Trinity Feature:
T1/E1 Configuration

Reference Guide Appendix

Appendix   T1/E1 Configuration

Chapter contents

Overview

This chapter describes how to configure T1/E1 on the Trinity platform.

> **Note** The menu, commands, and features for your model may vary slightly from what is shown in this manual. Some models may not include all of the features mentioned. Refer to the model's *User Manual*, available online at **www.patton.com/manuals**, to see which features are available.

Configuration Overview

T1 and E1 ports are used for framing and signaling data. T1 and E1 are TDM protocols. T1 is used primarily in the USA. Its frame consists of 1 framing bit and 24 timeslots that can carry data. E1 is used in most other countries. Its frame consists of 1 timeslot used for frame synchronization and 31 timeslots that can carry data. In some models, the T1/E1 timeslots are mapped to data channels that can then be used to transport PPP packets.

Configuring Data channels over the T1/E1 ports is done using the following steps:

1. **Configure Clocking**: T1/E1 clocking is a global setting - the clocking is used for all ports. Both the clock source and the fallback mode must be configured.

- **Clock Source**

    - Internal: Use the internal clock as the clock source at all times.

    - Primary/Secondary: Use the clock recovered from the primary port, the clock recovered from the secondary port, or the internal clock. When to use which clock source depends on the fallback mode and the link state of the primary and secondary ports.

- **Fallback Mode**

    – None: Use the primary clock source while the port is up. Otherwise, use the internal clock.

    – Fallback: Use the primary clock source until the port goes down. Then, use the secondary clock while the port is up, and the internal clock otherwise. To use the primary clock source again, the fallback condition must be manually reset.

    – Fall-Forward: Use the primary clock source while the port is up. Use the secondary clock source while the primary port is down. Use the internal clock while both the primary and secondary ports are down.

2. Select the Mode: T1 or E1.

> **Note** You cannot change the mode while there are any data channels mapped to the port.

3. **Configure the T1 or E1 Application**: Configure framing, line code, application, line build out, and loss-of-signal threshold.

- **Enabled**: Normal operation or power down the port.

- **Framing**: There are five framing formats available, two for T1 and three for E1:

    - D4 (T1 only)

- ESF (T1 only)

- Clear interface (E1 only): G.703. This is actually unframed. All timeslots carry data.

- Basic Frame (E1 only): G.703/G.704. This can also be referred to as fractional.

- CRC4 Multi-frame (E1 only)

- **Line Code**: There are three line codes available:

  - AMI (both T1 and E1)

  - B8ZS (T1 only)

  - HDB3 (E1 only)

- **Application:** This specifies the receiver sensitivity. Longer cables require greater receiver sensitivity.

  - Short-haul: Typically 655 feet and shorter cable length.

  - Long-haul: Typically longer than 655 feet cable length.

- **Line Build Out:** This only applies to T1 mode. It specifies the transmit pulse attenuation. This is used to prevent cross-talk in the far end. For short-haul applications, the value is set according to the cable length in feet. Valid settings are 0-133 ft., 133-266 ft., 266-399 ft., 399-533 ft., and 533-655 ft. For long-haul applications, the value is set in decibels. Valid settings are 0.0 dB, -7.5 dB, -15.0 dB, and -22.5 dB.

- **LOS (Loss-of-Signal) Threshold**: This only applies for long-haul applications, both in T1 and E1 mode. If the signal drops below the specified level, LOS will be reported. The level may be between -48 dB and -4 dB, inclusive.

4. Create data channels: Map data channels to selected T1 or E1 timeslots. These data channels can then be used as the transport for a PPP interface. The timeslots are specified using commas and dashes. For example: 1-3,5,7-8 maps the data channel to timeslots 1, 2, 3, 5, 7, and 8.

> **Note**   You cannot remove a data channel while it is bound to a PPP interface.

In addition to the above configuration, the following test modes are available:

- **Local Analog Loopback:** This is not useful for the 288x.

- **Local Digital Loopback:** This is not useful for the 288x.

- **Network Loopback:** This loops the clock and data received from the line back to the line. This can be used to allow the far end to run a bit error rate test (BERT) to test the link.

To configure T1/E1 through the WMI,
see the section "Web Management Interface (WMI)" on page 6.

To configure T1/E1 through the CLI,
see the section "Command Line Interface (CLI)" on page 10.

Web Management Interface (WMI)

To reach the main **T1/E1 Configuration** page, click on **Interface Configuration > T1/E1** in the main menu.

Figure 1. T1/E1 Configuration screen

Configure Clocking

To configure the clock source:

1. Choose an option from the **Primary Clock** drop-down menu.

   – **Internal:** Use the internal clock as the clock source.

   – **Primary/Secondary:** Use the clock recovered from the primary port, the clock recovered from the secondary port, or the internal clock. When to use which clock source depends on the fallback mode and the link state of the primary and secondary ports.

2. Select an option from the **Fallback Mode** drop-down menu.

   – **None:** Use the primary clock source while the port is up. Otherwise, use the internal clock.

   – **Fallback:** Use the primary clock source until the port goes down. Then, use the secondary clock while the port is up, and the internal clock otherwise. To use the primary clock source again, the fallback condition must be manually reset.

   – **Fall-Forward:** Use the primary clock source while the port is up. Use the secondary clock source while the primary port is down. Use the internal clock while both the primary and secondary ports are down.

   > **Note** The clock will fall-forward to the primary clock source when the primary clock source comes back up.

3. Click **Update**.

Manage Ports

To view the configuration screen for a T1/E1 port:

1. Click on the link of the port that you would like to configure in the **Port** column.

2. The link will lead to the port's status screen. On the port status screen, click on the **Configuration** tab.

Port Configuration

Mode. To configure the mode of a port:

1. Choose either **T1** or **E1** from the **Mode** drop-down menu.

> **Note** When switching modes, you need to delete any existing data channels, and then create any desired data channels.

2. Click **Update**.

Configuration Settings. To edit the configuration settings for a T1/E1 port:

1. Set the following options to configure a T1/E1 port:

   – **Enabled:** Select **Enabled** to enable the port; select **Disabled** to disable a port.

   – **Framing:**

      T1 Mode: Select **D4** or **ESF**.

      E1 Mode: Select **Clear interface**, **Basic Frame**, or **CRC4 Multi-frame**.

   – **Line Code:**

      T1 Mode: Select **AMI** or **B8ZS**.

      E1 Mode: Select **AMI** or **HDB3**.

   – **Application:** Select **Short Haul** or **Long Haul**.

      Short Haul: Typically 655 feet and shorter cable length.

      Long Haul: Typically longer than 655 feet cable length.

   – **Line Build Out:**
     For short-haul applications. select **0-133 ft.**, **133-266 ft.**, **266-399 ft.**, **399-533 ft.**, or **533-655 ft.**.
     For long-haul applications. select **0.0 dB**, **-7.5 dB**, **-15.0 dB**, or **-22.5 dB**.
     This only applies to T1 mode. It specifies the transmit pulse attenuation. This is used to prevent crosstalk in the far end. For short-haul applications, the value is set according to the cable length in feet. For long-haul applications, the value is set in decibels.

   – **LOS Threshold**: Select from a range of even-numbered intervals between **-4.0 dB to -48.0 dB**.
     This only applies for long-haul applications, both in T1 and E1 mode. If the signal drops below the specified level, LOS will be reported.

   – **Loopback:** Select **Off**, **Local Analog**, **Local Digital**, or **Network**. The Loopback options are test modes for T1/E1 configuration. The **Network Loopback** loops the clock and received data from the line and back to the line. This loopback mode can be used to allow the far end to run a bit error test to test the link.

2. Click **Update.**

Figure 2. T1/E1 Port Configuration Settings

Data Channels. To add a data channel:

1. Enter a number in the **Channel** field of the **Data Channels** table. This number is used to identify the channel.

2. Enter the number of timeslots in the **Timeslots** box. For T1 ports, the valid timeslots are from 1 to 24. For E1 ports, the valid timeslots are from 1 to 31 except when the framing type is clear-interface, in which case the timeslots must be exactly 0-31.

3. Enter a description (optional) (such as a location or other characteristic) in the **Description** field. If no description is specified, the system will use the default description (**Data Channel**).

4. Click the **Add** button in the Delete column.

To delete a data channel:

1. Select the checkbox for the interface in the **Delete** column of the **Data Channels** table.

2. Click **Delete.**

Figure 3. Adding and Deleting Data Channels

Port Status

To view the status of a T1/E1 port:

1. Click on the link of the port that you would like to configure in the **Ports** table on the main T1/E1 page, or, from a port configuration page, click on the **Status** tab.

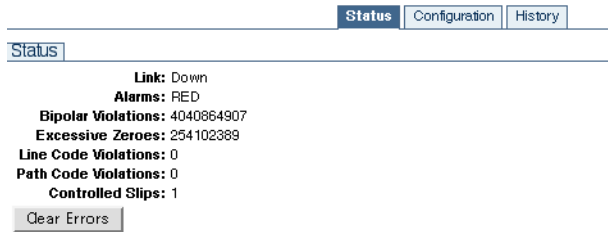2. Click **Clear Errors** to clear and refresh the status of a port.

Figure 4. Port Status

Port History

To view the history of a port:

1. Click on the link of the port that you would like to configure in the **Ports** table on the main T1/E1 page, or, from a port configuration page, click on the **History** tab.

2. Click **Clear History** to clear and refresh the history of a port. This will clear the performance history of the selected port, but not the error counters.

Figure 5. Port History

Command Line Interface (CLI)

Configuring the Clock Source

Table 1. T1/E1 - Clock Source - CLI Commands

Command	Explanation
Trinity# configure controller t1e1-clocking source primary internal	Set the clock source as internal. All ports slave from the internal clock. In internal clock mode, the secondary clock source and fallback mode are ignored.
Trinity# configure controller t1e1-clocking source primary <port>	Select a primary clock source.
Trinity# configure controller t1e1-clocking source secondary <port>	Select a secondary clock source.
Trinity# configure controller t1e1-clocking mode {no-fallback|fall-back|fallforward}	Select the fallback mode.
Trinity# configure controller t1e1-clocking reset fallback	Manual reset fallback. This is only valid if the fallback mode is set to fallback.
Trinity# configure controller t1e1-clocking show	Show the clocking settings.

Selecting T1 or E1 Mode

Table 2. T1/E1 - Mode - CLI Commands

Command	Explanation
Trinity# configure controller t1e1 <port>	Enter the configuration mode for the specified port.
Trinity[t1e1-0]# mode {t1|e1}	Select T1 or E1 mode.

Configuring T1 or E1 Applications

Table 3. T1/E1 - Applications - CLI Commands

Command	Explanation
Trinity[t1e1-0]# framing {d4|esf|clear-interface|fractional|crc}	Set the framing. D4 and ESF are valid T1 frames. Clear-interface (G.703), fractional (G.703/G.704), and CRC4 Multiframe are valid E1 frames.
Trinity[t1e1-0]# [no] shutdown	Power up/down the port.
Trinity[t1e1-0]# line-code {ami|b8zs|hdb3}	Set the line code. AMI is valid for both T1 and E1. B8ZS is valid for T1 only. HDB3 is valid for E1 only.
Trinity[t1e1-0]# application {short-haul|long-haul}	Select short haul (typically less than 655 feet cable) or long haul application.
Trinity[t1e1-0]# line-build-out {0-133|133-266|266-399|399-533|533-655|0.0|-7.5|-15.0|-22.5}	Set the line build out in order to prevent cross-talk in the far end. This is only valid in T1 mode.

Table 3. T1/E1 - Applications - CLI Commands

Command	Explanation
Trinity[t1e1-0]# los-threshold <-48 - -4>	Set the loss-of-signal threshold in dB. This is only valid in long-haul applications (both T1 and E1).

Creating Data Channels

Table 4. T1/E1 - Data Channels - CLI Command

Command	Explanation
Trinity[t1e1-0]# channel <id> timeslots <timeslots>	Map the specified timeslots to a data channel. Timeslots should be specified using dashes and commas. For example, 1-3,5,7-8 specifies timeslots 1, 2, 3, 5, 7, and 8.
	In T1 mode, the valid timeslots are from 1 to 24. In E1 mode, the valid timeslots are from 1 to 31 except when framing is clear-interface, in which case the timeslots must be exactly 0-31.
	Once the data channel is created, a PPP interface can use it.

Note

- When changing between T1 and E1 modes, the data channels are no longer valid for two reasons:

  – The timeslots may be invalid. For example, 1-31 is a valid timeslot selection for E1, but not for T1.

  – The same T1/E1 timeslot maps to a different timeslot internally on the pulse-code modulation (PCM) highway.

- A data channel should not be deleted if a PPP interface is using it.

Showing Configuration and Status

Table 5. T1/E1 - Show Configuration & Status - CLI Command

Command	Explanation
Trinity[t1e1-0]# show	Enter the show mode.
Trinity# show controller t1e1 0	Show the configuration, the status, and the data channels.

```
configuration:
  t1 esf (b8zs)
  short-haul, 0.0 dB line build out
  normal operation
status:
  link up
  alarms: clear
  errors: lcv=0 pcv=0 lcv=0 pcv=0 cs=0
data channels:
  channel 0   : 1-24
```

Trinity[t1e1-0]# show history	Show the performance history counters (most recent at the top).

```
    ES    SES   SEFS  UAS   CSS   LES   BES   DM

    ------ ------ ------ ------ ------ ------ ------ ------
 1:    0      0     0     0     0     0     0    0
 2:    0      0     0     0     0     0     0    0
 3:    0      0     0     0     0     0     0    0
 4:    0      0     0     0     0     0     0    0
 5:    7      0     0     0     7     7     0    0
```

Trinity# show interface data [<interface>]	If an interface is not specified, show all data channels and their port/timeslot map.
	If an interface is specified, show packet counters.

```
channel 0 is up, line protocol is up
        MTU 9236
        ARP disabled
        Multicast disabled
        Rx Statistics
                0 bytes in 0 packets
                0 errors 0 drops, 0 overruns
                0 multicast packets
        Tx Statistics
                180 bytes in 10 packets
                0 errors 0 drops, 0 collisions 0 carrier errors
```

Clearing Errors and Performance History

Table 6. T1/E1 - Clearing Errors - CLI Command

Command	Explanation
Trinity[t1e1-0]# clear errors	Clear all status for the selected port. This will clear not only error counters, but also performance history.
Trinity[t1e1-0]# clear history	Clear the performance history for the selected port, but leave the error counters unaffected.

Using Test Modes

Table 7. T1/E1 - Test Modes - CLI Command

Command	Explanation
Trinity[t1e1-0]# loopback {off|local-analog|local-digital|network}	Start or stop a loopback. The network loopback will loop data received on the line back to the line.