36 Managing Circuit Emulation Modules

Circuit emulation modules transport traditional T1 or E1 Time Division Multiplexing (TDM) and synchronous serial port traffic over ATM networks. Input data comes from traditional TDM or synchronous serial streams while output data goes out the ATM network in the form of a Constant Bit Rate (CBR) cell stream. Specifically, circuit emulation modules convert T1/E1 bits (or T1/E1 DS0 bundles) and serial data to ATM AAL1 cells.

Circuit Emulation modules (the ASM-CE and the CSM-CE) work best when connected to an ATM network using a single reference clock. This combination is best because circuit emulation is very timing sensitive, requiring the ATM Class of Service with the highest priority and lowest Cell Delay Transfer Variation (CDTV). Circuit Emulation modules process data segmentation and reassembly according to the ATM Forum Circuit Emulation Service Interoperability Specification (CES-IS), version 2.

T1 and E1 ports support structured or unstructured data transfer, which you can configure through software. Additional T1/E1 configuration options include frame format, line coding, and Facility Datalink Protocol. T1 and E1 ports also support synchronous, Synchronous Residual Time Stamp (SRTS), and adaptive clocking. Circuit Emulation modules can store up to 24 hours of performance statistics for local and remote ports.

♦ Note ♦

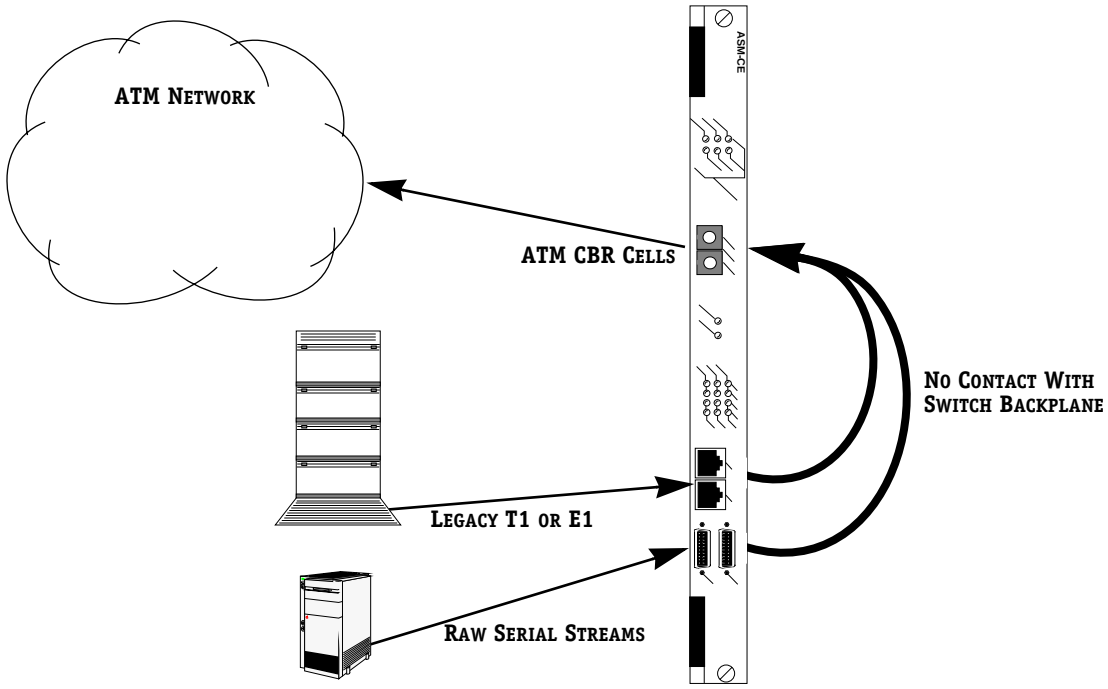
Additional overview and configuration information on T1/E1 ports can be found in Chapter 53, “Managing T1 and E1 Ports.”

This chapter is divided into two parts. The first part provides an overview of circuit emulation services and an application example. This first part runs from this page through page 36-10. The second part describes the configuration of the logical circuit emulation services supported on T1/E1 ports and the serial ports; this second part starts with the section, *The Circuit Emulation Menu* on page 36-11.

The ASM-CE

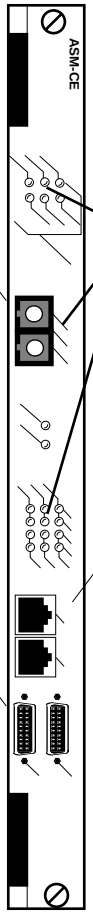
In addition to T1/E1 ports, all ASM-CE modules contain two synchronous serial ports. Serial ports support speeds from 56 KBPS to 2048 KBPS. Cable types used with serial ports can be V.35, X.21, RS-232, RS-449, or RS-530. Serial ports automatically detect cable type and initialize line drivers dynamically. Serial ports support unstructured data transfer only; they also support synchronous and Synchronous Residual Time Stamp (SRTS) clocking, but not adaptive clocking.

Unlike other switch modules, incoming circuit emulation traffic on an ASM-CE has no interaction with the switch backplane. Data from T1/E1 ports and serial ports comes into the ASM-CE and goes back out the ATM uplink port on the same ASM-CE module. The ATM uplink port may be factory configured as OC-3 (single mode or multimode), DS-3, or E3.



Data Flow Through a Circuit Emulation ATM Access Module

The ASM-CE Ports: An Overview



ATM Uplink Port

The ATM uplink port on the ASM-CE is equivalent to uplink ports on standard ASM modules. It switches traffic from the switch backplane or from the circuit emulation service ports on this module (T1/E1 or serial ports). You configure this port through ATM menu commands, such as **map**. You can configure ATM access services on the port through the **cas** command. Please refer to Chapter 35 for instructions on configuring this port, and Chapter 38 for configuring ATM services.

Serial Ports

These universal serial ports connect to devices that support raw serial transport, such as a video server. Traffic from these ports is converted into ATM cells and switched out the ATM uplink port on this module. You can configure physical layer parameters, such as clock speed, as well as circuit emulation services through the circuit emulation menu, which is described later in this chapter.

LED's

For information on LED functionality, refer to Chapter 7, "OmniSwitch Switching Modules."

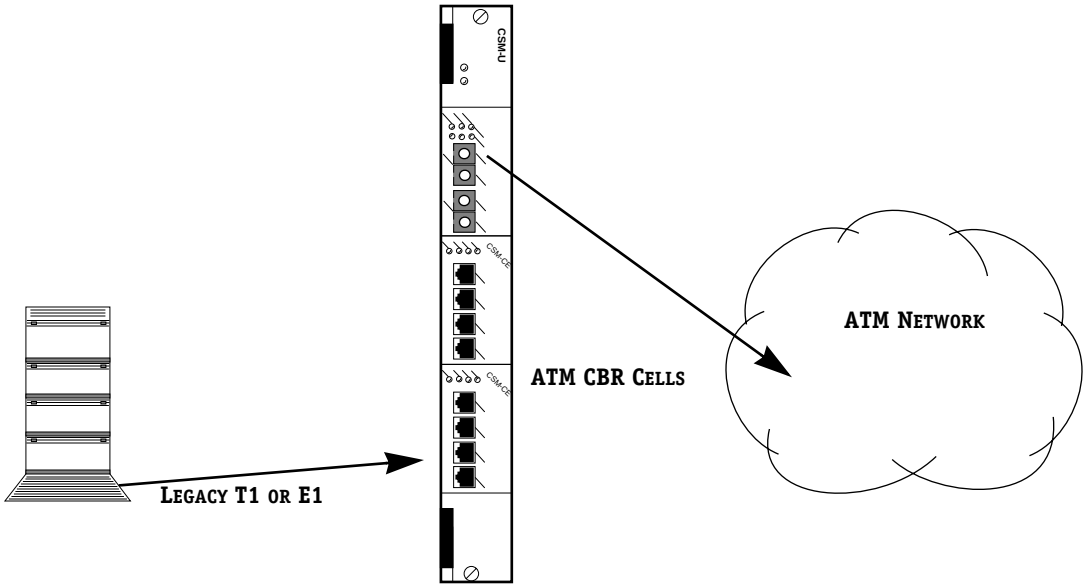
T1/E1 Ports

These two ports connect to traditional T1 or E1 links such as a PBX. Circuit emulation traffic from these ports is converted to ATM cells and switched out the ATM uplink port on this module. Physical layer parameters are configured through the T1/E1 menu, which is described in Chapter 53. Circuit emulation services are configured through the circuit emulation menu, which is described in this chapter.

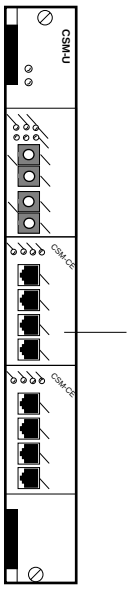
The CSM-CE

CSM-CE ports are part of an adapter board that connects to a CSM-U. Each CSM-U module can contain three adapter boards. This CSM-CE adapter board contains four T1 or E1 ports. Traditional T1/E1 traffic from a device such as a PBX comes in on a T1 or E1 port and is converted into ATM cells. These cells are forwarded directly onto the cell switching matrix. The CSM-CE ports are true ATM switch ports rather than uplink, or access, ports.

The bottom two adapter boards on the CSM-U module in this illustration are CSM-CE boards. Incoming traffic goes directly on the ATM cell switching matrix.



Data Flow Through a CSM Circuit Emulation Module



T1/E1 Ports

These ports connect to traditional T1 or E1 links such as a PBX. Circuit emulation traffic from these ports is converted to ATM cells and sent out to the ATM network. Physical layer parameters are configured through the T1/E1 menu, which is described in Chapter 53. Circuit emulation services are configured through the circuit emulation menu, which is described in this chapter.

CSM-CE Ports

Circuit Emulation T1/E1 Ports

Circuit emulation T1/E1 ports are *not* generic ATM ports like the ones on other ASM and CSM modules (e.g., CSM-AB-T1-4W, CSM-AB-IMA-T1-8W). Internally, a CSM-CE or ASM-CE module is connected to the switch fabric as a single ATM port. The AAL1 SAR receives multiple cell streams from the same internal ATM port, converts them to a traditional TDM T1/E1 stream, and sends them out to appropriate T1/E1 ports based on the VCIs of incoming cell streams.

For example, a CSM-AB-CE module is installed in adapter slot No. 1 in a CSM-U in slot 5. If you use the **slot** command, circuit emulation ports 5/1, 5/2, 5/3, and 5/4 will be displayed. (See Chapter 13, "Switch-Wide Parameters," for more information on the **slot** command.) However, if you execute the **vcs** or **vvc** command, a single CSM port, 5/1, will be displayed. (The **vvc** and **vcs** commands are described in Chapter 42, "Managing Cell Switching Modules (CSMs)," for CSMs and in Chapter 35, "Managing ATM Access Ports," for ASMs.)

If, for example, you create the following four (4) circuit emulation circuits with the **ceadd** command (which is described in *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12):

```
ceadd 5/1 256
ceadd 5/2 288
ceadd 5/3 320
ceadd 5/4 352
```

The **vvc** and **vcs** commands will display these virtual circuits as 5/1 0/256, 5/1 0/288, 5/1 0/320, and 5/1 0/352. In this example, the AAL1 SAR receives and transmits cells *only* from and to port 5/1.

Configuring a Circuit Emulation Module

The steps to configuring a circuit emulation module depend on whether you have an ASM-CE or a CSM-CE. Due to the different port types on the ASM-CE, configuration of the module requires several general steps. There are differences in the configuration for logical-level circuit emulation parameters, T1/E1 physical parameters, and ATM uplink parameters. These general steps are as follows:

Step 1. Configure T1/E1 Ports

Configure framing, line encoding, signaling and other options through the **temod** command. This command sets up physical level parameters for the T1 or E1 port. This step is required for ASM-CE and CSM-CE modules. See Chapter 53, "Managing T1 and E1 Ports," for directions on configuring a T1 or E1 port.

♦ Note ♦

Serial ports are configured while configuring circuit emulation parameters (in Step 3).

Step 2. Configure ATM Access Port (ASM-CE only)

The ATM port on the ASM-CE is the same port used with standard ASM ATM access modules. You use ATM menu commands to configure the ATM ports on the ASM-CE. This step is required for ASM-CE modules only. See Chapter 35, "Managing ATM Access Ports," for information on those commands.

Step 3. Configure Circuit Emulation

You configure the circuit emulation service parameters on T1, E1, and serial ports through the **ceadd** and **cemodify** commands. You create circuit emulation virtual circuits through the **ceadd** command. These parameters include VPI, VCI, and Cell Delay Transfer Variation (CDTV). See *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12 for T1 and E1 ports, or see *Creating a Virtual Channel Connection on a Serial Port* on page 36-21 for serial ports. This step is required for ASM-CE and CSM-CE modules.

You can also optionally configure port-level circuit emulation parameters, such as service modes and service clock modes, through the **cemodify** command. If you do not configure these port-level parameters, defaults will be assigned to ports.

Circuit Emulation Services

Once data comes into a circuit emulation module through a T1/E1 port or a serial port, it is passed onto the ATM network as ATM cells. There are two services available for segmenting data into ATM cells: structured and unstructured. In general, time slot information will be retained in a structured service and will not be interpreted in an unstructured service. Since serial port data does not use time slots, only an unstructured service is available for these ports.

Unstructured Service

An unstructured circuit emulation service assigns a single virtual circuit to an entire T1 or E1 bit stream. The data stream is segmented into AAL1 cells without regard to any structure in the user data or byte alignment between the user data and the ATM cell payload. Unstructured service is intended primarily for simple point-to-point applications. This service does not require the use of time slots associated with T1 and E1 data traffic. It is the required service for use with the serial ports on an ASM-CE.

The ATM cell format for unstructured service includes a 5-octet ATM cell header and a 1-octet AAL1 header. The 47 octets of data payload contain the T1 or E1 bit level data stream encapsulated in the same order they were received but without any structure. One ATM cell can hold 1.95 T1 frames (193 bit frames) or 1.47 E1 frames (256 bit frames).

Structured Service

In a structured circuit emulation service, time slots are considered before structuring data into ATM cells. Time slots allow a device such as a PBX to switch some data in one direction and other data in another direction. Time slots increase control over traffic and bandwidth.

A structured circuit emulation service preserves this extra control afforded by time slots when TDM traffic is converted to ATM cells. This service supports an *n* x 64 KBPS data format and assigns any combination of time slots to a virtual connection. Structured service supports up to 24 virtual connections on a T1 port and up to 31 virtual connections on an E1 port. This service can also optionally carry Channel Associated Signaling (CAS) bits.

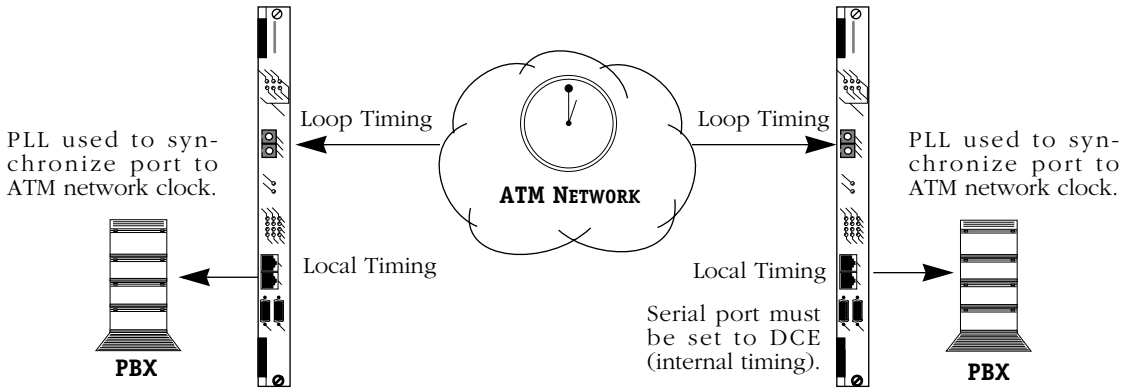
The ATM cell format for a structured service has a 5 octet ATM cell header and a 1- or 2-octet AAL1 header. The 46 or 47 octets of data payload contain the selected T1 or E1 channel and can optionally carry CAS bits. When CAS is included in the cell, it is collected from the appropriate time slots in the appropriate frame and placed at the end of the cell. A 2-octet AAL1 header has a 1-octet pointer (once every 8 cells) to point to the beginning of the multiframe.

Circuit Emulation Clocking Modes

The three service clock modes available for circuit emulation services are synchronous, Synchronous Residual Time Stamp (SRTS), and adaptive. The type of clocking that may be used depends on the circuit emulation service mode chosen. In structured service mode, synchronous and adaptive service clock modes are supported. In unstructured service mode, synchronous, adaptive, and SRTS clocking are supported.

Synchronous Clocking

Synchronous clocking can be used in an ATM network using a single master clock. Synchronous clocking is the most accurate form of clocking for circuit emulation services. The port uses a Phase Lock Loop (PLL) to synchronize to the ATM clock. This allows the port to derive and provide timing from the ATM network to attached devices.

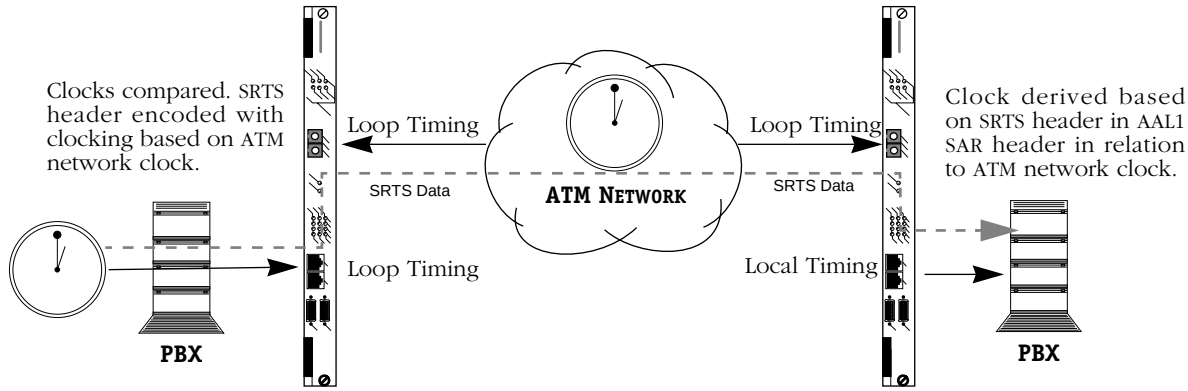


Synchronous Clocking

In a synchronous clocking mode, both sides of the connection (i.e., both circuit emulation ports) will use a local clock source. Therefore, the Transmit Clock Source setting should be set to *local timing*. The timing configuration for the port is shown in the above diagram.

Synchronous Residual Time Stamp (SRTS) Clocking

In SRTS clocking, the ATM network must provide a single master clock. The port receives the clock from the attached device, such as a PBX. The SRTS information is encoded within the AAL1 SAR header. The clock is derived and adjusted as needed on the remote port based on the SRTS information from the AAL1 SAR header.



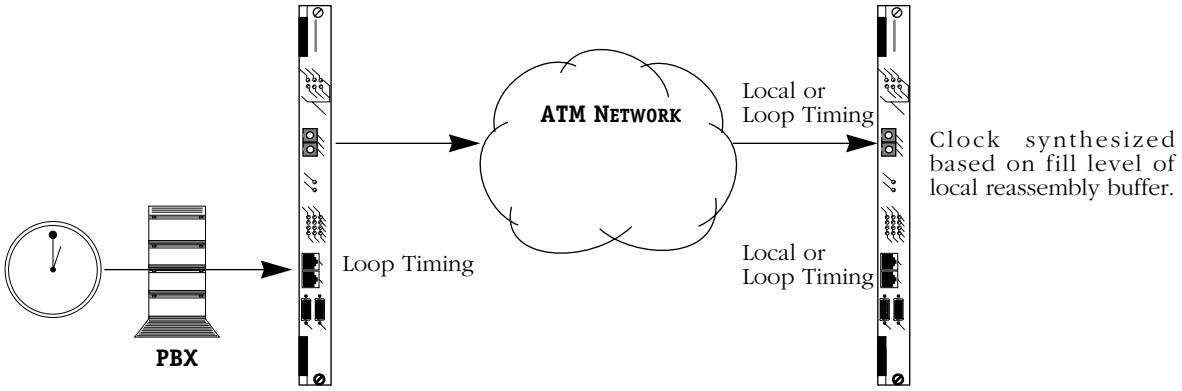
SRTS Clocking

In SRTS clocking, the port receives the clock on one end and regenerates the clock locally on the other end. In such a case, the Transmit Clock Source parameter for the port receiving the clock from the network should be configured to *loop timing* and the other end of the link should be configured to *local timing*.

SRTS clocking is supported on T1, E1, and serial ports. It can only be used with an unstructured circuit emulation service mode. In addition, when used on serial ports, the clocking speed must be set to 1.544 Mbits or 2.048 Mbits.

Adaptive Clocking

In adaptive clocking, the ATM network does not need to be running on a single master clock. The port receives the clock from the attached device, such as a PBX. No information on clocking is passed across the ATM network. The clock is synthesized and adjusted on the remote port based on the fill level of the local ATM reassembly buffer. If the buffer fills too much, the clock frequency is increased; if the buffer fills too little, the clock frequency is decreased. Adaptive clocking is the least accurate form of clocking and the most prone to bit errors.



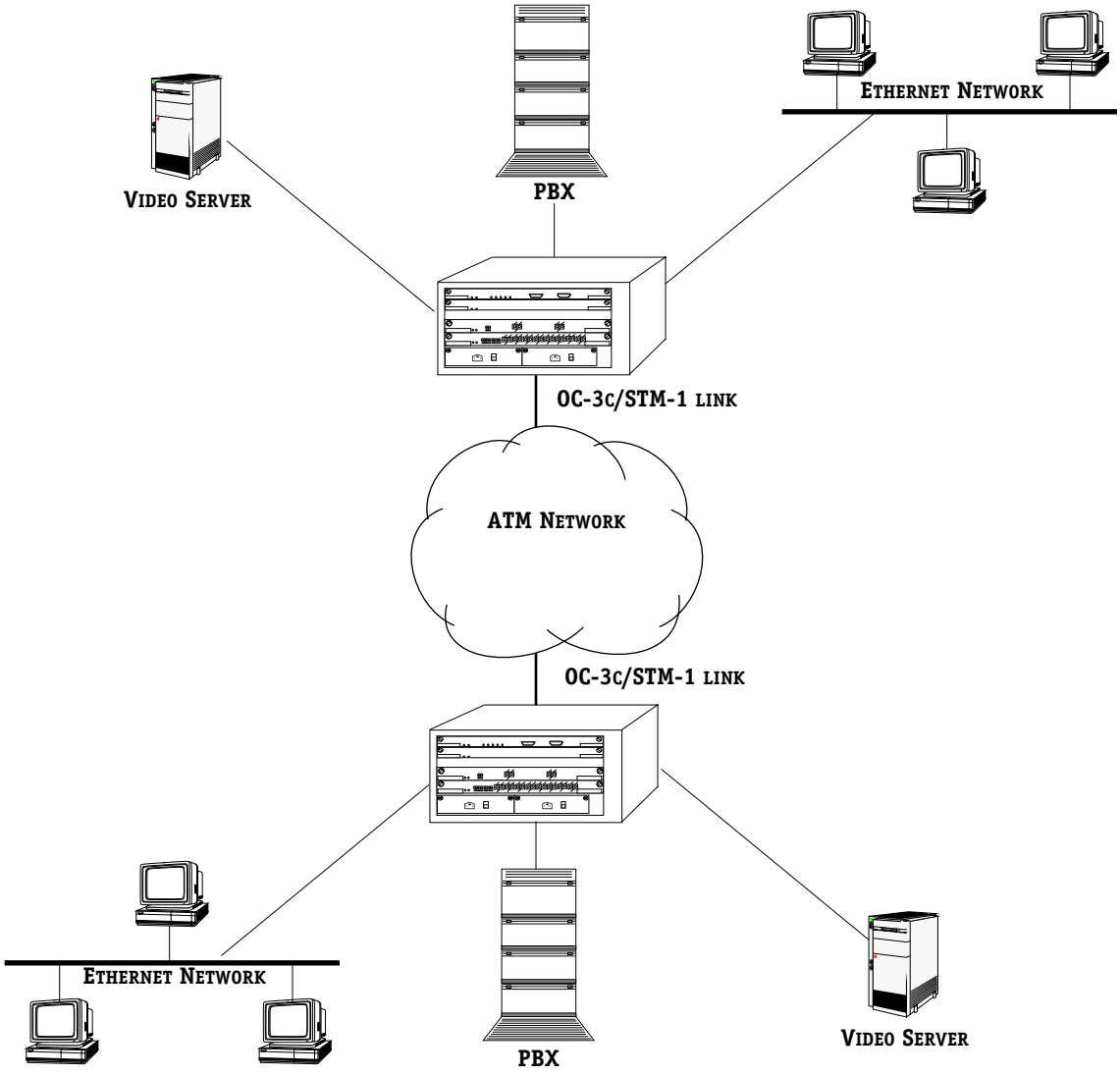
Adaptive Clocking

In adaptive clocking, the module receives the clock on one end and regenerates the clock locally on the other end. In such a case, the Transmit Clock Source parameter for the port receiving the clock from the network should be configured to *loop timing* and the other end of the link should be configured to *local timing*.

Adaptive clocking is supported for T1 and E1 ports only; it is not supported on serial ports.

Application Example - ASM-CE

Circuit emulation modules are typically used in networks in which legacy T1/E1 or synchronous serial traffic needs to be transmitted over an ATM network. The module can accept input from T1/E1 sources, such as a private branch exchange (PBX), or from pure serial traffic sources, such as a video server. The diagram below illustrates a circuit emulation application using an ASM-CE.



Typical Circuit Emulation Configuration

In this example, the PBX connects to one of the T1 ports on the circuit emulation module. The video server on each end of the network connects to one of the serial ports on an ASM-CE. The traffic from both of these sources is muxed and sent out as ATM cells through the ATM port on the ASM-CE. This ATM port in turn connects into the wider ATM network of cell switches. Other traffic, such as 10/100 Ethernet LAN traffic, that connects to the same switch can also be switched out the ATM port on an ASM-CE.

The Circuit Emulation Menu

The commands for configuring and monitoring circuit emulation virtual channel connections are contained in the ATM circuit emulation submenu. These commands control the circuit emulation services on both T1/E1 ports (ASM-CE and CSM-CE) and serial ports (ASM-CE only); they do not affect the ATM uplink port. This submenu displays as shown below and may be accessed (when in verbose mode) by entering **atmce** at a command line.

```
Command     ATM Circuit Emulation Management Menu
----------- ------------------------------------------------------------
cemodify    Modify a port or a virtual channel configuration
cestatus    View status of a port or a virtual channel connection
ceadd       Create a virtual channel connection
cedelete    Delete a virtual channel connection
cecls       Clear statistics of a virtual channel connection

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

You create virtual channel connections through the **ceadd** command and modify those virtual channels later through the **cemodify** command. You can view the status of virtual channel connections through the **cestatus** command. Additionally, you can configure port-level circuit emulation parameters on T1/E1 ports and serial ports through the **cemodify** command.

Creating a Virtual Channel Connection on a T1/E1 Port

The **ceadd** command allows you set up circuit emulation virtual channels for T1 or E1 ports on ASM-CE and CSM-CE submodules.

The configuration parameters in this command are different for T1/E1 ports and serial ports. This section describes options for T1 and E1 ports.

To configure a virtual channel connection on a T1 or E1 port, enter the following command

ceadd <slot>/<port> <vci>

where **<slot>** is the slot number where the board is located, **<port>** is the T1 or E1 port number on the board (Port 2 or Port 3), and **<vci>** is the virtual channel identifier for the virtual channel that you want to add.

When selecting a VCI, you need to be aware of the ranges available for each circuit emulation port. The following VCI ranges are available for each port:

CSM-CE Port Number *	ASM-CE Port Number	Valid VCI Range
1	2	256–287
2	3	288–319
3	4	320–351
4	5	352–383

* The actual port number is based upon which slot position the board occupies, and whether other modules are installed. Port numbers increment from left to right.

For example, to create a virtual channel with a VCI of 257 on port 2 on an ASM-CE board in switch slot 5, you would enter

ceadd 5/2 257

A screen similar to the following displays (NOTE: If the port is configured for unstructured service, time slot information will not be displayed):

```
        Slot 5 Port 2 Connection 257 Configuration

Available Time Slot:

  {1,2,3 }

1)  Description (30 chars max)                        : Connection 257
2)  Administration Status { UP (1), DOWN (2) }        : UP
3)  Virtual Path Identifier (0-128)                   : 0
4)  Partial Cell Fill Count (0-47)                    : 0
5)  Cell Loss Integration Period in second (1-64)     : 2
6)  Cell Delay Variation Tolerance in frame (1-255)   : 20
7)  Idle Code (0-FF)                                  : FF
8)  Reassembly Buffer Size in frame (1-512)           : 100
9)  Time slots used : {4, 5, 6, 7, 8, 9, 10, 11, 12,
                       13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24}
    (Usage: "+/-<ts|all>" add/remove a time slot. For example,
    "9=+10+12-9" to add time slot 10 & 12 and remove time slot 9.
    "9=+all" add all time slots.  "9=-all" remove all time slots)
10) Connection type { PVC (1), SPVC (2) }             : PVC
11) ATM uplink slot (1-5)                             : 3
12)  ATM uplink port (1-1)                            : 1
13) ATM uplink VPI                                    : 2
14) ATM uplink VCI                                    : 2
17) Signalling Code (0-F)                             : 0

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

1) Description

Enter a description for this virtual channel connection of up to 30 characters. This description will be used in screen displays to identify this connection.

2) Administration Status

This option enables and disables the virtual circuit you are modifying. Setting this option to **Up** enables the circuit and allows data to be sent or received as long as the Operational Status is also Up. Setting this option to **Down** disables the circuit; no data can be sent on the circuit. The **Down** option is a good option to use when preconfiguring a virtual circuit in advance of live network operation.

3) Virtual Path Identifier

The Virtual Path Identifier (VPI) with which the virtual channel connection you are setting up is associated.

♦ Note ♦

This field only appears if the VCI is being added to a T1/E1 port on a CSM-CE submodule.

4) Partial Cell Fill Count

Enables the partial cell fill count feature, which is used to decrease cell fill delay. In this field, indicate the minimum number of octets of user data allowed per ATM cell. No data cell will be transmitted out the ATM uplink port until it contains the number of bytes you specify here. If you set this parameter to zero (0), the partial cell fill count feature is disabled and all cells will be filled completely before they are sent.

5) Cell Loss Integration Period

The time, in seconds, after which lost cells will be declared lost. When cells are lost, this integration period begins. If cells are not recovered within this period, an internal variable will be set indicating that cells have been lost on this virtual circuit. This may affect statistics counters.

6) Cell Delay Variation Tolerance

The maximum cell delay variation of this virtual circuit in frame increments. One frame is defined as the size of the buffer that can store incoming data for up to time *T*. In structured mode, *T* equals 125 ms. In unstructured mode, a frame equals to 32 octets and the corresponding values for *T* are as follows:

- Unstructured T1 *T* = 166 ms
- Unstructured E1 *T* = 125 ms
- Unstructured serial port *T* = 32*8/speed

7) Idle Code

The idle character sent to the circuit emulation interface or to the ATM uplink port. This idle character is sent to T1/E1 time slots or to a serial port if the reassembly buffer for this virtual circuit is underrun or overrun. If an alarm is present on the T1/E1 port or if there is a cable drop on the serial port, this idle character will be sent upstream through the ATM network.

8) Reassembly Buffer Size

The maximum size of the ATM reassembly buffer, in frames. This buffer is used by the AAL1 SAR to buffer incoming data on the ATM uplink port. Data in the buffer is later passed on to the appropriate T1/E1 or serial port. This buffer allows some flexibility in the transmission of data to legacy T1/E1 and serial ports due to cell delay variation on the ATM network.

In unstructured mode, a frame equals 32 octets (256 bits). In structured mode, a frame is the number of time slots assigned to this virtual circuit. So, if 5 time slots are assigned to this virtual circuit and this parameter is set to 50, the total buffer size for all time slots in the virtual circuit is 250 bytes (each of the 5 time slots uses 50 bytes).

♦ Note ♦

The Reassembly Buffer Size must be greater than the Cell Delay Variation Tolerance.

9) Time Slots Used

Indicates which time slots this virtual circuit will use. You add time slots by entering **9=** followed by a plus sign (**+**) and the number of each time slot you want to add. For example to add time slots 14 and 15, you would specify:

```
9=+14+15
```

You can also enter a minus sign (**-**) followed by the number of the time slot you want to delete. For example, to delete time slot 14 from this virtual circuit, enter:

```
9=-14
```

♦ Note ♦

This field only appears if the T1/E1 port has been configured for Structured Service Mode. For more information on configuring the T1/E1 port, see *Configuring a Circuit Emulation T1/E1 Port* on page 36-23.

10) Connection Type

The type of VC you want to create, either a Permanent Virtual Circuit (PVC), or a Soft Permanent Virtual Circuit (SPVC). If you enter 2 (SPVC), additional options are displayed. See *Creating a Soft Permanent Virtual Circuit (SPVC) on T1/E1 Ports* on page 36-17 for more information on configuring SPVCS on a CSM-CE port. For more information on PVCs and SPVCs, see Chapter 42, "Managing Cell Switching Modules (CSMs)."

♦ Note ♦

You can only create SPVCs on CSM-CE modules.

11) ATM uplink slot

The slot in this chassis where input circuit emulation traffic will be transmitted. On an ASM-CE, this slot is the same slot as this ASM-CE, and may not be changed.

12) ATM uplink port

The port on the circuit emulation module where input circuit emulation traffic is transmitted. On an ASM-CE, this port will be Port 1, because the first port will always be used as the uplink port.

13) ATM uplink VPI

This parameter represents the VPI for the permanent virtual circuit on which cell traffic will be sent on the ATM network.

♦ Note ♦

This field only appears if the VCI is being added to a T1/E1 port on a CSM-CE submodule.

14) ATM uplink VCI

This parameter represents the VCI for the permanent virtual circuit on which cell traffic will be sent on the ATM network.

♦ Note ♦

This field only appears if the VCI is being added to a T1/E1 port on a CSM-CE submodule.

17) Signalling Code

Signaling code is used to carry signaling state information (e.g., on-hook, off-hook, ringing). Signaling bits are composed of four (4) bits for T1 Extended Superframe (ESF) and E1 Multi-frame (MF) or two (2) bits for T1 Superframe (SF).

This field specifies the 4-bit signaling code to be sent to attached and far-end equipment (e.g., alarms, receive cell starvation overflow). To change this parameter, enter a hexadecimal value from **0** to **f**.

♦ Note ♦

This field only applies to T1/E1 ports.

Creating a Soft Permanent Virtual Circuit (SPVC) on T1/E1 Ports

When creating a virtual channel connection for a T1 or E1 port on a CSM-CE module, the VCC can be either a Permanent Virtual Circuit (PVC) or a Soft Permanent Virtual Circuit (SPVC). A PVC is a point to point connection that is configured by the user and remains consistent despite switch restarts. Like PVCs, SPVCs require some user configuration, and are not affected by switch restarts, but use PNNI signaling to establish connections.

It is possible to create a SPVC on a T1 or E1 port, rather than a PVC. The procedure is nearly identical to configuring a PVC on a T1 or E1 port.

To configure a SPVC on a T1 or E1 port:

1. Enter the **ceadd** command as follows:

   ceadd <slot>/<port> <vci>

   where **<slot>** is the slot number where the board is located, **<port>** is the T1 or E1 port number on the board, and **<vci>** is the virtual channel identifier for the SPVC that you want to add.

   When selecting a VCI, you need to be aware of the ranges available for each Circuit Emulation port. See *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12 for the valid VCI ranges for each port.

   For example, to create a virtual channel with a VCI of 289 on port 2 in switch slot 5, you would enter

   ceadd 5/2 289

   The screen for creating a virtual channel connection appears, as shown:

```
Slot 5 Port 2 Connection 289 Configuration

Available Time Slot:

  {1,2,3 }

1)  Description (30 chars max)      : Connection 289
2)  Administration Status { UP (1), DOWN (2) }                  : UP
3)  Virtual Path Identifier (0-128)                             : 0
4)  Partial Cell Fill Count (0-47)                              : 0
5)  Cell Loss Integration Period in second (1-64)               : 2
6)  Cell Delay Variation Tolerance in frame (1-255)             : 20
7)  Idle Code (0-FF)                                            : FF
8)  Reassembly Buffer Size in frame (1-512)                     : 100
9)  Time slots used : {4, 5, 6, 7, 8, 9, 10, 11, 12,
                       13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24}
    (Usage: "+/-<ts|all>" add/remove a time slot. For example,
    "9=+10+12-9" to add time slot 10 & 12 and remove time slot 9.
    "9=+all" add all time slots.  "9=-all" remove all time slots)
10) Connection type { PVC (1), SPVC (2) }                       : PVC
11) ATM uplink slot (1-5)                                       : 3
12)  ATM uplink port (1-1)                                      : 1
13) ATM uplink VPI                                              : 2
14) ATM uplink VCI                                              : 2
17) Signalling Code (0-F)                                       : 0

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

♦ Note ♦

If the port is configured for unstructured service, time slot information is not displayed.

2. Configure options 1-9 as you would for a PVC. This procedure is described in *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12.

3. Change the **Connection type** from **PVC** to **SPVC** by entering the line number (**10**), an equals sign (**=**), and then **2** (the value for **SPVC**), as shown:

```
10=2
```

The Virtual Channel Connection menu changes. Fields 11 through 14 are removed, and new fields that apply to SPVCs appear, as shown:

```
Slot 5 Port 1Connection 256 Configuration

Available Time Slot:
   {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}

1) Description (30 chars max) : Connection 256
2) Administration Status { UP (1), DOWN (2) }          : UP
3) Virtual Path Identifier (0-128)                     : 0
4) Partial Cell Fill Count (0-47)                      : 0
5) Cell Loss Integration Period in second (1-64)       : 2
6) Cell Delay Variation Tolerance in frame (1-255)     : 10
7) Idle Code (0-FF)                                    : FF
8) Reassembly Buffer Size in frame (1-512)             : 20
9) Time slots used : { none }
     (Usage: "+/-<ts|all>" add/remove a time slot. For example,
       "9=+10+12-9" to add time slot 10 & 12 and remove time slot 9.
       "9=+all" add all time slots.  "9=-all" remove all time slots)
10) Connection Type { PVC (1), SPVC (2) }              : SPVC
     100) SVC Mode { Active (1), Passive (2) }         : Active
     101) Selector for Local ATM Address (1..FF)       : 1
11) Remote ATM Address : 00000000000000000000000000000000000000000000
12) Remote VPI                                         : 0
13) Remote VCI                                         : 256
14) SVC Retry Interval (0-36000 1/10ths sec)           : 10
15) SVC Retry Limit (0-65535)                          : 0
16) Restart { True (1), False (2) }                    : False
17) Signalling Code (0-F)                              : 0


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

♦ Note ♦

This menu can also be accessed through the **scvc** command in the ATM menu. For more information on the **scvc** command and the ATM menu, see Chapter 43, "Advanced CSM Management."

Descriptions for option1 (**Description**) through option 10 (**Connection Type**) and option 17 (**Signalling Code**) are described in *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12. Options 100 (**SVC Mode**) through 16 (**Restart**) are described below.

100) SVC Mode

Selects the mode the virtual circuit uses. The options are **Active (1)** and **Passive (2)**. In **Active** mode the SPVC can both initiate and receive calls, whereas in **Passive** mode the SPVC can only receive calls.

♦ Note ♦

When in passive mode, the **mvc** command does not function. For more information on this command, see Chapter 42, "Managing Cell Switching Modules (CSMs)."

101) Selector for the ATM Address

Determines an alphanumeric number to be appended to the ATM address. Since a port can have multiple SPVCs, the **Selector** allows for each SPVC to have a unique local ATM address.

11) Remote ATM Address

The ATM address of the remote end user for this SPVC. If this address is not supplied then the switch virtual circuit between this CES user and the remote CES user is not established.

12) Remote VPI

The Virtual Path Identifier (VPI) used for this circuit on the ATM switch at the other end of this soft PVC connection. This VPI is not the same one you specified in the **ceadd** command line; the VPI specified in the **scvc** command line is the input VPI used on this OmniSwitch. The **Remote VPI** is the VPI used at the destination end of this soft PVC.

13) Remote VCI

The Virtual Channel Identifier (VCI) used for this circuit on the ATM switch at the other end of this soft PVC connection. This VCI is not the same one you specified in the **ceadd** command line. The VCI specified in the **scvc** command line is the input VCI used on this OmniSwitch. The **Remote VCI** is the VCI used at the destination end of this soft PVC.

14) SVC Retry Interval

The amount of time (in intervals of one-tenth seconds) between call attempts after an attempt has failed. If this value is set to **0**, no retry is attempted.

15) SVC Retry Limit

The maximum number of unsuccessful call attempts allowed before the attempt to establish a connection is abandoned. If this number is set to **0**, then setup attempts continue until the connection is set up successfully.

16) Restart

If an attempt of an SPVC fails for any reason (for example, it exceeds the **SVC Retry Limit**) the **Restart** option resets the statistics governing retries so that a second attempt can be made. If this value is set to **True**, when a connection fails a new attempt is made based on the information set in the SVC Retry Interval and SVC Retry Limit as if the failed attempt had not occurred. If this value is set to False, then the values set in the SVC Retry Interval and SVC Retry Limit are followed and there are no further attempts to make this connection.

Creating a Virtual Channel Connection on a Serial Port

The **ceadd** command allows you to set up a circuit emulation virtual channel connection. The configuration parameters in this command are different for T1/E1 ports and serial ports. This section describes options for serial ports.

♦ Note ♦

This section applies only to the serial ports found on ASM-CE modules.

To configure a virtual channel connection on a serial port, enter the following command

ceadd <slot>/<port> <vci>

where **<slot>** is the slot number where the Circuit Emulation board is located, **<port>** is the serial port number on the Circuit Emulation board (Port 4 or Port 5), and **<vci>** is the virtual channel identifier for the virtual channel that you want to add.

When selecting a VCI, you need to be aware of the ranges available for each Circuit Emulation serial port. The following VCI ranges are available for each port:

ASM-CE Port Number	Valid VCI Range
2 (T1 or E1)	256–287
3 (T1 or E1)	288–319
4 (Serial)	320–351
5 (Serial)	352–383

♦ Important Note ♦

You can configure only one (1) connection on a serial port.

If you wanted to configure a virtual channel with a VCI of 320 on port 4 of the ASM-CE board in switch slot 5, you would enter

```
ceadd 5/4 320
```

A screen similar to the following is displayed:

```
Slot 5 Port 4 Connection 320 Configuration

Available Time Slot:
      { none }

1)  Description (30 chars max)                          : Connection 320
2)  Administration Status { UP (1), DOWN (2) }          : UP
4)  Partial Cell Fill Count (0-47)                      : 0
5)  Cell Loss Integration Period in second (1-64)       : 2
6)  Cell Delay Variation Tolerance in frame (1-255)     : 20
7)  Idle Code (0-FF)                                    : FF
8)  Reassembly Buffer Size in frame (1-512)             : 20
10) Connection type { PVC (1), SPVC (2) }               : PVC
11) ATM uplink slot (1-5)                               : 5
12)  ATM uplink port (1-1)                              : 1

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

The **ceadd** parameters for serial ports are the same as those used for T1/E1 ports. The difference between the two configurations is that the serial ports do not require time slot information. Descriptions for all of these configuration options are provided in the section, *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12.

Configuring a Circuit Emulation T1/E1 Port

The **cemodify** command allows you to configure port-level circuit emulation parameters, such as service and clock modes. Use of this command is not required, but if you do not specify parameters, default parameters will be used to set up circuit emulation services on this port.

To configure circuit emulation parameters on a T1 or E1 port, enter the following command

cemodify <slot>/<port>

where **<slot>** is the slot number where the circuit emulation board is located, and **<port>** is the T1 or E1 port number on the board (Port 2 or Port 3) that you want to modify. For example, to modify Port 2 on the board in switch slot 5, enter

cemodify 5/2

A screen similar to the following displays (the values shown are the default values):

```
Circuit Emulation Port Configuration for slot 5, port 2

1)  Description (30 chars max)                    : Circuit Emulation T1 Port
2)  Administration Status { UP (1), DOWN (2) }    : UP
3)  Service Mode { unstructured (1), structured (2) }  : structured
4)  Service Clock Mode { synchronous (1), srts (2),
                         adaptive (3) }           : synchronous

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

1) Description

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

2) Administration Status

This option enables or disables the port. If set to **UP**, the port has been enabled and can transmit data as long as its Operational Status is also UP. If set to **DOWN**, the port will not pass data even if its physical connection is good.

3) Service Mode

The mode used to service data passing through this port. In **unstructured** mode, this circuit emulation service port passes all bits, including framing bits, through to the ATM network; an entire T1 or E1 bit stream is assigned to a single virtual circuit. The input data stream is segmented into AAL1 cells without regard to any structure in the data stream or byte alignment between the data and the ATM cell payload. In **structured** mode, time slots are assigned to each virtual channel connection. See *Circuit Emulation Services* on page 36-7 for further information on service modes.

4) Service Clock Mode

Specifies the clock mode used for this logical circuit emulation port. When using a synchronous clock, the ATM network must be running on and provide a single master clock. Synchronous clocking is the most accurate form of clocking used with circuit emulation; it is the least prone to bit errors. Synchronous clocking can be used with either structured or unstructured service modes.

Synchronous Residual Time Stamp (SRTS) clocking also requires a clock from the ATM network. However, the circuit emulation end system receives the clock provided from the device being serviced. SRTS clocking requires the use of unstructured service. Both sides of the connection must be configured to use SRTS clocking.

Adaptive clocking does not require the ATM network to run on a single master clock. The end system receives the clock provided from the device being serviced. No information on clocking is passed across the ATM network. Adaptive clocking is the least accurate form of clocking; it is the most prone to bit errors. If using adaptive clocking with structured mode, time slot information must be set correctly; you configure time slots through the **cemod** command. Both sides of the connection must support adaptive clocking.

For more information on clock modes see *Circuit Emulation Clocking Modes* on page 36-8.

Configuring a Circuit Emulation Serial Port

The **cemodify** command allows you to configure port-level circuit emulation parameters, such as service and clock modes. Use of this command is not required, but if you do not specify parameters, default parameters will be used to set up the circuit emulation service on this port.

♦ Note ♦

This section applies only to the serial ports found on ASM-CE modules.

To configure circuit emulation parameters on a serial port, enter the following command

cemodify <slot>/<port>

where **<slot>** is the slot number where the board is located, and **<port>** is the serial port number on the board (Port 4 or Port 5) that you want to modify. For example, to modify Port 4 on the board in switch slot 4, enter

cemodify 4/4

A screen similar to the following displays:

```
Circuit Emulation Port Configuration for slot 4, port 4

1)  Description (30 chars max)                      : Circuit Emulation Serial Port
2)  Administration Status { UP (1), DOWN (2) }      : UP
3)  DCE Clock Speed { 56000, 64000, 128000, 256000,
                      384000, 512000, 768000, 1024000,
                      1536000, 1544000, 2048000 }   : 2048000
4)  DCE Clock Source { internal (1), split (3) }    : internal
5)  Receive Clock { non-inverted (1) , inverted (2) } : non-inverted
6)  Transmit Clock { non-inverted (1) , inverted (2) } : non-inverted
7)  Service Clock Mode { synchronous (1), srts (2),
                         adaptive (3) }             : synchronous
```

1) Description

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

2) Administration Status

This option enables or disables the port. If set to **UP**, the port has been enabled and can transmit data as long as its Operational Status is also UP. If set to **DOWN**, the port will not pass data even if its physical connection is good.

3) DCE Clock Speed

Indicates the data rate for this serial port if the port is a DCE device. Possible clock speeds for serial ports, in bps, are 56000, 64000, 128000, 256000, 384000, 512000, 768000, 1024000, 1536000, 1544000, and 2048000.

4) DCE Clock Source

Sets the type of clocking used to clock transmit and receive data in and out of the serial port. This value is only relevant if this serial port operates in DCE mode. If clocking is not controlled by this serial port (i.e., it is controlled by an external DCE device, such as a DSU), the external device will control clocking and the data rate on this port.

If you set this value to **Internal**, transmit and receive data are based on the local clock.

Split clocking uses additional control signals (TXCE) to keep the ASM-CE and external DTE device in sync. In split clocking, the DTE takes the incoming clock signals (TX clock) and loops them back out to the Circuit Emulation port. Split clocking should be used if the Circuit Emulation port is a physical DCE device and you are using a non-RS-232 cable, such as V.35.

♦ Important Note ♦

Split clocking is recommended if the access rate of the serial connection is greater than 256 Kbps. If split clocking is not used at these data rates, data out-of-phase errors, aborts, or CRC errors may occur. In cases where split clocking cannot be used because the clock is not returned, inverted clocking may be required.

5) Receive Clock

This parameter defines whether the serial port samples data on the falling or rising edge of the receive clock. If you select **non-inverted**, data is sampled on the falling edge of the receive clock. If you select **inverted**, data is sampled on the rising edge of the receive clock. Sampling data on the falling edge (non-inverted) is the appropriate option for most configurations. However, if the far-end is experiencing data errors due to a long cable, and therefore, propagation delay, you may need to invert the clock edge.

6) Transmit Clock

This parameter defines whether the serial port samples data on the falling or rising edge of the transmit clock. If you select **non-inverted**, data is sampled on the falling edge of the transmit clock. If you select **inverted**, data is sampled on the rising edge of the transmit clock. Sampling data on the falling edge (non-inverted) is the appropriate option for most configurations. However, if the far-end is experiencing data errors due to a long cable—and therefore, propagation delay—you may need to invert the clock edge.

7) Service Clock Mode

Specifies the clock mode used for this logical circuit emulation port. When using a synchronous clock, the ATM network must be running on and provide a single master clock. Synchronous clocking is the most accurate form of clocking used with circuit emulation; it is the least prone to bit errors. Synchronous clocking is supported for all serial port clock speeds.

Synchronous Residual Time Stamp (SRTS) clocking also requires a clock from the ATM network. However, the circuit emulation end system receives the clock provided from the device being serviced. SRTS clocking only operates at a clock speed of 1544000 or 2048000 bps.

Adaptive clocking is not supported on serial ports.

For more information on clock modes see *Circuit Emulation Clocking Modes* on page 36-8.

Modifying a Virtual Channel Connection

The **cemodify** command allows you to change circuit emulation virtual channel connection parameters that you previously set up through the **ceadd** command. The configuration parameters in this command are the same as those used in **ceadd**.

To modify a virtual channel connection, enter the following command

cemodify <slot>/<port> <vci>

where **<slot>** is the slot number where the circuit emulation board is located, **<port>** is the port number on the board, and **<vci>** is the virtual channel identifier for the virtual channel that you want to modify. For example, to modify a virtual channel with a VCI of 257 on Port 2 of the board in switch slot 5, enter

cemodify 5/2 257

A screen similar to the following displays:

```
Slot 5 Port 2 Connection 257 Configuration

Available Time Slot:

  { none }

1)  Description (30 chars max)                          : Connection 257
2)  Administration Status { UP (1), DOWN (2) }          : UP
3)  Virtual Path Identifier (0-128)                     : 0
4)  Partial Cell Fill Count (0-47)                      : 0
5)  Cell Loss Integration Period in second (1-64)       : 2
6)  Cell Delay Variation Tolerance in frame (1-255)     : 20
7)  Idle Code (0-FF)                                    : FF
8)  Reassembly Buffer Size in frame (1-384)             : 384
9)  Time slots used : {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
                       13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24}
    (Usage: "+/-<ts|all>" add/remove a time slot. For example,
    "9=+10+12-9" to add time slot 10 & 12 and remove time slot 9.
    "9=+all" add all time slots.  "9=-all" remove all time slots)
10) ATM uplink slot (1-5)                               : 5
11)  ATM uplink port (1-1)                              : 1
12) ATM Uplink VPI/VCI                                  : 2
13) ATM Uplink VCI                                      : 2
17) Signalling Code (0-F)                               : 0

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

The **cemodify** parameters for virtual channel connections are the same as those used in the **ceadd** command. For definitions of these parameters, please refer to *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12 for T1 and E1 ports, and *Creating a Virtual Channel Connection on a Serial Port* on page 36-21 for serial ports.

Deleting a Virtual Circuit

You can delete a circuit emulation virtual circuit as long as you know its VCI and the port where it exists. To delete a virtual circuit, enter the following command

cedelete <slot>/<port> <VCI>

where **<slot>** is the slot number for the board, **<port>** is the port where the virtual circuit is located, and **<VCI>** is the identification number for the virtual circuit. For example, to delete virtual circuit 300 on Port 4 of the board in slot 5, enter:

cedelete 5/4 300

The system returns the following prompt to confirm the deletion:

This will delete Slot 5, Port 4, VCI 300. Continue? {(Y)es, (N)o} (N)

Enter a **Y** to confirm the deletion or press **<Enter>** to cancel the deletion.

Viewing Circuit Emulation Information

The **ces** command provides circuit emulation information, including configuration parameters, time slot information, status, and statistics. You can obtain circuit emulation information on all circuit emulation boards in the switch, a single board, individual ports, and individual virtual circuits. You receive different displays depending upon which level you choose. The sections below describe all ways to use the **ces** command.

Viewing Information on All Circuit Emulation Boards in a Switch

To obtain circuit emulation service information on all circuit emulation boards in a switch, enter the **cestatus** command without any parameters as follows:

```
cestatus
```

This command displays a screen similar to the following:

Circuit Emulation Chassis Status

Slot/Port	Port Description	Admin/ Oper Status	Interface Type	Clock Speed	Setup VCCs
4/2	Circuit Emulation E1 Port	UP/UP	E1	2048000	2
4/3	Circuit Emulation E1 Port	UP/UP	E1	2048000	1
4/4	Circuit Emulation Serial Port	UP/DN	*NONE*	0	1
4/5	Circuit Emulation Serial Port	UP/DN	*NONE*	0	1
5/2	Circuit Emulation T1 Port	UP/UP	T1	1544000	1
5/3	Circuit Emulation T1 Port	UP/UP	T1	1544000	1
5/4	Circuit Emulation Serial Port	UP/UP	V35DCE	1544608	1
5/5	Circuit Emulation Serial Port	UP/UP	V35DTE	1544608	1

Each row in the table corresponds to a physical port on an board in the switch. The following sections describe the columns shown in this table:

Slot/Port. The first number in this column is the slot in the switch where this module is installed. The second number is the port number on the module.

Port Description. The textual description of this port as entered through the **cemodify** command.

Admin/Oper Status. This column shows the Administrative and Operational Status of this port. The status indicator before the slash refers to the Administrative Status. If **UP**, the port has been enabled and can transmit data as long as its Operational Status is also **UP**. If the Administrative Status is **DN**, the port will not pass data even if its physical connection is good.

The status indicator after the slash refers to the Operational Status. If **UP**, the port is capable of passing data as long as it has been logically enabled at the Administrative level. If **DN**, the port cannot pass data because of a problem in the physical connection (e.g., cable disconnected, hardware could not detect cable type) or because the port is Administratively Down.

Interface Type. This column indicates the physical cable type connected to this port. This cable type is automatically sensed by hardware.

For serial ports, this column indicates the cable type and whether it is DCE or DTE. The following values may display in this column

- **V35DTE** (V.35 DTE cable)
- **V35DCE** (V.35 DCE cable)
- **232DTE** (RS-232 DTE cable)
- **232DCE** (RS-232 DCE cable)
- **X21DTE** (X.21 DTE cable)
- **X21DCE** (X.21 DCE cable)
- **530DTE** (RS-530 or RS-449 EIA DTE cable)
- **530DCE** (RS-530 or RS-449 EIA DCE cable)
- **T1** (T1 CES port)
- **E1** (E1 CES port)

The ASM-CE sees RS-530 and RS-449 cables the same because they are electrically identical. However, this does not affect the operation of either cable type. Both RS-530 and RS-449 cables are supported.

If no serial port cable is connected to a port, this column will display

NONE

T1 and E1 ports will display their interface type whether or not a cable is attached. If an error has been detected on the port (e.g., cable type could not be detected), the following value displays:

ERROR!

Clock Speed. Indicates the data rate of the interface. T1 and E1 ports (ports 2 and 3) will always be set to 1544000 or 2048000, respectively. The clock speed of serial ports (ports 4 and 5) is dynamically derived from the cell rate. Possible clock speeds for serial ports, in bps, are 56000, 64000, 128000, 256000, 384000, 512000, 768000, 1024000, 1536000, 1544000, and 2048000.

Setup VCCs. The number of virtual channel connections (VCCs) that have been set up for the corresponding port in the table. Virtual channel connections are configured through the **ceadd** command, which is described on page 36-12.

Viewing Information on One Module

To obtain circuit emulation service information on an board in the switch, enter the following command

cestatus <slot>

where **<slot>** is the slot number where the board is located. For example, to display information on the board in switch slot 4, enter

cestatus 4

This command displays a screen similar to the following:

Circuit Emulation Status for slot 4

Port	Port Description	Admin/ Oper Status	Interface Type	Clock Speed	Setup VCCs
2	Circuit Emulation E1 Port	UP/UP	E1	2048000	2
3	Circuit Emulation E1 Port	UP/UP	E1	2048000	1
4	Circuit Emulation Serial Port	UP/DN	*NONE*	0	1
5	Circuit Emulation Serial Port	UP/DN	*NONE*	0	1

Descriptions of the columns in this table are given under the description of the **ces** command for all boards in a switch. Please refer to *Viewing Information on All Circuit Emulation Boards in a Switch* on page 36-29.

Viewing Information for a T1 or E1 Port

To obtain circuit emulation service information on one T1 or E1 port, enter the following command

cestatus <slot>/<port>

where **<slot>** is the slot number where the board is located and **<port>** is the port number on the board for which you want to view information. For example, to view information on Port 2 of the board in switch slot 4, enter

cestatus 4/2

This command displays a screen similar to the following:

Circuit Emulation Status for slot 4, port 2

Description : Circuit Emulation E1 Port
Admin/Oper Status : UP/UP
Service Mode : structured
Service Clock Mode : synchronous
Available Time Slots : { none }

Virtual Circuit Information

VPI/VCI	Channel Description	Admin/Oper Status	No. of Time Slots
0/256	Connection 256	UP/UP	4
0/257	Connection 257	UP/UP	27

Description. A textual description for this port entered when the port was configured through the **cemodify** command.

Admin/Oper Status. This field is described in *Viewing Information on All Circuit Emulation Boards in a Switch* on page 36-29.

Service Mode, **Service Clock Mode**. Descriptions of these two fields are given in the section, *Configuring a Circuit Emulation T1/E1 Port* on page 36-23.

Available Time Slots. The time slots that are available for virtual circuits on this port. Time slots are assigned to virtual circuits through the **ceadd** command, which is described in *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12.

The following table columns also display for each virtual circuit on this port.

VPI/VCI. The Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI) for virtual channels on which information is provided. You configure the VPI and VCI for virtual channel connections through the **ceadd** command, which is described in *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12.

Channel Description. A textual description of this virtual channel of up to 30 characters. This channel description is configured through the **ceadd** command.

Admin/Oper Status. This field is described in *Creating a Virtual Channel Connection on a T1/E1 Port* on page 36-12.

No. of Time Slots. The number of time slots for the given virtual circuit. You assign time slots to each virtual circuit through the **ceadd** command. Only circuit emulation services using a structured service mode require the use of time slots.

Viewing Information for a Serial Port

To obtain circuit emulation service information on one Circuit Emulation serial port, enter the following command

cestatus <slot>/<port>

where **<slot>** is the slot number where the ASM-CE board is located and **<port>** is the port number on the ASM-CE board for which you want information. For example, to view information on Port 4 for the ASM-CE board in switch slot 4, enter

cestatus 4/4

This command displays a screen similar to the following:

```
Circuit Emulation Status for slot 4, port 4

Description              : Circuit Emulation Serial Port
Admin/Oper Status        : UP/DOWN
Service Mode             : unstructured
Service Clock Mode       : synchronous
Clock Speed              : 0
Interface Type           : *NONE*          DCE Clock Source     : internal
Transmit Clock           : non-inverted    Receive Clock        : non-inverted

Virtual Circuit Information
                                                    Admin/Oper   No. of
 VPI/VCI          Channel  Description              Status       Time Slots
========== ============================== ========== ==========
 0/320      Connection 320                 UP/UP        N/A
```

Descriptions for the fields in the top section of this display can be found in *Configuring a Circuit Emulation Serial Port* on page 36-25.

Descriptions for the fields in the bottom section of the display can be found in *Viewing Information for a T1 or E1 Port* on page 36-32.

Viewing Information for a T1/E1 Virtual Circuit

To obtain circuit emulation service information on a virtual circuit (either a PVC or an SPVC) configured on a T1 or E1 port, enter the following command

cestatus <slot>/<port> <VCI>

where **<slot>** is the slot number where the board is located, **<port>** is the port number on the board, and **<VCI>** is the virtual channel identifier for the virtual channel for which you want to view information. For example, to view information on a virtual channel with a VCI of 257 on Port 2 of the board in switch slot 5, enter

cestatus 5/2 257

This command displays a screen similar to the following:

```
Circuit Emulation Status for slot 5, port 2, vci = 289

Description              : Connection 289
SVC MODE                 : Active
VPI/VCI                  : 0/289
ATM Uplink slot/port     : 5/1
Time Slot Used           : {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
                            13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24}
Admin/Oper Status        : UP/UP
Idle Code                : FF
Elapsed Time             : 0 days, 00:36:18.68
Receive Buffer Size      : 384                    CDVT                 : 20

                                                  Total          Rate
Transmit Data Cells                          :    4280757        4097
Transmit Conditioned Cells                   :      65543           0
Transmit Cells Suppressed                    :          0           0
Receive Data Cells                           :    4310044        4097
Receive Bad Sequence Number Cells            :          0           0
Receive Cells Dropped Pointer Search         :        183           0
Receive Cells Dropped Queue Underrun         :        183           0
Receive Cells Dropped Queue Overrun          :          0           0
```

Descriptions for fields in the top portion of this screen display (except for Elapsed Time) are described in the section, *Creating a Soft Permanent Virtual Circuit (SPVC) on T1/E1 Ports* on page 36-17.

Descriptions for fields in the bottom half of the display are provided below. Values in the **Total** column indicate the total number of cells transmitted or received on this virtual channel connection. Values in the **Rate** column indicate the number of cells transmitted or received in the last second.

Elapsed Time. This field identifies the length of time since the last time the virtual circuit statistics were cleared via the **cecls** command (see *Clearing ATM Circuit Emulation Statistics* on page 36-36 for more information). Elapsed Time is displayed in the format "xxx days, hh:dd:ss.tt."

Transmit Data Cells. The number of cells on this virtual circuit containing user data that has been transmitted upstream.

Transmit Conditioned Cells. The number of cells transmitted upstream on this virtual circuit when there are one or more active alarms on the port where this virtual circuit is configured.

Transmit Cells Suppressed. The number of cells that were dropped on this virtual circuit due to line resynchronization.

Receive Data Cells. The total number of data cells received on this virtual circuit.

Receive Bad Sequence Number Cells. The number of times that cells received had a bad sequence number in the AAL1 SAR header. This value indicates the number of times hardware *detected* bad sequence numbers, but the actual number of cells lost may be higher.

Receive Cells Dropped Pointer Search. The number of times the ATM-CE module dropped incoming cells during the pointer searching process. This value indicates the number of times hardware *detected* dropped cells due to this condition, but the actual number of cells lost may be higher.

Receive Cells Dropped Queue Underrun. The number of times the ATM-CE module dropped incoming cells because the reassembly buffer underran. This value indicates the number of times hardware *detected* dropped cells due to this condition, but the actual number of cells lost may be higher.

Receive Cells Dropped Queue Overrun. The number of times the ATM-CE module dropped incoming cells because the reassembly buffer overran. This value indicates the number of times hardware *detected* dropped cells due to this condition, but the actual number of cells lost may be higher.

Viewing Information for a Serial Port Virtual Circuit

To obtain circuit emulation service information on a virtual circuit configured on a serial port, enter the following command

cestatus <slot>/<port> <VCI>

where **<slot>** is the slot number where the circuit emulation board is located, **<port>** is the port number on the board, and **<VCI>** is the virtual channel identifier for the virtual channel for which you want to view information. For example, to view information on a virtual channel with a VCI of 320 on port 4 on the circuit emulation board in switch slot 5, enter

cestatus 5/3 320

This command displays a screen similar to the following:

```
Circuit Emulation Status for slot 5, port 3, vci = 320

Description              : Connection 320
VPI/VCI                  : 0/320
ATM Uplink slot/port     : 4/1
Admin/Oper Status        : UP/UP
Idle Code                : FF
Receive Buffer Size      : 100          CDVT                  : 20

                                              Total        Rate
Transmit Data Cells                        : 438420442      5448
Transmit Conditioned Cells                 :         0         0
Transmit Cells Suppressed                  :         0         0
Receive Data Cells                         : 438420442      5448
Receive Bad Sequence Number Cells          :         0         0
Receive Cells Dropped Pointer Search       :         0         0
Receive Cells Dropped Queue Underrun       :         1         0
Receive Cells Dropped Queue Overrun        :         0         0
```

Descriptions for fields in the top portion of this screen display are described in the section, *Creating a Soft Permanent Virtual Circuit (SPVC) on T1/E1 Ports* on page 36-17. Descriptions for fields in the bottom half of the display are described above in the section, *Viewing Information for a T1/E1 Virtual Circuit* on page 36-34.

Clearing ATM Circuit Emulation Statistics

To clear the accumulated statistics for an ATM CE circuit, use the **cecls** command, as follows:

cecls <slot>/<port> <VCI>

where **<slot>** is the slot number where the circuit emulation board is located, **<port>** is the port number on the board, and **<VCI>** is the virtual channel identifier for the virtual channel whose statistics you want to clear. For example, to clear the statistics on a virtual channel with a VCI of 256 on port 5 on the circuit emulation board in switch slot 1, enter

cecls 5/1 256

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

Statistics of Virtual Circuit 256 on 5/1 have been cleared.