



Multichannel STM-1 Port Adapter for the Cisco 7500 Series Router

This feature module describes the Multichannel STM-1 Port Adapter (PA-MC-STM-1). It includes information on the benefits of this port adapter, supported platforms, related documents, configuration examples and a command reference detailing new and enhanced commands.

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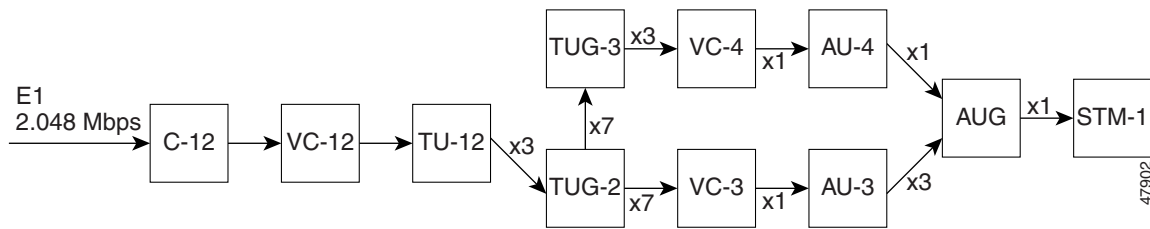
Feature Overview

The PA-MC-STM-1 is a high-speed single-port multichannel STM-1 port adapter. You can configure the PA-MC-STM-1 as a multichannel E1/E0 STM-1 port. The PA-MC-STM-1 can be configured into 63 individual E1 links. Each E1 link can carry a single channel at full or fractional rates, or be broken down into multiple DS0 or Nx64 Kbps rates. The PA-MC-STM-1 supports up to three TUG-3/AU-3 transport slots numbered 1 through 3. You can configure each TUG-3/AU-3 to carry 21 SDH TU-12s. Each SDH TU-12 is capable of carrying a channelized E1 frame, which can be unchannelized to N*64 Kbps timeslots.

PA-MC-STM-1 Multiplexing Hierarchy

Figure 1 illustrates the synchronous digital hierarchy (SDH) multiplexing structure supported on the PA-MC-STM-1. The PA-MC-STM-1 multiplexing structure is a subset of that defined in ITU-T G.707. At the lowest level, containers are input into virtual containers (VC) with stuffing bits to create a uniform VC payload with a common bit-rate, ready for synchronous multiplexing. The VCs are then aligned into tributary units (TUs) where pointer processing operations are implemented. This allows the TUs to be multiplexed into TU groups (TUGs). Three TU-12s can be multiplexed into one TUG-2.

Figure 1 PA-STM-1 Multiplexing Structure



The TUGs are then multiplexed into higher-level VCs, which in turn are multiplexed into administrative units (AUs). The AUs are then multiplexed into an AU group (AUG), and the final payload from the AUG is then multiplexed into the Synchronous Transport Module (STM).

Benefits

The PA-MC-STM-1 port adapter provides the following benefits:

- High-density IP aggregation
- Reduction in provisioning costs
- Improved cable management
- Easier scaling of services
- Improved network availability

Restrictions

The PA-MC-STM-1 does not support the following:

- VIP2
- More than 256 logical channel groups per PA-MC-STM-1
- Channel-associated-signaling (CAS) for voice channels
- E1 Facility Data Link (FDL)
- E3 and subrate E3

Related Features and Technologies

- PA-MC-T3
- PA-MC-E3

Related Documents

PA-MC-STM-1 Port Adapter Installation and Configuration

Supported Platforms

- Cisco 7500 series

Supported Standards, MIBs, and RFCs

Standards

- CCITT/ITU G.704
- CCITT/ITU G.706
- CSA C22.2, No. 950
- ITU-T O.151
- ITU-T O.152
- ITU-T O.153
- FCC Part 15, class A
- FCC Part 68
- G.704
- G.706
- G.707
- UL1950 3rd Edition

MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of MIBs supported by platform and Cisco IOS release and to download MIB modules, go to the Cisco MIB web site on Cisco Connection Online (CCO) at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

- RFC 1406, *Definitions of Managed Objects for the DS1 and E1 Interface Types*
- RFC 1595, *Definitions of Managed Objects for the SONET/SDH Interface Type*

**Note**

Because E1 FDL is not supported by the PA-MC-STM-1, the far-end statistics and control groups defined by RFC 1406 are not available.

Prerequisites

The PA-MC-STM-1 requires a VIP4-80 installed in a Cisco 7500 series router.

Configuration Tasks

See the following sections for configuration tasks for the PA-MC-STM-1. Each task in the list indicates if the task is optional or required.

- Configuring the SONET Controller (Required)
- Configuring an AU-3 (Required)
- Configuring a TUG-3 (Required)
- Configuring a Channel Group on an E1 of an AU-3 (Required)
- Configuring a Channel Group on an E1 of a TUG-3 (Required)
- Configuring an E1 Line Mapped to an AU-3 (Required)
- Configuring an E1 Line Mapped to a TUG-3 (Required)
- Verifying the Configuration

Configuring the SONET Controller

	Command	Purpose
Step 1	Router# configure terminal	Enters configuration mode and specifies that the console terminal is the source of the configuration subcommands.
Step 2	Router(config)# controller sonet <i>slot/port-adapter/port</i>	Selects a port of a PA-MC-STM-1 and enters controller configuration mode.
Step 3	Router(config-controller)# [no] framing {sonet sdh}	Configures the framing mode of the PA-MC-STM-1 to SONET or SDH. SDH is the ITU standards equivalent of SONET. SONET is the default.

	Command	Purpose
Step 4	Router(config-controller)# clock source { internal line }	Configures the clock source used by the SONET controller. <ul style="list-style-type: none"> internal—The clocking source is obtained from the port adapter line. line—The clocking source is obtained from the network.
Step 5	Router(config-controller)# [no] loopback { local network }	Enables or disables loopback mode on a SONET controller. <ul style="list-style-type: none"> local—Data is looped from the transmit path to the receive path allowing diagnostics to send data to itself without relying on any external connections. network—Data is looped from the external port to the transmit port and back out the external port. No loopback enabled is the default.
Step 6	Router(config-controller)# [no] description <i>string</i>	Specifies up to 80 characters of text describing the SONET controller. No description is the default.

Configuring an AU-3

Each of the administrative unit group (AUGs) and tributary unit group (TUGs) of a PA-MC-STM-1 can be configured to carry a set of E1 links that are mapped into TU-12s. To configure the AUG mapping to AU-3, follow the steps below:

	Command	Purpose
Step 1	Router(config)# controller sonet <i>slot/port-adapter/port</i>	Enters SONET controller configuration mode.
Step 2	Router(config-controller)# framing sdh	Configures the framing mode of the to SDH.
Step 3	Router(config-controller)# [no] aug mapping au-3	Maps the AUG to AU-3 with the following muxing/alignment/mapping: C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> VC-3 <--> AU-3 <--> AUG
Step 4	Router(config-controller)# au-3 <i>au-3-number</i>	Specifies the AU-3 number to configure:. <ul style="list-style-type: none"> <i>au-3-number</i>—a number in the range of 1 to 3.
Step 5	Router(config-ctrlr-au3)# mode c-12	Specifies the mode of operation of the AU-3. <ul style="list-style-type: none"> c-12—The AU-3 is divided into 21 TU-12s each carrying an E1.
Step 6	Router(config-ctrlr-au3)# idle pattern <i>pattern</i>	Configures the idle pattern that is to be transmitted for unused time slots on all E1 lines of a AU-3. <ul style="list-style-type: none"> <i>pattern</i>—number in the range 0x0 to 0xFF (hexadecimal) or 0 to 225 (decimal).


Configuring a TUG-3

Each of the administrative unit group (AUGs) and tributary unit group (TUGs) of a PA-MC-STM-1 can be configured to carry a set of E1 links that are mapped into TU-12s. To configure the AUG mapping to AU-4, follow the steps below:

	Command	Purpose
Step 1	<code>Router(config)# controller sonet slot/port-adapter/port</code>	Enters SONET controller configuration mode.
Step 2	<code>Router(config-controller)# framing sdh</code>	Configures the framing mode of the to SDH.
Step 3	<code>Router(config-controller)# [no] aug mapping au-4</code>	Maps the AUG to AU-4 with the following muxing/alignment/mapping: C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> TUG-3 <--> VC-4 <--> AU-4 <--> AUG
Step 4	<code>Router(config-controller)# au-4 au-4-number tug-3 tug-3-number</code>	Specifies the TUG-3 number to configure: <ul style="list-style-type: none"> <i>au-4-number</i>—a number in the range of 1 to N where N is the STM level (For the PA-MC-STM-1 N is always 1.) <i>tug-3-number</i>—a number in the range of 1 to 3.
Step 5	<code>Router(config-ctrlr-tug3)# mode c-12</code>	Specifies the mode of operation of a TUG-3: <ul style="list-style-type: none"> c-12—The TUG-3 is divided into 21 TU-12s each carrying an E1.
Step 6	<code>Router(config-ctrlr-tug3)# idle pattern pattern</code>	Configures the idle pattern that is to be transmitted for unused time slots on all E1 lines of an AU-4. <ul style="list-style-type: none"> <i>pattern</i>—number in the range 0x0 to 0xFF (hexadecimal) or 0 to 225 (decimal)


Configuring a Channel Group on an E1 of an AU-3

	Command	Purpose
Step 1	<code>Router(config)# controller sonet slot/port-adapter/port</code>	Enters SONET controller configuration mode.
Step 2	<code>Router(config-controller)# framing sdh</code>	Configures the framing mode of the to SDH.
Step 3	<code>Router(config-controller)# [no] aug mapping au-3</code>	Maps the AUG to an AU-3 with the following muxing/alignment/mapping: C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> VC-3 <--> AU-3 <--> AUG
Step 4	<code>Router(config-controller)# au-3 au-3-number</code>	Specifies the AU-3 number to configure: <ul style="list-style-type: none"> <i>au-3-number</i>—a number in the range of 1 to 3.

	Command	Purpose
Step 5	Router(config-ctrlr-au3)# mode c-12	Specifies the mode of operation of the AU-3. <ul style="list-style-type: none"> c-12—The AU-3 is divided into 21 TU-12s each carrying an E1.
Step 6	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> channel-group <i>channel-group-number</i> timeslots <i>list-of-timeslots</i>	Creates a logical channel group on an E1 line. <ul style="list-style-type: none"> <i>tug-2-number</i>—a number in the range of 1 to 7 <i>e1-number</i>—a number in the range of 1 to 3 channel-group—defines a logical channel group to be a channelized E1 line <i>channel-group-number</i>—a number in the range of 0 to 30 <i>list-of-timeslots</i>—a number in the range of 1 to 31 or a combination of subranges within 1 to 31 (Each subrange is a list of timeslots that makes up the E1 line.)
	or	Use the no form of this command to remove a logical channel group.
	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> unframed	The default is no channel group configured on an E1 line. Creates an unframed (clear channel) logical channel group on an E1 line. <ul style="list-style-type: none"> <i>tug-2-number</i>—a number in the range of 1 to 7 <i>e1-number</i>—a number in the range of 1 to 3
Step 7	Router(config-ctrlr-au3)# exit Router(config-controller)# exit	Returns to configuration mode.
Step 8	Router(config)# interface serial <i>slot/port-adapter/port.au-3-number/tug-2-number/e1-number:channel-group-number</i>	Selects the channel group interface to configure. <p> Note When an unframed (clear channel) logical channel group is configured on an E1 line, the <i>channel-group-number</i> is always 0.</p>
Step 9	Router(config-if)# ip address 1.1.1.10 255.255.255.255	Enables IP on the channel group interface.
Step 10	Router(config-if)# encapsulation ppp	Enables PPP on the channel group interface.

Configuring a Channel Group on an E1 of a TUG-3

	Command	Purpose
Step 1	Router(config)# controller sonet <i>slot/port-adapter/port</i>	Enters SONET controller configuration mode.
Step 2	Router(config-controller)# framing sdh	Configures the framing mode of the to SDH.
Step 3	Router(config-controller)# [no] aug mapping au-4	Maps the AUG to AU-4 with the following muxing/alignment/mapping: C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> TUG-3 <--> VC-4 <--> AU-4 <--> AUG
Step 4	Router(config-controller)# au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies the AU-4 and TUG-3 number to configure: <ul style="list-style-type: none"> • <i>au-4-number</i>—a number in the range of 1 to N where N is the STM level (For the PA-MC-STM-1 N is always 1.) • <i>tug-3-number</i>—a number in the range of 1 to 3.
Step 5	Router(config-ctrlr-tug3)# mode c-12	Specifies the mode of operation of an AU-4. <ul style="list-style-type: none"> • c-12—The TUG-3 is divided into 21 TU-12s each carrying an E1.
Step 6	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> channel-group <i>channel-group-number</i> timeslots <i>list-of-timeslots</i>	Creates a logical channel group on an E1 line. <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • channel-group—defines a logical channel group to be a channelized E1 line • <i>channel-group-number</i>—a number in the range of 0 to 30 • <i>list-of-timeslots</i>—a number in the range of 1 to 31 or a combination of subranges within 1 to 31 (Each subrange is a list of timeslots that makes up the E1 line.)
	or	Use the no form of this command to remove a logical channel group. The default is no channel group configured on an E1 line.
	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> unframed	Creates an unframed (clear channel) logical channel group on an E1 line. <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3
Step 7	Router(config-ctrlr-tug3)# exit Router(config-controller)# exit	Returns to configuration mode.

	Command	Purpose
Step 8	Router(config)# interface serial <i>slot/port-adapter/port.au-4-number/tug-3-number/tug-2-number/ e1-number:channel-group-number</i>	Selects the channel group interface to configure.  Note When an unframed (clear channel logical channel group is configured on an E1 line, the <i>channel-group-number</i> is always 0.
Step 9	Router(config-if)# ip address 1.1.1.10 255.255.255.255	Enables IP on the channel group interface.
Step 10	Router(config-if)# encapsulation ppp	Enables PPP on the channel group interface.

Configuring an E1 Line Mapped to an AU-3

Step 1	Router(config)# controller sonet <i>slot/port-adapter/port</i>	Enters SONET controller configuration mode.
Step 2	Router(config-controller)# [no] aug mapping au-3	Maps the AUG to an AU-3 with the following muxing/alignment/mapping: C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> VC-3 <--> AU-3 <--> AUG
Step 3	Router(config-controller)# au-3 <i>au-3-number</i>	Specifies the au-3 number to configure:. <ul style="list-style-type: none"> <i>au-3-number</i>—a number in the range of 1 to 3.
Step 4	Router(config-ctrlr-au3)# mode c-12	Specifies the mode of operation of the AU-3. <ul style="list-style-type: none"> c-12—The AU-3 is divided into 21 TU-12s each carrying an E1.
Step 5	Router(config-ctrlr-au3)# tug-2 <i>tug-2-number</i> e1 <i>e1-number framing {crc4 no crc4}</i>	Specifies the type of framing used an by an E1 line. <ul style="list-style-type: none"> <i>tug-2-number</i>—a number in the range of 1 to 7 <i>e1-number</i>—a number in the range of 1 to 3 <i>crc4</i>— 4-bit cyclic redundancy check <i>no crc4</i>—basic framing <p>The default is CRC4.</p>

Step 6	Router(config-ctrlr-au3)# tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> clock source { internal line }	<p>Specifies the clock source to be used by the E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • internal—Specifies the PA-MC-STM-1 as the clock source • line—Specifies the E1 line as the clock source
Step 7	Router(config-ctrlr-au3)# tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> national bits <i>pattern</i>	<p>Configures the national reserved bits for the E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • <i>pattern</i>—The national reserved bit pattern is a hexadecimal value in the range 0x0–0x1F (hexadecimal) or 0-31 (decimal). <p>The default setting is 0x1F.</p>
Step 8	Router(config-ctrlr-au3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> bert pattern <i>pattern</i> interval <i>time</i>	<p>Sends a BERT pattern on an E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • <i>pattern</i>: <ul style="list-style-type: none"> – 2¹¹, pseudorandom test pattern (2048 bits long) – 2¹⁵, pseudorandom O.151 test pattern (32,768 bits long) – 2²⁰-O153, 2²⁰-1 O.153 test pattern – 2²⁰-QRSS, pseudorandom QRSS O.151 test pattern (1048575 bits long) • <i>time</i>—an interval in the range of 1 to 14400 minutes <p>The default is no BER test configured.</p>

Step 9	Router(config-ctrlr-au3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> loopback [local network { line payload }]	<p>Specifies a loopback for an E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • local—Loops transmitted E1 output back to the router via the internal E1 framer and loops E1 output to the network via the internal E1 framer. • network—Loops E1 input back to the network.
Step 10	Router(config-ctrlr-au3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> shutdown	<p>Shuts down an E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3

Configuring an E1 Line Mapped to a TUG-3

Step 1	Router(config)# controller sonet 2/0/0	Enters SONET controller configuration mode.
Step 2	Router(config-controller)# [no] aug mapping au-4	<p>Maps the AUG to AU-4 with the following muxing/alignment/mapping:</p> <pre>C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> TUG-3 <--> VC-4 <--> AU-4 <--> AUG</pre>
Step 3	Router(config-controller)# au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	<p>Specifies the AU-4 and TUG-3 number to configure:</p> <ul style="list-style-type: none"> • <i>au-4-number</i>—a number in the range of 1 to N where N is the STM level. (For the PA-MC-STM-1 N is always 1.) • <i>tug-3-number</i>—a number in the range of 1 to 3.
Step 4	Router(config-ctrlr-tug3)# mode c-12	<p>Specifies the mode of operation of a TUG-3.</p> <ul style="list-style-type: none"> • c-12—The TUG-3 is divided into 21 TU-12s each carrying an E1.
Step 5	Router(config-ctrlr-tug3)# tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> framing { crc4 no crc4 }	<p>Specifies the type of framing used on an E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • <i>crc4</i>—4-bit cyclic redundancy check • <i>no crc4</i>—basic framing <p>The default is CRC4.</p>

Step 6	Router(config-ctrlr-tug3)# tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> clock source { internal line }	<p>Specifies the clock source to be used by the E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • internal—Specifies the PA-MC-STM-1 as the clock source. • line—Specifies the E1 line as the clock source.
Step 7	Router(config-ctrlr-tug3)# tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> national bits <i>pattern</i>	<p>Configures the national reserved bits for the E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • <i>pattern</i>—The national reserved bit pattern is a hexadecimal value in the range 0x0–0x1F (hexadecimal) or 0 to 31 (decimal). <p>The default setting is 0x1F.</p>
Step 8	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> bert pattern <i>pattern</i> interval <i>time</i>	<p>Sends a BERT pattern on an E1 line.</p> <ul style="list-style-type: none"> • <i>tug-2-number</i>—a number in the range of 1 to 7 • <i>e1-number</i>—a number in the range of 1 to 3 • <i>pattern</i>: <ul style="list-style-type: none"> – 2¹¹, pseudorandom test pattern (2048 bits long) – 2¹⁵, pseudorandom O.151 test pattern (32,768 bits long) – 2²⁰-O153, 2²⁰-1 O.153 test pattern – 2²⁰-QRSS, pseudorandom QRSS O.151 test pattern (1048575 bits long) • <i>interval</i>— an interval in the range of 1 to 14400 minutes <p>The default is no BER test configured.</p>

Step 9	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> loopback [local network { line payload }]	Specifies a loopback for an E1 line. <ul style="list-style-type: none">• <i>tug-2-number</i>—a number in the range of 1 to 7• <i>e1-number</i>—a number in the range of 1 to 3• local—Loops transmitted E1 output back to the router via the internal E1 framer and loops E1 output to the network via the internal E1 framer.• network—Loops E1 input back to the network.
Step 10	Router(config-ctrlr-tug3)# [no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> shutdown	Shuts down an E1 line. <ul style="list-style-type: none">• <i>tug-2-number</i>—a number in the range of 1 to 7• <i>e1-number</i>—a number in the range of 1 to 3

Verifying the Configuration

You can verify the configuration and status of the controller by using the **show controller** commands as detailed below.

When AUG mapping is AU-4, view information about the SONET controller using the **sonet controller sonet port/port-adapter/port [brief | tabular]** command.

```
Router# show controller sonet 2/0/0
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
  Applique type is Channelized Sonet/SDH
  Clock Source is Internal, AUG mapping is AU4.

Medium info:
  Type:SDH, Line Coding:NRZ, Line Type:Short SM

Regenerator Section Status:
  No alarms detected.

Multiplex Section Status:
  No alarms detected.

Higher Order Path Status:
  Path# 1 has no defects

Lower Order Path Status:
  VC-12 1/1/1/1 has no defects
  VC-12 1/1/1/2 has no defects
  VC-12 1/1/1/3 has no defects
  VC-12 1/1/2/1 has no defects
  VC-12 1/1/2/2 has no defects
  VC-12 1/1/2/3 has no defects

[display text omitted]

Data in current interval (137 seconds elapsed):
  Regenerator Section:
    0 CVs, 0 ESs, 0 SESs, 0 SEFSS
  Multiplex Section:
    0 CVs, 0 ESs, 0 SESs, 0 UASs
  Higher Order Path:
    Path# 1: 0 CVs, 0 ESs, 0 SESs, 0 UASs
  Lower Order Path:
    VC-12 1/1/1/1: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/1/1/2: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/1/1/3: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/1/2/1: 0 CVs, 0 ESs, 0 SESs, 0 UASs
[display text omitted]

SONET 2/0/0  E1  1/1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  Data in current interval (137 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
    0 Unavail Secs
SONET 2/0/0  E1  1/1/1/2 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
```

```
Data in current interval (137 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
  0 Unavail Secs
[display text omitted]

Router# show controller sonet 2/0/0 brief
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
  Applique type is Channelized Sonet/SDH
  Clock Source is Internal, AUG mapping is AU4.

Medium info:
  Type:SDH, Line Coding:NRZ, Line Type:Short SM

Regenerator Section Status:
  No alarms detected.

Multiplex Section Status:
  No alarms detected.

Higher Order Path Status:
  Path# 1 has no defects

Lower Order Path Status:
  VC-12 1/1/1/1 has no defects
  VC-12 1/1/1/2 has no defects
  VC-12 1/1/1/3 has no defects
  VC-12 1/1/2/1 has no defects
  VC-12 1/1/2/2 has no defects
  VC-12 1/1/2/3 has no defects
[display text omitted]

SONET 2/0/0  E1  1/1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
SONET 2/0/0  E1  1/1/1/2 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
SONET 2/0/0  E1  1/1/1/3 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
[display text omitted]

Router# show controller sonet 2/0/0 tabular
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
  Applique type is Channelized Sonet/SDH
  Clock Source is Internal, AUG mapping is AU4.

Medium info:
  Type:SDH, Line Coding:NRZ, Line Type:Short SM

Regenerator Section Status:
  No alarms detected.

Multiplex Section Status:
  No alarms detected.
```

Higher Order Path Status:
Path# 1 has no defects

Lower Order Path Status:
VC-12 1/1/1/1 has no defects
VC-12 1/1/1/2 has no defects
VC-12 1/1/1/3 has no defects
VC-12 1/1/2/1 has no defects
[display text omitted]

Regenerator Section:
INTERVAL CV ES SES SEFS
20:47-20:50 0 0 0 0

Multiplex Section:
INTERVAL CV ES SES UAS
20:47-20:50 0 0 0 0

Higher Order Path:
Path# 1:
INTERVAL CV ES SES UAS
20:47-20:50 0 0 0 0

Lower Order Path:
AU-4# 1, TUG-3# 1, TUG-2# 1 VC-12# 1:
INTERVAL CV ES SES UAS
20:47-20:50 0 0 0 0

AU-4# 1, TUG-3# 1, TUG-2# 1 VC-12# 2:
INTERVAL CV ES SES UAS
20:47-20:50 0 0 0 0

AU-4# 1, TUG-3# 1, TUG-2# 1 VC-12# 3:
INTERVAL CV ES SES UAS
20:47-20:50 0 0 0 0

[display text omitted]

SONET 2/0/0 E1 1/1/1/1 is up
No alarms detected.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
INTERVAL LCV PCV CSS SEFS LES DM ES BES SES UAS SS
20:47-20:50 0 0 0 0 0 0 0 0 0 0 0 0

SONET 2/0/0 E1 1/1/1/2 is up
No alarms detected.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
INTERVAL LCV PCV CSS SEFS LES DM ES BES SES UAS SS
20:47-20:50 0 0 0 0 0 0 0 0 0 0 0 0

SONET 2/0/0 E1 1/1/1/3 is up
No alarms detected.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
INTERVAL LCV PCV CSS SEFS LES DM ES BES SES UAS SS
20:46-20:50 0 1 0 0 0 0 0 0 0 0 32 0

[display text omitted]

When AUG mapping is AU-3, view information about the SONET controller using the **sonet controller sonet port/port-adapter/port [brief | tabular]** command.

```

Router# show controller sonet 2/0/0
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
  Applique type is Channelized Sonet/SDH
  Clock Source is Internal, AUG mapping is AU3.

Medium info:
  Type:SDH, Line Coding:NRZ, Line Type:Short SM

Regenerator Section Status:
  No alarms detected.

Multiplex Section Status:
  No alarms detected.

Higher Order Path Status:
  Path# 1 has no defects
  Path# 2 has no defects
  Path# 3 has no defects

Lower Order Path Status:
  VC-12 1/1/1 has no defects
  VC-12 1/1/2 has no defects
  VC-12 1/1/3 has no defects
  VC-12 1/2/1 has no defects
[display text omitted]
Data in current interval (85 seconds elapsed):
  Regenerator Section:
    0 CVs, 0 ESs, 0 SESs, 0 SEFSS
  Multiplex Section:
    0 CVs, 0 ESs, 0 SESs, 0 UASs
  Higher Order Path:
    Path# 1: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    Path# 2: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    Path# 3: 0 CVs, 0 ESs, 0 SESs, 0 UASs
  Lower Order Path:
    VC-12 1/1/1: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/1/2: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/1/3: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/2/1: 0 CVs, 0 ESs, 0 SESs, 0 UASs
    VC-12 1/2/2: 0 CVs, 0 ESs, 0 SESs, 0 UASs
[display text omitted]

SONET 2/0/0  E1  1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  Data in current interval (85 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
    0 Unavail Secs
SONET 2/0/0  E1  1/1/2 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  Data in current interval (85 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
    0 Unavail Secs

```

[display text omitted]

Router# **show controller sonet 2/0/0 brief**

SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
H/W Version :0.2.3, ROM Version :1.2
FREEDM version :2, F/W Version :1.2.0
Applique type is Channelized Sonet/SDH
Clock Source is Internal, AUG mapping is AU3.

Medium info:

Type:SDH, Line Coding:NRZ, Line Type:Short SM

Regenerator Section Status:

No alarms detected.

Multiplex Section Status:

No alarms detected.

Higher Order Path Status:

Path# 1 has no defects

Path# 2 has no defects

Path# 3 has no defects

Lower Order Path Status:

VC-12 1/1/1 has no defects

VC-12 1/1/2 has no defects

VC-12 1/1/3 has no defects

VC-12 1/2/1 has no defects

[display text omitted]

SONET 2/0/0 E1 1/1/1 is up

No alarms detected.

Framing is crc4, Clock Source is internal, National bits are 0x1F.

SONET 2/0/0 E1 1/1/2 is up

No alarms detected.

Framing is crc4, Clock Source is internal, National bits are 0x1F.

SONET 2/0/0 E1 1/1/3 is up

No alarms detected.

Framing is crc4, Clock Source is internal, National bits are 0x1F.

[display text omitted]

Router# **show controller sonet 2/0/0 tabular**

SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
H/W Version :0.2.3, ROM Version :1.2
FREEDM version :2, F/W Version :1.2.0
Applique type is Channelized Sonet/SDH
Clock Source is Internal, AUG mapping is AU3.

Medium info:

Type:SDH, Line Coding:NRZ, Line Type:Short SM

Regenerator Section Status:

No alarms detected.

Multiplex Section Status:

No alarms detected.

Higher Order Path Status:

Path# 1 has no defects

Path# 2 has no defects

Path# 3 has no defects

Lower Order Path Status:

```

VC-12 1/1/1 has no defects
VC-12 1/1/2 has no defects
VC-12 1/1/3 has no defects
VC-12 1/2/1 has no defects
[display text omitted]
Regenerator Section:
  INTERVAL      CV      ES      SES      SEFS
  21:22-21:24   0       0       0       0

Multiplex Section:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0

Higher Order Path:
Path# 1:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0

Path# 2:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0

Path# 3:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0

Lower Order Path:
AU-3# 1, TUG-2# 1 VC-12# 1:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0

AU-3# 1, TUG-2# 1 VC-12# 2:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0

AU-3# 1, TUG-2# 1 VC-12# 3:
  INTERVAL      CV      ES      SES      UAS
  21:22-21:24   0       0       0       0
[display text omitted]

SONET 2/0/0  E1  1/1/1 is up
No alarms detected.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
  INTERVAL      LCV      PCV      CSS      SEFS      LES      DM      ES      BES      SES      UAS      SS
  21:22-21:24   0       0       0       0       0       0       0       0       0       0       0
SONET 2/0/0  E1  1/1/2 is up
No alarms detected.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
  INTERVAL      LCV      PCV      CSS      SEFS      LES      DM      ES      BES      SES      UAS      SS
  21:22-21:24   0       0       0       0       0       0       0       0       0       0       0
SONET 2/0/0  E1  1/1/3 is up
No alarms detected.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
  INTERVAL      LCV      PCV      CSS      SEFS      LES      DM      ES      BES      SES      UAS      SS
  21:22-21:24   0       0       0       0       0       0       0       0       0       0       0
[display text omitted]

```

When AUG mapping is AU-4, view information about a specific E1 line of a SONET controller, using the **show controller sonet slot/port-adapter/port.au-4-number/tug-3-number/tug-2-number/e1-number [brief | tabular]** command. This command displays error and performance statistics.

```
Router# show controller sonet 2/0/0.1/1/1/1
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
SONET 2/0/0 E1 1/1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  Data in current interval (237 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
    0 Unavail Secs
Router#show controller sonet 2/0/0.1/1/1/1 brief
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
SONET 2/0/0 E1 1/1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
Router#show controller sonet 2/0/0.1/1/1/1 tabular
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
SONET 2/0/0 E1 1/1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  INTERVAL          LCV   PCV   CSS  SEFS  LES   DM   ES   BES  SES  UAS  SS
  20:47-20:51       0     0     0    0    0    0   0   0   0   0   0
Router#

Router# show controller sonet 0/0/0.1/2/4/1 brief
SONET 0/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version : 0.2.3, ROM Version : 1.2
  FREEDM version : 2, F/W Version : 0.14.0
SONET 0/0/0 E1 1/2/4/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is line, National bits are 0x1F.

Router# show controller sonet 0/0/0.1/2/4/1 tabular
SONET 0/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version : 0.2.3, ROM Version : 1.2
  FREEDM version : 2, F/W Version : 0.14.0
SONET 0/0/0 E1 1/2/4/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is line, National bits are 0x1F.
  INTERVAL          LCV   PCV   CSS  SEFS  LES   DM   ES   BES  SES  UAS  SS
  16:56-16:57       0     0     0    0    0    0   0   0   0   0   1   0
```

When AUG mapping is AU-3, view information about a specific E1 line of a SONET controller, using the **show controller sonet slot/port-adapter/port.au-3-number/tug-2-number/e1-number [brief | tabular]** command. This command displays error and performance statistics.

```
Router# show controller sonet 2/0/0.1/1/1
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
SONET 2/0/0 E1 1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  Data in current interval (175 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
    0 Unavail Secs
Router#show controller sonet 2/0/0.1/1/1 brief
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version :0.2.3, ROM Version :1.2
  FREEDM version :2, F/W Version :1.2.0
SONET 2/0/0 E1 1/1/1 is up
  No alarms detected.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.

Router# show controller sonet 2/0/0.1/1/1 brief
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version : 0.2.3, ROM Version : 1.2
  FREEDM version : 2, F/W Version : 0.14.0
SONET 2/0/0 E1 1/1/1 is down
  Transmitter is sending LOF Indication (RAI).
  Receiver has loss of frame.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
Router#

Router# show controller sonet 2/0/0.1/1/1 tabular
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
  H/W Version : 0.2.3, ROM Version : 1.2
  FREEDM version : 2, F/W Version : 0.14.0
SONET 2/0/0 E1 1/1/1 is down
  Transmitter is sending LOF Indication (RAI).
  Receiver has loss of frame.
  Framing is crc4, Clock Source is internal, National bits are 0x1F.
  INTERVAL          LCV  PCV  CSS  SEFS  LES  DM  ES  BES  SES  UAS  SS
  17:26-17:29       0    0    0    0    0    0  0  0    0  173  0
  17:11-17:26       0    0    0    0    0    0  0  0    0  471  0
  16:56-17:11       0    0    0    0    0    0  0  0    0    0  0
  16:41-16:56       0    0    0    0    0    0  0  0    0    0  0
  16:26-16:41       0    0    0    0    0    0  0  0    0  216  0
  16:11-16:26       0    0    0    0    0    0  0  0    0  225  0
  Total              0    0    0    0    0    0  0  0    0  912  0
Router#
```

Monitoring and Maintaining the PA-MC-STM-1

Use the command detailed below to monitor and maintain the PA-MC-STM-1:

Command	Purpose
<pre>Router# show interface serial 2/0/0.1.1.1.1:1 Serial2/0/0.1/1/1/1:1 is up, line protocol is up Hardware is cyBus Channelized OC3/STM-1 PA Internet address is 105.105.105.1/24 MTU 1500 bytes, BW 1984 Kbit, DLY 20000 usec, rely 255/255, load 36/255 Encapsulation HDLC, loopback not set Keepalive not set Last input 00:00:00, output 00:00:00, output hang never Last clearing of "show interface" counters never Input queue: 1/75/0 (size/max/drops); Total output drops: 0 Queueing strategy: weighted fair Output queue: 0/1000/64/0 (size/max total/threshold/drops) Conversations 0/1/256 (active/max active/max total) Reserved Conversations 0/0 (allocated/max allocated) 5 minute input rate 286000 bits/sec, 36 packets/sec 5 minute output rate 284000 bits/sec, 36 packets/sec 8019 packets input, 11695347 bytes, 0 no buffer Received 0 broadcasts, 0 runts, 0 giants, 0 throttles 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort 7991 packets output, 11650799 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) Used:1-31, Transmitter delay is 0 flags, transmit queue length 6 [Additional display text for remaining interfaces omitted]</pre>	<p>Displays the interface statistics of a PA-MC-STM-1 in port adapter slot 0 of a VIP4 in interface processor slot 2</p>

Configuration Examples

This section provides the following configuration examples:

- Configuring the PA-MC-STM-1
- Configuring a Logical Channel Group on an E1 Line
- Configuring a Channel Group Interface
- Configuring an E1 Unframed Channel

Configuring the PA-MC-STM-1

You can configure each of the AUGs and TUGs of a PA-MC-STM-1 to carry a set of E1 links that are mapped into tributary unit level-12s (TU-12s).

In the following example, SDH framing, internal clock source, AUG mapping au-4 and idle pattern are configured:

```
Router(config)# controller sonet 1/1/0
Router(config-controller)# framing sdh
Router(config-controller)# clock source internal
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# mode c-12
Router(config-ctrlr-tug3)# tug-2 4 e1 channel-group 15 timeslots 1-5, 20-23
Router(config-ctrlr-tug3)# idle pattern 0x0
Router(config-ctrlr-tug3)# exit
Router(config-controller)#
```

Configuring a Logical Channel Group on an E1 Line

To configure a logical channel group on an E1 line use the **tug-2 tug-2-number e1 e1-number channel-group channel-group-number timeslots list-of-timeslots** command. In the following example, logical channel group 15 on E1 line 1 is configured and channelized timeslots 1 to 5 and 20 to 23 are assigned to the newly created logical channel group:

```
Router(config)# controller sonet 1/1/0
Router(config-controller)# framing sdh
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# mode c-12
Router(config-ctrlr-tug3)# tug-2 4 e1 1 channel-group 15 timeslots 1-5, 20-23
Router(config-ctrlr-tug3)# exit
Router(config-controller)# exit
```

Configuring a Channel Group Interface

Once a channel group has been created, interface serial configuration commands may be used as in the example below:

```
Router(config)# controller sonet 1/1/0
Router(config-controller)# framing sdh
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# mode c-12
Router(config-ctrlr-tug3)# tug-2 4 e1 10 channel-group 15 timeslots 1-5, 20-23
Router(config-ctrlr-tug3)# exit
Router(config-controller)# exit
Router(config)# interface serial 1/1/0.1/2/4/1:15
Router(config-if)# ip address 1.1.1.10 255.255.255.252
Router(config-if)# encapsulation ppp
```

Configuring an E1 Unframed Channel

To create an unframed or clear channel logical channel group on an E1 line, use the **tug-2** *tug-2-number* **e1** *e1-number* **unframed** command, as shown in the example below:

```
Router(config)# controller sonet 1/1/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 unframed
Router(config-ctrlr-tug3)# mode c-12
```

Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications.

- **au-3**
- **au-4 tug-3**
- **au-3**
- **aug mapping**
- **framing**
- **mode**
- **tug-2 e1 bert pattern**
- **tug-2 e1 channel-group timeslots**
- **tug-2 e1 clock source**
- **tug-2 e1 framing**
- **tug-2 e1 loopback**
- **tug-2 e1 national bits**
- **tug-2 e1 shutdown**
- **tug-2 e1 unframed**

au-3

To configure a particular AU-3 of an E1 line that has been mapped to an AU-3, use the **au-3** configuration controller command.

au-3 *au-3-number*

Syntax Description	<i>au-3-number</i>	A number in the range of 1 to 3.
---------------------------	--------------------	----------------------------------

Defaults No default behaviors or values.

Command Modes Configuration controller

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines An AUG of an STM-1 can be derived from either AU-3s or an AU-4. Use the **aug mapping au-3** configuration controller command to map the AUG to an AU-3 with the following muxing/alignment/mapping:

C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> VC-3 <--> AU-3 <--> AUG

Configuring the **au-3** command enables you to enter configuration controller au3 command mode and creates a serial interface with the following name format:

slot/port-adapter/port.au-3-number/tug-2-number/e1-number

The **aug mapping au-3** and **au-3** commands are available only when SDH framing is configured.

Examples The following example configures AUG mapping to be derived from an AU-3 and selects AU-3 3 to configure as a serial interface:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-ctrlr-au3)# au-3 3
```

Related Commands	Command	Description
	aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
	au-4 <i>au-4-number</i>	Specifies a TUG-3 for configuration.
	tug-3 <i>tug-3-number</i>	

au-4 tug-3

To specify the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4, use the **au-4 tug-3** configuration controller command.

au-4 *au-4-number* **tug-3** *tug-3-number*

Syntax Description

<i>au-4-number</i>	A number in the range of 1 to N where N is the STM level. (For the PA-MC-STM-1 N is always 1.)
<i>tug-3-number</i>	A number in the range of 1 to 3.

Defaults

No default behaviors or values.

Command Modes

Configuration controller

Command History

Release	Modification
12.0(14)S	This command was introduced.

Usage Guidelines

An AUG of an STM-1 can be derived from either AU-3s or an AU-4. Use the **aug mapping au-4** configuration controller command to map the AUG to an TUG-3 with the following muxing/alignment/mapping:

C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> TUG-3 <--> VC-4 <--> AU-4 <--> AUG

Configuring the **au-4** command enables you to enter configuration controller **tug3** command mode and creates a serial interface with the following name format:

slot/port-adapter/port.au-4-number/tug-2-number/e1-number

The **aug mapping au-4** and **au-4 tug-3** commands are available only when SDH framing is configured.

Examples

The following example configures AUG mapping to be derived from a TUG-3 and selects TUG-3 1 of AU-4 1 to configure:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-ctrlr-tug3)# au-4 1 tug-3 1
```

Related Commands

Command	Description
aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.
au-4 <i>au-4-number</i>	Specifies a TUG-3 for configuration.
tug-3 <i>tug-3-number</i>	

aug mapping

To configure the AUG mapping mode of the PA-MC-STM-1, use the **aug mapping** command. To disable AUG mapping mode, use the **no** form of this command.

aug mapping {au-3 | au-4}

[no] aug mapping {au-3 | au-4}

Syntax Description	au-3	Configures the AUG to be derived from AU-3.
	au-4	Configures the AUG to be derived from AU-4.
Defaults	au-4	
Command Modes	Configuration controller	
Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines

An AUG of an STM-1 can be derived from either AU-3s or an AU-4. If you configure the AUG mapping to AU-3, the following muxing/alignment/mapping is configured:

C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> VC-3 <--> AU-3 <--> AUG

If you configure the AUG mapping to AU-4 the following muxing/alignment/mapping is configured:

C-12 <--> VC-12 <--> TU-12 <--> TUG-2 <--> TUG-3 <--> VC-4 <--> AU-4 <--> AUG

This command is available only when SDH framing is configured.

Examples

The following example configures AUG mapping to be derived from an AU-3:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-ctrlr-au3)# au-3 1
```

The following example configures AUG mapping to be derived from an AU-4:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-ctrlr-tug3)# au-4 1 tug-3 1
```

Related Commands	Command	Description
	au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.
	au-4 <i>au-4-number</i>	Specifies a TUG-3 for configuration.
	tug-3 <i>tug-3-number</i>	

framing

To configure the framing mode of the PA-MC-STM-1, use the **framing** controller configuration command. To disable the framing mode, use the **no** form of this command.

framing {sonet | sdh}

[no] **framing** {sonet | sdh}

Syntax Description	sonet	Configures the PA-MC-STM-1 to be used in SONET mode.
	sdh	Configures the PA-MC-STM-1 to be used in SDH mode.
Defaults	SONET	
Command Modes	Configuration controller	
Command History	Release	Modification
	12.0(14)S	This command was introduced.
Usage Guidelines	Use the framing command to select the framing mode, SONET or SDH, for the PA-MC-STM-1.	
Examples	The following example configures the framing mode of the PA-MC-STM-1 to SDH: <pre>Router# controller sonet 2/0/0 Router(config-controller)# framing sdh</pre>	
Related Commands	Command	Description
	[no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> unframed	Creates an unframed (clear channel) logical channel group on an E1 line.
	tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> framing { crc4 no-crc4 }	Specifies the type of framing used by the E1 lines.

mode

To configure the mode of an E1 line that has been mapped to a TUG-3, use the **mode** controller configuration `tug3` command.

To configure the mode of an E1 line that has been mapped to a AU-3, use the **mode** controller configuration `au3` command.

Use the **no** form of this command to disable the mode configuration.

```
mode {c-12}
```

```
[no] mode {c-12}
```

Syntax Description	c-12	The TUG-3 or AU-3 is divided into 21 TU-12s, each carrying an E1.
Defaults	c-12	
Command Modes	Configuration controller <code>tug3</code> (for an E1 line mapped to a TUG-3) Configuration controller <code>au3</code> (for an E1 line mapped to an AU-3)	
Command History	Release	Modification
	12.0(14)S	This command was introduced.
Usage Guidelines	You can configure each of the TUG-3s or AU-3s of a PA-MC-STM-1 to carry a set of TU-12s (E1s mapped into TU-12s). The mode c-12 command configures the mode of operation of a TUG-3 or AU-3 and specifies that the TUG-3 or AU-3 is divided into 21 TU-12s, each carrying an E1.	
Examples	<p>The following example configures the AUG-mapping of the SONET controller to AU-3 and specifies the mode of AU-3 1 to c-12:</p> <pre>Router(config)# controller sonet 1/0/0 Router(config-controller)# aug mapping au-3 Router(config-controller)# au3 1 Router(config-ctrlr-au3)# mode c-12</pre> <p>The following example configures the AUG-mapping of the SONET controller to AU-4 and specifies the mode of TUG-3 1 of AU-4 1 to c-12:</p> <pre>Router(config)# controller sonet 1/0/0 Router(config-controller)# aug mapping au-4 Router(config-controller)# au-4 1 tug-3 1 Router(config-ctrlr-tug3)# mode c-12</pre>	

tug-2 e1 bert pattern

To send a BER test pattern on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 bert pattern** configuration controller tug-3 command.

To send a BER test pattern on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 bert pattern** configuration controller au-3 command.

To stop the BERT test, use the **no** form of this command.

```
tug-2 tug-2 number e1 e1-number [bert pattern pattern interval time]
```

```
[no] tug-2 tug-2 number e1 e1-number [bert pattern pattern interval time]
```

Syntax Description		
<i>tug-2 number</i>		A number in the range of 1 to 7.
<i>e1-number</i>		A number in the range of 1 to 3.
<i>pattern</i>		<ul style="list-style-type: none"> • 2¹¹, pseudorandom test pattern (2048 bits long). • 2¹⁵, pseudorandom O.151 test pattern (32,768 bits long). • 2²⁰-O153, 2²⁰-1 O.153 test pattern. • 2²⁰-QRSS, pseudorandom QRSS O.151 test pattern (1048575 bits long).
<i>time</i>		An interval in the range of 1 to 14400 minutes.

Defaults No BER test is configured.

Command Modes Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines Use the **tug-2 e1 bert pattern** command in configuration controller tug3 command mode to send a BERT pattern on an E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command.

Use the **tug-2 e1 bert pattern** command in configuration controller au3 command mode to send a BERT pattern on an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

To view the test results of a BER test pattern, use the **show controller sonet** command.

Examples

The following example sends a BER 2¹¹ pseudorandom pattern through E1 line 1, that has been mapped to a TUG-3, for five minutes:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 bert pattern 2^11 interval 5
```

The following example sends a BER 2¹⁵ pseudorandom pattern through E1 line 1, that has been mapped to an AU-3, for ten minutes:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 bert pattern 2^15 interval 10
```

Related Commands

Command	Description
aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.

tug-2 e1 channel-group timeslots

To create a logical channel group on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 channel-group timeslots** configuration controller tug-3 command.

To create a logical channel group on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 channel-group timeslots** configuration controller au-3 command.

To remove a logical channel group, use the **no** form of this command.

```
tug-2 tug-2 number e1 e1-number [[channel-group channel-group-number] [timeslots
list-of-timeslots]]
```

```
[no] tug-2 tug-2 number e1 e1-number [[channel-group channel-group-number] [timeslots
list-of-timeslots]]
```

Syntax Description		
<i>tug-2 number</i>		A number in the range of 1 to 7.
<i>e1-number</i>		A number in the range of 1 to 3.
channel-group		Defines a logical channel group to be a channelized E1 line.
<i>channel-group-number</i>		A number in the range of 0 to 30.
timeslots		Creates the timeslots that make up the E1 line.
<i>list-of-timeslots</i>		A number in the range of 1 to 31 or a combination of subranges within 1 to 31.

Defaults No channel groups are configured on an E1 line.

Command Modes Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines Use the **tug-2 e1 channel group timeslots** command in configuration controller tug3 command mode to configure a logical channel group on an E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command.

Use the **tug-2 e1 channel group timeslots** command in configuration controller au3 command mode to configure a logical channel group on an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

Examples

The following example configures logical channel group 15 on E1 1, that is mapped to a TUG-3, and assigns channelized timeslots 1 to 5 and 20 to 23:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# framing sdh
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 channel group 15 timeslots 1-5, 20-23
```

The following example configures a logical channel group 10 on E1 1, that is mapped to an AU-3, and assigns channelized timeslots 1 to 5 and 20 to 23:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# framing sdh
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 channel group 10 timeslots 1-5, 20-23
```

Related Commands

Command	Description
aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.
[no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> unframed	Creates an unframed (clear channel) logical channel group on an E1 line.
tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> framing { crc4 no-crc4 }	Specifies the type of framing used by the E1 lines.

tug-2 e1 clock source

To set the clock source on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 clock source** configuration controller tug-3 command.

To set the clock source on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 clock source** configuration controller au-3 command.

```
tug-2 tug-2 number e1 e1-number clock source {internal | line}
```

Syntax Description		
	<i>tug-2 number</i>	A number in the range of 1 to 7.
	<i>e1-number</i>	A number in the range of 1 to 3.
	internal	Specifies the PA-MC-STM-1 as the clock source.
	line	Specifies the E1 line as the clock source.

Defaults Clock source is configured from the E1 line.

Command Modes Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines Use the **tug-2 e1 clock source** command in configuration controller tug3 command mode to configure the clock source of an E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command. Use the **tug-2 e1 clock source** command in configuration controller au3 command mode to configure the clock source of an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

Examples The following example configures E1 line 1, that has been mapped to a TUG-3 to use the PA-MC-STM-1 as the clock source:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 clock source internal
```

The following example configures E1 line 1, that has been mapped to an AU-3, to be the clock source:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 clock source line
```

Related Commands	Command	Description
	aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
	au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
	aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
	au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.

tug-2 e1 framing

To set the type of framing used by an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 framing** configuration controller tug-3 command.

To set the type of framing used by an E1 line that has been mapped to an AU-3, use the **tug-2 e1 framing** configuration controller au-3 command.

To disable the framing mode, use the **no** form of this command.

```
tug-2 tug-2 number e1 e1-number framing {crc4 | no-crc4}
```

```
[no] tug-2 tug-2 number e1 e1-number framing {crc4 | no-crc4}
```

Syntax Description		
<i>tug-2 number</i>	A number in the range of 1 to 7.	
<i>e1-number</i>	A number in the range of 1 to 3.	
crc4	Specifies 4-bit cyclic redundancy check framing.	
no-crc4	Specifies basic framing.	

Defaults Framing format is crc4.

Command Modes Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines Use the **tug-2 e1 framing** command in configuration controller tug3 command mode to configure the type of framing used by an E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command.

Use the **tug-2 e1 framing** command in configuration controller au3 command mode to configure the type of framing used by an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

Examples The following example configures E1 line 1, that has been mapped to a TUG-3 to use crc4 framing:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 framing crc4
```

The following example configures E1 line 1, that has been mapped to an AU-3, to use basic framing:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 framing no-crc4
```

Related Commands

Command	Description
aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.
[no] tug-2 <i>tug-2-number</i> e1 <i>e1-number</i> unframed	Creates an unframed (clear channel) logical channel group on an E1 line.

tug-2 e1 loopback

To specify a loopback on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 loopback** configuration controller tug-3 command.

To specify a loopback on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 loopback** configuration controller au-3 command.

To disable the loopback, use the **no** form of this command.

```
tug-2 tug-2 number e1 e1-number loopback {local | network {line | payload}}
```

```
[no] tug-2 tug-2 number e1 e1-number loopback {local | network {line | payload}}
```

Syntax Description		
<i>tug-2 number</i>		A number in the range of 1 to 7.
<i>e1-number</i>		A number in the range of 1 to 3.
local		Loops transmitted E1 output back to the router via the internal E1 framer.
network { line payload }		Sets the loopback toward the network before going through the framer (line) or after going through the framer (payload).

Defaults No loopbacks are set on an E1 line.

Command Modes Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines Use the **tug-2 e1 loopback** command in configuration controller tug3 command mode to specify a loopback for an E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command.

Use the **tug-2 e1 loopback** command in configuration controller au3 command mode to specify a loopback for an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

Examples The following example sets E1 line 1, that has been mapped to a TUG-3, into local loopback:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 loopback local
```

The following example sets E1 line 1, that has been mapped to an AU-3, into network line loopback:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 loopback network line
```

Related Commands

Command	Description
aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.

tug-2 e1 national bits

To set the national reserved bits on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 national bits** configuration controller tug-3 command.

To set the national reserved bits an E1 line that has been mapped to an AU-3, use the **tug-2 e1 national bits** configuration controller au-3 command.

tug-2 *tug-2 number* **e1** *e1-number* **national bits** *pattern*

Syntax Description		
<i>tug-2 number</i>		A number in the range of 1 to 7.
<i>e1-number</i>		A number in the range of 1 to 3.
<i>pattern</i>		The national reserved bit pattern is a hexadecimal value in the range 0x0-0x1F (hexadecimal) or 0-31 (decimal).

Defaults	
	0x1F

Command Modes	
	Configuration controller tug3 (for an E1 line mapped to a TUG-3) Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines	
	Use the tug-2 e1 national bits command in configuration controller tug3 command mode to configure the national reserved bits for an E1 line that has been mapped to a TUG-3 via the aug-mapping au-4 command.

Use the **tug-2 e1 national bits** command in configuration controller au3 command mode to configure the national reserved bits for an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

Examples	
	The following example configures the national reserved bits for E1 line 1, that has been mapped to a TUG-3, into a 0x0 hexadecimal pattern:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 national bits 0x0
```

The following example configures the national reserved bits for E1 line 1, that has been mapped to an AU-3, into decimal pattern 0:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 national bits 0
```

Related Commands	Command	Description
	aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
	au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
	aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
	au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.

tug-2 e1 shutdown

To shut down an individual E1 line that has been mapped to a TUG-3, use the **tug-2 e1 shutdown** configuration controller tug-3 command.

To shut down an individual E1 line that has been mapped to an AU-3, use the **tug-2 e1 shutdown** configuration controller au-3 command.

To enable an individual E1 line, use the **no** form of this command.

tug-2 *tug-2 number* **e1** *e1-number* **shutdown**

[no] **tug-2** *tug-2 number* **e1** *e1-number* **shutdown**

Syntax Description

<i>tug-2 number</i>	A number in the range of 1 to 7.
<i>e1-number</i>	A number in the range of 1 to 3.
shutdown	Shuts down an individual E1 line.

Defaults

E1 lines are not shut down.

Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History

Release	Modification
12.0(14)S	This command was introduced.

Usage Guidelines

Use the **tug-2 e1 shutdown** command in configuration controller tug3 command mode to shut down an individual E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command.

Use the **tug-2 e1 shutdown** command in configuration controller au3 command mode to shut down an individual E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

Examples

The following example shuts down E1 line 1, that has been mapped to a TUG-3:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 shutdown
```

The following example shuts down E1 line 1, that has been mapped to an AU-3:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 shutdown
```

Related Commands	Command	Description
	aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
	au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
	aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
	au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.

tug-2 e1 unframed

To create an E1 unframed (clear channel) logical channel group on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 unframed** configuration controller tug-3 command.

To create an E1 unframed (clear channel) logical channel group on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 unframed** configuration controller au-3 command.

To remove a logical channel group, use the **no** form of this command.

tug-2 *tug-2 number* **e1** *e1-number* **unframed**

[no] **tug-2** *tug-2 number* **e1** *e1-number* **unframed**

Syntax Description		
	<i>tug-2 number</i>	A number in the range of 1 to 7.
	<i>e1-number</i>	A number in the range of 1 to 3.
	unframed	Configures an E1 unframed channel.

Defaults No default behavior or values.

Command Modes Configuration controller tug3 (for an E1 line mapped to a TUG-3)
Configuration controller au3 (for an E1 line mapped to an AU-3)

Command History	Release	Modification
	12.0(14)S	This command was introduced.

Usage Guidelines Use the **tug-2 e1 unframed** command in configuration controller tug3 command mode to create an unframed (clear channel) logical channel group on an E1 line that has been mapped to a TUG-3 via the **aug-mapping au-4** command.

Use the **tug-2 e1 unframed** command in configuration controller au3 command mode to create an unframed (clear channel) logical channel group on an E1 line that has been mapped to an AU-3 via the **aug-mapping au-3** command.

The channel group number for unframed E1 lines is always 0.

Examples The following example configures an unframed logical channel group on E1 line 1, that has been mapped to a TUG-3:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 unframed
```

The following example configures an unframed logical channel group on E1 line 1, that has been mapped to an AU-3:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 unframed
```

Related Commands

Command	Description
aug-mapping au-4	Configures the AUG mapping mode of the PA-MC-STM-1 to TUG-3.
au-4 <i>au-4-number</i> tug-3 <i>tug-3-number</i>	Specifies a TUG-3 for configuration.
aug-mapping au-3	Configures the AUG mapping mode of the PA-MC-STM-1 to AU-3.
au-3 <i>au-3-number</i>	Specifies an AU-3 for configuration.

Glossary

AUG—administrative unit group in SDH mode

BER—bit error rate

CAS—channel associated signalling

CRC4—cyclic redundancy check. Error-checking technique in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending node.

E1—A digital carrier used to transmit a formatted signal at 2.048 Mbps.

ITU—International Telecommunication Union—Telecommunication standards sector

PRI—Primary Rate Interface

SDH—synchronous digital hierarchy. The ITU equivalent of SONET.

SONET—Synchronous Optical Network. The ANSI specification describing the data format used in high-speed optical data transmission

STM-n—Synchronous Transport Module level-n (STM-1 is 155.52 Mbps.)

TU-n—tributary unit level-n

TUG-n—tributary unit group-n

VC—virtual circuit

VC-n—virtual container level-n

VIP—Virtual Interface Processor

