PA-MC-E3 Multi-Channel E3 Synchronous Serial Port Adapter

Feature Summary

The PA-MC-E3 Multi-Channel E3 port adapter is available on Cisco 7200 series routers, on Cisco 7500 series routers, and on Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI).

The PA-MC-E3 has one channelized E3 high-speed serial interface that provides access to services at E1 (2.048 Mbps) data rates, transferring data bidirectionally. This port adapter divides the E3 signal stream into 16 E1 lines that can be further divided into the 64 kbps level, up to a total of 128 channels. The PA-MC-E3 complies with CCITT/ITU G.703 physical layer standards and CCITT/ITU G.751 for E3, G.742 for E2, and G.704 and G.706 for E1 fault and alarm detection and response actions.

Note The aggregation of multiple E1 lines for higher speed (called inverse multiplexing or bonding) is not supported. Further, 56-kbps timeslots are not supported.

For more information on the PA-MC-E3 port adapter, refer to the *PA-MC-E3 Multi-Channel E3 Port Adapter Installation and Configuration* publication that accompanies the hardware.

Benefits

The PA-MC-E3 port adapter provides the following key benefits:

- Reduced Cost—High levels of integration eliminate the cost of external DSUs and multiplexers. Channelization allows customers to lease fewer and more cost effective lines from service providers.
- Simplified Management—Management of the internal CSU/DSUs is handled through the router. No cabling complexity associated with large installations of external boxes.
- Flexible Provisioning—A single port can be used for up to 128 64K, Nx64K, FE1, and E1 connections to IP and Frame Relay networks. As network needs change, bandwidth can be reallocated without moving any cables.
- Increased Slot Utilization—Double to quadruple port density over previous port adapters (up to 32 E1s per Cisco 7500 slot) means increased value of each router slot.
- Increased Rack Space Utilization—Elimination of external CSUs frees up rack space. High port density reduces the number of routers required for large installations.

Platforms

This feature is supported on these platforms:

- Cisco 7200 series routers
- Cisco 7500 series routers
- Cisco 7000 series routers with the RSP7000 and RSP7000CI

Supported MIBs and RFCs

This feature supports the following RFCs:

- RFC 1406 for E1
- RFC 1407 for E3

Configuration Tasks

Perform the tasks in the following sections to configure the PA-MC-E3 (all tasks are optional except for the second task):

- Configure the E3 Controller (optional)
- Configure the E1 Lines (required)
- Troubleshoot the E3 and E1 Lines (optional)
- Monitor and Maintain the PA-MC-E3 (optional)

For more information on how to configure the PA-MC-E3, refer to the *PA-MC-E3 Multi-Channel E3 Port Adapter Installation and Configuration* publication that accompanies the hardware.

For information on other commands that can be used by the PA-MC-E3 interface, refer to the Cisco IOS Release 11.1 configuration guides.

Configure the E3 Controller

If you do not modify the E3 controller configuration of the PA-MC-E3, the configuration defaults in Table 1 are used.

Table 1 PA-MC-E3 Controller Defaults

Attribute	Default Value
Clock source	line
National reserve bit	1
Idle pattern	0x55

If you need to change any of the default configuration attributes, complete the first task in global configuration mode followed by any of the optional tasks in controller configuration mode:

Task	Command
Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Change the clock source used by the E3 controller.	**clock source** {**internal** | **line**}
Change the national reserve bit.	**national bit** {**0** | **1**}
Change the idle pattern.	**idle pattern** *hex-number*

Note The port number for the PA-MC-E3 is always 0.

Configure the E1 Lines

You can configure the E1 lines as

- Channelized
- Fractional
- Unframed
- PRI ISDN

If you assign only one channel group to an E1 line, it is a fractional E1 line. If you assign more than one channel group to an E1 line, it is a channelized E1 line.

For channelized (**e1 channel-group** command), fractional (**e1 channel-group** command), and unframed (**e1 unframed** command) configurations, each configured channel group, which might contain individual timeslots and/or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

For PRI ISDN (**e1 pri-group** command) configurations, each timeslot you assign to a PRI group for a configured E1 line, including each timeslot within a range of timeslots, uses one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a PRI group, five logical channels are used (because you assigned timeslots 3, 4, 5, 6, and 7), whereas if you assign just timeslot 3 to a PRI group, only one logical channel is used.

After you configure the E1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay. For information on configuring a serial interface, refer to the “Configure Serial Interface” section later in this document.

Change Default Settings

If you do not modify the E1 configuration of the PA-MC-E3, the configuration defaults in Table 2 are used.

Table 2 PA-MC-E3 E1 Channel Defaults

Attribute	Default Value
Clock source	line
National reserve bits pattern	0x1f
Framing format	crc4

If you need to change any of the default configuration attributes, complete the first task in global configuration mode followed by any of the optional tasks in controller configuration mode:

Task	Command
Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Change the clock source used by the E3 controller.	**e1** *line* **clock source** {**internal** | **line**}
Change the national reserve bits pattern.	**e1** *line* **national bits** *hex-number*
Change the framing format.	**e1** *line* **framing** {**crc4** | **no-crc4** | **none**}

Note The port number for the PA-MC-E3 is always 0. The E1 line is from 1 to 16.

Caution Hardware version 3.1.0 of the PA-MC-E3 port adapter has a limitation on the use of the internal clock. In this hardware, if you change the E1 clock source from line to internal or from internal to line, it is possible, although rare, that the change will cause the E1 line to transmit an invalid E1 framing pattern causing a loss of frame at the far end. To recover from this condition, manually reset the affected E1 line by using the **e1 shutdown** controller configuration command followed by the **no e1 shutdown** controller configuration command. To determine the hardware version on the port adapter, use the **show controllers e3** EXEC command. You cannot use the **e1 shutdown** command while running BERT or loopbacks; you must stop these functions first. In addition, you cannot start a BERT or loopback while an E1 line is shut down.

Configure Channelized E1 Lines

You can configure any of the 16 E1 lines as channelized E1 lines, but you are limited to a total of 128 logical channels. You can group the time slots in these E1 lines into several individual logical channel groups, each of which carries data with different data link layer protocol encapsulations. You can configure timeslot 16 as a data channel, although it is typically used for common channel signaling. Channel associated signaling (CAS) for voice channels and E1 Facilities Data Link (FDL) on timeslot 16 are not supported.

Each logical channel group can be composed of individual 64-kbps timeslots and/or ranges of timeslots, for example, 1, 9, 12–14. Each logical channel group can contain from 1–31 timeslots maximum; the same timeslot cannot be used in more than one logical channel group. Any unused timeslots are filled with programmable idle-channel data.

Note If you assign only one channel group to an E1 line, it is a fractional E1 line.
If you assign more than one channel group to an E1 line, it is a channelized E1 line.

To configure a channelized E1 line, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Step 2	Configure the E1 line (values are 1 to 16) in a logical channel group (values are 0 to 30) and specify the timeslots (values are 1 to 31).	**e1** *line* **channel-group** *number* **timeslots** *range*
Step 3	Repeat Step 2 for each logical channel group and exit when done.	**exit**

This configuration creates a serial interface. For more information on serial interfaces, refer to the "Configure Serial Interface" section later in this document.

Configure Fractional E1 Lines

You can configure any of the 16 E1 lines as fractional E1 lines, each of which can be either E1 frames or E1 cyclic redundancy check (CRC) multiframes, as specified by CCITT/ITU G.704 and G.706. A fractional E1 line is a subset of the full E1 bandwidth, which uses Nx64 kbps; where N is a timeslot in the range of 1–31.

Fractional E1 lines contain only a single logical channel group that can be either a single 64-kbps timeslot or a range of timeslots; for example timeslot 1, or timeslots 15–23. Any unused timeslots are filled with programmable idle-channel data (**idle pattern** controller configuration command).

Note If you assign only one channel group to an E1 line, it is a fractional E1 line. If you assign more than one channel group to an E1 line, it is a channelized E1 line.

To configure a fractional E1 line, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Step 2	Configure the E1 line (values are 1 to 16) in logical channel group (values are 0 to 30) and specify the timeslots (values are 1 to 31).	**e1** *line* **channel-group** *number* **timeslots** *range*

This configuration creates a serial interface. For more information on serial interfaces, refer to the "Configure Serial Interface" section later in this document.

Configure Unframed E1 Lines

You can configure any of the 16 E1 lines as unframed E1 data lines. Each unframed E1 line contains no framing overhead and is not divided into timeslots. To configure an unframed E1 line, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Step 2	Configure an unframed E1 line (values are 1 to 16) .	**e1** *line* **unframed**

This configuration creates a serial interface. For more information on serial interfaces, refer to the "Configure Serial Interface" section later in this document.

Configure PRI ISDN E1 Lines

You can configure any of the E1 lines to support the PRI ISDN application. You assign a PRI group to the E1 line. Each PRI group can contain from 1–31 timeslots maximum. It is not necessary to allocate all 30 timeslots for the ISDN application. Timeslot 16 is used for common channel signaling. Any unused timeslot are filled with programmable idle-channel data (**idle pattern** controller configuration command).

To configure an E1 line to support the PRI ISDN, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Step 2	Configure the E1 line (values are 1 to 16) as a PRI group and specify the timeslots (values are 1 to 31 the default is all timeslots).	**e1** *line* **pri-group** [**timeslots** *range*]

This configuration creates a serial interface. For more information on serial interfaces, refer to the "Configure Serial Interface" section later in this document.

Configure Serial Interface

After you configure the E1 lines on the PA-MC-E3, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the E1 channel. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay.

For more information on other commands available for serial interfaces, refer to the "Configure a Synchronous Serial Interface" section in the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*.

To enter interface configuration mode and configure the serial interface that corresponds to an E1 line, perform the following task in global configuration mode:

Task	Command
Define the serial interface for an E1 line (the E1 line values are 1 to 16 and the channel values are 0 to 30) and enter interface configuration mode.	**interface serial** *slot*/*port-adapter*/*port*/*e1-line*:*channel* (Cisco 7500 series and Cisco 7000 series with the RSP7000 and RSP7000CI) **interface serial** *slot*/*port*/*e1-line*:*channel* (Cisco 7200 series)

When configuring the serial interface, you must specify the slot number, port-adapter number (for Cisco 7500 series), port number, e1 line number, and channel. For unframed E1 lines, the channel is always zero (for example, interface serial 3/0/0/1:0). For channelized and fractional E1 lines, the channel is the number specified as the channel group number (for example, interface serial 3/0/0/3:20, where 20 is the channel group number). For PRI E1 lines, the channel is always 15 (for example, interface serial 3/0/0/3:15).

Troubleshoot the E3 and E1 Lines

You can use the following methods to troubleshoot the PA-MC-E3 using Cisco IOS software:

- Set Loopbacks
- Run Bit Error Rate Test

Set Loopbacks

The E3 local loopback simultaneously loops all channels toward the router and loops the E3 link back toward the network. Use E3 local loopback to diagnose problems with cables between the E3 controller and the central switching office at the E3 link level.

An E1 local loopback sets both local and line (remote) loopback modes simultaneously and loops data toward the router An E1 remote line loopback loops the E1 line to the remote end. Use E1 local loopback to diagnose problems with cables between the port adapter and the central switching office at the E1 line level. You can also use this loopback mode with bit error rate (BER) tests.

To set a loopback on the E3 or E1 lines, perform the following optional tasks beginning in global configuration mode:

Task		Command
Step 1	Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)

Task		Command
Step 2	Set a local loopback on the E3 controller.	**loopback local**
Step 3	Set a local loopback on the E1 line.	**e1** *line* **loopback local**

Run Bit Error Rate Test

The channelized E1 portion of the port adapter contains onboard E1 bit error rate test (BERT) circuitry. With this, the port adapter software can send and detect a programmable pattern that is compliant with CCITT/ITU O.151, O.152, and O.153 pseudo-random and repetitive test patterns. The BERT functionality is configurable to any of the E1 lines. BERTs allow you to test cables and signal problems in the field. You can configure any E1 line to connect to the onboard BERT circuitry.

When running a BER test, your system expects to receive the same pattern that it is transmitting. To help ensure this, two common options are available:

- Use a loopback somewhere in the link or network
- Configure remote testing equipment to transmit the same BER test pattern at the same time

Note BER testing for the E3 link is not supported.

Note The BER test is run over the currently configured framing option for the specified E1 line. Before running a BER test, you should configure the framing appropriate to your application. The BER test can be run unframed, or carried in the payload of the E1 frame.

To configure a, perform the following optional tasks beginning in global configuration mode:

Task		Command
Step 1	Select the E3 controller and enter controller configuration mode.	**controller e3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller e3** *slot*/*port* (Cisco 7200 series)
Step 2	Specify the BERT pattern for each E1 line (the values are 1 to 16) and the duration of the test in minutes (1 to 1440 minutes).	**e1** *line* **bert pattern** {**0s** | **1s** | **2^11** | **2^15** | **2^20-O153** | **2^20-QRSS** | **2^23** | **alt-0-1**} **interval** *minutes*
Step 3	View the BERT results.	**show controllers e3** *slot*/*port-adapter*/*port*/*e1-line*

A description of each type of test pattern follows:

- 0s—Repeating pattern of zeros (...000...).
- 1s—Repeating pattern of ones (...111...).
- 2^11—Pseudo-random test pattern that is 2,048 bits in length.
- 2^15—Pseudo-random O.151 test pattern that is 32,768 bits in length.
- 2^20-O153—Pseudo-random O.153 test pattern that is 1,048,575 bits in length.
- 2^20-QRSS—Pseudo-random QRSS O.151 test pattern that is 1,048,575 bits in length.

- 2^23—Pseudo-random 0.151 test pattern that is 8,388,607 bits in length.
- alt-0-1—Repeating alternating pattern of zeros and ones (...01010...).

Both the total number of error bits received and the total number of bits received are available for analysis. You can select the testing period from 1 minute to 24 hours, and you can also retrieve the error statistics anytime during the BER test.

Note To terminate a BER test during the specified test period, use the **no e1** *line* **bert** command.

You can view the results of a BER test at the following times:

- After you terminate the test using the **no e1** *line* **bert** command
- After the test runs completely
- Anytime during the test (in real time)

Monitor and Maintain the PA-MC-E3

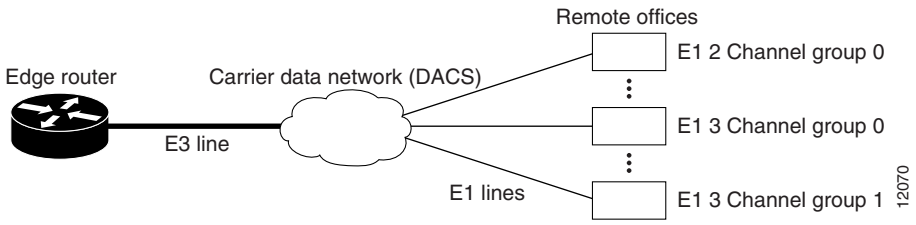
After configuring the new interface, you can monitor the status and maintain the PA-MC-E3 in Cisco 7200 series routers, Cisco 7500 series routers and Cisco 7000 series routers with RSP7000 by using **show** commands. To display the status of any interface, complete any of the following tasks in EXEC mode:

Task	Command
Display the status of the E3 controller.	**show controllers e3** [*slot*/*port-adapter*/*port*/*e1-line*] [**brief** | **tabular**] (Cisco 7500 series and Cisco 7000 series routers with RSP7000 and RSP7000CI) **show controllers e3** [*slot*/*port*/*e1-line*] [**brief** | **tabular**] (Cisco 7200 series)
Display statistics about the serial information for a specific E1 line (values are 1 to 16) and channel group (values are 0 to 30).	**show interface serial** *slot*/*port-adapter*/*port*/*e1-line:channel-group* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show interface serial** *slot*/*port*/*e1-line:channel-group* (Cisco 7200 series)

Configuration Example

The example in this section show how to configure the PA-MC-E3 port adapter. This example (shown in Figure 1) illustrates how multiple E1 lines at remote sites can be aggregated onto a single E3 line at the edge router. This application concentrates the E1s to the router without an E123 multiplexer or E1 CSU/DSU. For more information, refer to the "Configure the E3 Controller" and "Configure the E1 Lines" sections earlier in this chapter.

Figure 1 Channelized E1 Lines Example



Configuration on the Edge Router

In the following partial example, the PA-MC-E3 in slot 4 is configured as follows: E1 line 2 is assigned to channel group 0 and is using all timeslots (full E1 bandwidth), E1 line 3 is assigned to channel group 0 and is using timeslots 1 through 15, and E1 line 3 is also assigned to channel group 1 and is using timeslots 16 through 31. For the E3, the default clock source, national, bit, and idle pattern are used. For each E1 line, the default framing, national bits, and clock source are used. Each E1 channel is assigned an IP address. Other interface configuration commands can be assigned to the E1 channel at this time.

```
router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# controller e3 4/0/0
router(config-controll)# e1 2 channel-group 0 timeslot 1-31
router(config-controll)# e1 3 channel-group 0 timeslot 1-15
router(config-controll)# e1 3 channel-group 1 timeslot 16-31
...
router(config)# interface serial 4/0/0/2:0
router(config-if)# ip address 10.20.30.1 255.255.255.0
router(config)# interface serial 4/0/0/3:0
router(config-if)# ip address 10.20.40.1 255.255.255.0
router(config)# interface serial 4/0/0/3:1
router(config-if)# ip address 10.20.50.1 255.255.255.0
...
router(config-if)# end
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.1 command references.

- **controller e3**
- **e1 bert pattern**
- **e1 channel-group**
- **e1 clock source**
- **e1 framing**
- **e1 loopback local**
- **e1 national bits**
- **e1 pri-group**
- **e1 shutdown**
- **e1 unframed**
- **idle pattern**
- **loopback local (E3)**
- **national bit**
- **show controllers e3**
- **show interface serial**
- **shutdown (controller)**

controller e3

To configure the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **controller e3** global configuration command.

controller e3 *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with RSP7000 and RSP7000CI)
controller e3 *slot*/*port* (Cisco 7200 series)

Syntax Description

slot	Slot location of the of the port adapter.
port	Port number on the port adapter.
port-adapter	On the Cisco 7500 series and Cisco 7000 series with RSP7000 and RSP7000CI, specifies the ports on a VIP card. The value can be 0 or 1.

Default

None

Command Mode

Global configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Example

The following example enters controller configuration mode for the card in slot 1:

```
Router# controller e3 1/1/0
```

Related Commands

show controllers e3

e1 bert pattern

To enable a BERT test pattern on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 bert** controller configuration command. To disable a BERT test pattern, use the **no** form of this command.

e1 *line* **bert pattern** {**0s | 1s | 2^11 | 2^15 | 2^20-O153 | 2^20-QRSS | 2^23 | alt-0-1**} **interval** *minutes*
no e1 *line* **bert pattern** {**0s | 1s | 2^11 | 2^20-O153 | 2^20-QRSS | 2^23 | alt-0-1**} **interval** *minutes*

Syntax Description

line	Number of the E1 line. Range is 1 to 16.
pattern {**0s	1s	2^15	2^11	2^20-O153	2^20-QRSS	2^23	alt-0-1**}	Specifies the length of the repeating BERT test pattern. Values are: • 0s—Repeating pattern of zeros (...000...). • 1s—Repeating pattern of ones (...111...). • 2^11—Pseudo-random test pattern that is 2,048 bits in length. • 2^15—Pseudo-random O.151 test pattern that is 32,768 bits in length. • 2^20-O153—Pseudo-random O.153 test pattern that is 1,048,575 bits in length. • 2^20-QRSS—Pseudo-random QRSS 0.151 test pattern that is 1,048,575 bits in length. • 2^23—Pseudo-random 0.151 test pattern that is 8,388,607 bits in length. • alt-0-1—Repeating alternating pattern of zeros and ones (...01010...).
interval *minutes*	Specifies the duration of the BERT test. The interval can be a value from 1 to 14400 minutes.

Default

No BERT test is performed.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

The BERT test patterns from the PA-MC-E3 are framed test patterns (that is, the test patterns are inserted into the payload of the framed E1 signal).

To view the BERT results, use the **show controller e3** or **show controller e3 brief** EXEC command. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BERT test
- Total bit errors
- Total bits received

When the E1 line has a BERT test running, the line state is DOWN. Also, when the BERT test is running and the Status field is Not Sync, the information in the Bit Errors field is not valid. When the BERT test is done, the Status field is not relevant.

The **e1 bert** command is not written to NVRAM because it is only used for testing the E1 line for a short predefined interval and to avoid accidentally saving the command, which could cause the interface not to come up the next time the router reboots.

Example

In the following example, a BERT test pattern of all zeros is run for 30 minutes on E1 line 6 on the PA-MC-E3 in slot 9:

```
Router# controller e3 9/0/0
Router(config-controll)# e1 6 bert pattern 0s interval 30
```

Related Commands

e1 loopback local
show controllers e3

e1 channel-group

To create a channel group on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 channel-group** controller configuration command. To remove a channel group, use the **no** form of this command.

e1 *line* **channel-group** *group-number* **timeslots** *range*
no e1 *line* **channel-group** *group-number* **timeslots** *range*

Syntax Description

line	Number of the E1 line. Only E1 line 1, 2, and 3 can be configured as a channel group.
channel-group *group-number*	Number of the channel group. Range is 0 to 30.
timeslot *range*	Specifies the timeslots assigned to the E1 line. The range can be 1 to 31. A dash represents a range of timeslots, and a comma separates timeslots. For example, 1-10,15-18 assigns timeslots 1 through 10 and 15 through 18.

Default

None

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

You must specify the timeslots used by each each channel group of the E1 line. The unconfigured timeslots are not used and are filled with an idle pattern specified by the **idle pattern** controller configuration command.

If you assign only one channel group to an E1 line, it is a fractional E1 line. If you assign more than one channel group to an E1 line, it is a channelized E1 line.

For channelized (**e1 channel-group** command), fractional (**e1 channel-group** command), and unframed (**e1 unframed** command) configurations, each configured channel group, which might contain individual timeslots and/or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

For PRI ISDN (**e1 pri-group** command) configurations, each timeslot you assign to a PRI group for a configured E1 line, including each timeslot within a range of timeslots, uses one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a PRI group, then five logical channels are used (because you assigned timeslots 3, 4, 5, 6, and 7), whereas if you assign just timeslot 3 to a PRI group, only one logical channel is used.

After you configure the E1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay.

Examples

In the following example, timeslots 1, 2, 3, 4, 5, 20, 21, 22, and 23 are assigned to channel group 20, and timeslots 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 are assigned to channel group 21 on E1 line 1:

```
Router# configure terminal
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 1 channel-group 20 timeslot 1-5, 20-23
Router(config-controll)# e1 1 channel-group 21 timeslot 6-19
Router(config-controll)# interface serial 1/0/0/1:20
Router(config-if)# ip address 10.20.30.1 255.255.255.0
Router(config-if)# interface serial 1/0/0/1:21
Router(config-if)# ip address 10.20.40.1 255.255.255.0
```

In the following example, the full E1 bandwidth (timeslots 1 through 31) are assigned to E1 line 2:

```
Router# configure terminal
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 2 fractional timeslot 1-31
Router(config-controll)# interface serial 1/1/0/2:0
Router(config-if)# ip address 10.20.50.1 255.255.255.0
```

Related Commands

e1 pri-group
e1 unframed
show controllers e3

e1 clock source

To specify where the clock source is obtained for use by each E1 channel on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 clock source** controller configuration command.

e1 *line* **clock source** {**internal** | **line**}

Syntax Description

line	Number of the E1 line. Range is 1 to 16.
internal	Specifies that the internal clock source is used.
line	Specifies that the network clock source is used. This is the default.

Default

Line

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

If you do not specify the **e1 clock source** command, the default clock source of **line** is used by all the E1s on the PA-MC-E3.

You can also set the clock source for the PA-MC-E3 by using the **clock source** controller configuration command.

Caution Hardware version 3.1.0 of the PA-MC-E3 port adapter has a limitation on the use of the internal clock. In this hardware, if you change the E1 clock source from line to internal or from internal to line, it is possible, although rare, that the change will cause the E1 line to transmit an invalid E1 framing pattern causing a loss of frame at the far end. To recover from this condition, manually reset the affected E1 line by using the **e1 shutdown** controller configuration command followed by the **no e1 shutdown** controller configuration command. To determine the hardware version on the port adapter, use the **show controllers e3** EXEC command. You cannot use the **e1 shutdown** command while running BERT or loopbacks; you must stop these functions first. In addition, you cannot start a BERT or loopback while an E1 line is shut down.

Example

In the following example, the clock source for E1 6 on the PA-MC-E3 are set to internal:

```
Router# controller e3 9/0/0
Router(config-controll)# e1 6 clock source internal
```

Related Commands

clock source

e1 framing

To specify the type of framing used by the E1 channels on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 framing** controller configuration command.

e1 *line* **framing** {**crc4** | **no-crc4** | **none**}

Syntax Description

line	Number of the E1 line. Range is 1 to 16.
crc4	Set the framing format to E1 with 4-bit cyclic redundancy check. This is the default.
no-crc4	Set the framing format to E1 without 4-bit cyclic redundancy check.
none	Set the framing format to unframed.

Default

crc4

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

If you created a logical channel group and specified timeslots instead of using unframed format, you cannot set the E1 framing format to unframed with the **e1 framing** controller configuration command.

Example

In the following example, the E1 line 2 is set to unframed:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 2 framing none
```

e1 loopback local

To set both a local and line (remote) loopback simultaneously on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 loopback local** controller configuration command. To remove a loopback, use the **no** form of this command.

e1 *line* **loopback local**
no e1 *line* **loopback local**

Syntax Description

line	Number of the E1 line. Range is 1 to 16.

Default

No loopback is set.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

A local loopback loops the data toward the router, and a remote line loopback loops the E1 line to the remote end. Use the **e1 loopback local** command to diagnose problems with the cables between the port adapter and the central switching office at the E1 line level.

You can also use loopback mode with **e1 bert** command.

Example

In the following example, E1 line 2 is looped:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 2 loopback local
```

Related Commands

e1 bert pattern
loopback local (E3)

e1 national bits

To configure the national reserve bit pattern for a specific E1 channel on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 national bits** controller configuration command.

e1 *line* **national bits** *pattern*

Syntax Description

line	Number of the E1 line. Range is 1 to 16.
pattern	Hexadecimal value in the range 0x0 to 0x1f (hexadecimal) or 0-31 (decimal). You can enter this value in either hexadecimal or decimal. The default is 0x1f (or 31).

Default

0x1F hexadecimal (or 31 decimal)

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Example

In the following example, the national reserved bit pattern is set to 0x0 hexadecimal for E1 line 2:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 2 national bits 0x0
```

Related Commands

national bit

e1 pri-group

To create a Primary Rate Interface (PRI) Integrated Services Digital Network (ISDN) group on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 pri-group** controller configuration command. To remove a PRI ISDN group, use the **no** form of this command.

e1 *line* **pri-group** [**timeslots** *range*]
no e1 *line* **pri-group** [**timeslots** *range*]

Syntax Description

line	Number of the E1 line. Range is 1 to 16.
timeslot *range*	(Optional) Specifies the timeslots assigned to the E1 line. The default is all timeslots are assigned to the E1 line. The range can be 1 to 31 (excluding timeslot 16 because it supports contiguous timeslots as well as arbitrary timeslots). A dash represents a range of timeslots, and a comma separates timeslots. For example, 1-10,17-18 assigns timeslots 1 through 10 and 17 and 18.

Default

No PRI group is created.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

You must specify the timeslots used by each each PRI ISDN group of the E1 line. The unconfigured timeslots are not used and are filled with an idle pattern specified by the **idle pattern** controller configuration command.

For channelized (**e1 channel-group** command), fractional (**e1 channel-group** command), and unframed (**e1 unframed** command) configurations, each configured channel group, which might contain individual timeslots and/or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

For PRI ISDN (**e1 pri-group** command) configurations, each timeslot you assign to a PRI group for a configured E1 line, including each timeslot within a range of timeslots, uses one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a PRI group, then five logical channels are used (because you assigned timeslots 3, 4, 5, 6, and 7), whereas if you assign just timeslot 3 to a PRI group, only one logical channel is used.

After you configure the E1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay.

Examples

In the following example, timeslots 1, 2, 3, 4, 5, 20, 21, 22, and 23 are assigned to a PRI ISDN group on E1 line 1:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 1 pri-group timeslot 1-5, 20-23
Router(config-controll)# interface serial 1/1/0/1:15
Router(config-if)# ip address 10.20.30.1 255.255.255.0
```

In the following example, the full E1 bandwidth (timeslots 1 through 31) is assigned to a PRI ISDN group on E1 line 2:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 2 pri-group timeslot 1-31
Router(config-controll)# interface serial 1/1/0/2:15
Router(config-if)# ip address 10.20.40.1 255.255.255.0
```

Related Commands

e1 channel-group
e1 unframed
show controllers e3

e1 shutdown

To shutdown an individual E1 line on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 shutdown** controller configuration command. To activate an individual E1 line, use the **no** form of this command.

e1 *line* **shutdown**
no e1 *line* **shutdown**

Syntax Description

line	Number of the E1 line. Range is 1 to 16.

Default

E1 line is active.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

The **e1 shutdown** command disables the E1 line and sends an alarm indication signal (AIS) to the network.

Caution Hardware version 3.1.0 of the PA-MC-E3 port adapter has a limitation on the use of the internal clock. In this hardware, if you change the E1 clock source from line to internal or from internal to line, it is possible, although rare, that the change will cause the E1 line to transmit an invalid E1 framing pattern causing a loss of frame at the far end. To recover from this condition, manually reset the affected E1 line by using the **e1 shutdown** controller configuration command followed by the **no e1 shutdown** controller configuration command. To determine the hardware version on the port adapter, use the **show controllers e3** EXEC command. You cannot use the **e1 shutdown** command while running BERT or loopbacks; you must stop these functions first. In addition, you cannot start a BERT or loopback while an E1 line is shut down.

Example

In the following example, the E1 line 1 is shutdown:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 1 shutdown
```

Related Commands

shutdown (controller)

e1 unframed

To create an unframed (clear channel) logical channel group on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **e1 unframed** controller configuration command. To remove an unframed channel group, use the **no** form of this command.

e1 *line* **unframed**
no e1 *line* **unframed**

Syntax Description

line	Number of the E1 line. Range is 1 to 16.

Default

None

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

The E1 line contains no framing overhead and is not divided into timeslots.

The channel group is always 0 for unframed E1 lines.

For channelized, fractional, and unframed (**e1 unframed** command) configurations, each configured channel group, which might contain individual timeslots and/or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

For PRI ISDN (**e1 pri-group** command) configurations, each timeslot you assign to a PRI group for a configured E1 line, including each timeslot within a range of timeslots, uses one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a PRI group, then five logical channels are used (because you assigned timeslots 3, 4, 5, 6, and 7), whereas if you assign just timeslot 3 to a PRI group, only one logical channel is used.

After you configure the E1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay.

Example

In the following example, the E1 line 1 is configured as an unframed channel group. This creates serial interface 1/1/0/1:0.

```
Router(config)# controller e3 1/1/0
Router(config-controll)# e1 1 unframed
```

Related Commands

e1 channel-group
e1 pri-group
show controllers e3

idle pattern

To set the idle pattern that is transmitted for unused timeslots on all E1 lines on the PA-MC-E3 in Cisco 7200 series routers, Cisco 7500 series routers and Cisco 7000 series routers with RSP7000, use the **idle pattern** controller configuration command.

idle pattern *pattern*

Syntax Description

pattern	Hexadecimal value in the range 0x0 to 0xFF (hexadecimal) or 0-255 (decimal). You can enter this value in either hexadecimal or decimal. The default is 0x55 (or 84).

Default

0x55 hexadecimal (84 decimal)

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Example

In the following example, the idle pattern is set to 0x10 hexadecimal:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# idle pattern 0x10
```

loopback local (E3)

To set a local loopback on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **loopback local** controller configuration command. To remove the loopback, use the **no** form of this command.

loopback local
no loopback local

Syntax Description

This command has no arguments or keywords.

Default

No loopback is set.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Local loopback simultaneously loops all channels toward the router and loops the E3 link back toward the network. Use the **loopback local** command to diagnose problems with cables between the E3 controller and the central switching office at the E3 link level.

Example

In the following example, the E3 controller is placed in a local loopback:

```
Router(config)# controller e3 1/1/0
Router(config-controll)# loopback local
```

Related Commands

e1 loopback local

national bit

To configure the national reserved bit on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **national bit** controller configuration command.

national bit {**0** | **1**}

Syntax Description

0	Set the national reserved bit to 0.
1	Set the national reserved bit to 1. This is the default.

Default

1

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Example

In the following example, the national reserved bit is set to 0 :

```
Router(config)# controller e3 1/1/0
Router(config-controll)# national bit 0
```

Related Commands

e1 national bits

show controllers e3

To display information about all E1 lines on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **show controllers e3** EXEC command.

show controllers e3 [*slot*/*port-adapter*/*port*/*e1-line*] [**brief | tabular**] (Cisco 7500 series and Cisco 7000 series routers with RSP7000 and RSP7000CI)
show controllers e3 [*slot*/*port*/*e1-line*] [**brief | tabular**] (Cisco 7200 series)

Syntax Description

slot	(Optional) Slot location of the of the port adapter.
port-adapter	(Optional) On the Cisco 7500 series and Cisco 7000 series with RSP7000 and RSP7000CI, specifies the ports on a VIP. The value can be 0 or 1.
port	(Optional) Port number on the port adapter.
e1-line	(Optional) For the PA-MC-E3, the E1 line is a number between 1 and 16.
brief	(Optional) Displays a list of configurations only.
tabular	(Optional) Displays a list of configurations and MIB information in a tabular format.

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

If you use the **show controllers e3** command without specifying a port address (*slot/port-adapter/port/e1-line*) or either of the two optional arguments (**brief** or **tabular**), all information is displayed for the E3 controller you specified; therefore, the resulting display output can be extensive.

Sample Displays

The following is partial sample output from the **show controller e3 tabular** command for a PA-MC-E3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 1:

```
Router# show controllers e3 1/0/0 tabular
E3 1/0/0 is up.
  CE3 H/W Version : 3, CE3 ROM Version : 0.79, CE3 F/W Version : 0.30.0
  Applique type is Channelized E3
  Description: "UUT2 router"
  No alarms detected. Line Code is HDB3, Clock Source is Line.
  INTERVAL      LCV   PCV   CCV   PES  PSES  SEFS   UAS   LES   CES  CSES
  02:05-02:07     0     0     0     0     0     0     0     0     0     0
  01:50-02:05     0     0     0     0     0     0     0     0     0     0
  01:35-01:50     0     0     0     0     0     0     0     0     0     0
```

```
   01:20-01:35     0     0     0     0     0     0     0     0     0     0
   01:05-01:20     0     0     0     0     0     0     0     0     0     0
   00:50-01:05     0     0     0     0     0     0     0     0     0     0
   00:35-00:50     0     0     0     0     0     0     0     0     0     0
   00:20-00:35     0     0     0     0     0     0     0     0     0     0
   00:05-00:20     0     0     0     0     0     0     0     0     0     0
   23:50-00:05     0     0     0     0     0     0     0     0     0     0
   23:35-23:50     0     0     0     0     0     0     0     0     0     0
   23:20-23:35     0     0     0     0     0     0     0     0     0     0
   23:05-23:20     0     0     0     0     0     0     0     0     0     0
   22:50-23:05     0     0     0     0     0     0     0     0     0     0
   22:35-22:50     0     0     0     0     0     0     0     0     0     0
   22:20-22:35     0     0     0     0     0     0     0     0     0     0
   Total           0     0     0     0     0     0     0     0     0     0
E3 1/0/0 E1 1
   No alarms detected.
   Framing is crc4, Line Code is HDB3, Clock Source is line.
   INTERVAL      LCV   PCV   CSS  SELS   LES    DM    ES   BES   SES   UAS    SS
   02:05-02:07     0     0     0     0     0     0     0     0     0     0     0
   01:50-02:05     0     0     0     0     0     0     0     0     0     0     0
   01:35-01:50     0     0     0     0     0     0     0     0     0     0     0
   01:20-01:35     0     0     0     0     0     0     0     0     0     0     0
   01:05-01:20     0     0     0     0     0     0     0     0     0     0     0
   00:50-01:05     0     0     0     0     0     0     0     0     0     0     0
   00:35-00:50     0     0     0     0     0     0     0     0     0     0     0
   00:20-00:35     0     0     0     0     0     0     0     0     0     0     0
   00:05-00:20     0     0     0     0     0     0     0     0     0     0     0
   23:50-00:05     0     0     0     0     0     0     0     0     0     0     0
   23:35-23:50     0     0     0     0     0     0     0     0     0     0     0
   23:20-23:35     0     0     0     0     0     0     0     0     0     0     0
   23:05-23:20     0     0     0     0     0     0     0     0     0     0     0
   22:50-23:05     0     0     0     0     0     0     0     0     0     0     0
   22:35-22:50     0     0     0     0     0     0     0     0     0     0     0
   22:20-22:35     0     0     0     0     0     0     0     0     0     0     0
   Total           0     0     0     0     0     0     0     0     0     0     0
E3 1/0/0 E1 2
   Framing is none, Line Code is HDB3, Clock Source is line.
  .
  .
  .
```

Table 3 describes the **show controller e3** display fields.

Table 3 Show Controller E3 Field Descriptions

Field	Description
E3 1/0/0 is up	E3 controller in slot 1 is operating. The controller's state can be up, down, administratively down. Loopback conditions are shown by (Locally looped) or (Remotely Looped).
CE3 H/W Version	Version number of the hardware.
CE3 ROM Version	Version number of the ROM.
CE3 F/W Version	Version number of the firmware.
Applique type	Controller type.
Description	User-specified information about the E3 controller.

Table 3 Show Controller E3 Field Descriptions (Continued)

Field	Description
No alarms detected	Any alarms detected by the controller are displayed here. Possible alarms are as follows: • Transmitter is sending remote alarm. • Transmitter is sending AIS. • Receiver has loss of signal. • Receiver is getting AIS. • Receiver has loss of frame. • Receiver has remote alarm. • Receiver has no alarms.
Line Code is	Line coding format on the E3.
Clock Source is	User-specified clock source (line or internal).
Data in current interval (39 seconds elapsed)	Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. Accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.
LCV	Line Code Violations (LCV) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) occurring over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.
PCV	Path coding violation (PCV) error event is a frame synchronization bit error in the E1-noCRC formats or a CRC error in the E1-CRC formats.
CCV	Not applicable.
PES	P-bit errored seconds (PES) is a second with one or more PCVs, one or more out of frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.
PSES	P-bit severely errored seconds (PSES) is a second with 44 or more PCVs, one or more out of frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.
SEFS	Severely errored framing seconds (SEFS) is a second with one or more out of frame defects or a detected incoming AIS.
UAS	Unavailable seconds (UAS) are calculated by counting the number of seconds that the interface is unavailable. For more information, refer to RFC 1407.
LES	Line errored seconds (LES) is a second in which one or more code violations occurred or one or more LOS defects.
CES	C-bit errored seconds (CES) is a second with one or more Out of Frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
CSES	C-bit severely errored seconds (CSES) is a second with one or more Out of Frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
Total (last 1 15 minute intervals)	Shows the last 15-minute accumulation period.
E3 1/0/0 E1 1	E1 line.

Table 3 Show Controller E3 Field Descriptions (Continued)

Field	Description
No alarms detected	Any alarms detected by the E1 controller are displayed here. Possible alarms are as follows: • Transmitter is sending remote alarm. • Transmitter is sending AIS. • Receiver has loss of signal. • Receiver is getting AIS. • Receiver has loss of frame. • Receiver has remote alarm. • Receiver has no alarms.
Framing is	Type of framing used on the E1 line. Values are: CRC4, No-CRC4, or None.
LineCode is	Type of line coding used on the E1 line.
Clock Source is	Clock source on the E1 line. Values are: internal or line.
CSS	Controlled slip second (CSS) is a one-second interval containing one or more controlled slips.
SELS	Frame loss seconds (SELS) is the number of seconds an Out Of Frame (OOF) error is detected.
DM	Degraded minute (DM) is one in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3. For more information, refer to RFC 1406.
ES	Errored seconds (ES) is a second with one or more path coding violations, one or more Out of Frame defects, or one or more controlled slip events or a detected AIS defect.
BES	Bursty errored seconds (BES) is a second with fewer than 320 and more than one path coding violation error events, no Severely Errored Frame defects, and no detected incoming AIS defects. Controlled slips are not included in this parameter.
SES	Severely errored seconds (SES) is a second with 320 or more path code violation errors events, one or more Out of Frame defects, or a detected AIS defect.
SS	Stuffed seconds (SS) is a second in which one more bit stuffings take place. This happens when the Pulse Density Enforcer detects a potential violation in the output stream and inserts a 1 to prevent it. Such bit stuffings corrupt user data and indicate the network is misconfigured. This counter can be used to help diagnose this situation.

The following is partial sample output from the **show controller e3 brief** command for a PA-MC-E3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 1:

```
Router# show controllers e3 1/0/0 brief
E3 1/0/0 is up.
  CE3 H/W Version : 3, CE3 ROM Version : 0.79, CE3 F/W Version : 0.30.0
  Applique type is Channelized E3
  Description: "UUT2 router"
  No alarms detected. Line Code is HDB3, Clock Source is Line.
E3 1/0/0 E1 1
  No alarms detected.
  Framing is crc4, Line Code is HDB3, Clock Source is line.
E3 1/0/0 E1 2
  Framing is none, Line Code is HDB3, Clock Source is line.
E3 1/0/0 E1 3
.
.
.
```

The following is sample output from the **show controller e3 brief** command for a specific E1 line on a PA-MC-E3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 1:

```
Router# show controllers e3 1/0/0/1 brief
E3 1/0/0 is up.
  CE3 H/W Version : 3.0.0, CE3 ROM Version : 0.81, CE3 F/W Version : 0.32.0
E3 1/0/0 E1 1
  No alarms detected.
  Framing is crc4, Line Code is HDB3, Clock Source is line,
  National bits are 0x1F.
Router#
```

The following is sample output from the **show controller e3 tabular** command for a specific E1 line on a PA-MC-E3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 1:

```
Router# show controllers e3 1/0/0/1 tabular
E3 1/0/0 is up.
  CE3 H/W Version : 3.0.0, CE3 ROM Version : 0.81, CE3 F/W Version : 0.32.0
E3 1/0/0 E1 1
  No alarms detected.
  Framing is crc4, Line Code is HDB3, Clock Source is line,
  National bits are 0x1F.
  INTERVAL      LCV   PCV   CSS  SELS   LES    DM    ES   BES   SES   UAS    SS
  21:44-21:54     0     0     0     0     0     0     0     0     0     0     0
  21:29-21:44     0     0     0     0     0     0     0     0     0     0     0
  21:14-21:29     0     0     0     0     0     0     0     0     0     0     0
  20:59-21:14     0     0     0     0     0     0     0     0     0     0     0
  Total           0     0     0     0     0     0     0     0     0     0     0
Router#
```

The following is sample output from the **show controller e3** command for a specific E1 line on a PA-MC-E3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 1:

```
Router# show controllers e3 1/0/0/1
E3 1/0/0 is up.
  CE3 H/W Version : 3, CE3 ROM Version : 0.79, CE3 F/W Version : 0.23.0
E3 1/0/0 E1 1
  Transmitter is sending LOF Indication (RAI).
  Receiver is getting AIS.
  Framing is crc4, Line Code is HDB3, Clock source is line.
  Data in current interval (199 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
     199 Unavail Secs
  Data in Interval 1:
     0 Line Code Violations, 0 Path Code Violations
```

```
   0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
   0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
   900 Unavail Secs
Data in Interval 2:
   0 Line Code Violations, 0 Path Code Violations
   0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
   0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
   900 Unavail Secs
Total Data (last 2 15 minute intervals):
   0 Line Code Violations,0 Path Code Violations,
   0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
   0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
   1800 Unavail Secs, 0 Stuffed Secs
```

The following is sample output from the **show controller e3** command for a specific E1 line when a BER test is running on a PA-MC-E3 port adapter:

```
Router# show controller e3 1/0/0/1
E3 1/0/0 is up.
CE3 H/W Version : 3, CE3 ROM Version : 0.79, CE3 F/W Version : 0.29.0
E3 1/0/0 E1 1
No alarms detected.
Framing is crc4, Line Code is HDB3, Clock Source is line.
BERT test result (running)
   Test Pattern : 2^11, Status : Sync, Sync Detected : 1
   Interval : 5 minute(s), Time Remain : 5 minute(s)
   Bit Errors(Since BERT Started): 6 bits,
   Bits Received(Since BERT start): 8113 Kbits
   Bit Errors(Since last sync): 6 bits
   Bits Received(Since last sync): 8113 Kbits
```

Table 4 describes significant fields shown in the display.

Table 4 Show Controllers E3 Field Descriptions for BERT

Field	Description
BERT test result	Current state of the test. In this case, “running” indicates that the BER test is still in process. After a test completes, “done” is displayed.
Test Pattern : Status : Sync Detected :	Test pattern selected for the test (2^11), current synchronization state (sync), and number of time synchronization has been detected during this test (1).
Interval :	Time the test will take to run and time remaining for the test to run.
Time Remain :	For a BER test that you terminate, the time the test would have taken to run and the time remaining for the test to run had you not terminated it; “unable to complete” signifies that you interrupted the test.
Bit Errors(Since BERT Started): Bits Received(Since BERT start): Bit Errors(Since last sync): Bits Received(Since last sync):	Bit errors that have been detected versus the total number of test bits that have been received since the test started and since the last synchronization was detected.

Related Commands

controller e3

show interface serial

To display information about a serial interface on the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **show interfaces serial** privileged EXEC command.

show interfaces serial [*slot*/*port-adapter*/*port*/*e1-line*] [**:**channel-group] (Cisco 7500 series and Cisco 7000 series routers with RSP7000)
show interfaces serial [*slot*/*port*/*e1-line*] [**:***channel-group*] (Cisco 7200 series)

Syntax Description

slot	(Optional) Slot location of the of the port adapter.
port-adapter	(Optional) On the Cisco 7500 series and Cisco 7000 series with RSP7000 and RSP7000CI, specifies the ports on a VIP card. The value can be 0 or 1.
port	(Optional) Port number on the port adapter.
e1-line	(Optional) For the PA-MC-E3, the E1 line is a number between 1 and 16.
:*channel-group*	(Optional) Specifies the E1 channel-group number in the range of 0 to 30.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Sample Displays

The following is sample output from the **show interface serial** command for E1 line 1, channel group 0 on the PA-MC-E3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 1:

```
Router# show interface serial 1/0/0/1:0
Serial1/0/0/1:0 is up, line protocol is up
  Hardware is cyBus E3
  Internet address is 1.1.1.1/24
  MTU 1500 bytes, BW 2048 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input never, output 00:00:18, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/1 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
```

```
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     27 packets output, 9126 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     2 carrier transitions no alarm present
  Timeslot(s) NA, Transmitter delay is 0 flags, transmit queue length 7
```

Table 5 describes significant fields shown in the display.

Table 5 Show Interfaces Serial Field Descriptions

Field	Description
Serial... is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) or if it has been taken down by an administrator.
line protocol is {up | down}	Indicates whether the software processes that handle the line protocol consider the line usable (that is, whether keepalives are successful) or if it has been taken down by an administrator.
Hardware is	Specifies the hardware type.
Internet address is	Specifies the Internet address and subnet mask.
MTU	Maximum transmission unit of the interface.
BW	Indicates the value of the bandwidth parameter that has been configured for the interface (in kilobits per second). The bandwidth parameter is used to compute IGRP metrics only.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Input queue: (size/max/drops) Total output drops:	size—Number of packets in the input queue. max—maximum size of the queue. drops—number of packets dropped due to a full queue.
Output queue: (size/threshold/drops)	size—Current size of the output queue. threshold—congestive-discard threshold. Number of messages in the queue after which new messages for high-bandwidth conversations are dropped. drops—Number of dropped messages.

Table 5 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
Conversations (active/max active)	active—Number of currently active conversations. max active—Maximum number of concurrent conversations allowed.
Reserved Conversations (allocated/max allocated)	Weighted fair queue subqueues that are available and the maximum that are available to be reserved by the Resource Reservation Protocol (RSVP).
Five minute input rate Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.
frame	Not applicable
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.

Table 5 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
underruns	Number of times that the transmitter has been running faster than the router can handle. This might never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this might not balance with the sum of the enumerated output errors, as some datagrams can have more than one error, and others can have errors that do not fall into any of the specifically tabulated categories.
collisions	Not applicable
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds' time. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
output buffer failures	Number of no resource errors received on the output.
output buffers swapped out	Number of packets swapped to DRAM.
carrier transitions	Number of times the carrier detect signal of a serial interface has changed state. For example, if data carrier detect (DCD) goes down and comes up, the carrier transition counter will increment two times. Indicates modem or line problems if the carrier detect line is changing state often.
Timeslots	Number of timeslots allocated for this interface.
Transmitter delay	Number of idle flags inserted between each HDLC frame.
transmit queue length	Number of packets that can be queued to the interface for transmission.

shutdown (controller)

To disable the PA-MC-E3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP7000, use the **shutdown** controller configuration command. To enable the PA-MC-E3, use the **no** form of this command.

shutdown
no shutdown

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA. The information was modified in Cisco IOS Release 11.1 CC to support the PA-MC-E3.

Shutting down the PA-MC-E3 port adapter disables all functions on the interface. This command marks the interface as unavailable. To check if the PA-MC-E3 is disabled, use the **show controller e3** command.

The **no shutdown** command brings the E3 controller back up and sends an alarm indication signal (AIS) to the network.

Example

In the following example, the PA-MC-E3 is shutdown:

```
Router# controller e3 1/0/0
Router(conf-controll) shutdown
```

Related Commands

show controllers e3