Chapter 21

Configuring E3 Interfaces

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 software supports the E3 Physical Interface Card (PIC) and the E3 Intelligent Queuing (IQ) PIC. The E3 IQ PIC supports transmission scheduling on logical interfaces. For more information, see the *JUNOS Class of Service Configuration Guide*.

NOTE: In unframed mode, the E3 IQ PIC does not detect yellow or loss-of-frame alarms.

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;
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag value;
    (unframed | no-unframed);
}
```

This chapter contains the following sections:

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" on page 111.

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.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)
```

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the *JUNOS System Basics and Services Command Reference*.

Configuring the E3 CSU Compatibility Mode

Subrating an E3 interface reduces the maximum allowable peak rate by limiting the High-level Data Link Control (HDLC)-encapsulated payload. Subrate modes configure the PIC to connect with channel service units (CSUs) that use proprietary methods of multiplexing.

On M-series and T-series routing platforms, 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.

To configure an E3 interface so that it is compatible with the CSU at the remote end of the line, include the compatibility-mode statement at the [edit interfaces *interface-name* e3-options] hierarchy level:

```
[edit interfaces interface-name e3-options]
compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
```

The subrate of an E3 interface must exactly match that of the remote CSU. To specify the subrate, include the subrate statement in the configuration:

- For Kentrox CSUs, specify the subrate as a number from 1 through 48 that exactly matches the value configured on the CSU. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.
- For Digital Link CSUs, you can specify the subrate value to match the data rate configured on the CSU in the format *x*kb or *x.x*Mb. You can configure the subrate values shown in Table 37 on page 410.
- Larscom CSUs do not support E3 subrate.

Table 37: Subrate Values for E3 Digital Link Compatibility Mode

358 Kbps	7.2 Mbps	14.0 Mbps	20.8 Mbps	27.6 Mbps
716 Kbps	7.5 Mbps	14.3 Mbps	21.1 Mbps	27.9 Mbps
1.1 Mbps	7.9 Mbps	14.7 Mbps	21.5 Mbps	28.3 Mbps
1.4 Mbps	8.2 Mbps	15.0 Mbps	21.8 Mbps	28.6 Mbps
1.8 Mbps	8.6 Mbps	15.4 Mbps	22.2 Mbps	29.0 Mbps
2.1 Mbps	9.0 Mbps	15.8 Mbps	22.6 Mbps	29.4 Mbps
2.5 Mbps	9.3 Mbps	16.1 Mbps	22.9 Mbps	29.7 Mbps
2.9 Mbps	9.7 Mbps	16.5 Mbps	23.3 Mbps	30.1 Mbps
3.2 Mbps	10.0 Mbps	16.8 Mbps	23.6 Mbps	30.4 Mbps
3.6 Mbps	10.4 Mbps	17.2 Mbps	24.0 Mbps	30.8 Mbps
3.9 Mbps	10.7 Mbps	17.5 Mbps	24.3 Mbps	31.1 Mbps
4.3 Mbps	11.1 Mbps	17.9 Mbps	24.7 Mbps	31.5 Mbps
4.7 Mbps	11.5 Mbps	18.3 Mbps	25.1 Mbps	31.9 Mbps
5.0 Mbps	11.8 Mbps	18.6 Mbps	25.4 Mbps	32.2 Mbps
5.4 Mbps	12.2 Mbps	19.0 Mbps	25.8 Mbps	32.6 Mbps
5.7 Mbps	12.5 Mbps	19.3 Mbps	26.1 Mbps	32.9 Mbps
6.1 Mbps	12.9 Mbps	19.7 Mbps	26.5 Mbps	33.3 Mbps
6.4 Mbps	13.2 Mbps	20.0 Mbps	26.9 Mbps	33.7 Mbps
6.8 Mbps	13.6 Mbps	20.4 Mbps	27.2 Mbps	

For information about subrating a T3 interface, see “Configuring the T3 CSU Compatibility Mode” on page 624.

Configuring the E3 Frame Checksum

You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

On a channelized OC12 interface, the fcs statement is not supported. To configure FCS on each E3 channel, you must include the e3-options fcs statement in the configuration for each channel.

To configure a 32-bit checksum, include the fcs statement at the [edit interfaces *interface-name* E3-options] hierarchy level:

```
[edit interfaces interface-name e3-options]
fcs 32;
```

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

```
[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs** statement at the [edit interfaces *interface-name* e3-options] hierarchy level:

```
[edit interfaces interface-name e3-options]
fcs 16;
```

Configuring the E3 Idle Cycle Flag

By default, an E3 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the [edit interfaces *interface-name* e3-options] hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name e3-options]
idle-cycle-flag ones;
```

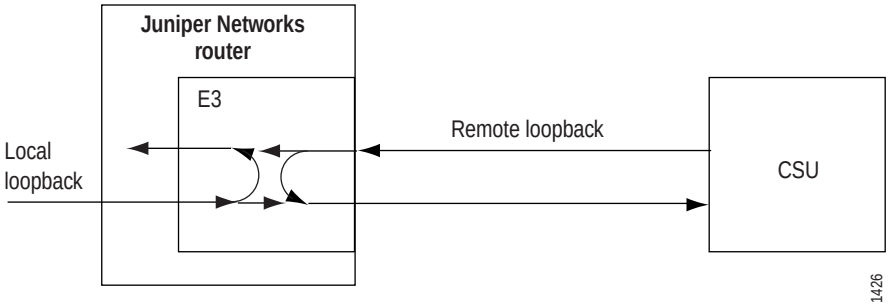
To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name e3-options]
idle-cycle-flag flags;
```

Configuring E3 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 29).

Figure 29: 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 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 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 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* e3-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]
e3-1/0/0 {
    no-keepalives;
    encapsulation cisco-hdlc;
    e3-options {
        loopback local;
    }
    unit 0 {
        family inet {
            address 10.100.100.1/24;
        }
    }
}
```

Configuring E3 HDLC Payload Scrambling

E3 HDLC payload scrambling, which is disabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.

To configure scrambling on the interface, you can include the payload-scrambler statement at the [edit interfaces *interface-name* e3-options] hierarchy level:

```
[edit interfaces interface-name e3-options]
payload-scrambler;
```

To explicitly disable HDLC payload scrambling, include the no-payload-scrambler statement at the [edit interfaces *interface-name* e3-options] hierarchy level:

```
[edit interfaces interface-name e3-options]
no-payload-scrambler;
```

To disable payload scrambling again (return to the default), delete the payload-scrambler statement from the configuration:

```
[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options payload-scrambler
```

Configuring the E3 Start and End Flags

By default, an E3 interface shares the transmission of the start and end flags

To configure an E3 interface to wait two idle cycles between the start and end flags, include the filler statement at the [edit interfaces *interface-name* e3-options start-end-flag] 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 shared statement at the [edit interfaces *interface-name* e1-options start-end-flag] hierarchy level:

```
[edit interfaces interface-name e3-options]
start-end-flag shared;
```

Configuring E3 IQ Unframed Mode

For E3 IQ interfaces only, you can enable or disable unframed mode. In unframed mode, the E3 IQ interface does 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;
```