Clear Channel T3/E3 with Integrated CSU/DSU

The Clear Channel T3/E3 NM-1 Network Module with Integrated CSU/DSU feature provides a software configurable T3/E3 product. This flexible network module allows you to switch between T3 and E3 applications with a single Cisco IOS command.

The T3/E3 NM-1 network module supports a single-port T3 or E3 with an integrated channel service unit (CSU) and a data service unit (DSU). It supports High-Level Data Link Control (HDLC), PPP, and Frame Relay. It includes the following features:

- Single port—universal T3/E3 version
- Clear and subrate support on both T3 and E3 modes
- Online insertion and removal (OIR) support on Cisco 3660 series and Cisco 3745 routers
- Onboard processing of Cisco Message Definition Language (MDL) and performance monitoring
- Support for scrambling and subrate can be independently or simultaneously enabled in each DSU mode
- Support for full T3 and E3 line rates

T3/E3 Applications and Positioning

The T3/E3 NM-1 network module provides high-speed performance for advanced, fully converged networks supporting a wide array of applications and services such as security and advanced QoS for voice and video. T3/E3 and subrate T3/E3 connectivity optimizes WAN bandwidth for deploying the new applications and service delivery. All the supported platforms, except the Cisco 2650XM or Cisco 2651XM routers, are capable of supporting line rate performance but impose varying levels of CPU overhead and therefore affect the overall platform performance. See Table 1 for recommended branch office positioning.

Table 1 T3/E3 NM-1 Branch Office Positioning and Support Comparison

Supported Platforms	Recommended Type of Service	Recommended Branch Office Sizes	Maximum T3/E3 Modes Supported
Cisco 2650/2651XM	Subrate T3/E3	**Small to medium offices**	1 [1]
Cisco 2691	Subrate T3/E3	**Small to medium offices**	1
Cisco 3660 series	Subrate and full-rate T3/E3	**Large and regional offices**	1

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Table 1 T3/E3 NM-1 Branch Office Positioning and Support Comparison (continued)

Supported Platforms	Recommended Type of Service	Recommended Branch Office Sizes	Maximum T3/E3 Modes Supported
Cisco 3725	Subrate and full-rate T3/E3	**Medium and large offices**	1
Cisco 3745	Subrate and full-rate T3/E3	**Medium, large, and regional offices**	2

1. For Cisco 2650XM and Cisco 2651XM platforms only, we recommend that you configure the NM-1 T3/E3 in subrate mode with a DSU setting of 15000 (15 mbps). All other platforms can operate with full DSU bandwidth.

Feature Specifications for the Clear Channel T3/E3 with Integrated CSU/DSU Feature

Feature History	
Release	**Modification**
12.2(11)YT	This feature was introduced.
12.2(15)T	This feature was integrated into Cisco IOS Release 12.2(15)T.
Supported Platforms	
Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745	

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for Clear Channel T3/E3 with Integrated CSU/DSU

- Implementation of this feature requires Cisco IOS Release 12.2(11)YT or a later release.
- See Table 2 for the minimum platform memory recommended.

Table 2 Minimum Memory Requirements

Supported Platforms	Flash Memory	DRAM Memory
Cisco 2650/2651XM	8 MB	**32 MB**
Cisco 2691	32 MB	**64 MB**
Cisco 3660 series	8 MB	**64 MB**
Cisco 3725	32 MB	**128 MB**
Cisco 3745	32 MB	**128 MB**

Information About Clear Channel T3/E3 with Integrated CSU/DSU

Configuration of the Clear Channel T3/E3 with Integrated CSU/DSU feature can be set up for a T3 interface and for an E3 interface:

- How to Configure the Clear Channel T3/E3 with Integrated CSU/DSU Feature for a T3 Interface, page 3
- How to Configure the Clear Channel T3/E3 with Integrated CSU/DSU Feature for an E3 Interface, page 11

How to Configure the Clear Channel T3/E3 with Integrated CSU/DSU Feature for a T3 Interface

This section describes the tasks used to configure the Clear Channel T3/E3 with Integrated CSU/DSU feature for a T3 interface:

- Configuring the Card Type and Controller for a T3 Interface (required)
- Configuring DSU Mode and Bandwidth for T3 (required)
- Configuring Scrambling for T3 (optional)
- Configuring the BERT for T3 (optional)
- Configuring Loopback for T3 (optional)
- Configuring the T3 Maintenance Data Link (optional)

Configuring the Card Type and Controller for a T3 Interface

When the Clear Channel T3/E3 network module is used for the first time, the running configuration does not show the T3/E3 controller and its associated serial interface. You can use the **show version** command to learn if the router recognized the T3/E3 card and was able to initialize the card properly. After the card type is configured for the slot, the respective controller and serial interface appear in the running configuration. See the "Use the show version Command" section on page 19.

After the network module has ascertained that the card has been initialized properly, use the **card type** command to configure the card. If the command is accepted successfully, Cisco IOS software creates a controller and a serial interface for the card.

Perform this task to select and configure a card type and controller as T3.

Note The autoconfig/setup utility does not support configuring the card type for the T3/E3 network module.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **card type t3** *slot*
4. **controller t3** *slot/port*
5. **framing** {**c-bit** | **m23**}
6. **cablelength** *feet*
7. **clock source** {**internal** | **line**}
8. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**card type t3** *slot* **Example:** `Router(config)# card type t3 1`	Selects the card type. • Creates a T3 controller and a serial interface. • **t3**—Selects the T3 controller. • *slot*—Slot number of the interface. • By default, the T3 controller does not show up in the **show running-config** output.
Step 4	**controller t3** *slot/port* **Example:** `Router(config)# controller t3 1`	Specifies the T3 controller and enters controller configuration mode. • *slot/port*—Backplane slot number and port number on the controller.

	Command or Action	Purpose
Step 5	**framing** {**c-bit** | **m23**} **Example:** `Router(config-controller)# framing c-bit`	Specifies the framing type. • **c-bit—**Specifies C-bit framing as the T3 framing type. • **m23—**Specifies M23 framing as the T3 framing type.
Step 6	**cablelength** *feet* **Example:** `Router(config-controller)# cablelength 250`	Specifies the distance from the routers to the network equipment. • *feet*—Number of feet in the range from 0 to 450. • The default value is 224 feet.
Step 7	**clock source {internal** | **line**} **Example:** `Router(config-controller)# clock source line`	Selects the clock source. • **internal**—Specifies that the internal clock source is used. This is the default for T3. • **line—**Specifies that the network clock source is used. This is the default for E3.
Step 8	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Configuring DSU Mode and Bandwidth for T3

Perform this task to specify the interoperability mode and maximum allowable bandwidth used by a T3 controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface serial** *slot*/*port*
4. **dsu mode** {**0** | **1** | **2** | **3** | **4**}
5. **dsu bandwidth** *kbps*
6. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface serial** *slot/port* **Example:** `Router(config)# interface serial 1/1`	Specifies the serial interface created on the controller.
Step 4	**dsu mode** {**0** | **1** | **2** | **3** | **4**} **Example:** `Router(config-if)# dsu mode 0`	Specifies the interoperability mode used by a T3 controller. • **0—**Connects a T3 controller to another T3 controller or to a Digital Link DSU (DL3100). Bandwidth range is from 300 to 44210 kbps. This is the default. • **1—**Connects a T3 controller to a Kentrox DSU. Bandwidth range is from 1500 to 35000/44210 kbps. **Note** If the bandwidth is set to greater than 35000 kbps, it defaults to 44210 kbps. • **2—**Connects a T3 controller to a Larscom DSU. Bandwidth range is from 3100 to 44210 kbps. • **3—**Connects a T3 controller to an Adtran T3SU 300. Bandwidth range is from 75 to 44210 kbps. • **4—**Connects a T3 controller to a Verilink HDM 2182. Bandwidth range is from 1500 to 44210 kbps.
Step 5	**dsu bandwidth** *kbps* **Example:** `Router(config-if)# dsu bandwidth 44210`	Specifies the maximum allowable bandwidth in the range from 1 to 44210 kbps. • The real (actual) vendor-supported bandwidth is in the range from 75 to 44210 kbps. **Note** For the Cisco 2650XM and Cisco 2651XM platforms only, we recommend that you set the DSU bandwidth to 15000 in any subrate mode.
Step 6	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode and returns to privileged EXEC mode.

Configuring Scrambling for T3

Perform this task to enable encryption of the payload on the T3 controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface serial** *slot/port*
4. **scramble**
5. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface serial** *slot/port* **Example:** `Router(config)# interface serial 1/1`	Enters interface configuration mode.
Step 4	**scramble** **Example:** `Router(config-if)# scramble`	Enables the scrambling of the payload. • Default is off.
Step 5	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode and returns to privileged EXEC mode.

Configuring the BERT for T3

Perform this task to configure a bit error rate (BER) test pattern on a T3 controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **controller t3** *slot/port*
4. **bert pattern** {**2^23** | **2^20** | **2^15** | **1s** | **0s** | **alt-0-1**} **interval** *time*
5. **no bert**
6. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**controller t3** *slot/port* **Example:** `Router(config)# controller t3 1/1`	Selects the T3 controller and enters controller configuration mode. • *slot/port*—Backplane slot number and port number on the controller.
Step 4	**bert pattern** {**2^23** | **2^20** | **2^15** | **1s** | **0s** | **alt-0-1**} **interval** *time* **Example:** `Router(config-controller)# bert pattern 2^20 interval 10000`	Configures a bit error rate test pattern. • Acceptable values are: – **2^23**—Pseudorandom 0.151 test pattern that is 8,388,607 bits in length. – **2^20**—Pseudorandom 0.153 test pattern that is 1,048,575 bits in length. – **2^15**—Pseudorandom 0.151 test pattern that is 32,768 bits in length. – **1s**—Repeating pattern of ones (...111...). – **0s**—Repeating pattern of zeros (...000...). – **alt-0-1**—Repeating pattern of alternating zeros and ones (...01010...). • **interval** *time*—Specifies the duration of the BER test. The interval can be a value from 1 to 14,400 minutes.
Step 5	**no bert** **Example:** `Router(config-controller)# no bert`	Disables the BERT test pattern.
Step 6	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Configuring Loopback for T3

Perform this task to loop an entire T3 line toward the line and back toward the router.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller t3** *slot*/*port*
4. **loopback** {**local** | **network** {**line** | **payload**} | **remote**}
5. **no loopback**
6. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**controller t3** *slot*/*port* **Example:** `Router(config)# controller t3 1/1`	Selects the T3 controller and enters controller configuration mode. • *slot*/*port*—Backplane slot number and port number on the controller.
Step 4	**loopback {local | network {line | payload} | remote}** **Example:** `Router(config-controller)# loopback local`	Loops the T3 line toward the line and back toward the router, • **local—**Loops the data back toward the router and sends an AIS signal out toward the network. On a dual port card, it is possible to run channelized on one port and primary rate on the other port. • **network {line | payload}—**Sets the loopback toward the network before going through the framer (**line**) or after going through the framer (**payload**). • **remote—**Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. FEAC requests (and therefore remote loopbacks) are possible only when the T3 is configured for C-bit framing. M23 format does not support remote loopbacks.

	Command	Purpose
Step 5	**no loopback** **Example:** `Router(config-controller)# no loopback`	Removes the loop.
Step 6	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Configuring the T3 Maintenance Data Link

Perform this task to configure the MDL message.

Note This configuration information is applicable only to C-bit parity T3.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller t3** *slot*/*port*
4. **mdl** {**transmit** {**path** | **idle-signal** | **test-signal**} | **string** {**eic** | **lic** | **fic** | **unit** | **pfi** | **port** | **generator**} *string*}
5. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**controller t3** *slot*/*port* **Example:** `Router(config)# controller t3 1/1`	Selects the T3 controller and enters controller configuration mode. • *slot*/*port*—Backplane slot number and port number on the controller.

	Command	Purpose
Step 4	**mdl** {**transmit** {**path** | **idle-signal** | **test-signal**} | **string** {**eic** | **lic** | **fic** | **unit** | **pfi** | **port** | **generator**} *string*} **Example:** `Router(config-controller)# mdl transmit path`	Configures the MDL message. • **transmit path—**Enables transmission of the MDL Path message. • **transmit idle-signal—**Enables transmission of the MDL idle signal message. • **transmit test-signal—**Enables transmission of the MDL test signal message. • **string eic** *string***—**Specifies the equipment identification code (EIC); can be up to 10 characters. • **string lic** *string*—Specifies the location identification code (LIC); can be up to 11 characters. • **string fic** *string*—Specifies the frame identification code (FIC); can be up to 10 characters. • **string unit** *string*—Specifies the unit identification code (UIC); can be up to 6 characters. • **string pfi** *string*—Specifies the facility identification code (PFI) sent in the MDL path message; can be up to 38 characters. • **string port** *string*—Specifies the port number string sent in the MDL idle signal message; can be up to 38 characters. • **string generator** *string*—Specifies the generator number string sent in the MDL test signal message; can be up to 38 characters.
Step 5	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

How to Configure the Clear Channel T3/E3 with Integrated CSU/DSU Feature for an E3 Interface

The section describes the commands used to configure the Clear Channel T3/E3 with Integrated CSU/DSU feature for an E3 interface:

- Configuring the Card Type and Controller for an E3 Interface (required)
- Configuring Scrambling for E3 (required)
- Configuring the BERT for E3 (optional)
- Configuring Loopback for E3 (optional)
- Configuring National Bit for E3 (optional)

Configuring the Card Type and Controller for an E3 Interface

Perform this task to configure the card type and controller for a E3 interface.

Note The autoconfig/setup utility does not support configuring the card type for the T3/E3 network module.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **card type e3** *slot*
4. **controller e3** *slot/port*
5. **framing** {**bypass** | **g751**}
6. **clock source** {**internal** | **line**}
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**card type e3** *slot* **Example:** `Router(config)# card type e3 1`	Selects the card type. • Creates an E3 controller and a serial interface. • **e3**—Specifies the E3 transmission scheme predominantly used in Europe. • Provides 34010 kbps. • *slot*—Slot number of the interface. • By default, the E3 controller does not show up in the **show running config** output.
Step 4	**controller e3** *slot/port* **Example:** `Router(config)# controller e3 1`	Specifies the E3 controller and enters controller configuration mode. • *slot/port*—Backplane slot number and port number on the controller.

	Command or Action	Purpose
Step 5	**framing** {**bypass** | **g751**} **Example:** `Router(config-controller)# framing bypass`	Specifies the framing type. • **bypass—**Specifies that the G.751 framing be bypassed. • **g751—**Specifies G.751 as the E3 framing type. • Default is **g751**.
Step 6	**clock source {internal** | **line}** **Example:** `Router(config-controller)# clock source line`	Selects the clock source. • **internal**—Specifies that the internal clock source is used. This is the default for T3. • **line—**Specifies that the network clock source is used. This is the default for E3.
Step 7	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Configuring DSU Mode and Bandwidth for E3

Perform this task to specify the interoperability mode used by an E3 controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface serial** *slot*/*port*
4. **dsu mode** {**0** | **1**}
5. **dsu bandwidth** *kbps*
6. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command	Purpose
Step 3	**interface serial** *slot/port* **Example:** `Router(config)# interface serial 1/1`	Enters interface configuration mode and specifies the serial interface created on the controller.
Step 4	**dsu mode** {**0** | **1**} **Example:** `Router(config-if)# dsu mode 0`	Specifies the interoperability mode used by an E3 controller. • **0—**Sets the interoperability mode to 0. This is the default. Specify mode 0 to connect an E3 controller to another E3 controller or to a Digital Link DSU (DL3100). Bandwidth range is from 358 to 24500/34010 kbps. **Note** If the bandwidth is set to greater than 24500 kbps, it defaults to 34010 kbps. • **1—**Sets the interoperability mode to 1. Specify mode 1 to connect an E3 controller to a Kentrox DSU. Bandwidth range is from 500 to 34010 kbps.
Step 5	**dsu bandwidth** *kbps* **Example:** `Router(config-if)# dsu bandwidth 44210`	Specifies the maximum allowable bandwidth in the range from 22 to 34010 kbps. • The real (actual) vendor-supported bandwidth is in the range from 358 to 34010 kbps. **Note** For the Cisco 2650XM and Cisco 2651XM platforms only, we recommend that you set the DSU bandwidth to 15000 in any subrate mode.
Step 6	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode and returns to privileged EXEC mode.

Configuring Scrambling for E3

Perform this task to enable encryption of the payload on the E3 controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface serial** *slot/port*
4. **scramble**
5. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface serial** *slot/port* **Example:** `Router(config)# interface serial 1/1`	Enters interface configuration mode.
Step 4	**scramble** **Example:** `Router(config-if)# scramble`	Enables the scrambling of the payload. • Default is off.
Step 5	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode and returns to privileged EXEC mode.

Configuring the BERT for E3

Perform this task to configure a BER test pattern on an E3 controller.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller t3** *slot*/*port*
4. **bert pattern** {**2^23** | **2^20** | **2^15** | **1s** | **0s** | **alt-0-1**}
5. **no bert**
6. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**controller e3** *slot*/*port* **Example:** `Router(config)# controller e3 1/0`	Selects the E3 controller and enters controller configuration mode. • *slot*/*port*—Backplane slot number and port number on the controller.
Step 4	**bert pattern** {**2^23** | **2^20** | **2^15** | **1s** | **0s** | **alt-0-1**} **Example:** `Router(config-controller)# bert pattern 2^20`	Configures a bit error rate test pattern. • Acceptable values are: – **2^23**—Pseudorandom 0.151 test pattern that is 8,388,607 bits in length. – **2^20**—Pseudorandom 0.153 test pattern that is 1,048,575 bits in length. – **2^15**—Pseudorandom 0.151 test pattern that is 32,768 bits in length. – **1s**—Repeating pattern of ones (...111...). – **0s**—Repeating pattern of zeros (...000...). – **alt-0-1**—Repeating pattern of alternating zeros and ones (...01010...).
Step 5	**no bert** **Example:** `Router(config-controller)# no bert`	Disables the BERT test pattern.
Step 6	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Configuring Loopback for E3

Perform this task to loop an entire E3 line toward the line and back toward the router.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller e3** *slot*/*port*
4. **loopback** {**local** | **network** {**line** | **payload**}}
5. **no loopback**
6. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**controller e3** *slot*/*port* **Example:** `Router(config)# controller e3 1/1`	Selects the E3 controller and enters controller configuration mode. • *slot*/*port*—Backplane slot number and port number on the controller.
Step 4	**loopback {local | network {line | payload}}** **Example:** `Router(config-controller)# loopback local`	Loops the E3 line toward the line and back toward the router, • **local—**Loops the data back toward the router and sends an AIS signal out toward the network. • **network {line | payload}—**Sets the loopback toward the network before going through the framer (**line**) or after going through the framer (**payload**).
Step 5	**no loopback** **Example:** `Router(config-controller)# no loopback`	Removes the loop.
Step 6	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Configuring National Bit for E3

Perform this task to set the E3 national bit in the G.751 frame used by the E3 controller. This configuration is used to set the bit when the E3 line crosses national boundaries.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller e3** *slot/port*
4. **national bit {1 | 0}**
5. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**controller e3** *slot/port* **Example:** `Router(config)# controller e3 1/1`	Selects the E3 controller and enters controller configuration mode. • *slot/port*—Backplane slot number and port number on the controller.
Step 4	**national bit {1 | 0}** **Example:** `Router(config-controller)# national bit 1`	Sets the E3 national bit in the G.751 frame used by the E3 controller. • **1 | 0—**Specifies the E3 national bit in the G.751 frame. • The default is 1.
Step 5	**exit** **Example:** `Router(config-controller)# exit`	Exits controller configuration mode and returns to privileged EXEC mode.

Verifying the T3 or E3 Configuration

Perform this task to verify that the T3 or E3 controller is configured correctly. Enter the **show running-config**, **show controllers**, or **show interfaces serial** privileged EXEC command to display the command settings for the router.

Troubleshooting Tips

You can use the methods described in this section to troubleshoot the T3/E3 network module using Cisco IOS software.

Set Loopbacks

The T3/E3 local loopback can be used to ensure that the router and the T3/E3 network module are working properly. The controller clock source should be configured to "internal."

Use T3/E3 network loopback and remote loopback to diagnose problems with cables between the T3/E3 controller and the central switching office at the link level. For this diagnostic setup to work, if the network module is looped toward the network, the network module must be configured with the clock source as "line."

Run Bit Error Rate Test

The network module contains onboard BERT circuitry. With this circuitry present, the software can send and detect a programmable pattern that is compliant with CCITT/ITU pseudorandom and repetitive test patterns. BERT allows you to test cables and signal problems in the field.

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

- Use a loopback somewhere in the link or network.
- Configure remote testing equipment to send the same BERT pattern at the same time.

Please refer to the **bert pattern (t3/e3)** command in the "Command Reference" section for instructions on how to run BERT and check the results.

Use the show version Command

Use the **show version** command to learn if the router recognized the T3/E3 card and was able to initialize the card properly. The **show version** command lists the hardware interfaces and controllers present in the router. You should find "1 Subrate T3/E3 port(s)" as shown in the following example.

```
Router# show version
.
.
.
Router uptime is 2 hours, 6 minutes
System returned to ROM by power-on
System image file is "flash:c3725-i-mz"

cisco 3725 (R7000) processor (revision 0.4) with 111616K/19456K bytes of memory.
Processor board ID 12345678901
R7000 CPU at 240Mhz, Implementation 39, Rev 3.3, 256KB L2 Cache
Bridging software.
X.25 software, Version 3.0.0
Primary Rate ISDN software, Version 1.1
2 FastEthernet/IEEE 802.3 interface(s)
1 Serial network interface(s)
2 Channelized T1/PRI port(s)
1 Subrate T3/E3 port(s)
DRAM configuration is 64 bits wide with parity disabled.
55K bytes of non-volatile configuration memory.
15680K bytes of ATA System CompactFlas (Read/Write)

Configuration register is 0x0
```

Configuration Example for the Clear Channel T3/E3 with Integrated CSU/DSU Feature

The following is sample output from the **show running-config** command for an E3 controller:

```
Router# show running-config

Building configuration...
%AIM slot 0 doesn't exist

Current configuration :1509 bytes
!
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router1
!
card type e3 1
no logging console
!
ip subnet-zero
no ip routing
!
!
!
!
!
voice call carrier capacity active
!
!
!
!
!
!
!
!
!
mta receive maximum-recipients 0
!
!
controller E3 1/0
 clock source internal
!
!
!
!
interface Loopback0
 no ip address
 no ip route-cache
 shutdown
 no keepalive
!
interface FastEthernet0/0
 ip address 10.0.145.34 255.255.255.0
 no ip route-cache
 no ip mroute-cache
 duplex auto
 speed auto
 no cdp enable
!
```

```
interface Serial0/0
 no ip address
 encapsulation ppp
 no ip route-cache
 no ip mroute-cache
 shutdown
 clockrate 2000000
 no fair-queue
!
interface FastEthernet0/1
 no ip address
 no ip route-cache
 no ip mroute-cache
 shutdown
 duplex auto
 speed auto
 no keepalive
 no cdp enable
!
interface Serial0/1
 no ip address
 encapsulation ppp
 no ip route-cache
 no ip mroute-cache
 shutdown
 clockrate 2000000
!
interface Serial0/2:0
 ip address 172.27.27.2 255.255.255.0
 no ip route-cache
 no keepalive
!
interface Serial1/0
 no ip address
 no ip route-cache
 no keepalive
 dsu bandwidth 34010
!
ip classless
no ip http server
!
ip pim bidir-enable
!
!
!
!
!
call rsvp-sync
!
!
mgcp profile default
!
!
!
dial-peer cor custom
!
!
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 login
```

```
!
end
```

Additional References

The following sections provide additional references related to the Clear Channel T3/E3 with Integrated CSU/DSU feature:

Related Documents

Related Topic	Document Title
Basic information about configurations	*Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2*
Detailed information about configuring interfaces	*Cisco IOS Interface Configuration Guide, Release 12.2*
Detailed information about Cisco IOS commands	*Cisco IOS Interface Command Reference*, Release 12.2 T
Detailed information about configuring voice, video, and fax applications	*Cisco IOS Voice, Video, and Fax Configuration Guide, Release 12.2*
Detailed information about Cisco IOS commands	*Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2 T*
Information on connecting network modules	*Connecting T3/E3 Network Modules, Release 12.2*

Standards

Standards	Title
None	

MIBs

MIBs	MIBs Link
• RFC 1407 MIB • CISCO-ICSUDSU-MIB	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

RFCs	Title
RFC 1407	*Definitions of Managed Objects for the DS3/E3 Interface Type*

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

The following modified commands are pertinent to this feature. To see the command pages for these commands and other commands used with this feature, go to the *Cisco IOS Master Commands List*, Release 12.4, at http://www.cisco.com/univercd/cc/td/doc/product/software/ios124/124mindx/124index.htm.

- **bert pattern (t3/e3)**
- **cablelength (t3)**
- **card type (t3/e3)**
- **clock source (t3/e3)**
- **controller e3**
- **dsu bandwidth (e3)**
- **dsu bandwidth (t3)**
- **dsu mode (e3)**
- **dsu mode (t3)**
- **framing (e3)**
- **framing (t3)**
- **loopback (e3)**
- **loopback (t3)**
- **mdl (t3)**
- **national bit (e3)**
- **scramble (t3/e3)**
- **show controllers (t3/e3)**

Glossary

backplane—The physical connection between an interface processor or card and the data buses and the power distribution buses inside a chassis.

BER—bit error rate. Ratio of received bits that contain errors.

CSU—channel service unit. Digital interface device that connects end-user equipment to the local digital telephone loop. Often referred to together with DSU as CSU/DSU.

DS-3—digital signal level 3. Framing specification used for sending digital signals at 44.736 Mbps on a T3 facility.

DSU—data service unit. Device used in digital transmission that adapts the physical interface on a DTE device to a transmission facility, such as T1 or E1. The DSU also is responsible for such functions as signal timing. Often referred to together with CSU as CSU/DSU.

E3—Wide-area digital transmission scheme used predominantly in Europe that carries data at a rate of 34.368 Mbps. E3 lines can be leased for private use from common carriers.

FEAC—far-end alarm code.

Frame Relay— industry-standard, switched data link layer protocol that handles multiple virtual circuits using HDLC encapsulation between connected devices. Frame Relay is more efficient than X.25, the protocol for which it generally is considered a replacement.

HDLC—High-Level Data Link Control. Bit-oriented synchronous data link layer protocol developed by ISO. Derived from SDLC, HDLC specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

MDL—Maintenance Data Link (MDL) message defined in the ANSI T1.107a-1990 specification. Also, the Cisco Message Definition Language—a high-level language used to specify protocols and protocol conversion operations on the VSC.

OIR—online insertion and removal. Feature that permits the addition, the replacement, or the removal of cards without interrupting the system power, entering console commands, or causing other software or interfaces to shut down.

PPP—Point-to-Point Protocol. Successor to SLIP that provides router-to-router and host-to-network connections over synchronous and asynchronous circuits. Whereas SLIP was designed to work with IP, PPP was designed to work with several network layer protocols, such as IP, IPX, and ARA. PPP also has built-in security mechanisms, such as CHAP and PAP. PPP relies on two protocols: LCP and NCP.

Subrate—Less than the standard rate of transmission, which is defined at the voice-grade rate of 64 kbps.

T3—Digital WAN carrier facility. T3 sends DS3-formatted data at 44.736 Mbps through the telephone switching network.

TDM—time-division multiplexing. Technique in which information from multiple channels can be allocated bandwidth on a single wire based on preassigned time slots. Bandwidth is allocated to each channel regardless of whether the station has data to send.