

E3 Background and Configuration Guidelines

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Introduction

This document provides some background on E3 signals within Plesiochronous Digital Hierarchy (PDH), and the operation and configuration of E3 interfaces on PA-E3/PA-2E3 and PA-MC-E3 for the Cisco 7200 and Cisco 7500.

Note: E3 ATM interfaces fall outside the scope of this document. For more information on this topic, see Troubleshooting Line Problems and Errors on E3 ATM Interfaces.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software and hardware versions.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

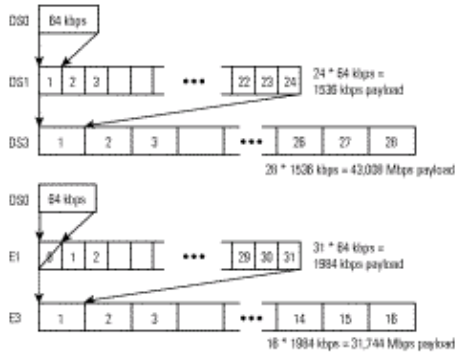
E3 within PDH

An E3 signal is situated at the third level within the Plesiochronous Digital Hierarchy (PDH) (reference: ITU-T Recommendation G.702), and has a bit rate of 34368 kbit/s.

PDH uses Time Division Multiplexing (TDM) techniques to:

- Combine 32 tributary channels of 64 kbit/s each (also known as Digital Signalling Zero (DSO)) in an E1 signal of 2048 kbit/s (the first PDH level).
- Combine four E1 tributaries of 2048 kbit/s each in an E2 signal of 8448 kbit/s (the second PDH level).

- Combine four E2 tributaries of 8448 kbit/s each in an E3 signal of 34368 kbit/s (the third PDH level).



Observe that the bit rates at the first, second, and third PDH levels are not exact multiples of each other. This is done to compensate the difference in clock speed between the tributaries. For example, each E1 signal may have a different clock source when multiplexing four E1 tributaries into an E2 signal. There is no fixed clock relationship between any of the E1 signals and the E2 signal.

The general physical characteristics of an E3 signal are (ref. ITU-T Recommendation G.703, paragraph 11):

- **Bit rate:** 34368 kbit/s \pm 20 parts per minute (ppm).
- **Line code:** High Density Bipolar of order 3 (HDB3).
- **Line impedance:** 75 ohms.

E3 Port Adapters

Cisco offers these Port Adapters (PAs) with E3 interfaces for the Cisco 7200 and the Cisco 7500:

- PA-E3 and PA-2E3 (referred to hereafter as PA-E3).
- PA-MC-E3.

Each PA uses the E3 bandwidth in a different way:

- The E3 interface on the PA-E3 carries a single data channel, with or without G.751 framing overhead. When you use G.751 framing overhead, payload subrates from 34010 kbit/s down to 22 kbit/s are supported for E3 back-to-back connections between two PA-E3s, and also for E3 links to Data Link and Kentrox channel service units/data service units (CSU/DSUs).
- The E3 interface on the PA-MC-E3 carries 16 E1 links which are combined in one E3 link via intermediate E2 signals as described above (reference: ITU-T Recommendations C.742 and G.751). Each E1 link can be configured for channelized, unchannelized (also called unframed), or ISDN PRI operation.

Note: The PA-MC-E3 does not provide direct access to the intermediate E2 signals.

E3 Configuration Guidelines

This section provides some guidelines on how to configure the E3 interfaces on the PA-E3 and the PA-MC-E3.

PA-E3

For further information, refer to the PA-MC-E3 Multi-Channel E3 Port Adapter Installation and Configuration.

Clock Source

- Configure **clock source line** if your telephone company or the remote DSU provides the master clock of the E3 connection.
- Configure **clock source internal** if your router provides the master clock of the E3 connection.

Note: For an E3 back-to-back connection between two PA-E3s, one E3 interface must be configured for **clock source internal** while the other must be configured for **clock source line**.

Framing

- Configure **framing g751** when the E3 connection terminates remotely on a Digital Link or Kentrox DSU, or when a subrate on an E3 connection between two PA-E3s is needed.
- Configure **framing bypass** to use the full E3 bandwidth of 34368 kbit/s on an E3 connection between two PA-E3s.

Note: The local interface configuration must match the remote interface, or DSU configuration.

DSU Mode

- Configure **dsu mode 0** for an E3 connection from a PA-E3 to another PA-E3 or Digital Link DSU.
- Configure **dsu mode 1** for an E3 connection from a PA-E3 to a Kentrox DSU.

Note: The local interface configuration must match the remote interface, or DSU configuration.

DSU Bandwidth

- When you use **framing g751**, **dsu bandwidth** can be used to select a payload subrate from 34010 kbit/s down to 22 kbit/s.
- When you use **framing bypass**, you must configure **dsu bandwidth 34010**.

Note: The local interface configuration must match the remote DSU, or interface configuration.

Scrambling

- When you use **framing g751**, configure **scrambling** to prevent some payload data from being mistakenly interpreted as G.751 framing bits by switches placed between the DSUs. By default, **no scrambling** is configured.
- When you use **framing bypass**, **no scrambling** must be configured.

Note: The local interface configuration must match the remote DSU, or interface configuration.

Note: The PA-E3 supports either scrambling or Kentrox subrate; not both at the same time.

National Bit

- When you use **framing g751**, bit 11 of the G.751 frame is reserved for national use and is set to 0 by default.
- Configure **national bit 1** only when required for interoperability with your telephone company.

PA-MC-E3

For further information, please refer to PA-MC-E3 Multi-Channel E3 Port Adapter Installation and Configuration.

Clock Source

- Configure **clock source line** if your telephone company or the remote DSU provides the master clock of the E3 connection.
- Configure **clock source internal** if your router provides the master clock of the E3 connection.

Note: For an E3 back-to-back connection between two PA-MC-E3s, one E3 interface must be configured for **clock source internal** while the other must be configured for **clock source line**.

National Reserve Bit

- Bit 11 of the G.751 frame is reserved for national use and is set to 0 by default.
- Configure **national bit 1** only when required for interoperability with your telephone company.

Idle Pattern

- All unused time slots on all E1 connections are filled with an idle pattern which is set to 0x55 by default.
- It can be set to any value from 0x00 to 0xFF, when required, for interoperability with your telephone company.

E1

Each E1 controller can be individually configured for channelized, unchannelized (also known as unframed), or ISDN PRI operation.

Note: The PA-MC-E3 supports a maximum of 128 logical channels for all E1 controllers together. Each E1 controller consumes:

- One logical channel in unframed operation.
- One logical channel per configured channel-group in framed operation.
- One logical channel per configured time slot in ISDN PRI operation (this includes B- and D-channels).

Use the **show controllers e3** command to find out the number of available and used logical channels.

```
dodi#show controllers e3 4/0
E3 4/0 is up.
CE3 H/W Version : 3.1.1, CE3 ROM Version : 1.1, CE3 F/W Version : 1.2.1
Applique type is Channelized E3
Total available channels 128, used 0
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
...
```

Note: The clock source of each E1 controller is configured independently from the clock source of the E3 controller. This is because, the first and third digital hierarchy level signals do not have a fixed clock relationship.

Related Information

- [Troubleshooting Line Problems and Errors on E3 ATM Interfaces](#)
 - [PA–MC–E3 Multi–Channel E3 Port Adapter Installation and Configuration](#)
 - [Access Product Support Pages](#)
 - [Dial Technology Support Pages](#)
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