3 interface, you must also disable payload scrambling.</p> <p><b>kentrox</b>—Configure compatibility with Kentrox CSUs. Kentrox subrate is valid for E3 IQ and T3 IQ interfaces only.</p> <p><b>larscom</b>—For T3 and T3 IQ interfaces only, configure compatibility with Larscom CSUs.</p> <p><b>verilink</b>—For T3 IQ and T3 IQE interfaces only, configure compatibility with Verilink CSUs.</p> <div>  <p><b>NOTE:</b> Verilink configuration is not functional if an IQ interface is paired with an IQE interface.</p> </div> <p><b>subrate value</b>—Subrate of the E3 or T3 line.</p> <p><b>Range:</b> For Kentrox CSUs on E3 IQ interfaces and T3 IQ interfaces the subrate value must match the value configured on the CSU. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring the E3 CSU Compatibility Mode on page 37</a></li> <li>• <a href="#">Configuring the T3 CSU Compatibility Mode on page 58</a></li> <li>• <a href="#">payload-scrambler on page 96</a></li> </ul>

## crc-major-alarm-threshold

---

<b>Syntax</b>	crc-major-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> t1-options]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	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.
<b>Default</b>	10-second monitoring period for all settings except 1e-5. The 1e-5 value uses a 50-second monitoring period.
<b>Options</b>	<p>1e-3—Error rate expressed as the number of errors per number of bits. The value 1e-3 is one crc error in 10<sup>3</sup> bits.</p> <p>1e-4—Error rate expressed as the number of errors per number of bits. The value 1e-4 is one crc error in 10<sup>4</sup> bits.</p> <p>1e-5—Error rate expressed as the number of errors per number of bits. The value 1e-5 is one crc error in 10<sup>5</sup> bits.</p> <p>5e-4—Error rate expressed as the number of errors per number of bits. The value 5e-4 is five crc errors in 10<sup>4</sup> bits.</p> <p>5e-5—Error rate expressed as the number of errors per number of bits. The value 5e-5 is five crc errors in 10<sup>5</sup> bits.</p> <p><b>Default: 5e-5</b></p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring T1 CRC Error Major Alarm Thresholds on page 48</a></li></ul>

## crc-minor-alarm-threshold

<b>Syntax</b>	crc-minor-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5   5e-6   1e-6);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> t1-options]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	Minor alarm error thresholds for T1 CRC errors. When the threshold is exceeded for one second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared.
<b>Default</b>	10-second monitoring period for values 1e-3, 5e-4, 1e-4, and 5e-5. The 1e-5 value uses a 50-second monitoring period. The 5e-6 value uses a 100-second monitoring period. The 1e-6 value uses a 500-second monitoring period.
<b>Options</b>	<p>1e-3—Error rate expressed as the number of errors per number of bits. The value 1e-3 is one crc error in 10<sup>3</sup> bits.</p> <p>1e-4—Error rate expressed as the number of errors per number of bits. The value 1e-4 is one crc error in 10<sup>4</sup> bits.</p> <p>1e-5—Error rate expressed as the number of errors per number of bits. The value 1e-5 is one crc error in 10<sup>5</sup> bits.</p> <p>1e-6—Error rate expressed as the number of errors per number of bits. The value 1e-5 is one crc error in 10<sup>6</sup> bits.</p> <p>5e-4—Error rate expressed as the number of errors per number of bits. The value 5e-4 is five crc errors in 10<sup>4</sup> bits.</p> <p>5e-5—Error rate expressed as the number of errors per number of bits. The value 5e-5 is five crc errors in 10<sup>5</sup> bits.</p> <p>5e-6—Error rate expressed as the number of errors per number of bits. The value 5e-5 is five crc errors in 10<sup>6</sup> bits.</p> <p><b>Default: 5e-6</b></p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">Configuring T1 CRC Error Minor Alarm Thresholds on page 49</a></li> </ul>

## e1-options

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<b>Syntax</b>	<pre>e1-options {     bert-algorithm <i>algorithm</i>;     bert-error-rate <i>rate</i>;     bert-period <i>seconds</i>;     fcs (16   32);     framing (g704   g704-no-crc4   unframed);     idle-cycle-flag (flags   ones);     invert-data;     loopback (local   remote);     start-end-flag (filler   shared);     timeslots <i>time-slot-range</i>; }</pre>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	Configure E1-specific physical interface properties.  The statements are explained separately.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Channelized E1 IQ and IQE Interfaces Overview</a></li><li>• <a href="#">Channelized STM1 Interfaces Overview</a></li><li>• <a href="#">E1 Interfaces Overview on page 27</a></li><li>• <a href="#">T1 Interfaces Overview on page 45</a></li></ul>

## e3-options

<b>Syntax</b>	<pre>e3-options {   atm-encapsulation (direct   plcp);   bert-algorithm <i>algorithm</i>;   bert-error-rate <i>rate</i>;   bert-period <i>seconds</i>;   buildout <i>feet</i>;   compatibility-mode (digital-link   kentrox   larscom) &lt;subrate <i>value</i>&gt;;   fcs (16   32);   framing (g.751   g.832);   idle-cycle-flag <i>value</i>;   invert-data;   loopback (local   remote);   (payload-scrambler   no-payload-scrambler);   start-end-flag <i>value</i>;   (unframed   no-unframed); }</pre>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Configure E3-specific physical interface properties.</p> <p>For ATM1 interfaces, you can configure a subset of E3 options statements.</p> <p>The statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">E3 Interfaces Overview on page 35</a></li> <li>• <a href="#">T3 Interfaces Overview on page 55</a></li> <li>• <i>atm-options</i></li> </ul>


## fast-aps-switch

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<b>Syntax</b>	fast-aps-switch;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options aps]
<b>Release Information</b>	Statement introduced in Junos OS Release 12.1.
<b>Description</b>	(M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only and EX Series switches) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.
	<div> <b>NOTE:</b><ul style="list-style-type: none"><li>• Configuring this statement reduces the APS switchover time only when the Layer 2 circuit encapsulation type for the interface receiving traffic from a Layer 2 circuit neighbor is SAToP.</li><li>• When the fast-aps-switch statement is configured in revertive APS mode, you must configure an appropriate value for revert time to achieve reduction in APS switchover time.</li><li>• To prevent the logical interfaces in the data path from being shut down, configure appropriate hold-time values on all the interfaces in the data path that support TDM.</li><li>• The fast-aps-switch statement cannot be configured when the APS annex-b option is configured.</li><li>• The interfaces that have the fast-aps-switch statement configured cannot be used in virtual private LAN service (VPLS) environments.</li></ul></div>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <i>Reducing APS Switchover Time in Layer 2 Circuits</i></li></ul>



## fcs

<b>Syntax</b>	fcs (16   32);
<b>Hierarchy Level</b>	[edit interfaces e1- <i>fpc/pic/port</i> ], [edit interfaces t1- <i>fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> e1-options], [edit interfaces <i>interface-name</i> e3-options], [edit interfaces <i>interface-name</i> sonet-options], [edit interfaces <i>interface-name</i> t1-options], [edit interfaces <i>interface-name</i> t3-options]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	<p>For E1/E3, SONET/SDH, and T1/T3 interfaces, configure the frame checksum (FCS) on the interface. The checksum must be the same on both ends of the interface.</p> <p>On a channelized OC12 interface, the SONET/SDH <b>fcs</b> statement is not supported. To configure FCS on each DS3 channel, you must include the <b>t3-options fcs</b> statement in the configuration for each channel. For SONET/SDH, the channelized OC12 interface supports DS3 to STS-1 to OC12. For SDH, the channelized OC12 interface supports NxDS3 to NxVC3 to AU3 to STM.</p> <div style="margin-top: 20px;">  <p><b>NOTE:</b> When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <b>fcs</b> statement must be included at the [edit interfaces e1-<i>fpc/pic/port</i>] or [edit interfaces t1-<i>fpc/pic/port</i>] hierarchy level as appropriate.</p> </div>
<b>Options</b>	<p><b>16</b>—Use a 16-bit frame checksum on the interface.</p> <p><b>32</b>—Use a 32-bit frame checksum on the interface. Using a 32-bit checksum provides more reliable packet verification, but some older equipment might not support 32-bit checksums.</p> <p><b>Default:</b> 16</p>
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring the E1 Frame Checksum on page 29</a></li> <li>• <a href="#">Configuring the E3 Frame Checksum on page 39</a></li> <li>• <a href="#">Configuring the SONET/SDH Frame Checksum</a></li> <li>• <a href="#">Configuring the T1 Frame Checksum on page 50</a></li> <li>• <a href="#">Configuring the T3 Frame Checksum on page 61</a></li> </ul>

## feac-loop-respond

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<b>Syntax</b>	(feac-loop-respond   no-feac-loop-respond);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>For T3 interfaces only, configure the router so a remote CSU can place the local router into loopback.</p> <p>If you configure remote or local loopback with the T3 <b>loopback</b> statement, the router does not respond to FEAC requests from the CSU even if you include the <b>feac-loop-respond</b> statement in the configuration. For the router to respond, you must delete the <b>loopback</b> statement from the configuration.</p> <p>You must rollback the setting done on the remote CSU prior to deactivating the <b>feac-loop-respond</b> statement. If the remote CSU cannot comply, clear the remote loop through local configuration to achieve the cleanup. For example, configure remote loopback on the interface and then delete the remote loopback.</p>
<b>Default</b>	The router does not respond to FEAC requests.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the T3 FEAC Response on page 61</a></li><li>• <a href="#">loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 94</a></li><li>• <a href="#">remote-loopback-respond on page 97</a></li></ul>

## framing (E1, E3, and T1 Interfaces)

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

<b>Default</b>	<code>esf</code> for T1 interfaces; <code>g704</code> for E1 interfaces. There is no default value for E3 over ATM interfaces.
<b>Options</b>	<p><code>esf</code>—Extended superframe (ESF) mode for T1 interfaces.</p> <p><code>g704</code>—G.704 framing format for E1 interfaces.</p> <p><code>g704-no-crc4</code>—G.704 framing with no cyclic redundancy check 4 (CRC4) for E1 interfaces.</p> <p><code>g.751</code>—G.751 framing format for E3 over ATM interfaces.</p> <p><code>g.832</code>—G.832 framing format for E3 over ATM interfaces.</p> <p><code>sf</code>—Superframe (SF) mode for T1 interfaces.</p> <p><code>unframed</code>—Unframed mode for E1 interfaces.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring E1 Framing on page 30</a></li> <li>• <a href="#">Configuring E3 and T3 Parameters on ATM Interfaces</a></li> <li>• <a href="#">Configuring T1 Framing on page 50</a></li> </ul>

## idle-cycle-flag

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<b>Syntax</b>	<code>idle-cycle-flag value;</code>
<b>Hierarchy Level</b>	<code>[edit interfaces e1-fpc/pic/port],</code> <code>[edit interfaces t1-fpc/pic/port],</code> <code>[edit interfaces interface-name ds0-options],</code> <code>[edit interfaces interface-name e1-options],</code> <code>[edit interfaces interface-name e3-options],</code> <code>[edit interfaces interface-name serial-options],</code> <code>[edit interfaces interface-name t1-options],</code> <code>[edit interfaces interface-name t3-options]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	Configure the value that the DS0, E1, E3, T1, or T3 interface transmits during idle cycles.
<div> <b>NOTE:</b> When configuring E1 or T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the <code>idle-cycle-flag</code> statement must be included at the <code>[edit interfaces e1-fpc/pic/port]</code> or <code>[edit interfaces t1-fpc/pic/port]</code> hierarchy level as appropriate.</div>	
<b>Options</b>	<b>value</b> —Value to transmit in the idle cycles: <ul style="list-style-type: none"><li><b>flags</b>—Transmit the value 0x7E.</li><li><b>ones</b>—Transmit the value 0xFF (all ones).</li></ul> <b>Default:</b> <code>Flags</code>
<b>Required Privilege Level</b>	<code>interface</code> —To view this statement in the configuration. <code>interface-control</code> —To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li><a href="#">Configuring the E1 Idle Cycle Flag on page 30</a></li><li><a href="#">Configuring the E3 Idle Cycle Flag on page 39</a></li><li><a href="#">Configuring the T1 Idle Cycle Flag on page 53</a></li><li><a href="#">Configuring the T3 Idle Cycle Flag on page 62</a></li></ul>

## invert-data

<b>Syntax</b>	invert-data;
<b>Hierarchy Level</b>	[edit interfaces <i>e1-fpc/pic/port</i> ], [edit interfaces <i>t1-fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> <b>e1-options</b> ], [edit interfaces <i>interface-name</i> <b>t1-options</b> ], [edit interfaces <i>interface-name</i> <b>e3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	Invert the transmission of unused data bits on the DS0, E1, E3, and T1 interface.



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

<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring E1 Data Inversion on page 31</a></li> <li>• <a href="#">Configuring E3 Data Inversion on page 40</a></li> <li>• <a href="#">Configuring T1 Data Inversion on page 49</a></li> </ul>

## line-encoding

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<b>Syntax</b>	line-encoding (ami   b8zs);
<b>Hierarchy Level</b>	[edit interfaces <i>ct1-fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> <b>t1-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	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.

<b>Default</b>	The default line encoding is B8ZS.
<b>Options</b>	<b>ami</b> —Use Alternate Mark Inversion (AMI) line encoding. <b>b8zs</b> —Use bipolar with 8-zeros substitution (B8ZS) line encoding.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring T1 Line Encoding on page 51</a></li></ul>

## long-buildout

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<b>Syntax</b>	(long-buildout   no-long-buildout);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <b>t3-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Configure the T3 line buildout. A T3 interface has two settings for the T3 line buildout: a short setting, which is less than 255 feet (68 meters), and a long setting, which is greater than 255 feet and shorter than 450 feet (137 meters).</p> <p>This statement applies to copper-cable-based T3 interfaces only. You cannot configure a line buildout for a DS3 channel on a channelized OC12 interface, which runs over fiber-optic cable.</p>
<b>Default</b>	A T3 interface uses the short line buildout setting ( <b>no-long-buildout</b> ) for wires shorter than 255 feet (68 meters).
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the T3 Line Buildout on page 62</a></li></ul>

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

<b>Syntax</b>	<code>loopback (local   payload   remote);</code>
<b>Hierarchy Level</b>	<code>[edit interfaces ce1-fpc/pic/port],</code> <code>[edit interfaces ct1-fpc/pic/port],</code> <code>[edit interfaces t1-fpc/pic/port],</code> <code>[edit interfaces interface-name ds0-options],</code> <code>[edit interfaces interface-name dsl-options],</code> <code>[edit interfaces interface-name e1-options],</code> <code>[edit interfaces interface-name e3-options],</code> <code>[edit interfaces interface-name shdsl-options],</code> <code>[edit interfaces interface-name sonet-options],</code> <code>[edit interfaces interface-name t1-options],</code> <code>[edit interfaces interface-name t3-options]</code>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
<b>Description</b>	Configure a loopback connection. To turn off the loopback capability, remove the <b>loopback</b> 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. NxDS0 IQ interfaces do not support local loopback.




**payload**—For channelized T3, T1, and NxDS0 IQ interfaces only, loop back data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated. Neither ATM-over-asymmetrical digital subscriber line (ADSL) interfaces nor ATM-over-SHDSL interfaces support payload loopback.

**remote**—Loop packets, including both data and timing information, back on the remote router's interface card. NxDS0 IQ interfaces do not support remote loopback.

<b>Required Privilege</b>	interface—To view this statement in the configuration.
<b>Level</b>	interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <i>Configuring E3 and T3 Parameters on ATM Interfaces</i></li><li>• <a href="#">Configuring E1 Loopback Capability on page 31</a></li><li>• <a href="#">Configuring E3 Loopback Capability on page 40</a></li><li>• <i>Configuring SONET/SDH Loopback Capability</i></li><li>• <i>Configuring SHDSL Operating Mode on an ATM Physical Interface</i></li><li>• <a href="#">Configuring T1 Loopback Capability on page 51</a></li><li>• <a href="#">Configuring T3 Loopback Capability on page 63</a></li><li>• <a href="#">feac-loop-respond on page 88</a></li></ul>

## payload-scrambler

<b>Syntax</b>	(payload-scrambler   no-payload-scrambler);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <a href="#">e3-options</a> ], [edit interfaces <i>interface-name</i> sonet-options], [edit interfaces <i>interface-name</i> <a href="#">t3-options</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	<p>Enable or disable HDLC scrambling on an E3, a SONET/SDH, or a T3 interface. This type of scrambling provides better link stability. Both sides of a connection must either use or not use scrambling.</p> <p>If you commit a T3 interface configuration that has HDLC payload scrambling enabled, the interface must also be configured to be compatible with the channel service unit (CSU) at the remote end of the line.</p> <p>Disable payload scrambling on an E3 interface if Digital Link compatibility mode is used.</p> <p>On a channelized OC12 interface, the <b>sonet payload-scrambler</b> statement is ignored. To configure scrambling on the DS3 channels on the interface, you can include the <b>t3-options payload-scrambler</b> statement in the configuration for each DS3 channel.</p>
	<div>  <p><b>NOTE:</b> The <b>payload-scrambler</b> statement at the [edit interfaces <i>interface-name</i> <a href="#">e3-options</a>] hierarchy level is not valid for IQE PICs.</p> </div>
<b>Default</b>	Payload scrambling is disabled on all E3 and T3 interfaces; it is enabled by default on E3/T3 over ATM interfaces and on SONET/SDH interfaces.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring E3 and T3 Parameters on ATM Interfaces</a></li> <li>• <a href="#">Configuring E3 HDLC Payload Scrambling on page 41</a></li> <li>• <a href="#">Configuring SONET/SDH HDLC Payload Scrambling</a></li> <li>• <a href="#">Configuring T3 HDLC Payload Scrambling on page 65</a></li> <li>• <a href="#">Examples: Configuring T3 Interfaces on page 66</a></li> <li>• <a href="#">compatibility-mode on page 81</a></li> </ul>

## remote-loopback-respond

<b>Syntax</b>	remote-loopback-respond;
<b>Hierarchy Level</b>	[edit interfaces <i>ct1-fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> <b>t1-options</b> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	For T1 interfaces only, configure the router to respond to remote loopback requests. Remote loopback requests can be from the facilities data link or inband.




**NOTE:** When configuring CT1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the `remote-loopback-respond` statement must be included at the [edit interfaces *ct1-fpc/pic/port*] hierarchy level.

<b>Default</b>	The router does not respond to remote loop requests.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring the T1 Remote Loopback Response on page 50</a></li> <li>• <a href="#">feac-loop-respond on page 88</a></li> <li>• <a href="#">loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 94</a></li> </ul>

## start-end-flag

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<b>Syntax</b>	start-end-flag (filler   shared);
<b>Hierarchy Level</b>	[edit interfaces e1- <i>fpc/pic/port</i> ], [edit interfaces t1- <i>fpc/pic/port</i> ], [edit interfaces <i>interface-name</i> ds0-options], [edit interfaces <i>interface-name</i> e1-options], [edit interfaces <i>interface-name</i> e3-options], [edit interfaces <i>interface-name</i> t1-options], [edit interfaces <i>interface-name</i> t3-options]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.
<b>Description</b>	For DS0, E1, E3, T1, and T3 interfaces, configure the interface to share the transmission of start and end flags.
<div> <b>NOTE:</b> When configuring E1 or T1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the start-end-flag statement must be included at the [edit interfaces e1-<i>fpc/pic/port</i>] or [edit interfaces t1-<i>fpc/pic/port</i>] hierarchy level as appropriate.</div>	
<b>Options</b>	<b>filler</b> —Wait two idle cycles between the start and end flags.  <b>shared</b> —Share the transmission of the start and end flags. This is the default.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring E1 Start and End Flags on page 33</a></li><li>• <a href="#">Configuring the E3 Start and End Flags on page 42</a></li><li>• <a href="#">Configuring T1 Start and End Flags on page 53</a></li><li>• <a href="#">Configuring T3 Start and End Flags on page 65</a></li></ul>

## t1-options

<b>Syntax</b>	<pre> t1-options {   bert-algorithm <i>algorithm</i>;   bert-error-rate <i>rate</i>;   bert-period <i>seconds</i>;   buildout <i>value</i>;   byte-encoding (nx56   nx64);   crc-major-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5);   crc-minor-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5   5e-6   1e-6);   fcs (16   32);   framing (esf   sf);   idle-cycle-flag (flags   ones);   invert-data;   line-encoding (ami   b8zs);   loopback (local   payload   remote);   remote-loopback-respond;   start-end-flag (filler   shared);   timeslots <i>time-slot-range</i>; } </pre>
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> ]
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.</p>
<b>Description</b>	<p>Configure T1-specific physical interface properties.</p> <p>The statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">T1 Interfaces Overview on page 45</a></li> </ul>

## 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 55](#)

## timeslots

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

- [Configuring Fractional E1 Time Slots on page 33](#)
- [Configuring Fractional T1 Time Slots on page 54](#)
- [Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots](#)

---

## unframed

---

<b>Syntax</b>	(unframed   no-unframed);
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> <a href="#">e3-options</a> ]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4.
<b>Description</b>	For E3 IQ interfaces only, enable or disable unframed mode. In unframed mode, the E3 IQ interface do not detect yellow ( <b>ylw</b> ) or loss-of-frame ( <b>lof</b> ) alarms.
<b>Default</b>	Unframed mode is disabled.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring E3 IQ and IQE Unframed Mode on page 42</a></li></ul>



## PART 4

# Troubleshooting

- [Investigate T1 Interfaces on page 105](#)
- [Investigate T3 Interfaces on page 127](#)



## CHAPTER 7

# Investigate T1 Interfaces

- [Investigating Interface Steps and Commands on page 105](#)
- [Troubleshooting T1 Interfaces on page 108](#)
- [Use Loopback Testing for T1 Interfaces on page 109](#)
- [Locate T1 Alarms and Errors on page 121](#)

### Investigating Interface Steps and Commands

---

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

- [Investigating Interface Steps and Commands Overview on page 105](#)
- [Monitoring Interfaces on page 105](#)
- [Performing a Loopback Test on an Interface on page 106](#)
- [Locating Interface Alarms on page 108](#)

### Investigating Interface Steps and Commands Overview

The “[Monitoring Interfaces](#)” on [page 105](#) section helps you determine the nature of the interface problem. The “[Performing a Loopback Test on an Interface](#)” on [page 106](#) section provides information to help you isolate the source of the problem. The “[Locating Interface Alarms](#)” on [page 108](#) 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 106](#) lists and describes the operational mode commands you use to monitor interfaces.

**Table 5: Commands Used to Monitor Interfaces**

CLI Command	Description
<b>show interfaces terse <i>interface-name</i></b> For example: <b>show interfaces terse t1*</b>	Displays summary information about the named interfaces.
<b>show interfaces <i>interface-name</i></b> For example: <b>show interfaces t1-x/y/z</b>	Displays static status information about a specific interface.
<b>show interfaces <i>interface-name</i> extensive</b> For example: <b>show interfaces t1-x/y/z extensive</b>	Displays very detailed interface information about a specific interface.
<b>monitor interface <i>interface-name</i></b> For example: <b>monitor interface t1-x/y/z</b>	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. To 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. To 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 107](#) 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 <i>interface-name</i> interface-options] set loopback (local   remote)	All interfaces	The <b>loopback</b> statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU).  To turn off loopback, remove the <b>loopback</b> statement from the configuration.
show	All interfaces	Verify the configuration before you commit it.
commit	All interfaces	Save the set of changes to the database and cause the changes to take operational effect.  Use after you have verified a configuration in all configuration steps.
[edit interfaces <i>interface-name</i> ] set clocking internal	T1, T3, ATM, and SONET interfaces	The <b>clocking</b> statement at this hierarchy level configures the clock source of the interface to internal.
show interfaces <i>interface-name</i>	Used for all interfaces	Display static status information about a specific interface.
[edit interfaces <i>interface-name</i> unit logical-unit-number family inet address ip-address] set arp ip-address mac mac-address	Fast Ethernet and Gigabit Ethernet interfaces	The <b>arp</b> statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses.
show arp no-resolve	Fast Ethernet and Gigabit Ethernet interfaces	Display the entries in the ARP table without attempting to determine the hostname that corresponds to the IP address (the <b>no-resolve</b> option).
clear interfaces statistics <i>interface-name</i>	All interfaces	Reset the statistics for an interface to zero.
[edit interfaces <i>interface-name</i> ] set encapsulation cisco-hdlc	T1, T3, SONET, and Multichannel DS3 interfaces	The <b>encapsulation</b> statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces <i>interface-name</i> ] set no-keepalives	T1, T3, SONET, and Multichannel DS3 interfaces	The <b>no-keepalives</b> statement at this level disables the sending of keepalives on the physical interface.

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

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

## 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.

## Troubleshooting T1 Interfaces

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

- [Checklist for Monitoring T1 Interfaces on page 108](#)

### 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 108](#) provides the links and commands for monitoring T1 interfaces.

Table 7: Checklist for Monitoring T1 Interfaces

Tasks	Command or Action
<i>Monitor T1 Interfaces</i>	
1. <i>Display the Status of T1 Interfaces</i>	<b>show interfaces terse t1*</b>

Table 7: Checklist for Monitoring T1 Interfaces (*continued*)

Tasks	Command or Action
2. <i>Display the Status of a Specific T1 Interface</i>	<code>show interfaces t1-fpc/pic/port</code>
3. <i>Display Extensive Status Information for a Specific T1 Interface</i>	<code>show interfaces t1-fpc/pic/port extensive</code>
4. <i>Monitor Statistics for a T1 Interface</i>	<code>monitor interface t1-fpc/pic/port</code>

**Related Documentation**

- [T1 Interfaces Overview on page 45](#)

## 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 on page 109](#)
- [Diagnose a Suspected Hardware Problem with a T1 Interface on page 110](#)
- [Create a Loopback on page 111](#)
- [Set Clocking to Internal on page 112](#)
- [Verify That the T1 Interface Is Up on page 113](#)
- [Clear T1 Interface Statistics on page 114](#)
- [Force the Link Layer To Stay Up on page 115](#)
- [Verify the Status of the Logical Interface on page 116](#)
- [Ping the T1 Interface on page 118](#)
- [Check for T1 Interface Error Statistics on page 118](#)
- [Diagnose a Suspected Circuit Problem on page 120](#)

### Checklist for Using Loopback Testing for T1 Interfaces

**Purpose** To use loopback testing for T1 interfaces.

**Action** [Table 8 on page 109](#) provides commands for using loopback testing for T1 interfaces.

Table 8: Checklist for Using Loopback Testing for T1 Interfaces

Tasks	Command or Action
<b>“Diagnose a Suspected Hardware Problem with a T1 Interface” on page 110</b>	
1. Create a Loopback on page 111	
a. Create a Physical Loopback on page 111	Connect a T1 loopback plug.

Table 8: Checklist for Using Loopback Testing for T1 Interfaces (*continued*)

Tasks	Command or Action
b. <a href="#">Configure a Local Loopback on page 111</a>	<code>[edit interfaces <i>interface-name</i> t1-options] set loopback local show commit</code>
2. <a href="#">Set Clocking to Internal on page 112</a>	<code>[edit interfaces <i>interface-name</i>] set clocking internal show commit</code>
3. <a href="#">Verify That the T1 Interface Is Up on page 113</a>	<code>show interfaces t1-<i>fpc/pic/port</i></code>
4. <a href="#">Clear T1 Interface Statistics on page 114</a>	<code>clear interfaces statistics t1-<i>fpc/pic/port</i></code>
5. <a href="#">Force the Link Layer To Stay Up on page 115</a>	
a. <a href="#">Configure Encapsulation to Cisco-HDLC on page 115</a>	<code>[edit interfaces <i>interface-name</i>] set encapsulation cisco-hdlc show commit</code>
b. <a href="#">Configure No-Keepalives on page 115</a>	<code>[edit interfaces <i>interface-name</i>] set no-keepalives show commit</code>
6. <a href="#">Verify the Status of the Logical Interface on page 116</a>	<code>show interfaces t1-<i>fpc/pic/port</i> show interfaces t1-<i>fpc/pic/port</i> terse</code>
7. <a href="#">Ping the T1 Interface on page 118</a>	<code>ping interface t1-<i>fpc/pic/port</i> <i>local-IP-address</i> bypass-routing count 1000 rapid</code>
8. <a href="#">Check for T1 Interface Error Statistics on page 118</a>	<code>show interfaces t1-<i>fpc/pic/port</i> extensive</code>
<b>“Diagnose a Suspected Circuit Problem” on page 120</b>	
1. <a href="#">Create a Loop from the Router to the Network on page 120</a>	<code>[edit interfaces <i>interface-name</i> t1-options] set loopback remote show commit</code>
2. <a href="#">Create a Loop to the Router from Various Points in the Network on page 121</a>	Perform Steps 2 through 8 from “Diagnose a Suspected Hardware Problem with a T1 Interface” on page 110.

## 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 111](#)
2. [Set Clocking to Internal on page 112](#)
3. [Verify That the T1 Interface Is Up on page 113](#)
4. [Clear T1 Interface Statistics on page 114](#)
5. [Force the Link Layer To Stay Up on page 115](#)
6. [Verify the Status of the Logical Interface on page 116](#)
7. [Ping the T1 Interface on page 118](#)
8. [Check for T1 Interface Error Statistics on page 118](#)

## 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 111](#)
2. [Configure a Local Loopback on page 111](#)

---

### 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 115](#)
2. [Configure No-Keepalives on page 115](#)

---

### 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](mailto:support@juniper.net), or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

## Check for 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](mailto:support@juniper.net), or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

## Diagnose a Suspected Circuit Problem

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 120](#)
2. [Create a Loop to the Router from Various Points in the Network on page 121](#)

### 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 110](#). 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.

**Related Documentation**

- [T1 Interfaces Overview on page 45](#)

## Locate T1 Alarms and Errors

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

- [Checklist for T1 Alarms and Errors on page 121](#)
- [Display T1 Alarms and Errors on page 122](#)
- [Locate Most Common T1 Alarms and Errors on page 124](#)

### Checklist for T1 Alarms and Errors

**Purpose** To check T1 alarms and errors.

**Action** [Table 9 on page 121](#) provides the links and commands for checking T1 alarms and errors.

**Table 9: Checklist for T1 Alarms and Errors**

Tasks	Command or Action
<a href="#">“Display T1 Alarms and Errors” on page 122</a>	<code>show interfaces t1-fpc/pic/port extensive</code>
<a href="#">“Locate Most Common T1 Alarms and Errors” on page 124</a>	

Table 9: Checklist for T1 Alarms and Errors (*continued*)

Tasks	Command or Action
1. <a href="#">Locate Loss of Signal and Loss of Frame Alarms on page 124</a>	Check the connection between the router port and the first T1 network element.
2. <a href="#">Locate Alarm Indication Signal Alarms on page 125</a>	Check the T1 network element connected to the T1 interface.
3. <a href="#">Locate an Incoming Yellow Alarm on page 126</a>	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           0
```

```

ES                               32
SES                              32
SEFS                             32
BES                              0
UAS                              32
HDL 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 10 on page 123 lists the T1 media-specific alarms or defects that can render the interface unable to pass packets.

**Table 10: 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

Table 10: T1 Interface Alarms and Error Definitions (*continued*)

T1 Alarm or Error	Definitions
BPV	Bipolar violation
EXZ	Excessive zeros
LCV	Line code violation
PCV	Path code violation
CS	Controlled slip
LES	Line errored seconds
ES	Errored seconds
SES	Severely errored seconds
SEFS	Severely errored frame seconds
BES	Bursty errored seconds
UAS	Unavailable seconds

## Locate Most Common T1 Alarms and Errors

To locate common alarms and errors, follow these steps:

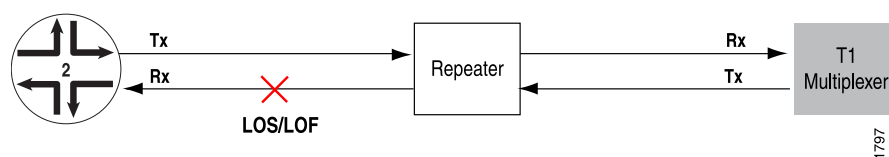
1. [Locate Loss of Signal and Loss of Frame Alarms on page 124](#)
2. [Locate Alarm Indication Signal Alarms on page 125](#)
3. [Locate an Incoming Yellow Alarm on page 126](#)

### 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 124](#), 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.

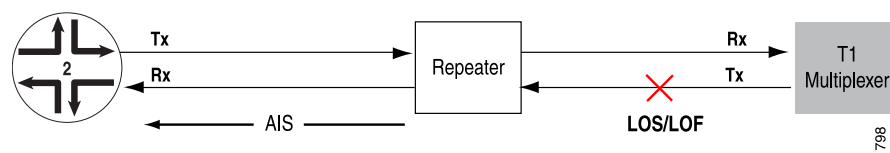
### Locate Alarm Indication Signal Alarms

**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 125](#) 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 125](#), 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.

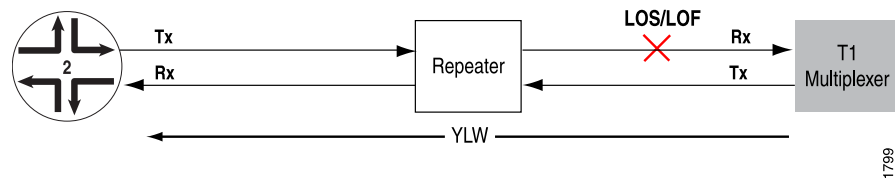
## Locate an Incoming Yellow Alarm

**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 126](#) 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 126](#), the T1 multiplexer detects an LOS or LOF alarm on its connection from Router 2 and sends a yellow (YLW) alarm to Router 2.

**Related Documentation**

- [T1 Interfaces Overview on page 45](#)



## CHAPTER 8

# Investigate T3 Interfaces

- [Investigating Interface Steps and Commands on page 127](#)
- [Monitor T3 Interfaces on page 130](#)
- [Use Loopback Testing for T3 Interfaces on page 135](#)
- [Locate T3 Alarms and Errors on page 137](#)

### Investigating Interface Steps and Commands

---

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

- [Investigating Interface Steps and Commands Overview on page 127](#)
- [Monitoring Interfaces on page 127](#)
- [Performing a Loopback Test on an Interface on page 128](#)
- [Locating Interface Alarms on page 130](#)

### Investigating Interface Steps and Commands Overview

The “[Monitoring Interfaces](#)” on [page 105](#) section helps you determine the nature of the interface problem. The “[Performing a Loopback Test on an Interface](#)” on [page 106](#) section provides information to help you isolate the source of the problem. The “[Locating Interface Alarms](#)” on [page 108](#) 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 106](#) lists and describes the operational mode commands you use to monitor interfaces.

**Table 11: Commands Used to Monitor Interfaces**

CLI Command	Description
<b>show interfaces terse <i>interface-name</i></b> For example: <b>show interfaces terse t1*</b>	Displays summary information about the named interfaces.
<b>show interfaces <i>interface-name</i></b> For example: <b>show interfaces t1-x/y/z</b>	Displays static status information about a specific interface.
<b>show interfaces <i>interface-name</i> extensive</b> For example: <b>show interfaces t1-x/y/z extensive</b>	Displays very detailed interface information about a specific interface.
<b>monitor interface <i>interface-name</i></b> For example: <b>monitor interface t1-x/y/z</b>	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. To 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. To 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 107](#) 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 12: Commands Used to Perform Loopback Testing on Interfaces**

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

Table 12: Commands Used to Perform Loopback Testing on Interfaces (*continued*)

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

## 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 on page 130](#)
- [Monitor T3 Interfaces on page 131](#)

## Checklist for Monitoring T3 Interfaces

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

**Action** [Table 13 on page 131](#) provides the links and commands for monitoring T3 interfaces.

Table 13: Checklist for Monitoring T3 Interfaces

Tasks	Command or Action
<b>“Monitor T3 Interfaces” on page 131</b>	
1. <a href="#">Display the Status of T3 Interfaces on page 131</a>	<b>show interfaces terse t3*</b>
2. <a href="#">Display the Status of a Specific T3 Interface on page 132</a>	<b>show interfaces t3-<i>fpc/pic/port</i></b>
3. <a href="#">Display Extensive Status Information for a Specific T3 Interface on page 133</a>	<b>show interfaces t3-<i>fpc/pic/port</i> extensive</b>
4. <a href="#">Monitor Statistics for a T3 Interface on page 134</a>	<b>monitor interface t3-<i>fpc/pic/port</i></b>

## 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 131](#)
2. [Display the Status of a Specific T3 Interface on page 132](#)
3. [Display Extensive Status Information for a Specific T3 Interface on page 133](#)
4. [Monitor Statistics for a T3 Interface on page 134](#)

### 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 14 on page 132](#) for a description of what the output means.

Table 14: Status of T3 Interfaces

Physical Interface	Logical Interface	Status Description
<b>t3-1/0/0</b> <b>Admin Down</b> <b>Link Up</b>	<b>t3-1/0/0.0</b> <b>Admin Up</b> <b>Link Down</b>	This interface is administratively disabled and the physical link is healthy ( <b>Link Up</b> ), but the logical interface is not established. The logical interface is down because the physical link is disabled ( <b>Link Down</b> ).
<b>t3-1/0/1</b> <b>Admin Up</b> <b>Link Down</b>	<b>t3-1/0/1.0</b> <b>Admin Up</b> <b>Link Down</b>	This interface is not functioning between the local router and the remote router because both the physical and logical links are down ( <b>Link Down</b> ). The interface is not administratively disabled because both the physical and logical links are up ( <b>Admin Up</b> ).
<b>t3-1/0/2</b> <b>Admin Up</b> <b>Link Up</b>	<b>t3-1/0/2.0</b> <b>Admin Up</b> <b>Link Up</b>	This interface has both the physical and logical links up and running.
<b>t3-1/0/3</b> <b>Admin Up</b> <b>Link Down</b>		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 137](#) 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 15 on page 135 presents problem situations and actions to help you further understand the problem.

**Table 15: 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.

**Related Documentation**

- [T3 Interfaces Overview on page 55](#)

## 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 on page 135](#)

### Checklist for Using Loopback Testing for T3 Interfaces

**Purpose** To use loopback testing to isolate T3 interface problems.

**Action** [Table 16 on page 135](#) provides links and commands for using loopback testing for T3 interfaces.

**Table 16: Checklist for Using Loopback Testing for T3 Interfaces**

<i>Diagnose a Suspected Hardware Problem with a T3 Interface</i>	Command or Action
1. <i>Create a Loopback</i>	

Table 16: Checklist for Using Loopback Testing for T3 Interfaces (*continued*)

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

Related • [T3 Interfaces Overview on page 55](#)  
Documentation

## Locate T3 Alarms and Errors

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

- [Checklist of Common T3 Alarms and Errors on page 137](#)
- [Display T3 Alarms and Errors on page 137](#)
- [Locate Most Common T3 Alarms and Errors on page 139](#)

### Checklist of Common T3 Alarms and Errors

**Purpose** To check T3 alarms and errors,

**Action** [Table 17 on page 137](#) provides the links and commands for checking T3 alarms and errors.

**Table 17: Checklist of Common T3 Alarms and Errors**

Tasks	Command or Action
<a href="#">“Display T3 Alarms and Errors” on page 137</a>	<code>show interfaces t3-fpc/pic/port extensive</code>
<a href="#">“Locate Most Common T3 Alarms and Errors” on page 139</a>	
1. <a href="#">Locate Loss of Signal and Loss of Frame Alarms on page 139</a>	Check the connection between the router port and the first T3 network element.
2. <a href="#">Locate Alarm Indication Signal Alarms on page 140</a>	Check the T3 network element connected to the T3 interface.
3. <a href="#">Locate an Incoming Yellow Alarm on page 141</a>	Check the cable between the T3 interface and the directly connected T3 network element.
4. <a href="#">Locate IDLE on a T3 Interface on page 141</a>	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 18 on page 139](#) lists the T3 media-specific alarms or errors that can render the interface unable to pass packets.

**Table 18: 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:

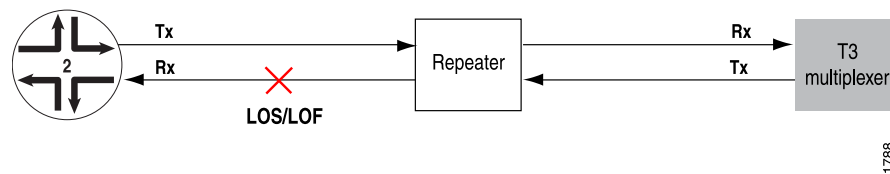
1. [Locate Loss of Signal and Loss of Frame Alarms on page 139](#)
2. [Locate Alarm Indication Signal Alarms on page 140](#)
3. [Locate an Incoming Yellow Alarm on page 141](#)
4. [Locate IDLE on a T3 Interface on page 141](#)

### 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 140](#), 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

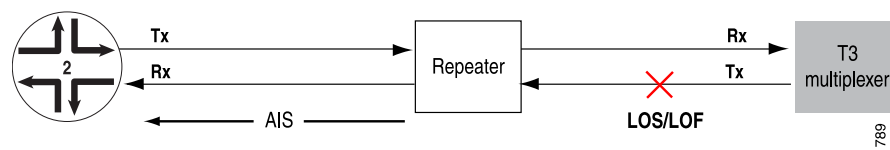
**Problem** An alarm indication signal (AIS) is a valid framed signal with payload containing a repeating 1010 pattern. An AIS alarm indicates a problem with the line upstream from the T3 network element connected to the T3 interface.

**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 140 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 140, 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.

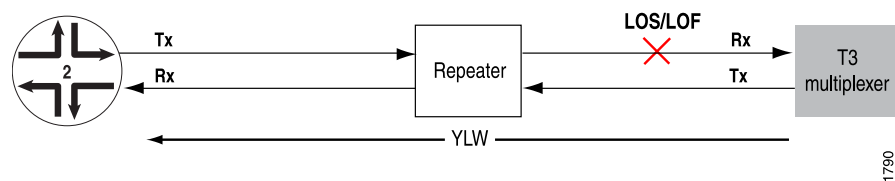
### Locate an Incoming Yellow Alarm

**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 141](#) 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
```

**Related Documentation**

- [T3 Interfaces Overview on page 55](#)





## PART 5

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