40 SONET Error Collection

Synchronous Optical Network (SONET) is the North American (and Japanese) standard for telecommunications transmission using fiber optic cable. Synchronous Digital Hierarchy (SDH) is its European equivalent and has only slight differences. SONET defines the interface standards at the physical layer of the seven-layer OSI model that enable connection of fiber optic transmission systems and management of high bandwidth services. SONET is now an ANSI standard (ANSI T1.105, ANSI T1.106, and ANSI T1.117) and SDH is a UTI-T standard (G.707, G.708, G.709, and G.783).

One of the primary advantages of SONET is that it allows many different transmission formats (e.g., DS1, DS3, E3, video) to be transmitted on a single line. Basically, separate, slower signals can be multiplexed directly onto higher speed SONET signals without intermediate stages of multiplexing.

Transmission Rates and Signals

Synchronous Transport Signal 1 (STS-1) is the SONET standard for transmission over Optical Carrier 1 (OC-1) optical fiber at 51.84 Mbps. Higher-level signals are multiples of this basic rate. For example, STS-3/OC-3 (155.52 Mbps) is three times STS-1 and STS-12/OC-12 (622.08 Mbps) is 12 times the STS-1 rate. In SONET, 28 DS1 signals operating at 1.544 Mbps can be multiplexed into one STS-1 signal. (A small amount of the bandwidth is used for overhead. In SDH, the standard Synchronous Transport Module 1 (STM-1) is the SDH standard for transmission over OC-3 optical fiber at 155.52 Mbps.

The STS signal consists of two parts: the STS payload (i.e., data) and the STS overhead. The overhead bytes manage the payload bytes and perform centalized fault management.

User Interface Commands

You can monitor the performance of SONET ATM ports and troubleshoot problems on these ports with SONET error collection. You can enable, configure, and monitor SONET error collection through User Interface (UI) commands. Descriptions of these commands begin on page 40-5.

♦ Note ♦

You *must* install the **sec.img** image file to run the SONET error collection commands.

SONET error collection is supported on OmniSwitch Cell Switching Modules (CSMs) and ATM access modules (ASMs and ASM2s on the OmniSwitch and ASXs on the Omni Switch/Router). In addition, SONET error collection is not supported on the FCSM or FCSM II. Also, it is not supported on Ethernet, Token Ring, or FDDI modules.

SONET Error Collection and Switch Performance

When SONET collection is enabled, there is a small impact upon switch performance depending on the number of ports on which SONET is enabled and the number of intervals (see *SONET Error Collection Intervals* on page 40-2) of error collection that have been configured. However, under normal operating conditions, SONET error collection will not add more than 10% CPU overhead.

SONET Overview

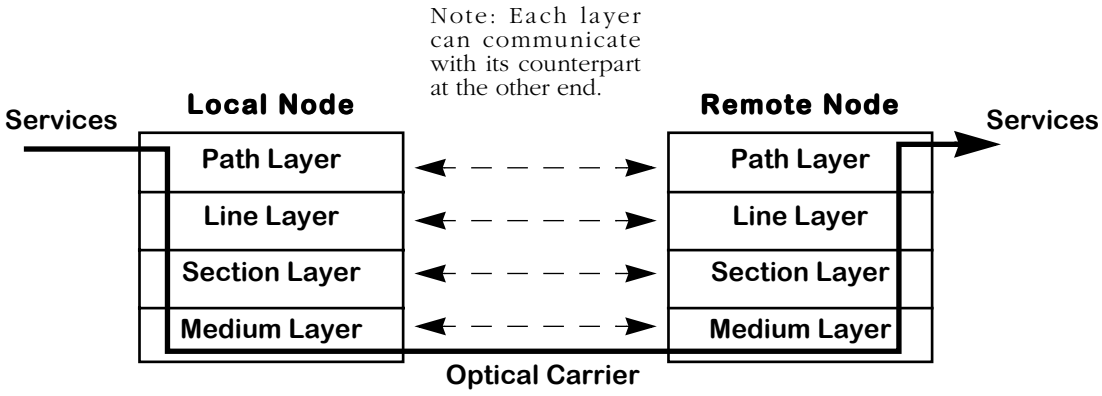
The following sections provide a brief overview of SONET/SDH topics that are important to SONET error collection.

SONET Error Collection Intervals

Once SONET error collection is enabled, the ATM timer invokes the physical level every second to read the hardware registers and send any physical-level errors to the statistics update module. Information about the physical medium is also sent to the statistics update module. This module calculates RFC 1595 errors and then updates the current table data structure. Every 15 minutes, the current samples are moved to a list of previous samples. Each 15-minute period is referred to as an *interval*.

SONET Protocol Layers

The SONET protocol stack consists of the medium, section, line, and path layers. The figure below illustrates four levels of hierarchy. Each layer can communicate with the layers above and below it. In addition, each layer can communicate with its counterpart on the far end. All of these layers are described in the subsections below.



Hierarchy of SONET Protocol Layers

Path Layer

Path Terminating Equipment (PTE) multiplexes/demultiplexes the STS payload and inserts STS path overhead, which consists of signaling and protocol information. The path layer maps services onto STS frames and transports them between the PTE. These services can be DS1, DS3, and video.

The main function of the path layer is to map signals into the format required by the line layer. The path layer reads, interprets, and modifies path overhead for performance and automatic protection switching. See *Viewing SONET Error Statistics Tables* on page 40-10 for displaying detailed statistics and *Viewing the Summary of SONET Error Statistics* on page 40-23 for displaying a summary of error statistics for this level.

Line Layer

A *line* is defined as the medium required to transmit data from the originating line equipment to the Line Terminating Equipment (LTE). The main function of the line layer is to provide synchronization and multiplexing for the path layer (described on the previous page). See *Viewing SONET Error Statistics Tables* on page 40-10 for displaying detailed statistics and *Viewing the Summary of SONET Error Statistics* on page 40-23 for displaying a summary of error statistics for this level.

Section Layer

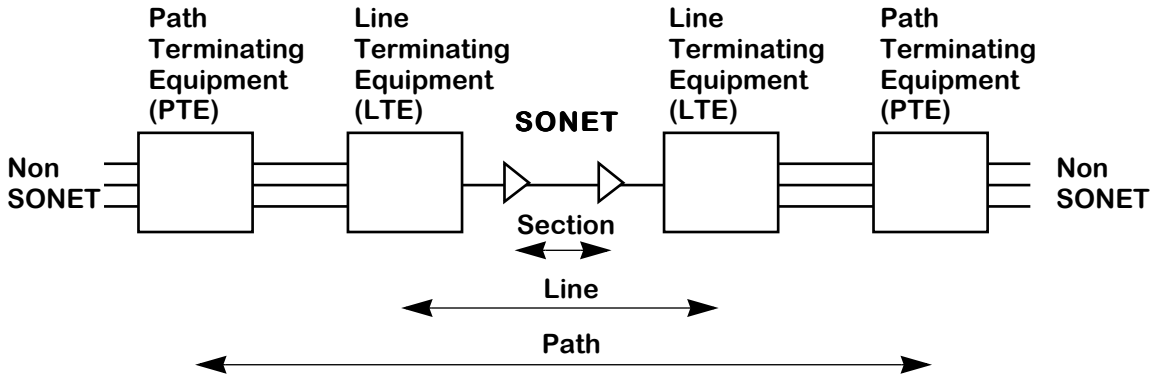
The section layer deals with the transport of STS frames across the physical medium. Section layer functions include framing, scrambling, section error monitoring, and insertion/termination of the section layer overhead. See *Viewing SONET Error Statistics Tables* on page 40-10 for displaying detailed statistics and *Viewing the Summary of SONET Error Statistics* on page 40-23 for displaying a summary of error statistics for this level.

Medium Layer

The medium layer, also known as the photonic layer, deals with the transport of bits across the physical medium. Its main function is the conversion between the electrical STS signal and optical OC signal. This layer is concerned with wavelength, pulse shape, and power level. See *Viewing the SONET Medium Table* on page 40-8 for documentation on displaying statistics for this layer.

SONET Connections

The figure below shows a simple SONET end-to-end connection. A non SONET signal is converted to an STS signal by the local Path Terminating Equipment (PTE). The PTE multiplexes the STS signal and adds path overhead. The PTE passes the STS signal to the Line Terminating Equipment (LTE), which provides reliable transport of the path layer payload and its overhead across the physical medium. The LTE passes the STS payload to the Section Terminating Equipment (STE). Basically, an STE is any two adjacent SONET network elements (e.g., a regenerator).



Simple SONET End-to-End Connection

Enabling and Disabling SONET Error Collection

You enable and disable the SONET error collection with the **smon** command. When the **smon** command is executed for the first time, the **sec.img** file is loaded and the SONET error collection commands (described in *The SONET Error Collection Menu* on page 40-5) are loaded. In addition, you can also display whether the SONET error collection has been enabled.

The syntax for the **smon** command is as follows:

```
smon [on | off]
```

The subsection below describe the three ways the **smon** command can be used.

Displaying SONET Error Collection Status

To display whether the SONET error collection has been enabled, enter

```
smon
```

at the system prompt. If SONET error collection have has enabled, then the following will be displayed.

```
     Sonet Monitoring is ON
Usage: smon status
status  "on"  - To Start Sonet Monitoring
        "off" - To Stop Sonet Monitoring
```

If the SONET error collection has been disabled, then the following will be displayed.

```
     Sonet Monitoring is OFF
Usage: smon status
status  "on"  - To Start Sonet Monitoring
        "off" - To Stop Sonet Monitoring
```

Enabling SONET Error Collection

To enable the SONET error collection, enter

```
smon on
```

at the system prompt. After a few seconds, a screen similar to the following will be displayed.

```
Restoring SEC on 3/1, 3/2, 3/3, 3/4, 3/5, 3/6, 3/7, 3/8
Config Restore of SEC over.
```

If you have installed the **sec.img** image file, you can now run the SONET error collection commands. Descriptions of these commands begin on page 40-5.

Disabling SONET Error Collection

To disable the SONET error collection, enter

```
smon off
```

The SONET Error Collection Menu

Before you can use the SONET error collection commands, you *must* perform the following steps:

- Load the **sec.img** file, which contains the software for these commands, onto your switch. (See Chapter 9, "Installing Switch Software," for more information on installing image files.)
- Enable the commands with the **smon** command, which is described in *Enabling SONET Error Collection* on page 40-4.

After you have accomplished these steps, the SONET submenu will be displayed in the Interface menu, as shown below.

```
Command      Physical Interface Menu
-----------  -------------------------------------------------------
slipc        Configure SLIP (Serial Line IP) on a TTY Port
eth100       Enter the 100BaseT sub-menu
10/100       Enter the 10/100BaseT sub-menu
sonet        Enter Sonet Sub-Menu
atm          Enter the ATM Management sub-menu

    Main       File       Summary  VLAN       Networking
    Interface  Security   System   Services   Help
```

To enter the SONET submenu, enter

```
sonet
```

at the system prompt. Enter a question mark (**?**) to display the SONET submenu commands, as shown below.

```
Command      Sonet Error Statistics Menu
-----------  -------------------------------------------------------
ses          Enable SONET Error Collection on Slot/Intf
sedm         Display SONET Medium Table
seds         Display Error Statistics Tables
secs         Clear Error Statistics Tables
sess         Display Summary of Error Statistics Collected

    Main       File       Summary  VLAN       Networking
    Interface  Security   System   Services   Help
```

The **ses** command is described in *Enabling SONET Error Collection on ATM Ports* on page 40-6. The **sedm** command is described in *Viewing the SONET Medium Table* on page 40-8. The **seds** command is described in *Viewing SONET Error Statistics Tables* on page 40-10. The **secs** command is described in *Clearing SONET Error Statistics Tables for the Current Interval* on page 40-21. And the **sess** command is described in *Viewing the Summary of SONET Error Statistics* on page 40-23.

Enabling SONET Error Collection on ATM Ports

You can enable SONET error collection on a single ATM port, on all ATM ports on a switching module, or on every ATM port in a switch with the **ses** command. The syntax for the **ses** command is as follows:

```
ses <slot/port> | <slot> | all
```

The subsections that follow describe the three different ways you can enable SONET error collection.

Enabling SONET Error Collection on a Single Port

To enable SONET error collection on a single ATM port, enter **ses** followed by the slot number of the module, a slash (*/*), and the port number. For example, to enable SONET error collection on ATM port 3/6, enter

```
ses 3/6
```

at the system prompt. A screen similar to the following will be displayed.

```
   SONET Error Statistics Collection

1) S/UNI Error Collection {Enable(1), Disable(2)} : Enable
2) Number of 15 minutes samples to be stored (4..96) : 32


Enter (option=value/save/cancel) :
```

Select the number of the item you want to change. To change any of the values listed above, enter the line number, followed by an equal sign, and then the new value. For example, to set the number of 15-minute samples collected to 5, enter

```
2=5
```

at the prompt. To update the values you have changed, enter **save**. If you do not want to save the changes enter **quit** or **cancel**, or press **Ctrl-D**. If your changes have been successfully made, the following confirmation message will be displayed.

```
saving...
```

The configurable parameters in the **ses** command are described below.

1) S/UNI Error Collection

Enter **1** to enable SONET error collection or **2** to disable it.

2) Number of 15 minutes samples to be stored

Enter the number of 15-minute samples to be collected. The valid range is **4** to **96**. (Setting this value to **96** will set up collection for a 24-hour period.)

Enabling SONET Error Collection on all ATM Ports on a Switching Module

To enable SONET error collection on all ATM ports on a switching module, enter **ses** followed by the slot number. For example, to enable SONET error collection on all ATM ports on slot 3, enter

```
ses 3
```

A screen similar to the following will be displayed.

```
SONET Error Statistics Collection on All Ports in Slot 3

1) S/UNI Error Collection {Enable(1), Disable(2)} : -
2) Number of 15 minutes samples to be stored (4..96) : -


Enter (option=value/save/cancel) :
```

Select the number of the item you want to change. See *Enabling SONET Error Collection on a Single Port* on page 40-6 for documentation on configuring these items.

Enabling SONET Error Collection on all ATM Ports in a Switch

To enable SONET error collection on all ATM ports, enter

```
ses all
```

at the system prompt. A screen similar to the following will be displayed.

```
SONET Error Statistics Collection on All Slots and Ports

1) S/UNI Error Collection {Enable(1), Disable(2)} : -
2) Number of 15 minutes samples to be stored (4..96) : -
```

Select the number of the item you want to change. See *Enabling SONET Error Collection on a Single Port* on page 40-6 for documentation on configuring these items.

Viewing the SONET Medium Table

You use the **sedm** command to display physical media statistics for a single ATM port, all ATM ports on a switching module, or all ATM ports in a switch. The syntax for the **sedm** command is as follows:

```
sedm <slot/port> | <slot> | all
```

See the subsection below for documentation on viewing physical media statistics on a single port; see *Viewing the SONET Medium Table for All ATM Ports on a Switching Module* on page 40-9 for documentation on viewing physical media statistics on all ATM ports on a switching module; and see *Viewing the SONET Medium Table for all ATM Ports* on page 40-9 for documentation on viewing physical media statistics on all ATM ports in a switch.

Viewing the SONET Medium Table for a Single ATM Port

To display the physical media statistics for a single ATM port, enter **sedm** followed by the slot number of the port, a slash (*/*), and the port number. For example to display the physical media statistics for port 3/1, enter

```
sedm 3/1
```

at the system prompt. A screen similar to the following will be displayed.

```
SONET Medium Table for 3/1
==========================

Medium Type             SONET
Time Elapsed            16 sec
Number of samples       10
Line Coding             NRZ
Line Type               Multi Mode
Circuit Identifier      PMC SUNI
```

The fields displayed by the **sedm** command are described below.

Medium Type. This field identifies whether a North American SONET signal or a European SDH signal is used on this port.

Time Elapsed. The number of seconds, including partial seconds, that have elapsed since the current error-measuring period.

Number of samples. The number of pervious intervals for which valid data has been stored.

Line Coding. The type of line coding used on this port. The types of line coding include B3Zs and CMI, which are used for electrical SONET/SDH signals (STS-1 and STS-3), and Non-Return to Zero (NRZ) and Return to Zero (RZ), which are used for optical SONET/SDH signals. If the type of line coding is unknown, then **Other** will be displayed.

Line Type. The line type used on this port. The line types include Short Single Mode, Long Single Mode, and Multi Mode used on fiber interfaces, and Coax and UTP used on electrical interfaces. If the line type is unknown, then **Other** will be displayed

Circuit Identifier. This field displays the transmission vendor's circuit identifier. This information can be used to aid troubleshooting.

Viewing the SONET Medium Table for All ATM Ports on a Switching Module

To display the physical media statistics for all ATM ports on a switching module, enter **sedm** followed by the slot number. For example, to display the physical media statistics for all ATM ports, enter

```
sedm 3
```

at the system prompt. See *Viewing the SONET Medium Table for a Single ATM Port* on page 40-8 for a sample display and descriptions of statistics.

Viewing the SONET Medium Table for all ATM Ports

To display the physical media statistics for all ATM ports on a switch, enter **sedm** followed by **all**. For example, to display the physical media statistics for all ATM ports, enter

```
sedm all
```

at the system prompt. See *Viewing the SONET Medium Table for a Single ATM Port* on page 40-8 for a sample display and descriptions of statistics.

Viewing SONET Error Statistics Tables

You use the **seds** command to view the SONET error statistics tables. The syntax for the **seds** command is as follows:

```
seds <slot/port> [<interval>] [<table>]
```

The **<interval>** option lets you display a specific interval (described in *Viewing SONET Error Statistics for a Single Interval* on page 40-16) or all intervals (described in *Viewing SONET Error Statistics for All Intervals* on page 40-18). If you do not use this option, then the current interval will be displayed (described in the subsection below).

The **<table>** option lets you display a specific table for a single interval, the current interval, or all intervals. See *Viewing Individual SONET Error Statistics Tables* on page 40-20 for a description of this option.

Viewing SONET Error Statistics for the Current Interval

To view the SONET error statistics table for the current interval, enter **seds** followed by the slot number of the module, a slash (*/*), and the port number. (You can also view just one table with the **<table>** option, which is described in *Viewing Individual SONET Error Statistics Tables* on page 40-20.) For example, to view the error statistics for ATM port 3/4, enter

```
seds 3/4
```

at the system prompt. A screen similar to the following will be displayed.

```
                    SONET Section Table
                    ===================

Interval Number                     Current Interval
Interval Start Time                 THU SEP 16 16:25:40 1999

Line Status                         LOS and LOF
Coding Violations                   2165901
Errored Seconds                     44
Severely Errored Seconds            44
Severely Errored Framing Seconds    44

                    SONET Line Table
                    ================

Interval Number                     Current Interval
Interval Start Time                 THU SEP 16 16:25:40 1999

Errors                              Line            Far End Line
======                              ====            ============
Line Status                          AIS              NA
Coding Violations                    0                0
Errored Seconds                      9                0
Severely Errored Seconds             0                0
Unavailable Seconds                  44               0

                    SONET Path Table
                    ================

Interval Number                     Current Interval
Interval Start Time                 THU SEP 16 16:25:40 1999

Errors                              Path            Far End Path
======                              ====            ============
Line Status                          STS AIS, STS RDI, LabelMismatch
Coding Violations                    0                0
Errored Seconds                      9                0
Severely Errored Seconds             0                0
Unavailable Seconds                  46               0
```

The fields displayed by the **seds** command are grouped into statistics for the section, line, and path tables. In addition, the line and path interval tables are divided into local and far-end groups for most statistics. See the subsections on the following pages for descriptions of these statistics for the current interval.

Section Table Statistics

The section table statistics displayed by the **seds** command for the current interval are described below.

Interval Number. This field displays the text **Current Interval**.

Interval Start Time. The start time of the current interval.

♦ Note ♦

The following field, **Line Status**, only displays when you select the current interval.

Line Status. This field displays the current status of the interface for this interval. The following lists the possible values:

NoDefect. The interface is operating properly.

LOS. The interface is experiencing a Loss of Signal (LOS) failure.

LOF. The interface is experiencing a Loss of Frame (LOF) failure. An LOF defect is declared when an Out of Frame/Severely Errored Frame (OOF/SEF) defect persists for a period of 3 milliseconds. An LOF failure is declared when the LOF defect persists for a period of 2.5 (+/- 0.5) seconds (except when the LOS failure or defect is present).

Coding Violations. The number of coding violations encountered by the SONET/SDH section layer in this 15-minute interval. Coding violations are Bit Interleaved Parity (BIP) errors detected in the incoming signal. Section level coding violations are collected using BIP-8 in the B1 byte located in the section overhead of STS-1 No. 1.

Errored Seconds. The number of errored seconds encountered by the SONET/SDH section layer in this 15-minute interval. An errored second is a second with one or more coding violations at this layer or one or more incoming defects (e.g., a Severely Errored Frame (SEF), a Loss of Signal (LOS), an Alarm Indication Signal (AIS), or a Loss of Pointer(LOP)) has occurred.

Severely Errored Seconds. The number of severely-errored seconds encountered by the SONET/SDH section layer in this 15-minute interval. A severely errored second is a second with a rate of *x* or more coding violations at this layer (depending on the data rate, as shown in the table below), or a second during which at least one or more incoming defects at this layer has occurred.

Severely Errored Second Values for the Section Layer

Rate	Number of Coding Violations (*x*)	Min. Bit error rate
OC-1	9	1.5×10^{-7}
OC-3	16	1.0×10^{-7}
OC-9	47	1.0×10^{-7}
OC-12	63	1.0×10^{-7}

Severely Errored Framing Seconds. The number of Severely Errored Framing Seconds (SEFS) encountered by the SONET/SDH section layer in this 15-minute interval. An SEFS is a second containing one or more Out of Frame (OOF) errors.

Line Table Statistics

The line table statistics displayed by the **seds** command for the current interval are described below.

Interval Number. This field displays the text **Current Interval**.

Interval Start Time. The start time of the current interval.

Local Line Table Statistics

♦ Note ♦

The following field, **Line Status**, only displays when you select the current interval.

Line Status (**Line**). This field displays the current status of the interface for this interval. The following lists the possible values:

NoDefect. The interface is operating properly.

AIS. The interface is experiencing an Alarm Indication Signal (AIS) failure. A line AIS defect is detected as a "111" pattern in bits 6, 7, and 8 of the K2 byte, which is used for Automatic Protection Switching (APS) signaling, in five (5) consecutive frames. A line AIS failure is declared when the Line AIS defect persists for 20.5 (+/- 0.5) seconds.

RDI. The interface is experiencing a Remote Defect Indication (RDI). A line RDI defect is a "110" code in bits 6, 7, and 8 of the K2 byte, which is used for Automatic Protection Switching (APS) signaling, of STS-1 No. 1 in five (5) consecutive frames.

Coding Violations.The number of coding violations encountered by the SONET/SDH line layer in this 15-minute interval. Coding violations are Bit Interleaved Parity (BIP) errors detected in the incoming signal. Line level coding violations are collected using BIP-8s in B2 bytes located in the line overhead of each STS-1.

Errored Seconds. The number of errored seconds encountered by the SONET/SDH line layer in this 15-minute interval. An errored second is a second with one or more coding violations at this layer or one or more incoming defects (e.g., a Severely Errored Frame (SEF), a Loss of Signal (LOS), an Alarm Indication Signal (AIS), or a Loss of Pointer (LOP)) has occurred.

Severely Errored Seconds. The number of severely errored seconds encountered by the SONET/SDH line layer in this 15-minute interval. A severely errored second is a second with a rate of *x* or more coding violations at this layer (depending on the data rate, as shown in the table below), or a second during which at least one or more incoming defects at this layer has occurred.

Severely Errored Second Values for the Line Layer

Rate	Number of Coding Violations (*x*)	Min. Bit error rate
OC-1	12	2.0×10^{-7}
OC-3	32	2.0×10^{-7}
OC-9	94	2.0×10^{-7}
OC-12	124	2.0×10^{-7}

Unavailable Seconds. The number of unavailable seconds encountered by the SONET/SDH line layer in this 15-minute interval. The SONET/SDH interface at this level becomes unavailable at the onset of 10 contiguous severely errored seconds.

Far End Line Statistics

Line Status (**Far End Line**). See the description for the **Line Status** field on the previous page.

Coding Violations (**Far End Line**).The number of far-end coding violations reported via the far-end block counter encountered by the SONET/SDH line layer in the current 15-minute interval. See the description for the **Coding Violations** field for the local line layer on the previous page for more information.

Errored Seconds (**Far End Line**). The number of far-end errored seconds encountered by the SONET/SDH line layer in the current 15-minute interval. See the description for the **Errored Seconds** field for the local line layer on the previous page for more information.

Severely Errored Seconds (**Far End Line**). The number of far-end severely-errored seconds encountered by the SONET/SDH line layer in the current 15-minute interval. See the description for the **Severely Errored Seconds** field for the local line layer on the previous page for more information.

Unavailable Seconds (**Far End Line**). The number of far-end unavailable seconds encountered by the SONET/SDH line layer in the current 15-minute interval. See the description for the **Unavailable Seconds** field for the local line layer above for more information.

Path Table Statistics

The path table statistics displayed by the **seds** command for the current interval are described below.

Interval Number. This field displays the text **Current Interval**.

Interval Start Time. The start time of the current interval.

Local Path Table Statistics

♦ Note ♦

The following field, **Line Status**, only displays when you select the current interval.

Line Status. This field displays the current status of the interface. The following lists the possible values:

NoDefect. The interface is operating properly.

STS LOP. The interface is experiencing an STS Loss of Pointer (LOP) failure. An LOP defect is declared when either a valid pointer is not detected in eight (8) consecutive frames, or when eight (8) consecutive frames are detected with the New Data Flag (NDF) set to "1001" with a valid concatenation indicator.

An STS Path LOP failure is declared when the STS Path LOP defect period persists for a period of 2.5 (+/- 0.5) seconds.

STS AIS. The interface is experiencing an STS Alarm Indication Signal (AIS) failure. The STS Path defect is detected as all ones in bytes H1 and H2, which are used to indicate the offset between the pointer and the first byte of the STS-1 SONET Payload Envelope (SPE), in three (3) consecutive frames. An STS Path AIS failure is declared when the STS Path AIS defect persists for 2.5 (+/- 0.5 seconds).

STS RDI. The interface is experiencing an STS Remote Defect Indication (RDI). STS path RDI is detected by the upstream STS Path Terminating Equipment (PTE) as a "1" in bit 5 of the Path Status Byte (G1) for five (5) contiguous frames.

Unequipped. The interface is currently idle.

LabelMismatch. The interface is detecting a signal label mismatch.

Coding Violations.The number of coding violations encountered by the SONET/SDH path layer in this 15-minute interval. Path level coding violations are collected using the BIP-8 in the B3 byte of the STS Path overhead of the Path Terminating Equipment (PTE).

Errored Seconds. The number of errored seconds encountered by the SONET/SDH path layer in this 15-minute interval.

Severely Errored Seconds. The number of severely-errored seconds encountered by the SONET/SDH path layer in this 15-minute interval. A severely errored second is a second with a rate of *x* or more coding violations at this layer (depending on the data rate, as shown in the table below), or a second during which at least one or more incoming defects at this layer has occurred.

Severely Errored Second Values for the Path Layer

Rate	Number of Coding Violations (*x*)	Min. Bit Error Rate
STS-1	9	1.5×10^{-7}
STS-3	16	1.0×10^{-7}

Unavailable Seconds. The number of unavailable seconds encountered by the SONET/SDH path layer in this 15-minute interval. The SONET/SDH interface at this level becomes unavailable at the onset of 10 contiguous severely errored seconds.

Far-End Path Table Statistics

Line Status (**Far End Path**). See the description for the **Line Status (Path)** field on the previous page.

Coding Violations (**Far End Path**).The number of far-end coding violations reported by the far-end block count encountered via the SONET/SDH line layer in this 15-minute interval. See the description for the **Coding Violations** field for the local path layer on the previous page for more information.

Errored Seconds (**Far End Path**). The number of far-end errored seconds encountered by the SONET/SDH path layer in this 15-minute interval. See the description for the **Errored Seconds** field for the local path layer above for more information.

Severely Errored Seconds (**Far End Path**). The number of far-end severely-errored seconds encountered by the SONET/SDH path layer in this 15-minute interval. See the description for the **Severely Errored Seconds** field for the local path layer above for more information.

Unavailable Seconds (**Far End Path**). The number of unavailable seconds encountered by the SONET/SDH path layer in this 15-minute interval you selected. See the description for the **Unavailable Seconds** field for the local path layer above for more information.

Viewing SONET Error Statistics for a Single Interval

To view the SONET error statistics table for a single interval, enter **seds** followed by the slot and port number of the ATM port, and followed by the interval number, which *must* be a value between 1 and 96. (You can also view just one table with the **<table>** option, which is described in *Viewing Individual SONET Error Statistics Tables* on page 40-20.) For example, to view the SONET error statistics for ATM port 3/4 for the fifth interval, enter

```
seds 3/4 5
```

at the system prompt. A screen similar to the following will be displayed.

```
                    SONET Section Table
                    ===================

Interval Number                     Previous Interval #5
Interval Start Time                 WED SEP 22 12:06:11 1999

Coding Violations                   43930404
Errored Seconds                     900
Severely Errored Seconds            900
Severely Errored Framing Seconds    900

                    SONET Line Table
                    ================

Interval Number                     Previous Interval #5
Interval Start Time                 WED SEP 22 12:06:11 1999

Errors                          Line          Far End Line
======                          ====          ============
Coding Violations                 0               0
Errored Seconds                   0               0
Severely Errored Seconds          0               0
Unavailable Seconds             900               0

                    SONET Path Table
                    ================

Interval Number                     Previous Interval #5
Interval Start Time                 WED SEP 22 12:06:11 1999

Errors                          Path          Far End Path
======                          ====          ============
Coding Violations                 0               0
Errored Seconds                   0               0
Severely Errored Seconds          0               0
Unavailable Seconds             900               0
```

The fields displayed by the **seds** command are grouped into statistics for the section, line, and path tables. See *Viewing SONET Error Statistics for the Current Interval* on page 40-10 for descriptions of all statistics except for **Interval Number** and **Interval Start Time**, which are described below.

Interval Number. This field displays the interval number you selected. The interval must be between 1 and 96.

Interval Start Time. The start time of the 15-minute interval you selected.

Viewing SONET Error Statistics for All Intervals

To view the SONET error statistics table for all intervals, enter **seds** followed by the slot number of the module, a slash (*/*), the port number, and **all**. (You can also view just one table with the **<table>** option, which is described in *Viewing Individual SONET Error Statistics Tables* on page 40-20.) For example, to view the error statistics for all intervals on ATM port 3/4, enter

```
seds 3/5 all
```

at the system prompt. A screen similar to the following will be displayed.

```
                SONET Section Interval Table
                ============================
Interval    Coding      Errored     Severely Errored    Severely Errored
Number      Violation   Seconds     Seconds             Framing Seconds
========    =========   =======     ================    ================
  1         43931988    900         900                 900
  2         43930434    900         900                 900
  3         43929612    900         900                 900
  4         43934406    900         900                 900
  5         43930404    900         900                 900
  6         43929618    900         900                 900
  7         43932786    900         900                 900
  8         43930416    900         900                 900
  9         43937622    900         900                 900
  10        43938396    900         900                 900

                SONET Line Interval Table
                =========================
Interval    Coding      Errored     Severely Errored    Unavailable
Number      Violation   Seconds     Seconds             Seconds
========    ========    =======     ================    ===========
  1         0           0           0                   900
  2         0           0           0                   900
  3         0           0           0                   900
  4         0           0           0                   900
  5         0           0           0                   900
  6         0           0           0                   900
  7         0           0           0                   900
  8         0           0           0                   900
  9         0           0           0                   900
  10        0           0           0                   900

                SONET Far End Line Interval Table
                =================================
Interval    Coding      Errored     Severely Errored    Unavailable
Number      Violation   Seconds     Seconds             Seconds
========    ========    =======     ================    ===========
  1         0           0           0                   0
  2         0           0           0                   0
  3         0           0           0                   0
  4         0           0           0                   0
  5         0           0           0                   0
  6         0           0           0                   0
  7         0           0           0                   0
  8         0           0           0                   0
  9         0           0           0                   0
  10        0           0           0                   0
```

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SONET Path Interval Table

Interval Number	Coding Violation	Errored Seconds	Severely Errored Seconds	Unavailable Seconds
1	0	0	0	900
2	0	0	0	900
3	0	0	0	900
4	0	0	0	900
5	0	0	0	900
6	0	0	0	900
7	0	0	0	900
8	0	0	0	900
9	0	0	0	900
10	0	0	0	900

SONET Far End Path Interval Table

Interval Number	Coding Violation	Errored Seconds	Severely Errored Seconds	Unavailable Seconds
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0

The fields displayed by the **seds** command are grouped into statistics for the section, line, and path tables. See *Viewing SONET Error Statistics for the Current Interval* on page 40-10 for descriptions of all statistics except for **Interval Number**, which is described below.

Interval Number. The interval number for this instance.

Viewing Individual SONET Error Statistics Tables

You can use the **<table>** option with the **seds** command to view individual SONET error statistics tables on a single ATM port, on all ATM ports on a switching module, or on all ATM ports. The following lists the valid **<table>** option:

s or **S**. Use this option to view the section table.

l or **L**. Use this option to view the local and far-end line tables.

p or **P**. Use this option view the local and far-end path tables.

For example, to display the local and far-end path table statistics for the fifth interval on port 3/4, enter

```
seds 3/4 5 p
```

at the system prompt. A screen similar to the following will be displayed.

```
                    SONET Path Table
                    ================

Interval Number                    Previous Interval #5
Interval Start Time                WED SEP 22 14:23:28 1999


Errors                        Path          Far End Path
======                        ====          ============
Coding Violations              0              0
Errored Seconds                0              0
Severely Errored Seconds       0              0
Unavailable Seconds            900            0
```

See *Viewing SONET Error Statistics for the Current Interval* on page 40-10 for descriptions of parameters if you use the **<table>** option for the current interval, see *Viewing SONET Error Statistics for a Single Interval* on page 40-16 for a specific interval, or see *Viewing SONET Error Statistics for All Intervals* on page 40-18 for descriptions of parameters if you use the **<table>** option for all intervals.

Clearing SONET Error Statistics Tables for the Current Interval

You use the **secs** command to clear one or all statistics tables for the current interval on one ATM port, all ATM ports on a switching module, or all ATM ports on your switch. The syntax for the **secs** command is as follows:

secs <slot/port> | <slot> | all [<table>]

The **<table>** option lets you clear the error statistics for a single table. If you do not use this option, then the statistics will be cleared for all tables. See *Clearing Error Statistics for a Single Table* on page 40-22 for more information on this option. To clear the statistics for all tables, see the subsection below.

♦ Important Note ♦

The **secs** command only clears statistics for the current interval and does *not* affect previous intervals.

Clearing Error Statistics for All Tables

To the clear all SONET error statistic tables for the current interval on all ATM ports in your switch, enter

secs all

at the system prompt. To clear the all the SONET error statistics on all ATM ports on a switching module, enter **secs** followed by the slot number. For example, to clear the SONET error statistics for all fiber ports on Slot 3 for the current interval, enter

secs 3

at the system prompt. To clear the all the SONET error statistic tables on a single ATM port, enter *secs* followed by the slot number of the port, a slash (*/*), and the port number. For example, to clear the SONET error statistic tables for port 3/2 for the current interval, enter

secs 3/2

at the system prompt.

Clearing Error Statistics for a Single Table

You can use the **<table>** option with the **secs** command to clear the statistics (for the current interval) for a single table on all ATM ports in a switch, all ATM ports on a switching module, or a single ATM port. The following lists the valid **<table>** option:

s or **S**. Use this option to clear the section table.

l or **L**. use this option to clear the near-end line table.

fl or **FL**. use this option to clear the far-end line table.

p or **P**. Use this option clear the path table.

fp or **FP**. Use this option to clear the far-end path table.

For example, to clear the far-end path table statistics on a ATM port 3/4, enter

```
secs 3/4 fp
```

at the system prompt.

♦ Note ♦

When using the **<table>** option, do *not* mix upper- and lower-case letters. While the **FL** or **fl** options will clear the far-end line table statistics, **fL** or **Fl** will just produce an error message.

You must clear the statistics for one table or all of the tables (see *Clearing Error Statistics for All Tables* on page 40-21). You cannot select more than one **<table>** option.

Viewing the Summary of SONET Error Statistics

You can display a summary of SONET error statistics for one ATM port, all ATM ports on a switching module, or all ATM ports on a switch with the **sess** command. The syntax for the **sess** command is as follows:

sess <slot/port> | <slot> | all

For example, to display the SONET error statistics for all ATM ports on the switching module in slot 3, enter

sess 3

at the system prompt. A screen similar to the following will be displayed.

```
SONET Error Statistics Summary for Slot 3

Slot/Port       Layer          Errored Interval
========        =====          ================

  3/1           Section        Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/1           Line           Previous - 77
  3/1           Path           Previous - 77
  3/2           Section      Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/2           Line           Previous - 77
  3/2           Path           Previous - 77
  3/3           Section        Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/3           Line           Previous - 77
  3/3           Path           Previous - 77
  3/4           Section        Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/4           Line           Previous - 77
  3/4           Path           Previous - 77
  3/5           Section        Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/5           Line         Previous - 77
  3/5           FarEnd Line  Previous - 77
  3/5           Path         Previous - 77
  3/5           FarEnd Path  Previous - 77
```

— Output continues on next page —

```
  3/6          Section      Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/6          Line         Previous - 77
  3/6          FarEnd Line  Previous - 77
  3/6          Path         Previous - 77
  3/6          FarEnd Path  Previous - 77
  3/7          Section      Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77
  3/7          Line         Previous - 77
  3/7          FarEnd Line  Previous - 77
  3/7          Path         Previous - 77, 78
  3/7          FarEnd Path  Previous - 78
  3/8          Section      Current, Previous - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70,
71, 72, 73, 74, 75, 76, 77, 78
  3/8          Line         Previous - 78
  3/8          FarEnd Line  Previous - 78
  3/8          Path         Previous - 78
  3/8          FarEnd Path  Previous - 78
```

The fields displayed by the **sess** command are described below.

Slot/Port. The port number for this instance

Layer. The layer where the error (or errors) occurred. This can be **Section** for the section layer, **Line** for the line layer, or **Path** for the path layer.

Errored Interval. The intervals that the error (or errors) occurred in.