

# DS1, T1 and E1 Glossary

Document ID: 25540

---

## Introduction

### Prerequisites

Requirements

Components Used

Conventions

### T1/E1 Terms

Error Events

Performance Defects

Performance Parameters

Failure States

Other Terms

### Related Information

---

## Introduction

This document describes various terms associated with T1 and E1 lines. Use this document in conjunction with the following T1 and E1 troubleshooting documentation:

- T1 Troubleshooting Flowchart
- E1 Troubleshooting Flowchart

## Prerequisites

### Requirements

Readers of this document should have knowledge of the following topic:

- The output of the **show controllers t1** and **show controllers e1** commands.

### Components Used

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

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

### Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

## T1/E1 Terms

Many of the terms listed below are directly visible in the **show controllers t1** or **show controllers e1** command output. For more information, refer to the document Understanding the show controllers e1 Command.

## **Error Events**

### **Bipolar Violation (BPV) Error Event**

A BPV error event for an alternate mark inversion (AMI)–coded signal is the occurrence of a pulse of the same polarity as the previous pulse. A BPV error event for a B8ZS– or HDB3– coded signal is the occurrence of a pulse of the same polarity as the previous pulse without being a part of the zero substitution code.

### **Controlled Slip (CS) Error Event**

A Controlled Slip is the replication or deletion of the payload bits of a digital signal level 1 (DS1) frame. A Controlled Slip may be performed when there is a difference between the timing of a synchronous receiving terminal and the received signal. A Controlled Slip does not cause an Out of Frame defect.

### **Excessive Zeroes (EXZ) Error Event**

An EXZ error event for an AMI–coded signal is the occurrence of more than fifteen contiguous zeroes. For a binary 8–zero substitution (B8ZS) coded signal, the defect occurs when more than seven contiguous zeroes are detected.

### **Line Coding Violation (LCV) Error Event**

An LCV is the occurrence of either a Bipolar Violation or Excessive Zeroes error event.

### **Path Coding Violation (PCV) Error Event**

A PCV error event is a frame synchronization bit error in the D4 and E1–no cyclic redundancy check (CRC) formats, or a CRC error in the Extended Super Frame (ESF) and E1–CRC formats.

## **Performance Defects**

### **Alarm Indication Signal (AIS) Defect**

For D4 and ESF links, the 'all ones' condition is detected at a DS1 line interface upon observing an unframed signal with a one's density of at least 99.9 percent present for a time equal to or greater than T, where 3 ms is less than or equal to T, which is less than or equal to 75 ms. The AIS is terminated upon observing a signal not meeting the one's density or the unframed signal criteria for a period equal to or greater than T.

For E1 links, the 'all–ones' condition is detected at the line interface as a string of 512 bits containing fewer than three zero bits.

### **Out Of Frame (OOF) Defect**

An OOF defect is the occurrence of a particular density of Framing Error events.

For T1 links, an OOF defect is declared when the receiver detects two or more framing errors within a 3 msec period for ESF signals and 0.75 msec for D4 signals, or two or more errors out of five, or fewer consecutive framing–bits.

For E1 links, an OOF defect is declared when three consecutive frame alignment signals have been received with an error.

When an OOF defect is declared, the framer starts searching for a correct framing pattern. The OOF defect

ends when the signal is in-frame.

In-frame occurs when there are fewer than two frame bit errors within a 3 msec period for ESF signals and 0.75 msec for D4 signals.

For E1 links, in-frame occurs when:

- in frame N, the frame alignment signal is correct
- and
- in frame N+1, the frame alignment signal is absent (that is, bit 2 in TS0 is set to one)
- and
- in frame N+2, the frame alignment signal is present and correct.

## Performance Parameters

All performance parameters are accumulated in fifteen minute intervals and up to 96 intervals (covering a 24 hour period ) are kept by an agent. Fewer than 96 intervals of data will be available if the agent has been restarted within the last 24 hours. In addition, there is a rolling 24-hour total of each performance parameter.

There is no requirement for an agent to ensure a fixed relationship between the start of a fifteen minute interval and clock time; however some agents may align the fifteen minute intervals with quarter hours.

### Bursty Errored Seconds (BES)

A Bursty Errored Second (also known as Errored Second type B) is a second with fewer than 320 and more than one Path Coding Violation error events, no Severely Errored Frame defects and no detected incoming AIS defects. Controlled slips are not included in this parameter.

This is not incremented during an Unavailable Second.

### Controlled Slip Seconds (CSS)

A Controlled Slip Second is a one-second interval containing one or more controlled slips.

### Degraded Minutes

A Degraded Minute is one in which the estimated error rate exceeds  $1E-6$  but does not exceed  $1E-3$ .

Degraded Minutes are determined by collecting all of the Available Seconds, removing any Severely Errored Seconds grouping the result in 60-second long groups and counting a 60-second long group (minute) as degraded if the cumulative errors during the seconds present in the group exceed  $1E-6$ . Available seconds are merely those seconds which are not unavailable as described below.

### Errored Seconds (ES)

For ESF and E1-CRC links an Errored Second is a second with one of the following:

- one or more Path Code Violations
- one or more Out of Frame defects
- one or more Controlled Slip events
- a detected AIS defect

For D4 and E1–noCRC links, the presence of Bipolar Violations also triggers an Errored Second. This is not incremented during an Unavailable Second.

### **Line Errored Seconds (LES)**

A Line Errored Second, according to T1M1.3, is a second in which one or more Line Code Violation error events were detected.

While many implementations are currently unable to detect the zero strings, it is expected that interface manufacturers will add this capability in deference to ANSI; therefore, it will become available in time.

In the T1M1.3 specification, near end Line Code Violations and far end Line Errored Seconds are counted. For consistency, we count Line Errored Seconds at both ends.

### **Severely Errored Framing Second (SEFS)**

An Severely Errored Framing Second is a second with either one or more OOF defects or a detected AIS defect.

### **Severely Errored Seconds (SES)**

A Severely Errored Second for ESF signals is a second with one of the following:

- 320 or more Path Code Violation Error Events
- one or more OOF defects
- a detected AIS defect

For E1–CRC signals, a Severely Errored Second is a second with either 832 or more Path Code Violation error events or one or more OOF defects.

For E1–noCRC signals, a Severely Errored Second is a 2048 LCVs or more.

For D4 signals, a Severely Errored Second is a count of one–second intervals with Framing Error events, or an OOF defect, or 1544 LCVs or more.

Controlled slips are not included in this parameter.

This is not incremented during an Unavailable Second.

### **Unavailable Seconds (UAS)**

Unavailable Seconds are calculated by counting the number of seconds that the interface is unavailable. The DS1 interface is said to be unavailable from the onset of ten contiguous SESs, or the onset of the condition leading to a failure (see Failure States). If the condition leading to the failure was immediately preceded by one or more contiguous SESs, then the DS1 interface unavailability starts from the onset of these SESs. Once unavailable, and if no failure is present, the DS1 interface becomes available at the onset of ten contiguous seconds with no SESs. Once unavailable, and if a failure is present, the DS1 interface becomes available at the onset of 10 contiguous seconds with no SESs, if the failure clearing time is less than or equal to ten seconds. If the failure clearing time is more than ten seconds, the DS1 interface becomes available at the onset of ten contiguous seconds with no SESs, or the onset period leading to the successful clearing condition, whichever occurs later. With respect to the DS1 error counts, all counters are incremented while the DS1 interface is deemed available. While the interface is deemed unavailable, the only count that is incremented is UASs.

A special case exists when the ten or more second period crosses the 900 second statistics window boundary, as the foregoing description implies that the Severely Errored Second and Unavailable Second counters must be adjusted when the Unavailable Signal State is entered. Successive "gets" of the affected dsx1IntervalSESs and dsx1IntervalUASs objects will return differing values if the first get occurs during the first few seconds of the window. This is viewed as an unavoidable side-effect of selecting the presently-defined managed objects.

## **Failure States**

The following failure states are received or detected failures that are reported. The conditions under which a DS1 interface would, if ever, produce the conditions leading to the failure state are described in the appropriate specification.

### **Alarm Indication Signal (AIS) Failure**

The Alarm Indication Signal failure is declared when an AIS defect is detected at the input and the AIS defect still exists after the Loss Of Frame failure (which is caused by the unframed nature of the 'all-ones' signal) is declared. The AIS failure is cleared when the Loss Of Frame failure is cleared.

### **Far End Alarm Failure(Yellow Alarm)**

The Far End Alarm failure is also known as a Yellow Alarm in the T1 case and a Distant Alarm in the E1 case.

For D4 links, the Far End Alarm failure is declared when bit 6 of all channels has been zero for at least 335 ms and is cleared when bit 6 of at least one channel is non-zero for a period T, where T is usually less than one second and always less than five seconds. The Far End Alarm failure is not declared for D4 links when a Loss of Signal is detected.

For ESF links, the Far End Alarm failure is declared if the Yellow Alarm signal pattern occurs in at least seven out of ten contiguous 16-bit pattern intervals and is cleared if the Yellow Alarm signal pattern does not occur in ten contiguous 16-bit signal pattern intervals.

For E1 links, the Far End Alarm failure is declared when bit 3 of time-slot zero is received set to one on two consecutive occasions. The Far End Alarm failure is cleared when bit 3 of time-slot zero is received set to zero.

### **Far End Loss Of Multiframe Failure**

The Far End Loss Of Multiframe failure is declared when bit 2 of TS16 of frame 0 is received set to one on two consecutive occasions. The Far End Loss Of Multiframe failure is cleared when bit 2 of TS16 of frame 0 is received set to zero. The Far End Loss Of Multiframe failure can only be declared for E1 links operating in Channel Associated Signalling mode.

### **Loopback Pseudo-Failure**

The Loopback Pseudo-Failure is declared when the near end equipment has placed a loopback (of any kind) on the DS1. This allows a management entity to determine from one object whether the DS1 can be considered to be in service or not (from the point of view of the near end equipment).

### **Loss Of Frame(LOF) Failure**

For T1 links, the Loss Of Frame failure is declared when an OOF or LOS defect has persisted for T seconds, where T is more than or equal to two, but less than or equal to ten. The Loss Of Frame failure is cleared when there have been no OOF or LOS defects during a period T is more than or equal to zero, but less than or equal

to twenty. Many systems will perform "hit integration" within the period T before declaring or clearing the failure.

For E1 links, the Loss Of Frame Failure is declared when an OOF defect is detected.

### **Loss Of MultiFrame Failure**

The Loss Of MultiFrame failure is declared when two consecutive multiframe alignment signals (bits 4 through 7 of TS16 of frame 0) have been received with an error. The Loss Of Multiframe failure is cleared when the first correct multiframe alignment signal is received. The Loss Of Multiframe failure can only be declared for E1 links operating with framing (sometimes called Channel Associated Signalling mode).

### **Loss Of Signal (LOS) Failure**

For T1, the Loss Of Signal failure is declared upon observing 175 +/- 75 contiguous pulse positions with no pulses of either positive or negative polarity. The LOS failure is cleared upon observing an average pulse density of at least 12.5 percent over a period of 175 +/- 75 contiguous pulse positions starting with the receipt of a pulse.

For E1 links, the Loss Of Signal failure is declared when greater than ten consecutive zeroes are detected.

### **TS16 Alarm Indication Signal Failure**

For E1 links, the TS16 Alarm Indication Signal failure is declared when time-slot 16 is received as all ones for all frames of two consecutive multiframes. This condition is never declared for T1.

## **Other Terms**

### **Circuit Identifier**

This is a character string specified by the circuit vendor, and is useful when communicating with the vendor during the troubleshooting process.

---

## **Related Information**

- [T1 Troubleshooting Flowchart](#)
- [E1 Troubleshooting Flowchart](#)
- [Configuring a Cisco 3600 Router with T1/E1 and Digital Modem Network Modules](#)
- [Configuring Channelized E1 and Channelized T1](#)
- [Access Technology Support Pages](#)
- [Technical Support – Cisco Systems](#)

---

[Contacts & Feedback](#) | [Help](#) | [Site Map](#)

© 2008 – 2009 Cisco Systems, Inc. All rights reserved. [Terms & Conditions](#) | [Privacy Statement](#) | [Cookie Policy](#) | [Trademarks of Cisco Systems, Inc.](#)

---

Updated: Sep 09, 2005

Document ID: 25540

---