

## Chapter 20

# Configuring E1 Interfaces

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).

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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;  
}
```

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## Configuring E1 BERT Properties

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This section discusses BERT properties for the E1 interface specifically. For general information about the JUNOS implementation of the BERT procedure, see “Interface Diagnostics” on page 111.

You can configure an E1 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 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.

*rate* is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (0, which corresponds to no errors) to  $10^{-7}$  (1 error per 10 million bits). The default is 0.

Individual concatenated E1 interfaces do not support the `bert-algorithm` configuration statement. For individual concatenated E1 interfaces, the `bert-algorithm` statement at the `[edit interfaces interface-name e1-options]` hierarchy level is ignored. The algorithm for the E1 BERT procedure is `pseudo-2e15-o151` (pattern is  $2^{15}-1$ , as defined in the CCITT/ITU O.151 standard).

For channelized E1 intelligent queuing (IQ) 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.152 standard)
pseudo-2e20-o151  Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e20-o153  Pattern is 2^20 - 1 (per O.153 standard)
```

## Configuring the E1 Frame Checksum

By default, the E1 interface supports a 16-bit checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the `fcs 32` statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the `fcs 32` statement from the configuration:

```
[edit]
user@host# delete interfaces e1-fpc/pic/port e1-options fcs 32
```

To explicitly configure a 16-bit checksum, include the `fcs 16` statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
fcs 16;
```

## Configuring E1 Framing

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By default, E1 interfaces use the G704 framing mode. You can configure the alternative unframed mode if needed.

To have the interface use the unframed mode, include the **framing** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **unframed** option:

```
[edit interfaces interface-name e1-options]
  framing unframed;
```

To explicitly configure G704 framing, include the **framing** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **g704** option:

```
[edit interfaces interface-name e1-options]
  framing g704;
```

By default, G704 framing uses CRC4. To explicitly configure an interface's G704 framing to not use CRC4, include the **framing** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **g704-no-crc4** option:

```
[edit interfaces interface-name e1-options]
  framing g704-no-crc4;
```

## Configuring the E1 Idle Cycle Flag

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By default, an E1 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name e1-options]
  idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name e1-options]
  idle-cycle-flag flags;
```

## Configuring E1 Data Inversion

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By default, data inversion is disabled. To enable data inversion at the HDLC level, include the **invert-data** statement at the [edit interfaces *interface-name* e1-options] hierarchy level:

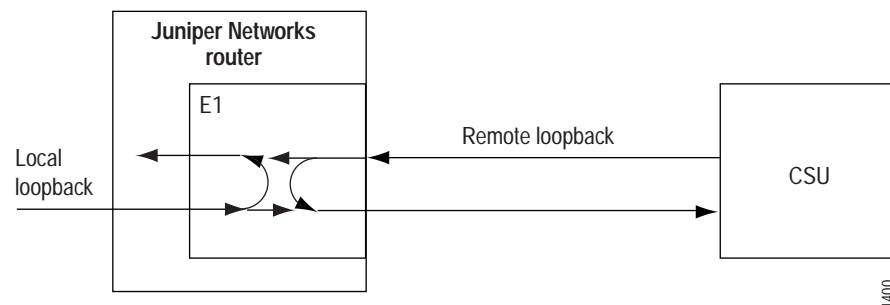
```
[edit interfaces interface-name e1-options]
  invert-data;
```

When you enable data inversion, all data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Data inversion is normally used only in AMI mode to guarantee ones density in the transmitted stream.

## Configuring E1 Loopback Capability

You can configure loopback capability between the local E1 interface and the remote channel service unit (CSU), as shown in Figure 28. 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 28: 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 routing platform or the remote CSU.

To exchange BERT patterns between a local routing platform and a remote routing platform, include the `loopback remote` statement in the interface configuration at the remote end of the link. From the local routing platform, you issue the `test interface` command.

For more information about configuring BERT, see “Interface Diagnostics” on page 111. For more information about using operational mode commands to test interfaces, see the *JUNOS System Basics and Services Command Reference*.

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

```
[edit]
user@host# delete interfaces e1-fpc/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 routing platform. 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 routing platform. The `loopback local` statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
e1-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
  e1-options {
    loopback local;
  }
  unit 0 {
    family inet {
      address 10.100.100.1/24;
    }
  }
}
```

### Configuring E1 Start and End Flags

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By default, an E1 interface transmits the start and end flags at the same time.

To configure an E1 interface to wait two idle cycles between the start and end flags, include the `filler` statement at the `[edit interfaces interface-name e1-options start-end-flag]` 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 `shared` statement at the `[edit interfaces interface-name e1-options start-end-flag]` hierarchy level:

```
[edit interfaces interface-name e1-options]
start-end-flag shared;
```

## Configuring Fractional E1 Time Slots

By default, all the time slots on an E1 interface are used. To configure the number of time slots allocated to a fractional E1 interface, include the `timeslots` statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
timeslots time-slot-range;
```

There are 32 time slots on an E1 interface. Time slot 0 is always reserved for framing and cannot be used to configure a fractional E1 interface.

Time slot numbering constraints vary for different E1 PICs. 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 IQ PICs, the configurable time-slot range is 2 through 32 (time slots 0 and 1 are reserved for framing).

For 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. 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.

<b>Use Time Slots 3 Through 5, 10, and 24</b>	<code>[edit interfaces <i>interface-name</i> e1-options] # Fractional E1 interface</code> <code>timeslots 4-6,11,25;</code>
<b>Use Time Slots 1 Through 10</b>	<code>[edit interfaces <i>interface-name</i> e1-options]</code> <code>timeslots 1-10;</code>
<b>Use Time Slots 1 Through 5, 10, and 24</b>	<code>[edit interfaces <i>interface-name</i> e1-options]</code> <code>timeslots 1-5,10,24;</code>

