Chapter 19

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).

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;
}
```

You can configure the following E1-specific properties:

- Configuring E1 BERT Properties on page 360
- Configuring the E1 Frame Checksum on page 361
- Configuring E1 Framing on page 362
- Configuring the E1 Idle Cycle Flag on page 362
- Configuring E1 Data Inversion on page 362
- Configuring E1 Loopback Capability on page 363
- Configuring E1 Start and End Flags on page 364
- Configuring Fractional E1 Time Slots on page 365

See also the following sections, which apply to a number of different interfaces:

- Configuring the Media MTU on page 69
- Configuring the Encapsulation on a Physical Interface on page 75
- Configuring the Clock Source on page 89
- Configuring Receive and Transmit Leaky Bucket Properties on page 90
- Configuring an ISDN Dialer Interface as a Backup Interface on page 466

Configuring E1 BERT Properties

This section discusses BERT properties for the E1 interface specifically. For general information about the JUNOS implementation of the BERT procedure, see "Interface Diagnostics" on page 94.

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 0.152 standard)
pseudo-2e15-o151     Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151     Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153     Pattern is 2^20 - 1 (per 0.153 standard)
```

Configuring the E1 Frame Checksum

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

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

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

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

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

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

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

Configuring E1 Framing

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

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

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

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

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

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

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

Configuring the E1 Idle Cycle Flag

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

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

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

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

Configuring E1 Data Inversion

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

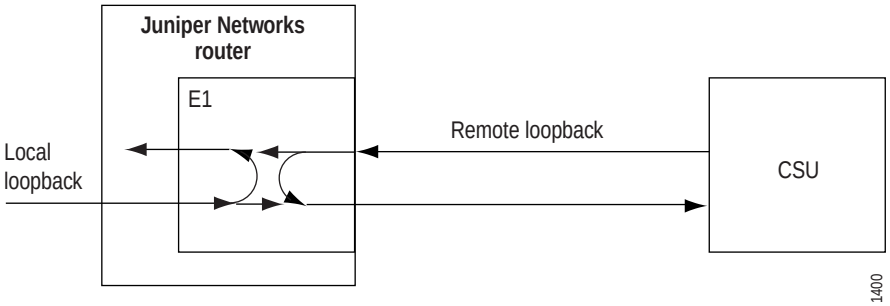
```
[edit interfaces interface-name e1-options]
invert-data;
```

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

Configuring E1 Loopback Capability

You can configure loopback capability between the local E1 interface and the remote channel service unit (CSU), as shown in Figure 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 94. 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

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.

Use Time Slots 3 Through 5, 10, and 24

```
[edit interfaces interface-name e1-options] # Fractional E1 interface
timeslots 4-6,11,25;
```

Use Time Slots 1 Through 10

```
[edit interfaces interface-name e1-options]
timeslots 1-10;
```

Use Time Slots 1 Through 5, 10, and 24

```
[edit interfaces interface-name e1-options]
timeslots 1-5,10,24;
```