Cisco 1- and 2-port T1/E1 Multiflex Voice/WAN Interface Cards for the Cisco 1721 Router

The Cisco 1- and 2-port T1/E1 multiflex interface cards support generic single- or dual-port T1 or E1 trunk interfaces for voice, data, and integrated voice/data applications. These cards provide basic structured T1 service, as well as structured and unstructured E1 services.

On the Cisco 1721 router, these cards can be used as trunk interfaces for data services only, such as fractional *n* x 64-Kbps service for WANs (Frame Relay or leased line).

Table 1 describes and names each T1/E1 card that can be used in the Cisco 1721 router.

Table 1 T1/E1 Multiflex Voice/WAN Interface Cards

Description	Name
1-Port RJ-48 Multiflex Trunk, T1/E1	VWIC2-1MFT-T1/E1
2-Port RJ-48 Multiflex Trunk, T1/E1	VWIC2-2MFT-T1/E1
1-Port RJ-48 Multiflex Trunk, E1 G.703	VWIC2-1MFT-G703
2-Port RJ-48 Multiflex Trunk, E1 G.703	VWIC2-2MFT-G703

Related Documentation

This document provides updated information on Cisco 1- and 2-port T1/E1 multiflex interface cards. This information supplements the *Cisco Interface Cards Hardware Installation Guide*.

Use this document with the following guides:

- *Cisco 1700 Router Hardware Installation Guide*
- *Cisco Interface Cards Hardware Installation Guide*
- *Cisco 1700 Series Router Software Configuration Guide*
- Cisco IOS Release 12.2 *Dial Services Configuration Guide: Signaling Configuration*
- *Regulatory Compliance and Safety Information for Cisco 1600 and Cisco 1700 Routers*

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The platform documents are available at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/1700/index.htm

The IOS documents are available at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/

Software Configuration Information

This section provides pointers to information that is useful for configuring the interface card.

- T1/E1

  WAN Data Traffic Configuration on Digital T1/E1 Packet Voice Trunk Network Modules

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121x/121xh/121xh_2/t1e1wan.htm

  Configuring T1/E1 High Capacity Digital Voice Port Adapters

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xe/120xe5/t1_vo_xe.htm

- G.703

  G.703 Configuration for Multiflex Voice/WAN Interface Cards on Cisco 2600 and 3600 Series Routers

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121t/121t1/dtg703.htm

- Extended availability drop-and-insert (EADI)

  T1/E1 Multiflex VWIC Enhancements

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121x/121xh/121xh_2/dteadi.htm

- T1 channel-associated signaling, drop-and-insert

  Configuring Digital T1 Packet Voice Trunk Network Modules on Cisco 2600 and Cisco 3600 Series Routers

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120t/120t7/t1_vo_t6.htm

  Configuring 1- and 2-Port T1/E1 Multiflex Voice/WAN Interface Cards on Cisco 2600 and 3600 Series Routers

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xk/1205xk/t1_mf_xk.htm

1- and 2-Port Multiflex Interface Cards

On the Cisco 1721 router, Cisco 1- and 2-port T1/E1 multiflex interface cards provide data access to the Public Switched Telephone Network (PSTN) domain through time-division multiplexing (TDM) ports.

Descriptions and connection information for Cisco 1-port multiflex interface cards are available at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/1700/1700cnts/t1e11700.htm#wp49314

Descriptions and connection information for Cisco 2-port multiflex interface cards are available at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/1700/1700cnts/t1e11700.htm#wp49419

T1/E1 Data Configuration

Follow these steps to configure your digital T1/E1 voice WAN interface card (VWIC) for WAN data traffic.

	Command	Purpose
Step 1	Router#**configure terminal**	Enters global configuration mode. Skip this step if you are already in terminal configuration mode.
Step 2	Router(config)# **card type** {**t1** | **e1**} *subslot*	Sets or changes the card type to support either T1 (t1) or E1 (e1) circuits. • *subslot* Specifies the VWIC slot number. Range can be 0 to 3, depending on host module or platform. • When the command is used for the first time, the configuration takes effect immediately. • A subsequent change in the card type will not take effect unless you enter the **reload** command or reboot the router.
Step 3	Router(config)#**controller** {**T1** | **E1**} *port*	Enters controller configuration mode for T1 or E1 controller at the *port* location specified. Skip this step if you are already in controller configuration mode.
Step 4	Router(config-controller)#**framing** {**esf** | **sf**} or Router(config-controller)#**framing** {**crc4** | **no-crc4**}	Specifies the framing type designated by your service provider. Extended Superframe (ESF) and Super Frame (SF) are for T1 circuits, whereas cyclic redundancy check 4 (CRC4) and NO-CRC4 are for E1 circuits. The default setting for T1 framing is esf. The default setting for E1 framing is crc4.

	Command	Purpose

Step 5	Router(config-controller)# **clock source** {**line** [**primary** | **bits**] | **internal**} [**independent**]	Specifies the clock source:
		• When both ports are set to line clocking with no primary specification, port 0 is the default primary clock source and port 1 is the default secondary clock source.
		– When both ports are set to line and one port is set as the primary clock source, the other port is by default the backup or secondary source and is loop-timed.
		– If one port is set to **clock source line** and the other is set to **clock source internal**, the internal port recovers clock from the clock source line port if the clock source line port is up. If it is down, then the internal port generates its own clock.
		– If both ports are set to **clock source internal**, there is only one clock source—internal.
		– The optional keywords **primary** and **bits** have no effect on this feature.
		• NMSI Mode:
		– The **independent** keyword expands on the **clock source internal** and **clock source line** to specify that the port can operate on an independent clocking domain. Currently, on a 2-port VWIC-MFT, if both ports are configured as **clock source line**, the 2-port is really looped, which means that it's getting the clock from the first port. With NMSI mode, this dependency no longer exists, so the keyword **independent** means that both ports can be independently clocked.
		Note When NMSI mode is configured, the controller will support only one channel-group. If you try to configure more than one channel-group, the following error message will occur:
		`router(config-controller)#channel-group 2 timeslots 3`
		`%Channel-group already created.`
		`%Only 1 channel-group can be configured with independent clocking.`
		`%Insufficient resources to create channel group`
		When configuring between **clock source independent** and **no clock source independent**, the channel-group has to be removed.

	Command	Purpose
Step 6	Router(config-controller)#**linecode** {**ami** | **b8zs**} or Router(config-controller)#**linecode hdb3**	Specifies the line code type designated by your service provider. Alternate mark inversion (AMI) is used on older T1 circuits and references signal transitions with a binary 1, or *mark*. Binary 8 zero substitution (B8ZS), a more reliable method, is more popular. B8ZS encodes a sequence of eight zeros in a unique binary sequence to detect line-coding violations. The default setting for the T1 line code is b8Zs. High density binary 3 (HDB3) is used on E1 circuits.
Step 7	Router(config-controller)#**channel-group** *channel-group-no* **timeslots** *timeslot-list*	Enter this command to set up channel groups for WAN data services. The *channel-group-no* parameter is a value from 0 to 1 for T1/E1 data configuration. The *timeslot-list* parameter can be a single number, numbers separated by commas, or a pair of numbers separated by a hyphen to indicate a range of time slots. The valid range is from 1 to 24 for T1. For E1, the range is from 1 to 31. **Note** Only a speed of 64-Kbps is supported on Cisco 1700 series routers.
Step 8	Router(config-controller)#**no shutdown**	Activates the controller.
Step 9	Router(config-controller)#**exit**	Exits configuration mode.
Step 10	Router(config)#**interface serial** *port:channel-group-no*	Enters interface configuration mode for a serial interface that you specify by port. The *channel-group-no* portion of the command is required only for channelized T1 or E1 interfaces.
Step 11	Router(config-if)#**encapsulation** {**atm-dxi** | **frame-relay** | **hdlc** | **lapb** | **ppp** | **smds** | **x25**}	Configures synchronous serial encapsulation. The default encapsulation is hdlc.
Step 12	Router(config-if)#**ip address** *ip-address mask*	Assigns the IP address and subnet mask to the interface.
Step 13	Router(config-if)#**end**	Exits interface configuration mode.

T1/E1 Data Configuration Examples

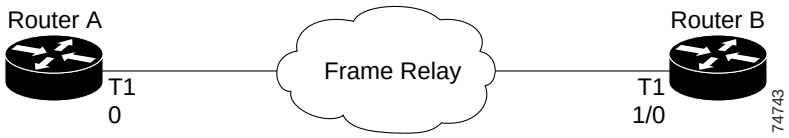
This section shows an example of a digital T1/E1 VWIC configured for Frame Relay to send WAN data traffic.

The **channel-group 0** command is configured in such a way that the service provider can send Frame Relay link management information (LMI) on the T1 or E1 controller for Frame Relay data services. This command automatically creates serial interface 0:0.

All the WAN and Layer 3 protocol details are configured in the **interface Serial 0:0** command. In the example below, Frame Relay encapsulation and IP address assignments are configured in **interface Serial 0:0** commands.

Figure 1 shows a diagram for the configuration example.

Figure 1 Configuration Example for T1/E1 WAN



T1 Configuration Example

This section shows a T1 configuration example for Router A, a Cisco 1721 router. (See Figure 1.)

```
card type t1
controller T1 0
  framing esf
  clock source internal
  linecode b8zs
  channel-group 0 timeslots 1-24
!
interface Serial 0:0
  no ip address
  encapsulation frame-relay
  no keepalive
!
interface Serial 0:0.1 point-to-point
  ip address 209.165.200.252 255.255.255.224
  frame-relay interface-dlci 100
!
interface FastEthernet0/0
  ip address 209.165.200.250 255.255.255.224
!
router eigrp 1
  network 209.165.200.224
```

This section shows a T1 configuration example for Router B, a Cisco 3600 series router. (See Figure 1.)

```
controller T1 1/0
  framing esf
  linecode b8zs
  channel-group 0 timeslots 1-24 speed 64
!
interface Serial 1/0:0
  no ip address
  encapsulation frame-relay
  no keepalive
!
interface Serial 1/0:0.1 point-to-point
  ip address 209.165.200.253 255.255.255.224
  frame-relay interface-dlci 100
!
interface FastEthernet0/0
  ip address 209.165.201.1 255.255.255.224
!
router eigrp 1
  network 209.165.200.224
  network 209.165.201.0
```

E1 Configuration Example

This section shows an E1 configuration example for Router A, a Cisco 1721 router. (See Figure 1.)

```
card type e1
controller E1 0
  framing crc4
  clock source internal
  linecode hdb3
  channel-group 0 timeslots 1-31
!
interface Serial 0:0
  no ip address
  encapsulation frame-relay
  no keepalive
!
interface Serial 0:0.1 point-to-point
  ip address 209.165.200.252 255.255.255.224
  frame-relay interface-dlci 100
!
interface FastEthernet0/0
  ip address 209.165.200.250 255.255.255.224
!
router eigrp 1
  network 209.165.200.224
```

This section shows an E1 configuration example for Router B, a Cisco 3600 series router. (See Figure 1.)

```
controller E1 1/0
  framing crc4
  linecode hdb3
  channel-group 0 timeslots 1-31
!
interface Serial 1/0:0
  no ip address
  encapsulation frame-relay
  no keepalive
!
interface Serial 1/0:0.1 point-to-point
  ip address 209.165.200.253 255.255.255.224
  frame-relay interface-dlci 100
!
interface FastEthernet0/0
  ip address 209.165.201.1 255.255.255.224
!
router eigrp 1
  network 209.165.200.224
  network 209.165.201.0
```

Verifying Controller Settings

The **show controller t1/e1** command displays the status of T1 or E1 controllers, clock sources, and other settings for the ports. See the following examples for a T1 controller and an E1 controller, respectively.

```
Router#show controller t1 0
T1 0 is up.
  Applique type is Channelized T1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
```

```
  Data in current interval (130 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 e1 0
E1 0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is CRC4, Line Code is HDB3, Clock Source is Internal.
  Data in current interval (17 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
```

Verifying a Serial Interface Configuration

To verify serial interface configuration, enter the **show interfaces serial** command. This command shows the status of all serial interfaces or of a specific serial interface. You can use this command to check the bandwidth, encapsulation, IP addressing, and other settings.

This example shows the verification of a T1 interface.

```
Router#show interfaces serial0:0
Serial0:0 is up, line protocol is up
  Hardware is DSX1
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  FR SVC disabled, LAPF state down
  Broadcast queue 0/64, broadcasts sent/dropped 1/0, interface broadcasts 0
  Last input 00:00:37, output 00:00:19, output hang never
  Last clearing of "show interface" counters 00:00:47
  Input queue: 0/75/0/0 (size/max/drops/flushes); 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)
     Available Bandwidth 1152 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     1 packets input, 314 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
     1 packets output, 328 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

This example shows the verification of an E1 interface.

```
Router#show interfaces serial 0:0
Serial0:0 is up, line protocol is up
  Hardware is DSX1
  MTU 1500 bytes, BW 1984 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:04, output 00:00:08, output hang never
  Last clearing of "show interface" counters 00:00:08
```

```
Input queue: 0/75/0/0 (size/max/drops/flushes); 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)
   Available Bandwidth 1488 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   1 packets input, 24 bytes, 0 no buffer
   Received 1 broadcasts, 0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
   0 packets output, 0 bytes, 0 underruns
   0 output errors, 0 collisions, 0 interface resets
   0 output buffer failures, 0 output buffers swapped out
   0 carrier transitions
```

T1/E1 Drop-and-Insert Configuration

T1/E1 VWICs with drop-and-insert functionality connect other devices to a T1 or E1 data stream. Drop-and-insert technology is sometimes called *TDM cross-connect*.

Note The Activity LED on the router does not light when the port is using the drop-and-insert feature.

The following steps configure your T1/E1 VWIC for drop-and-insert capability. Repeat the procedure for each controller.

	Command	Purpose
Step 1	Router#**configure terminal**	Enters global configuration mode. Skip this step if you are already in terminal configuration mode.
Step 2	Router(config)# **card type** {**t1** | **e1**} *subslot*	Sets or changes the card type to support either T1 (t1) or E1 (e1) circuits. • *subslot* Specifies the VWIC slot number. Range can be 0 to 3, depending on host module or platform. • When the command is used for the first time, the configuration takes effect immediately. • A subsequent change in the card type will not take effect unless you enter the **reload** command or reboot the router.
Step 3	Router(config)#**controller** {**T1** | **E1**} *port*	Enters controller configuration mode for a T1 or E1 controller at the *port* location specified. Skip this step if you are already in controller configuration mode.

	Command	Purpose
Step 4	Router(config-controller)#**framing** {**esf** | **sf**} or Router(config-controller)#**framing** {**crc4** | **no-crc4**}	Specifies the framing type designated by your service provider. Extended Superframe (ESF) and Super Frame (SF) are for T1 circuits, whereas cyclic redundancy check 4 (CRC4) and NO-CRC4 are for E1 circuits. The default setting for T1 framing is esf. The default setting for E1 framing is crc4. **Note** When configuring drop and insert, the T1 framing under the controllers involved (where the tdm-groups are configured), needs to be the same. If different framing types are used, the signaling bits may not be understood properly when a channel from one controller is dropped and inserted into a channel from another controller.

	Command	Purpose

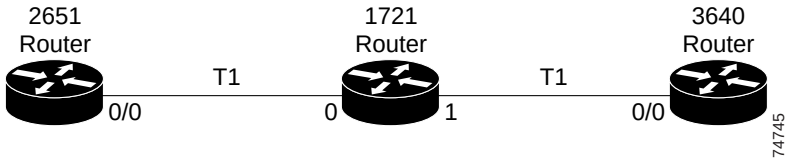
Step 5	Router(config-controller)# **clock source** {**line** [**primary** | **bits**] | **internal**} [**independent**]	Specifies the clock source:
		• When both ports are set to line clocking with no primary specification, port 0 is the default primary clock source and port 1 is the default secondary clock source.
		– When both ports are set to line and one port is set as the primary clock source, the other port is by default the backup or secondary source and is loop-timed.
		– If one port is set to **clock source line** and the other is set to **clock source internal**, the internal port recovers clock from the clock source line port if the clock source line port is up. If it is down, then the internal port generates its own clock.
		– If both ports are set to **clock source internal**, there is only one clock source—internal.
		– The optional keywords **primary** and **bits** have no effect on this feature.
		• NMSI Mode:
		– The **independent** keyword expands on the **clock source internal** and **clock source line** to specify that the port can operate on an independent clocking domain. Currently, on a 2-port VWIC-MFT, if both ports are configured as **clock source line**, the 2-port is really looped, which means that it's getting the clock from the first port. With NMSI mode, this dependency no longer exists, so the keyword **independent** means that both ports can be independently clocked.
		Note When NMSI mode is configured, the controller will support only one channel-group. If you try to configure more than one channel-group, the following error message will occur:
		`router(config-controller)#channel-group 2 timeslots 3`
		`%Channel-group already created.`
		`%Only 1 channel-group can be configured with independent clocking.`
		`%Insufficient resources to create channel group`
		When configuring between **clock source independent** and **no clock source independent**, the channel-group has to be removed.

	Command	Purpose
Step 6	Router(config-controller)#**linecode** {**ami** | **b8zs**} or Router(config-controller)#**linecode hdb3**	Specifies the line code type designated by your service provider. Alternate mark inversion (AMI) is used on older T1 circuits and references signal transitions with a binary 1, or *mark*. Binary 8 zero substitution (B8ZS), a more reliable method, is more popular. B8ZS encodes a sequence of eight zeros in a unique binary sequence to detect line-coding violations. The default setting for T1 line code is b8zs. High density binary 3 (HDB3) is used on E1 circuits.
Step 7	Router(config-controller)# **tdm-group** *tdm-group-no* **timeslots** *timeslot-list*	Used only when you need TDM groups for the drop-and-insert (also called *TDM cross-connect*) function with a 2-port T1/E1 trunk multiflex interface card. The *tdm-group-no* parameter is a value from 0 to 23 for T1, and is a value from 0 to 30 for E1. The *timeslot-list* parameter can be a single number, numbers separated by commas, or a pair of numbers separated by a hyphen that indicate a range of time slots. For T1, allowable values are from 1 to 24. For E1, allowable values are from 1 to 31. The number of time slots must be the same on both ports in order for them to be cross-connected. **Note** The group number for the TDM group must be unique. For example, a TDM group should not have the same ID number as a channel group.
Step 8	Router(config-controller)#**no shutdown**	Activates the controller.
Step 9	Router(config-controller)#**exit**	Exits controller configuration mode.
Step 10	Router(config)#**connect** *id* {**T1** | **E1**} *port tdm-group-no-1* {**T1** | **E1**} *port tdm-group-no-2*	This global configuration command sets up the connection between two T1/E1 TDM groups. The *id* parameter is a name for the connection. The *tdm-group-no-1* and *tdm-group-no-2* parameters identify the TDM group numbers (from 0 to 31) on the specified controller. (These groups were set up in Step 7.) **Note** The cross-connection must occur on the same VWIC, but on different ports.
Step 11	Router(config-tdm-conn)#**end**	Exits to privileged EXEC mode.

Drop-and-Insert Configuration Example

This section shows a sample configuration of a T1 drop-and-insert VWIC that provides a data connection between a Cisco 2651 router and a Cisco 3640 router, using T1. Figure 2 shows a diagram of the example.

Figure 2 Configuration Example for Drop-and-Insert



The following is the configuration for the Cisco 1721 router in Figure 2:

```
card type t1
controller T1 0
  framing esf
  linecode b8zs
  tdm-group 2 timeslots 13-24
!
controller T1 1
  framing esf
  clock source internal
  linecode b8zs
  tdm-group 3 timeslots 1-12
!
connect dfw1 T1 0 2 T1 1 3
```

The following shows a configuration for the Cisco 2651 router in Figure 2:

```
controller T1 0/0
framing esf
  clock source internal
  linecode b8zs
  channel-group 0 timeslots 13-24
!
interface Serial 0/0:0
  ip address 209.165.200.253 255.255.255.224
```

The following shows a configuration for the Cisco 3640 router in Figure 2:

```
controller T1 0/0
  framing esf
  linecode b8zs
  channel-group 2 timeslots 1-12
!
interface Serial 0/0:0
  ip address 209.165.200.252 255.255.255.224
```

Please note the following:

- The **tdm-group 2 timeslots 13-24** command defines drop-and-insert capability by setting the time slots from each T1 that will be used in the digital cross-connection.
- The **connect dfw1 T1 0 2 T1 1 3** command activates the drop-and-insert digital cross-connection between the T1s. The *dfw1* parameter is a name for the cross-connection; the name can be any word, any number, or any series of letters.
- You can verify drop-and-insert connections by using the **show connection all** command.

Verifying Controller Settings

The **show controller t1/e1** command displays the status of T1 or E1 controllers and displays information about clock sources for the ports:

```
Router#show controller t1
T1 0 is up.
  Applique type is Channelized T1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is ESF, Line Code is B8ZS, Clock Source is Line.
  Data in current interval (708 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
T1 1 is up.
  Applique type is Channelized T1
  Cablelength is long gain36 0db
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
  Data in current interval (708 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
```

Verifying Drop-and-Insert Configuration

To verify drop-and-insert configuration, enter the **show connection all** command.

```
Router#show connection all

ID  Name    Segment 1    Segment 2   State
=========================================
1   dfw1     T1 0 02      T1 1 03     UP
```

E1 G.703 Unstructured Configuration

The following steps configure your E1 G.703 VWIC for unstructured G.703 capability.

For detailed information about configuring unstructured service for E1 networks, see the *G.703 Configuration for Multiflex Voice/WAN Interface Cards on Cisco 2600 and 3600 Series Routers* online document.

Repeat the following procedure for each E1 controller.

	Command	Purpose
Step 1	Router#**configure terminal**	Enters global configuration mode. Skip this step if you are already in terminal configuration mode.
Step 2	Router(config)# **card type e1** *subslot*	Sets or changes the card type to support E1 (e1) circuits. • *subslot* Specifies the VWIC slot number. Range can be 0 to 3, depending on host module or platform. • When the command is used for the first time, the configuration takes effect immediately. • A subsequent change in the card type will not take effect unless you enter the **reload** command or reboot the router.
Step 3	Router(config)#**controller E1** *port*	Enters controller configuration mode for E1 controller at the specified *port* location. Skip this step if you are already in controller configuration mode.

	Command	Purpose

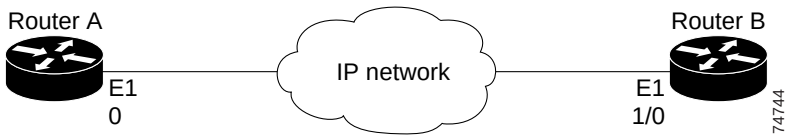
Step 4	Router(config-controller)# **clock source** {**line** [**primary** | **bits**] | **internal**} [**independent**]	Specifies the clock source:
		• When both ports are set to line clocking with no primary specification, port 0 is the default primary clock source and port 1 is the default secondary clock source.
		– When both ports are set to line and one port is set as the primary clock source, the other port is by default the backup or secondary source and is loop-timed.
		– If one port is set to **clock source line** and the other is set to **clock source internal**, the internal port recovers clock from the clock source line port if the clock source line port is up. If it is down, then the internal port generates its own clock.
		– If both ports are set to **clock source internal**, there is only one clock source—internal.
		– The optional keywords **primary** and **bits** have no effect on this feature.
		• NMSI Mode:
		– The **independent** keyword expands on the **clock source internal** and **clock source line** to specify that the port can operate on an independent clocking domain. Currently, on a 2-port VWIC-MFT, if both ports are configured as **clock source line**, the 2-port is really looped, which means that it's getting the clock from the first port. With NMSI mode, this dependency no longer exists, so the keyword **independent** means that both ports can be independently clocked.
		Note When NMSI mode is configured, the controller will support only one channel-group. If you try to configure more than one channel-group, the following error message will occur:
		`router(config-controller)#channel-group 2 timeslots 3`
		`%Channel-group already created.`
		`%Only 1 channel-group can be configured with independent clocking.`
		`%Insufficient resources to create channel group`
		When configuring between **clock source independent** and **no clock source independent**, the channel-group has to be removed.

	Command	Purpose
Step 5	Router(config-controller)#**channel-group** *channel-group-no* **unframed**	Enter this command to set up channel groups for unframed WAN data services with an MFT-G703 interface card. The *channel-group-no* parameter is a value from 0 to 1 for E1. Specify **unframed** for G.703 support.
Step 6	Router(config-controller)#**no shutdown**	Activates the controller.
Step 7	Router(config-controller)#**exit**	Exits controller configuration mode.
Step 8	Router(config)#**interface serial** *port:channel-group-no*	Enters interface configuration mode for a serial interface that you specify by port. The *channel-group-no* portion of the command is required only for channelized E1 interfaces.
Step 9	Router(config-if)#**ip address** *ip-address mask*	Assigns the IP address and subnet mask to the interface.
Step 10	Router(config-if)#**end**	Exits to the privileged EXEC mode.

E1 G.703 Configuration Example

Figure 3 shows a diagram for the sample E1 G.703 configuration.

Figure 3 Configuration Example: E1 G.703



The following is the configuration for Router A, a Cisco 1721 router.

```
card type e1
controller E1 0
  clock source internal
  channel-group 0 unframed
!
interface Serial 0:0
  ip address 209.165.200.252 255.255.255.224
```

The following is the configuration for Router B, a Cisco 3600 series router:

```
controller E1 1/0
  channel-group 0 unframed
!
interface Serial 1/0:0
  ip address 209.165.200.253 255.255.255.224
```

Verifying Controller Settings

The **show controller e1** command displays the status of E1 controllers and displays information about clock sources for the ports:

```
Router#show controller e1 0
E1 0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  alarm-trigger is not set
  Version info Firmware: 20011109, FPGA: 15
  Framing is UNFRAMED, Line Code is HDB3, Clock Source is Internal.
  Data in current interval (48 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
```

Verifying Serial Interface Configuration

To verify serial interface configuration, enter the **show interfaces serial** command, which shows the status of all serial interfaces or the status of a specific serial interface. You can use this command to check the encapsulation, IP addressing, and other parameters:

```
Router#show interfaces serial0:0
Serial0:0 is up, line protocol is up
  Hardware is DSX1
  Internet address is 209.165.200.252/27
  MTU 1500 bytes, BW 2048 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:01, output 00:00:03, output hang never
  Last clearing of "show interface" counters 00:00:25
  Input queue: 0/75/0/0 (size/max/drops/flushes); 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)
     Available Bandwidth 1536 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     1 packets input, 24 bytes, 0 no buffer
     Received 1 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     1 packets output, 24 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

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Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

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You can access the most current Cisco documentation at this URL:

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San Jose, CA 95134-9883

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http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

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- Report security vulnerabilities in Cisco products.
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http://www.cisco.com/go/psirt

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

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- Emergencies—security-alert@cisco.com
- Nonemergencies—psirt@cisco.com

Tip We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.*x* through 8.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&exact=on

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

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Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

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For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

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