Chapter 30

Configuring T1 Interfaces

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

ANSI TI.107, TI.102

GR 499-core, GR 253-core

AT&T Pub 54014

ITU G.751, G.703

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 (nx64 | nx56);
    fcs (32 | 16);
    framing (sf | esf);
    idle-cycle-flag (flags | ones);
    invert-data;
    line-encoding (ami | b8zs);
    loopback (local | payload | remote);
    remote-loopback-respond;
    start-end-flag (shared | filler);
    timeslots time-slot-range;
}
```

You can configure the following T1 interface-specific properties:

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

Configuring T1 BERT Properties

You can configure a T1 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* 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.

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.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 Network and Services Interfaces Command Reference*.

Configuring the T1 Buildout

A T1 interface has five possible setting ranges for the T1 line buildout: 0-132, 133-265, 266-398, 399-531, or 532-655 feet. By default, the T1 interface uses the shortest setting (0-132).

To have the interface drive a line at one of the longer distance ranges, include the buildout statement with the appropriate value at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
buildout value;
```

Configuring T1 Byte Encoding

By default, T1 interfaces use a byte encoding of 8 bits per byte (nx64). You can configure an alternative byte encoding of 7 bits per byte (nx56).

To have the interface use 7 bits per byte encoding, include the byte-encoding statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the nx56 option:

```
[edit interfaces interface-name t1-options]
byte-encoding nx56;
```

To explicitly configure nx64 byte encoding, include the byte-encoding statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the nx64 option:

```
[edit interfaces interface-name t1-options]
byte-encoding nx64;
```

Configuring T1 Data Inversion

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the invert-data statement at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
invert-data;
```

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

Configuring the T1 Frame Checksum

By default, T1 interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the fcs 32 statement at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
fcs 32;
```

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

```
[edit]
user@host# delete interfaces t1-fpc/pic/port t1-options fcs 32
```

To explicitly configure a 16-bit checksum, include the fcs 16 statement at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
fcs 16;
```

Configuring the T1 Remote Loopback Response

The T1 facilities data-link loop request signal is used to communicate various network information in the form of in-service monitoring and diagnostics. Extended superframe, through the facilities data link (FDL), supports nonintrusive signaling and control, thereby offering clear-channel communication. Remote loopback requests can be over the FDL or inband. To configure the routing platform 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 routing platform does not respond to remote loopback requests.

Configuring T1 Framing

By default, T1 interfaces use extended superframe framing format. You can configure SF (superframe) as an alternative.

To have the interface use the SF framing format, include the framing statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the sf option:

```
[edit interfaces interface-name t1-options]
framing sf;
```

To explicitly configure ESF framing, include the framing statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the esf option:

```
[edit interfaces interface-name t1-options]
framing esf;
```

Configuring T1 Line Encoding

By default, T1 interfaces use B8ZS line encoding. You can configure AMI line encoding if necessary.

To have the interface use AMI line encoding, include the line-encoding statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the ami option:

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

To explicitly configure B8ZS line encoding, include the line-encoding statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the b8zs option:

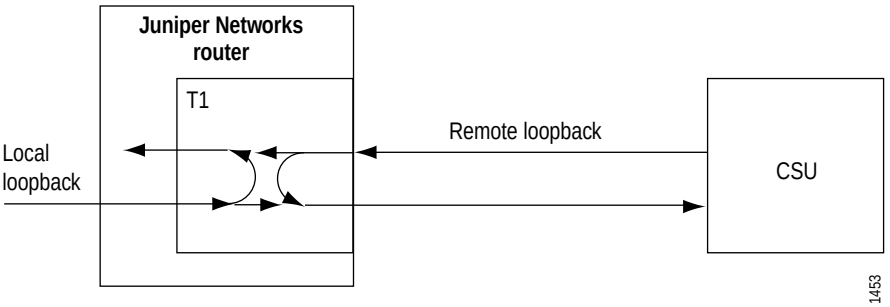
```
[edit interfaces interface-name t1-options]
line-encoding b8zs;
```

When setting the line encoding parameter, you must set the same value for paired ports. Ports 0 and 1 must share the same value, and likewise ports 2 and 3 must share the same value, but ports 0 and 1 can have a different value from that of ports 2 and 3.

Configuring T1 Loopback Capability

You can configure loopback capability between the local T1 interface and the remote channel service unit (CSU), as shown in Figure 34. 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 34: 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 routing platform or the remote CSU. Local and remote loopback loop back both data and clocking information.

To exchange BERT patterns between a local routing platform and a remote routing platform, you 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 “Configuring BERT Properties” on page 86. For more information about using operational mode commands to test interfaces, see the *JUNOS Netw ork and Services Interf aces Command R eference*.

For channelized T3, T1, and *N*xDS0 intelligent queuing (IQ) interfaces only, you can include the loopback payload statement in the configuration to loop back data only (without clocking information) on the remote routing platform’s PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the loopback payload statement at the [edit interfaces ct3-*fpc*/*pic*/*port*] and [edit interfaces t3-*fpc*/*pic*/*port*:*channel*] hierarchy levels. For T1 interfaces, you can include the loopback payload statement in the configuration at the [edit interfaces t1-*fpc*/*pic*/*port*:*channel*] hierarchy level; it is ignored if included at the [edit interfaces ct1-*fpc*/*pic*/*port*] hierarchy level. For *N*xDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. *N*xDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote 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* 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;
        }
    }
}
```

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.

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
```

Configuring the T1 Idle Cycle Flag

By default, a T1 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the idle-cycle-flag statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the ones option:

```
[edit interfaces interface-name t1-options]
idle-cycle-flag ones;
```

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

```
[edit interfaces interface-name t1-options]
idle-cycle-flag flags;
```

Configuring T1 Start End Flags

By default, a T1 interface waits two idle cycles between sending start and end flags. To configure the interface to share the transmission of start and end flags, include the start-end-flag statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the shared option:

```
[edit interfaces interface-name t1-options]
start-end-flag shared;
```

To explicitly configure the default of waiting two idle cycles between the start and end flags, include the idle-cycle-flag statement with the filler option:

```
[edit interfaces interface-name t1-options]
start-end-flag filler;
```

Configuring Fractional T1 Time Slots

By default, all the time slots on a T1 interface are used. To configure the number of time slots allocated to a fractional T1 interface, include the timeslots statement at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
timeslots time-slot-range;
```

For T1 interfaces, the time-slot range is from 1 through 24. There are 24 time slots on a T1 interface. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

Example: Configuring Fractional T1 Time Slots

Use Time Slots 1 Through 10

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

Use Time Slots 1 Through 5, 10, and 24

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

Use the First Four Odd-Numbered Time Slots

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