29 Managing T1 and E1 Ports

T1 and E1 ports are supported on the OmniAccess 408. They share a common set of physical level attributes and a common set of software configuration commands. T1/E1 configuration options include frame format, line coding, and Facility Datalink Protocol. T1/E1 ports can store up to 24 hours of performance statistics for local and remote ports. These software commands do not configure time slots.

♦ Note ♦

Circuit Emulation serial, T1, and E1 ports will always be in slot 2 of an OmniAccess 408 switch. In addition, the T1 or E1 port will always be port 1 or 2 (i.e., slot 2, port 1). For more information on slot designations see Chapter 1, titled "OmniAccess 408 Switches."

This chapter is divided into two parts. The first part provides an overview of T1/E1 digital services. The second part describes the configuration of physical T1 and E1 ports; this second part starts with the section, *The T1/E1 Menu* on page 29-3.

T1 and E1 Overview

Carrier digital services were designed primarily to support digitized voice over long distances. Digital services are the primary method for carrying voice between two endpoints using two pairs of copper wire. Digital wide-area data networking uses the same digital services that were originally designed for digitized voice.

Analog to Digital Conversion

To improve quality and reliability, long-distance phone networks upgraded their backbones from analog Frequency Division Multiplexing (FDM) to digital Time Division Multiplexing (TDM). In TDM, analog data is converted to digital data using a CODEC device that employs a method called Pulse Code Modulation (PCM).

In Pulse Code Modulation, the CODEC samples the analog signal 8,000 times a second and converts each sample to an 8-bit digital value. These 8,000 8-bit samples yield a total digital data rate of 64,000 BPS for one voice service. This service is also known as Digital Service Zero (DS0), which is the basis for T1 and E1 connections.

These 8,000 8-bits in time are also known as a *time slot*. A *channel* is a time slot that can carry voice or data. Using Time Division Multiplexing, 24 channels (for T1) or 32 channels (for E1) are multiplexed to create a service called Digital Service 1 (DS1). The more common name for DS1 is *T1* or *E1*.

T1 Framing

A T1 frame consists of 24, 8-bit time slots and a 1-bit synchronization and control bit. Twelve (12) T1 frames can be grouped into a *SuperFrame (SF/D4)*, or 24 T1 frames can be grouped into an *Extended SuperFrame*. In each SuperFrame, the 6th and 12th frame may contain "robbed bit" (A, B) signalling, which means the least significant bit is robbed from each time slot in the 6th and 12th frame and used for signalling. In Extended SuperFrames, this robbed-bit signalling (A, B, C, D) occurs in the 6th, 12th, 18th, and 24th frames.

E1 Framing

The E1 frame consists of 32, 8-bit time slots (two of these time slots are used for synchronization and multiframe signalling) for 256 bits per frame at 2.048 megabits per second. Sixteen (16) E1 frames are grouped into a multiframe. An E1 multiframe can use Channel Associated Signalling (CAS) contained in time slot 16. Timeslot 16 in multiframe 0 is used for multiframe synchronization and control. Timeslot 16 of multiframes 1 through 15 are used to carry A, B, C, and D signaling bits.

ATM Over T1/E1

When ATM is run over a T1 or E1 port, the same framing options are used. The only difference is that the payload is comprised of cells, rather than time slots.

The T1/E1 Menu

The commands for configuring and monitoring T1 and E1 ports are contained in the **te** submenu. This submenu displays as shown below and may be accessed (when in verbose mode) by entering **te** at a system prompt.

Command	T1/E1 Port Management Menu
tes	View status of a T1/E1 port configuration and statistics
temod	Modify a T1/E1 port configuration
tecls	Clear framer statistics of a T1/E1 port
telts	Display 24-hour period statistics of a local T1/E1 port
telcs	Display current 15-minute statistics of a local T1/E1 port
telis	Display 15-minute interval statistics of a local T1/E1 port
terts	Display 24-hour period statistics of a remote T1/E1 port
tercs	Display current 15-minute statistics of a remote T1/E1 port
teris	Display 15-minute interval statistics of a remote T1/E1 port
tebcfg	Configure BERT test
tebs	Display BERT statistics
tebcls	Clear BERT statistics
tecfg	Configure T1/E1 port type

The commands in this menu are described in the following sections. The first command, **tes**, displays configuration information on ports. This configuration information is configured through the **temod** command. The remaining commands, listed after the **telts** command provide a variety of interval statistics for local and remote T1 and E1 connections.

♦ Important Note ♦

The front panel of an OA-408 switch is divided into several areas labeled **10/100**, **CES**, **UPLINK**, etc. Conceptually, think of these areas as a division of the switch into several modules, or slots. For more information on slot designations see Chapter 1, titled "OmniAccess 408 Switches."

Configuring a T1 Port

The **temod** command configures a T1 port at the physical level and is generic to all such ports regardless of the logical level service that controls them.

To configure a T1 port, enter the following command

temod <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the T1 port number. For example, to modify port number 1 on the board in switch slot 2, enter

temod 2/1

A screen similar to the following displays:

```
T1 Port Configuration for slot 2, port 1

1)  Circuit Identifier (30 chars max)                    : Alcatel T1 Circuit
2)  Frame Format { ESF (2), SF (3), unframed (8) }       : ESF
3)  Line Build Out { short(1), long(2) }                 : short
      30) Line Length in meters (0-200)                  : 30
4)  Line Coding { B8ZS (2) , AMI (5) }                   : B8ZS
5)  Facility Datalink { ANSI T1.403 (2), AT&T 54016 (4),
                        T1.403-AT&T (6), none (8) }      : none
6)  Facility Datalink Port Role { network (1), user (2) } : network
7)  Transmit Clock Source { loopTiming (1),
                            localTiming (2) }            : localTiming
8)  Loopback Mode { none (1), payload (2), line (3),
                    inward (5) }                         : inward
9)  Signalling { none (1), CAS (2), CCS (3) }            : none
10) Trap Generation { enabled (1), disabled (2) }        : disabled

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

1) Circuit Identifier

Enter a textual description of this T1 port, up to 30 characters. This text will be used in other screen displays to identify this T1 port.

2) Frame Format

Specify the frame format to be used on this port. The choices are Extended SuperFrame (**ESF**), SuperFrame or D4 (**SF**), or no special frame format (**unframed**). A T1 frame consists of 24 8-bit time slots and a 1-bit synchronization and control. Twelve (12) T1 frames can be grouped into a SuperFrame, and 24 T1 frames can be grouped into an Extended SuperFrame.

♦ Important Note ♦

When configuring ATM T1 lines, you can only use Extended SuperFrame (ESF) as the framing format.

3) Line Build Out

Indicate whether the T1 port supports short haul or long haul interfaces. T1 ports equipped with Line Interface Unit (LIU) support long haul. Long haul support is necessary if this T1 port is directly connected to a Central Office (CO) and the cable length is greater than 655 feet. If this T1 port connects locally (i.e., it is not connected to an external CSV) using less than 655 feet of cable, short haul is adequate.

♦ Note ♦

All OmniAccess 408 T1/E1 ports are equipped with a Line Interface Unit (LIU) chip.

An additional prompt displays for either the line length between this port and the T1 device (short haul configurations) or the attenuation of the cable attaching this port and the T1 device (long haul configurations). Each of these options is described below.

40) Line Length in meters

Displayed only when **short haul** is chosen as the **Line Build Out** option. Specify the distance, in meters, between this T1 port and the attached T1 device.

41) Attenuation

Displayed only when **long haul** is chosen as the **Line Build Out** option. Specify the attenuation of the line between this T1 port and the attached T1 device.

4) Line Coding

The type of physical encoding used on the connection. AMI (Alternate Mark Inversion) is more sensitive. B8ZS (Bipolar 8 Zero Substitution) should be used when possible. In all cases, the Line Coding you select must match that provided by your service provider.

♦ Important Note ♦

When configuring ATM T1 lines, you can only use B8ZS as the line coding.

5) Facility Datalink

Facility Datalink (FDL) gathers performance statistics every second and stores them in the 24-hour local statistical database. It also sends local performance statistics to the remote T1 port depending on the type of FDL chosen and the "role" of the FDL (specified in the next field). In order to obtain far-end, or remote, performance statistics (viewed through the **terts**, **tercs**, and **teris** commands), you must enable an FDL protocol.

♦ Note ♦

Facility Datalink requires a T1 port and the frame type must be Extended SuperFrame.

You have the following choices:

ANSI T1.403 The FDL exchange recommended by ANSI. The FDL method sends Performance Report Messages (PRMs) to the far-end port every second, processes received PRMs, and stores them in a 24-hour far-end statistical database.

AT&T 54106 The operation of this FDL protocol depends on the **Facility DataLink Port Role** setting (configured in the next field). The FDL protocol will either be active (**network**) or passive (**user**) in its sending of PRMs.

T1.403-AT&T In this combination selection, the port supports both the ANSI (**ANSI T1.403**) and AT&T Extended Superframe (AT&T 54106) protocols at the same time. The port processes ANSI messages as described for the **ANSI T1.403** option and responds to AT&T request messages.

none The port does not use Facility Datalink.

6) Facility Datalink Port Role

Indicates the role of this port in relation to the remote port. This setting only affects configurations where the Facility Datalink field is set to **AT&T 54016**. When set to **network**, far-end historical statistics are updated by periodically sending 24-hour and 1-hour performance statistics requests to the far-end port. When set to **user**, the FDL passively waits for messages from the far-end port.

7) Transmit Clock Source

The source of the transmit clock. Loop timing means the receive clock (recovered from receive data) is used as the transmit clock. Local timing indicates the local clock source (generated from PLLs) is used as the transmit clock.

8) Loopback Mode

The loopback configuration for this port. Loopback configurations describe the relation between the device attached to a T1 port and the framing functionality within the T1 port. Framing functionality assembles T1 frames into SuperFrames and Extended SuperFrames, depending on how the port is configured. Possible values are as follows:

none The port is not in a loopback state. This is the typical live network state for a T1 port.

payload The received signal at this T1 port is looped out of the port after passing through the port's framing functionality. This state should only be used for debugging purposes.

line The received signal at this T1 port does not go through the port's framing functionality, and is looped straight back out the port. This state should only be used for debugging purposes.

inward The transmitted signal from the inward side of this port is looped back internally. The signal passes through the T1 framing functionality before looping back. This state should only be used for debugging purposes.

9) Signaling

The type of signaling used on this port. The OSWSM supports only the **none**, or no signalling, option.

10) Trap Generation

Enables or disables all of the SNMP-based traps related to T1 and E1 ports.

Configuring an E1 Port

The **temod** command configures an E1 port at the physical level and is generic to all such ports regardless of the logical level service that controls them.

To configure an E1 port, enter the following command

temod <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the E1 port number you want to modify. For example, to modify port number 1 on the board in switch slot 2, you would enter

temod 2/1

A screen similar to the following displays:

```
E1 Port Configuration for slot 2, port 1

1)  Circuit Identifier (30 chars max)                    : Alcatel E1 Circuit
2)  Frame Format { E1 (4), E1-CRC (5), E1-MF (6),
                   E1-CRC-MF (7), unframed (9) }         : E1
3)  Not FAS { enabled (1), disabled (2) }                : enabled
4)  Line Build Out { short(1), long(2) }                 : short
    40) Cable Type { 75 Ohm (1), 120 Ohm (2) }           : 75 Ohm
5)  Line Coding { HDB3 (3), AMI (5) }                    : HDB3
6)  Transmit Clock Source { loopTiming (1),
                            localTiming (2) }            : localTiming
7)  Loopback Mode { none (1), payload (2), line (3),
                    inward (5) }                         : none
8)  Signalling { none (1), CAS (2), CCS (3) }            : none
9)  Trap Generation { enabled (1), disabled (2) }        : disabled

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

1) Circuit Identifier

Enter a textual description of this E1 port, up to 30 characters. This text will be used in other screen displays to identify this E1 port.

2) Frame Format

Specify the E1 frame format to be used on this port. The choices are as follows:

E1 Standard E1 frame format using the framing bits in time slot 0 for framing.

E1-CRC E1 frame using framing bits in both time slot 0 and CRC-4 multiframe for framing.

E1-MF E1 frame using framing bits in both time slot 0 and time slot 16 multiframe for framing.

E1-CRC-MF E1 frame using framing bits in time slot 0, time slot 16 multiframe, and CRC-4 multiframe for framing.

unframed The framing software will not look for framing bits to determine the start of a frame or multiframe. Data is treated as a data stream.

3) Not FAS

Indicates whether you want to add an extra level of frame checking. E1 frames in time slot 0 are composed of alternating bits of FAS (Frame containing Frame Alignment Signal) and NFAS (Frame not containing Frame Alignment Signal). The **Not FAS** option tells the framer to check framing on FAS and NFAS bits. Normally, the framer checks only FAS bits, which contain the frame alignment signal pattern. If you enable **Not FAS**, then framing software will additionally also check NFAS bits, which include remote alarm indication information.

4) Line Build Out

The E1 port supports short haul or long haul interfaces. E1 ports equipped with a Line Interface Unit (LIU) chip support long haul. Long haul support is necessary if this E1 port is directly connected to a Central Office (i.e., not connected via an external CSU) and the cable length is greater than 655 feet. If this E1 port connects locally using less than 665 feet of cable, then short haul is adequate.

♦ Note ♦

All OmniAccess 408 T1/E1 ports except are equipped with a Line Interface Unit (LIU) chip.

An additional prompt displays requesting the resistance type used for this port connection.

40) Cable Type

Indicate the cable resistance type used on the short or long haul interface. The cable resistance type can be 75 ohm or 120 ohm. The resistance is a set via a jumper on the E1 board; it is not configurable through software.

5) Line Coding

The type of physical encoding used on the connection. AMI (Alternate Mark Inversion) is more sensitive. HDB3 (High Density Bipolar 3) should be used when possible. In all cases, the Line Coding you select must match that provided by your service provider.

6) Transmit Clock Source

The source of the transmit clock. Loop timing means the receive clock (recovered from receive data) is used as the transmit clock. Local timing indicates the local clock source (generated from PLLs) is used as the transmit clock.

7) Loopback Mode

The loopback configuration for this port. Loopback configurations describe the relation between the device attached to an E1 port and the framing functionality within the E1 port. Framing functionality assembles E1 frames into multiframes, depending on how the port is configured. Possible values are as follows:

none The port is not in a loopback state. This is the typical live network state for an E1 port.

payload The received signal at this E1 port is looped out of the port after passing through the port's framing functionality. This state should only be used for debugging purposes.

line The received signal at this E1 port does not go through the port's framing functionality, and is looped straight back out the port. This state should only be used for debugging purposes.

inward The transmitted signal from the inward side of this port is looped back internally. The signal passes through the E1 framing functionality before looping back. This state should only be used for debugging purposes.

8) Signalling

The type of signaling used on this port. The OSWSM supports only the **none**, or no signalling, option. This option should always be set to **none**.

9) Trap Generation

Enables or disables all of the SNMP-based traps.

Viewing T1/E1 Configuration and Alarm Information

You can view all current parameters and alarms for a T1 or E1 port using the **tes** command. These parameters will be either the default parameters or parameters you modified through the **temod** command or network management software.

You have a choice of viewing parameters at the chassis or port level. You receive different displays depending upon which level you choose. The sections below describe all ways to use the **tes** command.

Viewing Information for all T1/E1 Ports in the Switch

To view port parameters for all T1/E1 ports in a chassis, enter the following command

tes

A screen similar to following displays:

T1/E1 Chassis Status

Slot/Port	Type	Active Alarms
2/1	E1	NoAlarm

Slot/Port. The T1 or E1 slot and port for which information is supplied. The slot is listed first, followed by a slash (*/*), followed by the port number.

Type. The port type. The port will either be a T1 or E1 port.

Active Alarms. Alarms that have occurred on this port. Possible alarms for each port are:

NoAlarm The port is free of any alarms.

RcvYellow This port is receiving a yellow alarm from the far-end port. A yellow alarm occurs in SuperFrames when bit 6 of all channels has been zero for at least 425 milliseconds. The yellow alarm will not occur if a Loss of Signal alarm has already occurred. In Extended SuperFrames, an alarm occurs if the yellow alarm pattern is found.

XmtYellow The port is transmitting a yellow alarm *to* the far-end port. See the above definition of **RcvYellow** for a description of a yellow alarm.

RcvAIS This port is receiving Alarm Indication Signal (AIS) from the far-end port. An AIS occurs when an unframed signal with a high density of 1s (99.9% density) is received for more than 1.5 seconds.

XmtAIS This port is transmitting Alarm Indication Signal (AIS) *to* the far-end port. An AIS occurs when an unframed signal with a high density of 1s (99.9% density) is received for more than 1.5 seconds.

RedAlarm The port is in red alarm state. A red alarm occurs when a T1 port has been in Out-of-Frame (OOF) condition for 2.55 seconds. The red alarm condition will be removed if the OOF condition has been absent for at least 16.6 seconds.

LossOfSignal The port has experienced a Loss of Signal (LOS), or Loss of Carrier. An LOS event occurs after 175 contiguous pulse positions with no pulses (10 absent pulses on E1 ports). An LOS failure is cleared after the switch observes a single pulse.

RcvLOMF This port is receiving loss of multiframe (LOMF) alarms from the far-end port. When a far-end E1 port detects an out-of-multiframe condition, it transmits a frame with the alarm indication bit set (in time slot 16) back to the local E1 port. This error is similar to a yellow alarm on T1 ports.

LocalUA This port is not available possibly because a cable is not attached.

Loopback The port is currently in loopback mode. Loopback mode can be configured through the **temod** command or dynamically activated through Facility Data Link (ANSI T1.403 and AT&T 54106) or through loopback control codes on a T1 port.

Viewing Information for T1/E1 Ports

To view port parameters, enter the following command

tes <slot>

where **<slot>** is the slot number for which you want to view information. For example, to view configuration parameters for the board in slot 2, enter

tes 2

A screen similar to following displays:

T1/E1 Port Status for slot 2

Port	Type	Active Alarms
1	T1	NoAlarm, Loopback

Explanations of the columns in this table are described in the section, *Viewing Information for all T1/E1 Ports in the Switch* on page 29-10.

Viewing Information For a T1 Port

To view T1 port parameters, enter the following command

tes <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the T1 port number which you want to view information. For example, to view information for Port 1 on the board in slot 2, enter

tes 2/1

A screen similar to following displays for a T1 port:

T1/E1 Port Status for slot 2, port 1

Circuit Identifier	**: Alcatel T1 Circuit**		
Frame Format	**: ESF**	**Line Build Out**	**: 30 (SH)**
Facility Datalink	**: none**	**FDL Port Role**	**: network**
Line Coding	**: B8ZS**	**Signalling**	**: none**
Transmit Clock Source	**: localTiming**	**Trap Generation**	**: disabled**
Status Change Time	**: 0 days, 00:07:24.69**		
Loopback Status	**: LocalInwardLoop**		
Line Status	**: NoAlarm, Loopback**		

Framer Statistics

Loss of Signal Events	**: 0**
Line Code Violation Events	**: 431986**
Out of Frame Events	**: 0**
Red Alarm Events	**: 1**
Squelch Alarm Events	**: 0**
Frame Bit Error Events	**: 2**
Alarm Indication Signal Events	**: 0**
Yellow Alarm Events	**: 1**
ESF CRC-6 Error Events	**: 3**

Circuit Identifier, Frame Format, Line Build Out, Facility Datalink, FDL Port Role, Line Coding, Signaling, Transmit Clock Source, Trap Generation. These parameters are described in the section, *Configuring a T1 Port* on page 29-4. Please refer to that section for descriptions.

Status Change Time. The system time when the last change in Line Status (i.e., alarm) parameter occurred.

Loopback Status. The type of loopback mode configured for this port through the **temod** command or activated remotely through FDL. Loopback modes are described in *Configuring a T1 Port* on page 29-4.

Line Status. A list of any alarms that have occurred on his port. The possible items in the list are the same as those for **Active Alarms** described in *Viewing Information for all T1/E1 Ports in the Switch* on page 29-10.

Loss of Signal Events. The total number of Loss of Signal (LOS) events that have been detected on this port. An LOS event occurs after 175 contiguous pulse positions with no pulses (10 absent pulses on E1 ports). An LOS failure is cleared after the switch observes a single pulse.

Line Code Violation Events. The occurrence of either a bipolar violation or an excessive zeros error. A bipolar violation is the occurrence of a pulse of the same polarity as the previous pulse. In B8ZS coded signals, a bipolar violation is a pulse of the same polarity as the previous without being part of the zero substitution code. An excessive zeros error is the occurrence of more than 15 contiguous zeros in an AMI-coded signal; in a B8ZS-coded signal, it is the occurrence of seven (7) or more contiguous zeros.

Out of Frame Events. The total number of out of frame events that have been detected on this port. An out of frame event occurs when two or more framing errors occur within a 3 microsecond period for Extended SuperFrame signals, or when two or more errors occur out of five or fewer consecutive framing bits. The signal will be back in frame when there have been fewer than two frame bit errors within a 3 microsecond period for Extended SuperFrame signals.

Red Alarm Events. The number of times this port has been in a red alarm state, which occurs when a T1 port has been in Out-of-Frame (OOF) condition for 2.55 seconds. The red alarm condition will be removed if the OOF condition has been absent for at least 16.6 seconds.

Squelch Alarm Events. The number of squelch alarm events that have been detected on this port. A squelch alarm occurs when the line signal level of the input pulse is below a threshold level. The threshold level on a T1 line is 0.5V.

Frame Bit Error Events. The number of framing bit error events that have been detected on this port. A frame bit error occurs when an error bit is detected during the framing process.

Alarm Indication Signal Events. The number of Alarm Indication Signal (AIS) events that have been detected on this port. An AIS occurs when an unframed signal with a high density of 1s (99.9% density) is received for more than 1.5 seconds.

Yellow Alarm Events. The total number of yellow alarm events that have occurred on this T1 port. A yellow alarm occurs in SuperFrames when bit 6 of all channels has been zero for at least 335 microseconds. The yellow alarm will not occur if a Loss of Signal alarm has already occurred. In Extended Superframes, an alarm occurs if the yellow alarm pattern is found.

ESF CRC-6 Error Events. The number of times a CRC-6 error has been found in an Extended SuperFrame.

Viewing Information For an E1 Port

To view E1 port parameters, enter the following command

tes <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the E1 port number which you want to view information. For example, to view information for Port 1 on the board in slot 2, enter

tes 2/1

A screen similar to following displays for an E1 port:

T1/E1 Port Status for slot 2, port 1

Circuit Identifier	**: Alcatel E1 Circuit**		
Frame Format	**: E1**	**Line Build Out**	**: 120 Ohm (SH)**
Line Coding	**: HDB3**	**Signalling**	**: none**
Transmit Clock Source	**: localTiming**	**Trap Generation**	**: disabled**
Status Change Time	**: 0 days, 00:06:34.69**		
Loopback Status	**: NoLoop**		
Line Status	**: NoAlarm**		

Framer Statistics

Loss of Signal Events	**:**	**1**
Line Code Violation Events	**:**	**9**
Out of Frame Events	**:**	**2**
Red Alarm Events	**:**	**1**
Squelch Alarm Events	**:**	**1**
Frame Bit Error Events	**:**	**9**
Alarm Indication Signal Events	**:**	**3**
Out of Sub-multiframe Events	**:**	**0**
Out of TS16 Multiframe Events	**:**	**0**
Far End Frame Alarm Events	**:**	**2**
Far End Multiframe Alarm Events	**:**	**0**
Far End Block Error Events	**:**	**0**
CRC-4 Error Events	**:**	**0**

Circuit Identifier, Frame Format, Line Build Out, Line Coding, Signaling, Transmit Clock Source, Trap Generation. These parameters are described in the section, *Configuring an E1 Port* on page 29-7. Please refer to that section for descriptions.

Status Change Time. The system time when the last change in Line Status (i.e., alarm) parameter occurred.

Loopback Status. The type of loopback mode configured for this port through the **temod** command. Loopback modes are described in *Configuring an E1 Port* on page 29-7.

Line Status. A list of any alarms that have occurred on his port. The possible items in the list are the same as those for **Active Alarms** described in *Viewing Information for all T1/E1 Ports in the Switch* on page 29-10.

Loss of Signal Events. The total number of Loss of Signal (LOS) events that have been detected on this port. An LOS event occurs after the port detects more than 10 consecutive zeros.

Line Code Violation Events. The occurrence of either a bipolar violation or excessive zeros error. A bipolar violation is the occurrence of a pulse of the same polarity as the previous pulse. In HDB3 coded signals, a bipolar violation is a pulse of the same polarity as the previous without being part of the zero substitution code. An excessive zeros error is the occurrence of more than 15 contiguous zeros in an AMI-coded signal; in an HDB3-coded signal, it is the occurrence of seven (7) or more contiguous zeros.

Out of Frame Events. The total number of out of frames events that have been detected on this port. An out of frame event occurs when three consecutive frame alignment signals have been received with an error. The signal will be back in frame when frame alignment signalling is normal for three consecutive frames.

Red Alarm Events. The number of times this port has been in a Red alarm state. A red alarm occurs when a T1 port has been in Out-of-Frame (OOF) condition for 2.55 seconds. The red alarm condition will be removed if the OOF condition has been absent for at least 16.6 seconds.

Squelch Alarm Events. The number of squelch alarm events that have been detected on this port. A squelch alarm occurs when the line signal level of the input pulse is below a threshold level.

Frame Bit Error Events. The number of framing bit error events that have been detected on this port. A frame bit error occurs when an error bit is detected during the framing process.

Alarm Indication Signal Events. The number of Alarm Indication Signal (AIS) events that have been detected on this port. An AIS occurs when an unframed signal with a high density of 1s (99.9% density) is received for more than 1.5 seconds.

Out of Sub-multiframe Events. The number of sub-multiframe events that have been detected on this E1 port. This error occurs when four (4) consecutive CRC-4 multiframe alignment signals have been received in error or when a frame alignment error has been lost.

Out of TS16 Multiframe Events. The number of TS16 multiframe events that have been detected on this E1 port. This error occurs when two (2) consecutive TS16 multiframe alignment signals have been received in error, or all bits in time slot 16 are logic 0 for one TS16 multiframe, or frame alignment has been lost.

Far End Frame Alarm Events. The number of times the remote end has detected an out-of-frame condition. When a far end E1 port detects an out-of-frame condition, it transmits a frame with the alarm indication bit set (in time slot 0) back to the local E1 port. This error is similar to a yellow alarm on T1 ports.

Far End Multiframe Alarm Events. The number of times the remote end has detected an out-of-multiframe condition. When a far-end E1 port detects an out-of-multiframe condition, it transmits a frame with the alarm indication bit set (in time slot 16) back to the local E1 port. This error is similar to a yellow alarm on T1 ports.

Far End Block Error Events. The number of times the remote end has received a frame with a bad CRC-4. When the far end E1 port detects a CRC-4 error in the incoming frame, it transmits the frame with the E bit cleared.

CRC-4 Error Events. The number times a frame has been received with a bad CRC-4.

Viewing T1/E1 Local Statistics

There are a number of commands available for viewing local T1 and E1 statistics. These commands provide statistics for the past 24 hours, the current 15-minute interval, or the past 96 15-minute intervals. The following sections describe these commands.

Viewing Total Local Statistics

You can view statistics occurring during the past 24 hours on a single port by entering the following command

telts <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on which you want to view statistics. For example, to view 24-hour statistics for Port 1 on the board in slot 2, enter

telts 2/1

A screen similar to the following displays:

Local 24-hour Period Statistics for port 1 on slot 2

Circuit Identifier : Alcatel T1 Circuit
Valid Intervals : 1 of 96 Elapsed Time : 421 of 900

ES	SES	BES	UAS	SEFS	LES	CSS	PCV	LCV
3	1	1	0	1	313	0	2	313

Circuit Identifier. The textual description of this T1 or E1 port as configured through the **temod** command.

Valid Intervals. Indicates the number of 15-minute intervals for which valid statistics were gathered during the previous 24 hours. Statistics may be gathered for up to 96 15-minute intervals during a 24 hour period.

Elapsed Time. The number of seconds that have elapsed during this 15-minute interval of gathering statistics. This time will be reset to zero when a 15-minute session of statistics gathering is complete (and stored) and the next 15-minute interval begins.

ES. Errored Seconds. For T1-ESF and E1-CRC conditions, this is a second with one or more Path Code Violations, one or more out-of-frame defects, one or more controlled slip errors, or an AIS error.

SES. Severely Errored Seconds. For T1-ESF frames, this is a second with 320 or more Path Code Violation errors, one or more out-of-frame defects, or an AIS error. For E1-CRC conditions, this is a second with 832 or more Path Code Violation errors, or one or more out-of-frame defects. For E1-noCRC signals, this is a second with 2048 or more Line Code Violation errors. For D4/(SF) frames, this is a second with framing errors, an out-of-frame error, or a second with 1544 or more line code violation errors.

BES. Bursty Errored Seconds. The number of seconds with fewer than 320 but more than one (1) Path Code Violation error (see below for definition), no Severely Errored Frame errors, and no AIS errors.

UAS. Unavailable Seconds. The number of seconds this port was unavailable for transmitting or receiving data. In general, a port is unavailable after 10 consecutive Severely Errored Seconds or after a failure on the interface occurs.

SEFS. Severe Errored Framing Second. A second with one or more out-of-frame errors or an AIS error.

LES. Line Errored Seconds. The number of seconds during which one or more Line Code Violation errors have occurred (see also the definition of Line Code Violation below).

CSS. Controlled Slip Seconds. A one-second interval with one or more controlled slip errors. Controlled slip errors are the replication or deletion of the payload bits on a frame. Such an error may occur when there is a difference between the timing of a synchronous receiving terminal and the received signal.

PCV. Path Code Violations. A frame synchronization bit error in EF/D4 and E1-noCRC frames, or a CRC or frame synchronization error in the T1-ESF (Extended Super Frame) and E1-CRC frames.

LCV. Line Code Violations. The occurrence of either a bipolar violation or excessive zeros error. A bipolar violation is the occurrence of a pulse of the same polarity as the previous pulse. In B8ZS and HDB3 coded signals, a bipolar violation is a pulse of the same polarity as the previous without being part of the zero substitution code. An excessive zeros error is the occurrence of more than 15 contiguous zeros in an AMI-coded signal; in a B8ZS-coded signal, it is the occurrence of seven (7) or more contiguous zeros.

Viewing Current Local Statistics

You can view statistics for the current 15-minute interval on a single port by entering the following command

telcs <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on which you want to view statistics. For example, to view 15-minute interval statistics for Port 1 on the board in slot 2, enter

telcs 2/1

A screen similar to the following displays:

```
                Local Current 15-minute Measurement for port 1 on slot 2

Circuit Identifier          : Alcatel T1 Circuit
Valid Intervals             : 1 of 96          Elapsed Time          : 431 of 900

  ES      SES     BES     UAS    SEFS    LES     CSS     PCV     LCV
======= ======= ======= ======= ======= ======= ======= ======= =======
     0       0       0       0       0       0       0       0       0
```

Definitions of the fields and columns in this display are the same as those used for the **telts** command. See *Viewing Total Local Statistics* on page 29-16 for an explanation of these statistics.

Viewing Local Historical Statistics

The **telis** command allows you to display historical statistics for the past 96 15-minute intervals. Enter the following command

telis <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on which you want to view statistics. For example, to view historical 15-minute interval statistics for Port 1 on the board in slot 2, enter

telis 2/1

A screen similar to the following displays:

Local 15-minute Interval Statistics for port 1 on slot 2

Circuit Identifier : Alcatel T1 Circuit
Valid Intervals : 5 of 96 Elapsed Time : 440 of 900

Intv#	ES	SES	BES	UAS	SEFS	LES	CSS	PCV	LCV
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0

Definitions of the fields and columns in this display are the same as those used for the **telts** command. See *Viewing Total Local Statistics* on page 29-16 for an explanation of these statistics.

Viewing T1 Remote Statistics

To receive and monitor remote statistics on T1 ports you must enable the Facility Datalink (FDL) protocol through the **temod** command. These statistics will not be available if you do not enable FDL.

♦ Note ♦

Because there is no FDL standard for E1 configurations, remote statistics are not supported on E1 ports.

Viewing Total Remote Statistics

You can view remote statistics occurring during the past 24 hours on a single port by entering the following command

terts <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number for which you want to view statistics. For example, to view remote 24-hour statistics for Port 1 on the board in slot 2, enter

terts 2/1

A screen similar to the following displays:

Remote 24-hour Period Statistics for port 1 on slot 2

Circuit Identifier : Alcatel T1 Circuit
Valid Intervals : 1 of 96 Elapsed Time : 1 of 900

ES	SES	BES	UAS	DM	SEFS	LES	CSS	PCV	LOFC
0	0	0	0	0	0	0	0	0	0

Definitions of the fields and columns in this display are the same as those used for the **telts** command. See *Viewing Total Local Statistics* on page 29-16 for an explanation of these statistics.

LOFC. Loss of Frame Count. A loss of frame count is the accumulation of the number of times a “Loss of Frame” is declared.

Viewing Current Remote Statistics

You can view remote statistics for the current 15-minute interval on a single port by entering the following command

tercs <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on for which you want to view statistics. For example, to view remote 15-minute interval statistics for Port 1 on the board in slot 2, enter

tercs 2/1

A screen similar to the following displays:

Remote Current 15-minute Measurement for port 1 on slot 2

Circuit Identifier : Alcatel T1 Circuit
Valid Intervals : 1 of 96 Elapsed Time : 1 of 900

ES	SES	BES	UAS	DM	SEFS	LES	CSS	PCV	LOFC
0	0	0	0	0	0	0	0	0	0

Definitions of the fields and columns in this display are the same as those used for the **telts** command. See *Viewing Total Local Statistics* on page 29-16 for an explanation of these statistics.

Viewing Remote Historical Statistics

The **teris** command allows you to display remote historical statistics for the past 96 15-minute intervals. Enter the following command

teris <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number for which you want to view statistics. For example, to view remote historical 15-minute interval statistics for Port 1 on the board in slot 2, enter

teris 2/1

A screen similar to the following displays:

Remote 15-minute Interval Statistics for port 1 on slot 2

Circuit Identifier : Alcatel T1 Circuit
Valid Intervals : 5 of 96 Elapsed Time : 25 of 900

Intv#	ES	SES	BES	UAS	DM	SEFS	LES	CSS	PCV	LOFC
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0

Definitions of the fields and columns in this display are the same as those used for the **telts** command. See *Viewing Total Local Statistics* on page 29-16 for an explanation of these statistics.

Clearing the Framer Statistics for a T1/E1 Port

The **tecls** command enables you to clear the accumulated physical-layer (Framer) statistics for a T1 or E1 port. To clear statistics, enter

tecls <slot>/<port>

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on for which you want to clear statistics. For example, to statistics for Port 1 on the board in slot 2, enter

tecls 2/1

Once the statistics have been cleared, the following message will be displayed:

Statistics of port 2/1 have been cleared.

Running Bit Error Ratio Tests (BERT)

Bit Error Rate Testing (BERT) patterns are framed test patterns, meaning they are inserted into the payload of the framed DS1 signal. BERT patterns are used to test the signal integrity between two T1 machines. To configure a T1 port to use BERT patterns, enter the **tebcfg** command with the slot and port number, as shown

```
tebcfg <slot>/<port>
```

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on for which you want to clear statistics. For example, to statistics for Port 1 on the board in slot 4, enter

```
tecls 4/1
```

A screen similar to the following is displayed:

```
BERT Configuration for slot 4, port 1

1) BERT state { active(1), inactive(2) }                    : active
2) Pattern { 2^3 - 1(1),     2^4 - 1(2),      2^5 - 1(3),
             63(4),          127(5),          511(6),
             2^10 - 1(7),    2047(8),          2^15 - 1(9),
             2^17 - 1(10),   2^18 - 1(11),    2^20 - 1(12),
             QRSS(13),       2^21 - 1(14),    2^22 - 1(15),
             2^23 - 1(16),   2^25 - 1(17),    2^28 - 1(18),
             2^29 - 1(19),   2^31 - 1(20),    All 1(21),
             All 0(22),      Alt 1/0(23),     Dbl Alt 1/0(24),
             3 in 24(25),    1 in 16(26),     1 in 8(27),
             1 in 4(28) }                                   : QRSS
3) Direction { normal(1), reverse(2) }                      : normal
4) Verbose { on(1), off(2) }                                : off
5) Update Inverval (1-60)                                   : 5 seconds
```

The fields in the above display are described below.

1) BERT state

This field allows you to activate the BERT pattern and send it over the specified T1 line. Once BERT patterns are activated, they will be sent regularly according to the **Update Interval**.

2) Pattern

There are several different types of BERT patterns that can be sent over a line to test the integrity of the line. Select which type of pattern from the following list:

2^3 - 1(1)

A 7-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^4 - 1(2)

A 15-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^5 - 1(3)

A 31-bit long pseudo-random pattern as defined by ITU-T 0.151.

63(4)

A 63-bit long pseudo-random pattern as defined by ITU-T 0.151.

127(5)

A 127-bit long pseudo-random pattern as defined by ITU-T 0.151.

511(6)

A 511-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^10 - 1(7)

A 1023-bit long pseudo-random pattern as defined by ITU-T 0.151.

2047(8)

A 2047-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^15 - 1(9)

A 32767-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^17 - 1(10)

A 131071-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^18 - 1(11)

A 262143-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^20 - 1(12)

A 1048575-bit long pseudo-random pattern as defined by ITU-T 0.151.

QRSS(13)

A 1048575-bit long pseudo-random pattern with 1's substituted as defined by ITU-T 0.151.

2^21 - 1(14)

A 2097151-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^22 - 1(15)

A 4194303-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^23 - 1(16)

A 8388607-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^25 - 1(17)

A 33554431-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^28 - 1(18)

A 268435455-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^29 - 1(19)

A 536870911-bit long pseudo-random pattern as defined by ITU-T 0.151.

2^31 - 1(20)

A 2147483647-bit long pseudo-random pattern as defined by ITU-T 0.151.

All 1(21)

BERT pattern is all ones (1).

All 0(22)

BERT pattern is all zeros (0).

Alt 1/0(23)

BERT pattern alternates between ones and zeros (10101).

Dbl Alt 1/0(24)

BERT pattern alternates between double ones and zeros (1100110011).

3 in 24(25)

Three 1 bits for every 24 bits (all others set to 0).

1 in 16(26)

One 1 bit for every 16 bits (all others set to 0).

1 in 8(27)

One 1 bit for every 8 bits (all others set to 0).

1 in 4(28) }

One 1 bit for every 4 bits (all others set to 0).

3) Direction

4) Verbose

5) Update Interval

When a BERT test is sent, this field determines the length of the test in seconds.

Displaying BERT Statistics

After a BERT pattern has been configured and activated, the statistics for the test can be viewed with the **tebs** command. Enter the command as shown:

```
tebs <slot>/<port>
```

where **<slot>** is the slot number where the port is located, and **<port>** is the port number on for which you want to clear statistics. For example, to statistics for Port 1 on the board in slot 4, enter

```
tebs 4/1
```

A screen similar to the following is displayed:

```
BERT statistics for slot 4, port 1

Elapsed Time          : 0 days, 00:02:57.60
Test Pattern          : QRSS
Direction             : Normal
Current Status        : Sync
Rx Data               : 0xA0567A2E
Sync Loss             : 0
Bit Errors            : 0
```

Current Status

Rx Data

Sync Loss. The number of times that synchronization between the end points of the T1 line has been lost.

Bit Errors. The number of bit errors found by the BERT pattern test.

Clearing BERT Statistics

To clear BERT statistics for a port, enter the **tebcls** command as follows:

```
tebcls <slot>/<port>
```

where **<slot>** is the slot number where the port is located (either 2 or 4), and **<port>** is the port number. For example, to clear BERT statistics for port 1 on slot 2, enter:

```
tebcls 4/1
```

A message confirming the operation is displayed.

Configuring Port Type (T1/E1)

The OmniAccess 408 allows you to configure whether the circuit emulation (ports 1 and 2) and IMA ports (if installed) are T1 or E1 compatible. This is done using the **tecfg** command.

♦ Important Note ♦

When configuring ports to be T1 or E1, all ports on the switch will be set to the same medium. In other words, all ports must either be T1 or E1. You cannot split the switch with some ports being T1 and others being E1.

To set the port type, enter the **tecfg** command at the system prompt, followed by either T1 or E1. For example, to set the switch to use E1, enter:

```
tecfg e1
```

The following message is displayed to confirm your selection:

```
System reboot is required for T1E1 port type change to take affect.
```

Once you reboot the switch, it will be set to handle E1 traffic.