CHAPTER 3

Serial Port and T1/E1 Trunk Configuration

This chapter describes how to configure serial ports 0 and 1, and the T1/E1 trunk on the Cisco MC3810 multiservice access concentrator. This chapter includes the following sections:

Note This chapter describes how to configure serial ports and how to configure settings for the T1/E1 trunk. This chapter does not describe how to configure synchronized network clocking on serial ports and the T1/E1 trunk. For more information, see Chapter 4, "Configuring Synchronized Clocking."

For information on configuring Frame Relay or Asynchronous Transfer Mode (ATM) for data traffic only, see the *Wide Area Networking Configuration Guide.* For information on configuring voice traffic over Frame Relay, ATM or High Level Data Link Control (HDLC), see the appropriate chapters in this guide.

The Cisco MC3810 concentrator provides two universal input/output (UIO) serial ports for voice, video, and data traffic, a T1/E1 trunk, and either six analog voice ports or one digital voice module (DVM) that provides 24 digital voice ports for voice traffic.

The Cisco MC3810 also provides support for ISDN BRI and ISDN PRI only in the following cases:

- For ISDN BRI data backup.

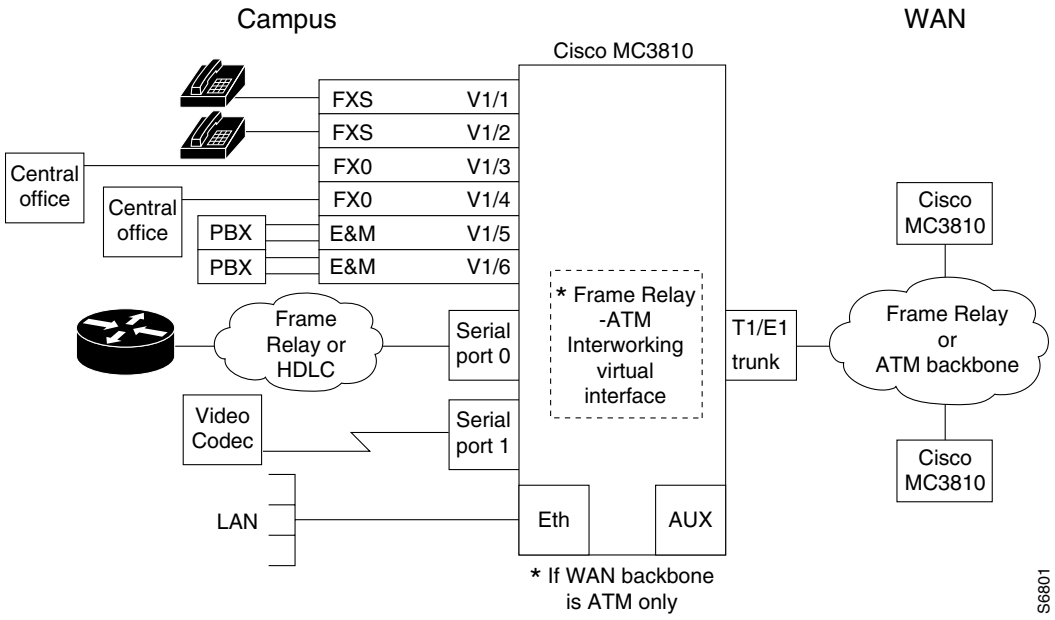
  For more information, see the "Configuring ISDN BRI Backup" section on page 3-10.

- For ISDN PRI only when Q.SIG is configured on a DVM to Private Integrated services Network Exchange (PINX) devices.

  For more information, see Chapter 11, "Configuring Support for PBX Signaling Formats."

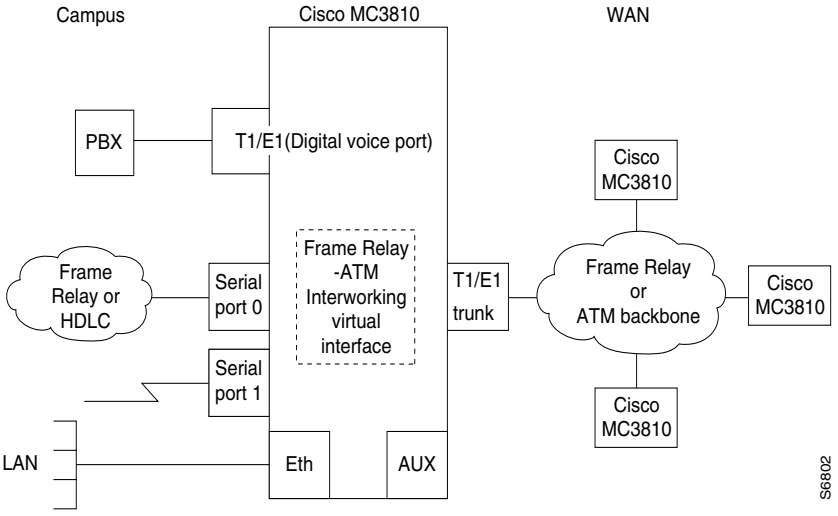
Figure 3-1 and Figure 3-2 show logical representations of the interface port options for the two different Cisco MC3810 versions and the types of devices to which each port type can be connected.

Figure 3-1 Cisco MC3810 Ports (Analog Voice Port Version)



Note For this example, the analog voice port configuration shown includes two of each type of analog voice personality module. These voice personality modules can be installed in any combination. For information on configuring voice ports, see Chapter 10, "Configuring Voice Ports."

Figure 3-2 Cisco MC3810 Ports (Digital Voice Port Version)



The configuration procedures in this guide progress from configuring the physical port specifications to the higher-layer network configurations necessary to configure voice or video traffic over the WAN backbone.

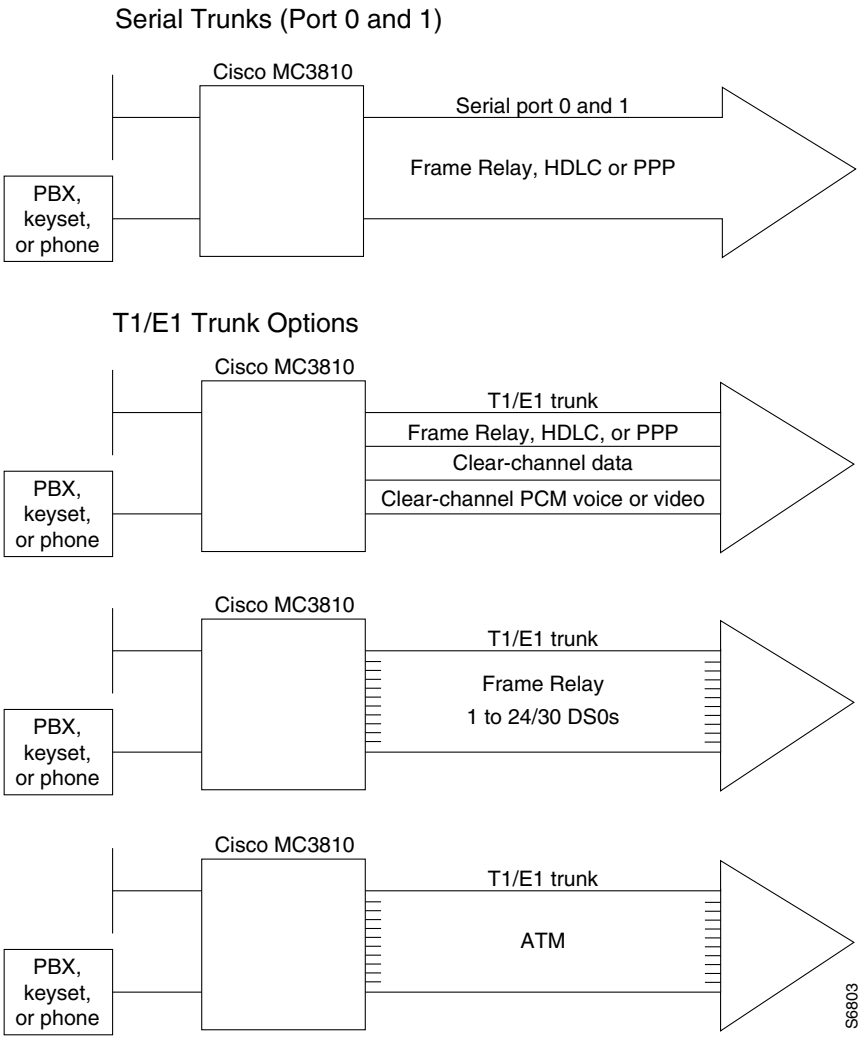
Table 3-1 provides an overview of the serial ports, and the traffic types each supports.

Table 3-1 Serial Port and T1/E1 Trunk Traffic Type Support

WAN Traffic Types	UIO Serial Port 0	UIO Port 1	T1/E1 Trunk
ATM	Not supported	Not supported	Data Compressed voice Circuit Emulation Services (CES) video
Frame Relay	Data Compressed voice	Data Compressed voice	Data Compressed voice (one channel group only)

Figure 3-3 shows a graphic representation of the different trunk options for the serial ports.

Figure 3-3 Cisco MC3810 Trunk Options



Configuring Basic Settings for Serial Ports 0 or 1

To configure basic settings for serial ports 0 and 1, complete the following steps:

Step	Command	Purpose
Step 1	`router>` **`show interface serial {0 | 1}`**	Display the default configuration.
Step 2	`router>` **`enable`**	Enable privileged EXEC command mode.

Step 3	`router#` **`configure terminal`**
	The following message displays:
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`router(config)#`
		Enter global configuration mode.

Step 4	`router(config)#` **`interface serial {0 | 1}`**	Enter serial interface configuration mode.
Step 5	`router (config-if)#` **`ip address`** *`address mask`* [**`secondary`**]	Enter the IP address for the serial port.
Step 6	`router(config-if)#` **`encapsulation clear-channel`**	If the serial port will be used to cross-connect to a trunk controller, set the encapsulation to clear-channel. For more information about configuring the serial port to a trunk controller, see the "Configuring TDM Cross-Connect (Data Pass-Through)" section on page 3-9.
Step 7	`router(config-if)#` **`no shutdown`**	Activate the serial port.
Step 8	Repeat steps 5 through 10 to configure the other serial port.	

This completes the basic configuration for serial ports 0 and 1.

Note By default, serial ports 0 and 1 are in data terminal equipment (DTE) mode. To switch the serial port to data communications equipment (DCE) mode, use the **frame-relay intf-type** interface configuration command.

Verifying the Configuration

To verify the serial interface configuration, enter the following command in privileged EXEC mode:

Step	Command	Purpose
Step 1	`router#` **`show interface serial {0 | 1}`**	Display the serial port configuration to verify the new settings**.**

Configuring T1/E1 Controller Settings

The T1/E1 controller is used as the trunk interface for many applications on the Cisco MC3810. To serve as the trunk interface, the T1/E1 controller is associated with the multiflex trunk module (MFT), which provides support for either ANSI T1.403 (T1) or ITU G.703 (E1). The MFT also provides a built-in channel service unit/data service unit (CSU/DSU).

Note In previous releases, the designation "serial 2" indicated the T1/E1 trunk. That designation is no longer valid.

Note When configuring the T1/E1 controller settings when using the digital voice module (DVM), select a framing format that best suits the type of signals that are carried by the T1/E1. Some T1/E1 equipment can be confused by repeating data patterns, such as when all voice channels are idle, and may have difficulty maintaining frame synchronization with some frame formats. In these cases, choose a different framing format or vary the location and CAS-type of voice channels, to help the external T1/E1 equipment maintain frame synchronization.

To configure the basic controller settings for the T1/E1 trunk, complete the following steps:

Step	Command	Purpose
Step 1	`router> enable`	Enable privileged EXEC command mode.

Step 2	`router# configure terminal`
	
	The following message displays:
	`Enter configuration commands, one per line. End with CNTL/Z. router(config)#`
		Enter global configuration mode.

Step 3	`router(config)# controller {t1 | e1} number`	Enter controller configuration mode. Specify whether your controller is T1 or E1, and enter the controller number. The *number* should be 1 if the controller is for the interface to the local phone device or PBX (through the DVM). The *number* should be 0 for the interface to the WAN (through the MFT).
Step 4	`router(config-controller)# description LINE`	Enter a description of the controller, such as the destination or its application, for the *LINE* value. The description can be up to 80 characters long.

After you have completed these basic settings, proceed to the "Configuring T1 Controller Settings" section on page 3-5 or the "Configuring E1 Controller Settings" section on page 3-6 depending on the controller type.

Configuring T1 Controller Settings

To configure T1 controller settings, complete the following steps in controller configuration mode:

Step	Command	Purpose
Step 1	`router(config-controller)# framing {sf | esf}`	Configure the DS1 link framing format. Extended SuperFrame format (ESF) is required for ATM traffic.
Step 2	`router(config-controller)# fdl {ansi| att | both}`	(Optional) If the framing format was configuring to esf, you can configure the format used for Facility Data Link (FDL). Select **ansi** for FDL to use the ANSI T1.403 standard. Select **att** for FDL to use the AT&T TR54016 standard. Select **both** to use both formats.
Step 3	`router(config-controller)# linecode {ami | b8zs}`	Configure the line encoding format for the DS1 link. The b8zs setting is required for Frame Relay and ATM traffic.
Step 4	`router(config-controller)# no shutdown`	Activate the T1 controller.
Step 5	`router(config-controller)# exit`	Exit controller configuration mode.

This completes the T1 controller configuration.

Verifying the Configuration

To verify the T1 controller configuration, enter the following command in privileged EXEC mode:

Step	Command	Purpose
Step 1	`router# show controller T1 {0|1}`	Verify the controller configuration.

Configuring E1 Controller Settings

To configure E1 controller settings, complete the following steps in controller configuration mode:

Step	Command	Purpose
Step 1	`router(config-controller)# framing {crc4 | no-crc4} [australia]`	Configure the E1 framing format. If the trunk will be connected to a device in Australia, enter the **australia** option.
Step 2	`router(config-controller)# linecode {ami | hdb3}`	Configure the E1 line encoding format. The hdb3 setting is required for Frame Relay and ATM traffic.
Step 3	`router(config-controller)# no shutdown`	Activate the E1 controller.
Step 4	`router(config)# exit`	Exit configuration mode.

This completes the E1 controller configuration.

Verifying the Configuration

To verify the E1 controller configuration, enter the following command in privileged EXEC mode:

Step	Command	Purpose
1	`router# show controller E1 {0|1}`	Verify the controller configuration.

Performing E1 Controller Loopback Diagnostics

To perform E1 controller loopback diagnostics as needed, complete the following steps in controller configuration mode:

Step	Command	Purpose
Step 1	`router(config-controller)# loopback {local | line | payload}`	Place the E1 controller into loopback mode.
Step 2	`router(config-controller)# no loopback {local | line | payload}`	When finished performing the loopback diagnostics, disable loopback mode.

Advanced Configurations

This section describes how to do the following configurations that are more advanced, or might be applicable to only specific situations:

- Performing T1 Controller Loopback Diagnostics, page 3-7
- Configuring T1 Cable Length Settings, page 3-8
- Configuring T1 Controller Channel Groups (Frame Relay Transport), page 3-8
- Configuring TDM Cross-Connect (Data Pass-Through), page 3-9
- Configuring ISDN BRI Backup, page 3-10

Note Channel groups, CAS voice groups, time-division multiplexing (TDM) groups and voice groups are assigned group numbers. All group numbers configured for channel groups, CAS voice groups, TDM groups and voice groups must be unique on the local Cisco MC3810 concentrator. For example, you cannot use the same group number for a channel group and for a TDM group.

Performing T1 Controller Loopback Diagnostics

To perform T1 controller loopback diagnostics as needed, complete the following steps in controller configuration mode:

Step	Command	Purpose
Step 1	`router(config-controller)# loopback {local | remote | line | payload}`	Place the T1 controller into loopback mode.
Step 2	`router(config-controller)# loop-detect`	Enable loop detection on the T1 controller.
Step 3	`router(config-controller)# no loopback {local | remote | line | payload}`	When finished performing the loopback diagnostics, disable loopback mode.

Configuring T1 Cable Length Settings

To configure the T1 cable length settings if necessary, complete the following task in controller configuration mode:

Step	Command	Purpose
Step 1	Configure the cable length setting by entering one of the following commands:	
	`router(config-controller)# cablelength short {133 | 266 | 399 | 533 | 655}`	Configure the cable length if the length is 655 feet or shorter.
	`router(config-controller)# cablelength long {gain26 | gain36} {-15db | -22.5db | -7.5db | 0db}`	Configure the cable length if the length is longer than 655 feet.

Note Depending on the DVM hardware configuration, either the **cablelength long** command or the **cablelength short** command is available. Both commands are not available on the same Cisco MC3810 at the same time.

Configuring T1 Controller Channel Groups (Frame Relay Transport)

Channel groups enable you configure a group of timeslots into a channel group on a T1 controller. Channel groups are required if you will be sending Frame Relay traffic over the T1 controller.

To configure a T1 controller channel group, enter the following command in controller configuration mode:

Step	Command	Purpose
Step 1	`router(config-controller)# channel-group` *channel-no* `timeslots` *timeslot-list* `speed {56 | 64}`	Configure a channel group for specific timeslots**.** This step is required for Frame Relay traffic. Make sure to set the speed to handle the largest throughput required for Frame Relay.

Note If you specify 56 kbps, the channel group is limited to 14 channels on the Cisco MC3810 MFT. Because **56** is the default, you should specify **64** if you need more than 14 channels.

Configuring TDM Cross-Connect (Data Pass-Through)

Using the time-division multiplexing (TDM) cross-connect function, you can perform cross-connect in one of two situations:

- Cross-connect two groups of DS0 timeslots from two controllers
- Cross-connect pass-through traffic from either UIO serial port 0 or 1 to a trunk controller

To configure TDM cross-connect, complete the following steps in controller configuration mode:

Step	Command	Purpose
Step 1	To configure a TDM channel group, do one of the following:	
	`router(config-controller)# tdm-group` *tdm-group-no* `timeslot` *timeslot-list* `[type {e&m | fxs [loop-start | ground-start] | fxo [loop-start | ground-start]}]`	Configure a TDM channel group for T1. If configuring cross-connect for data traffic only, do not specify the **type** option. The **type** option only applies if the **mode cas** command is enabled.
	`router(config-controller)# tdm-group` *tdm-group-no* `timeslot` *timeslot-list* `[type {e&m | fxs [loop-start | ground-start] | fxo [loop-start | ground-start] | fxs-melcas | fxo-melcas | e&m-melcas}]`	Configure a TDM channel group for E1. The "melcas" options are supported only on E1 and apply to the Mercury Exchange Limited (MEL) Channel Associated Signaling (CAS) standard, used primarily in the United Kingdom. The MEL options help preserve CAS integrity on the line. If configuring cross-connect for data traffic only, do not specify the **type** option. The **type** option only applies if the **mode cas** command is enabled.
Step 2	`router(config-controller)# exit`	Exit controller configuration mode.
Step 3	Do one of the following in configuration mode, depending on the cross-connect operation you are configuring:	
	`router(config)# cross-connect` *id controller-1 tdm-group-no-1 controller-2 tdm-group-no-2*	Configure cross-connect pass-through between two controllers.
	`router(config)# cross-connect` *id interface-serial controller tdm-group-no*	Configure cross-connect pass-through from UIO serial port 0 or 1 to a controller.

This completes the TDM cross-connect configuration.

Note If configuring cross-connect pass-through from UIO serial port 0 or 1 to a controller, you must configure the **encapsulation clear-channel** on the serial port.

Configuring ISDN BRI Backup

The Cisco MC3810 provides an ISDN Basic Rate Interface (BRI) that can be used as a backup interface for data only. The standard Cisco IOS ISDN implementation is supported with the following exceptions:

- Voice traffic is not supported on the ISDN BRI backup interface.
- ATM traffic is not supported over the ISDN BRI backup interface.
- The ISDN BRI backup interface does not act as a standby to answer a call until the backup mode is triggered. The ISDN BRI backup interface does not make calls or receive calls until the primary interface has gone down.
- The ISDN BRI backup interface cannot be used for a leased-line service in which there is no call setup or teardown.
- ISDN semipermanent connections between the BRI interface and the 1TR6 basic rate switch are not supported.
- The Cisco MC3810 may take longer to switch from the T1/E1 interface to the BRI backup interface than other Cisco products.

For more information about standard Cisco ISDN BRI configuration, see the *Dial Solutions Configuration Guide*.

Note When the BRI backup interface is active, only one channel group can be supported. In this case, a single Frame Relay or ATM channel group is supported. However, no voice groups or TDM groups can be supported when the BRI backup interface is active.

To configure the ISDN BRI backup interface, complete the following steps beginning in global configuration mode:

Step	Command	Purpose
Step 1	`router(config)# isdn switch-type` *switch-type*	Configure the global ISDN switch type to match the service provider switch type. For a list of keywords, refer to Table 3-2.
Step 2	`router(config)# isdn tei [first-call | powerup]`	Configure when the ISDN Terminal Endpoint Identifier (TEI) negotiation occurs. The **first-call** option is primarily used in European ISDN switch types, such as NET3 networks. The **powerup** option should be used in most other locations.
Step 3	`router(config)# interface bri 0`	Enter interface configuration mode for the BRI backup interface. ISDN BRI backup is supported only on **interface bri 0**.
Step 4	`router(config-if)# ip address` *ip-address mask*	Enter the IP address and subnet mask for the BRI backup interface.
Step 5	Configure the appropriate encapsulation on the BRI backup interface by entering one of the following:	
	`router(config-if)# encapsulation ppp`	Enable Point-to-Point Protocol (PPP) encapsulation on the BRI backup interface.

Step	Command	Purpose
	`router(config-if)# encapsulation frame-relay`	Enable Frame Relay encapsulation on the BRI backup interface.
	`router(config-if)# encapsulation hdlc`	Enable High-Level Data Link Control (HDLC) encapsulation on the BRI backup interface.
Step 6	`router(config-if)# isdn switch-type switch-type`	Configure the interface ISDN switch type to match the service provider switch type. The interface ISDN switch type overrides the global ISDN switch type on the interface. For a list of keywords, refer to Table 3-2.
Step 7	`router(config-if)# isdn answer1 [called-party-number] [:subaddress]`	(Optional) Configure called party number verification, to verify a called-party number or subaddress number in the incoming setup message.
Step 8	`router(config-if)# isdn not-end-to-end [56 | 64]`	(Optional) Configure the speed for incoming calls recognized as not ISDN end-to-end.
Step 9	`router(config-if)# isdn fast-rollover-delay seconds`	(Optional) Configure a fast rollover delay.
Step 10	`router(config-if)# isdn sending-complete`	(Optional) Configure the BRI backup interface to include the Sending Complete information element in the outgoing call Setup message. Used in some geographic locations, such as Hong Kong and Taiwan, where the sending complete information element is required in the outgoing call setup message.

Table 3-2 ISDN Switch Types

Country	ISDN Switch Type	Description
Australia	basic-ts013	Australian TS013 switches
Europe	basic-1tr6	German 1TR6 ISDN switches
	basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
	basic-net3	NET3 ISDN switches (UK and others)
	vn2	French VN2 ISDN switches
	vn3	French VN3 ISDN switches
Japan	ntt	Japanese NTT ISDN switches
New Zealand	basic-nznet3	New Zealand NET3 switches
North America	basic-5ess	AT&T basic rate switches
	basic-dms100	NT DMS-100 basic rate switches
	basic-nil1	National ISDN-1 switches

Verifying the Configuration

To verify the ISDN BRI interface configuration, complete the following steps in privileged EXEC mode:

Step	Command	Purpose
Step 1	`router# show interfaces bri 0`	Display information about the physical attributes of the ISDN BRI B and D channels.
Step 2	`router# show controllers bri 0`	Display protocol information about the ISDN B and D channels.
Step 3	`router# show isdn {active | history | memory | status | timers}`	Display information about calls, history, memory, status, and Layer 2 and Layer 3 timers.
Step 4	`router# show dialer interface bri number`	Obtain general diagnostic information about the specified interface.