



# Connecting Cisco ISDN PRI Network Modules to the Network

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**Revised: May 1, 2008, OL-12811-01**

This guide describes how to connect Cisco Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) network modules to your network. It contains the following sections:

- [Channelized T1/E1 PRI Network Modules with G.703, page 2](#)
- [Channelized T1/ISDN PRI Network Modules, page 5](#)
- [Channelized T1/ISDN PRI with CSU Network Modules, page 6](#)
- [Channelized E1/ISDN PRI Balanced \(120-Ohm\) Network Modules, page 8](#)
- [Channelized E1/ISDN PRI Unbalanced \(75-Ohm\) Network Modules, page 10](#)
- [PRI Module LEDs, page 11](#)
- [Online Insertion and Removal with a Cisco PRI Network Module \(Cisco 3660 and Cisco 3745 Only\), page 15](#)
- [Upgrading ISDN PRI Network Modules, page 15](#)
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- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page 16](#)



**Note**

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Unless specifically identified, references to PRI modules in this chapter include all these network modules.

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**Note**

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Do not install an ISDN BRI network module in the same chassis as an ISDN PRI network module, unless you are using Cisco IOS Release 11.3(3)T or later. Earlier Cisco IOS releases do not support this configuration.

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**Note**

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For network module cabling specification, see [Cabling for Cisco Network Modules](#).

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CT1/PRI modules are available with or without a built-in channel service unit (CSU), and with one or two ports. CT1/PRI modules connect to an external CSU; CT1/PRI-CSU modules connect directly to the network. Each T1 module provides up to 24 virtual channels per T1 port. Each channel can be configured individually as a serial interface.

CT1/PRI and CT1/PRI-CSU modules receive and transmit data bidirectionally, at the T1 rate of 1.544 Mbps.

## Channelized T1/E1 PRI Network Modules with G.703

This section provides information about the following network modules:

- 1-port T1/E1 channelized PRI network module with G.703 (NM-1CE1T1-PRI) (see [Figure 1](#))
- 2-port T1/E1 channelized PRI network module with G.703 (NM-2CE1T1-PRI) (see [Figure 2](#))

Cisco T1/E1 channelized PRI network modules with G.703 provide connection of one or two primary rate ISDN lines. T1 or E1 interfaces are configurable through Cisco IOS command-line interface (CLI) commands. Each port supports 100/120-ohm balanced and 75-ohm unbalanced termination, and features RJ-48C connectors and cable accessories allowing for DB-15, BNC, and other connector types. An onboard advanced integration module (AIM) connector allows for future universal port AIM support.



### Caution

To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the 1-port T1/E1 channelized PRI network modules with G.703 (NM-1CE1T1-PRI) and 2-port T1/E1 channelized PRI network modules with G.703 (NM-2CE1T1-PRI) only to intrabuilding or nonexposed wiring or cabling. The intrabuilding cable must be shielded and the shield must be grounded at both ends.

Cisco T1/E1 channelized PRI network modules with G.703 (NM-1CE1T1-PRI and NM-2CE1T1-PRI) replace the following network modules (also described in this chapter):

- NM-1CE1B
- NM-1CE1U
- NM-1CT1
- NM-1CT1-CSU
- NM-2CE1B
- NM-2CE1U
- NM-2CT1
- NM-2CT1-CSU

For information on Cisco modular access routers supporting Cisco channelized T1/E1 PRI network modules with G.703, see [Table 1](#).

**Table 1** *Modular Access Routers Supporting Cisco Channelized T1/E1 PRI Network Modules with G.703*

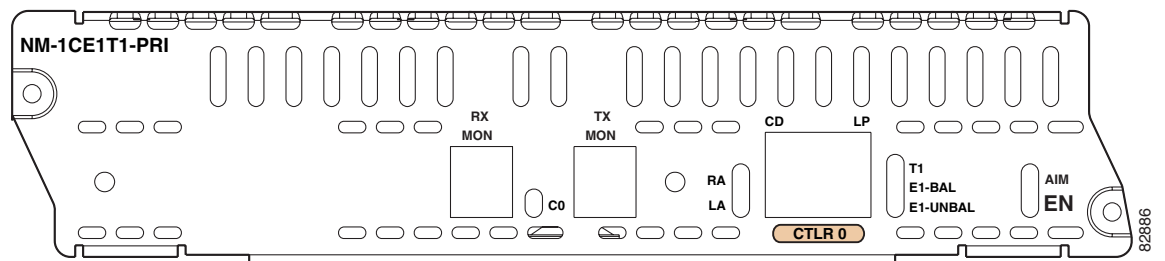
Modular Access Router	NM-1CE1T1-PRI	NM-2CE1T1-PRI
Cisco 26xx	No	No
Cisco 26xxXM	Yes	Yes
Cisco 2691	Yes	Yes

**Table 1** *Modular Access Routers Supporting Cisco Channelized T1/E1 PRI Network Modules with G.703*

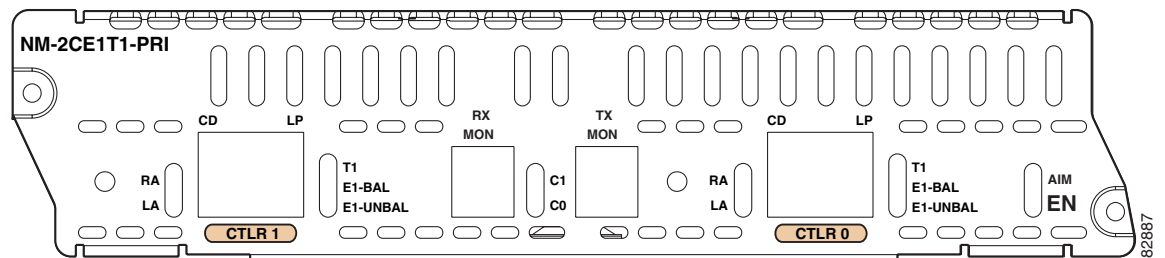
Modular Access Router	NM-1CE1T1-PRI	NM-2CE1T1-PRI
Cisco 3620	No	No
Cisco 3631	Yes	Yes
Cisco 3640	No	No
Cisco 3660	Yes	Yes
Cisco 37xx	Yes	Yes

Figure 1 and Figure 2 show the faceplates for the 1-port and 2-port channelized T1/E1 PRI network modules with G.703.

**Figure 1** *1-Port Channelized T1/E1 PRI Network Module with G.703*



**Figure 2** *2-Port Channelized T1/E1 PRI Network Module with G.703*



## Enabling Wetting Current on Channelized T1/E1 PRI Network Modules with G.703

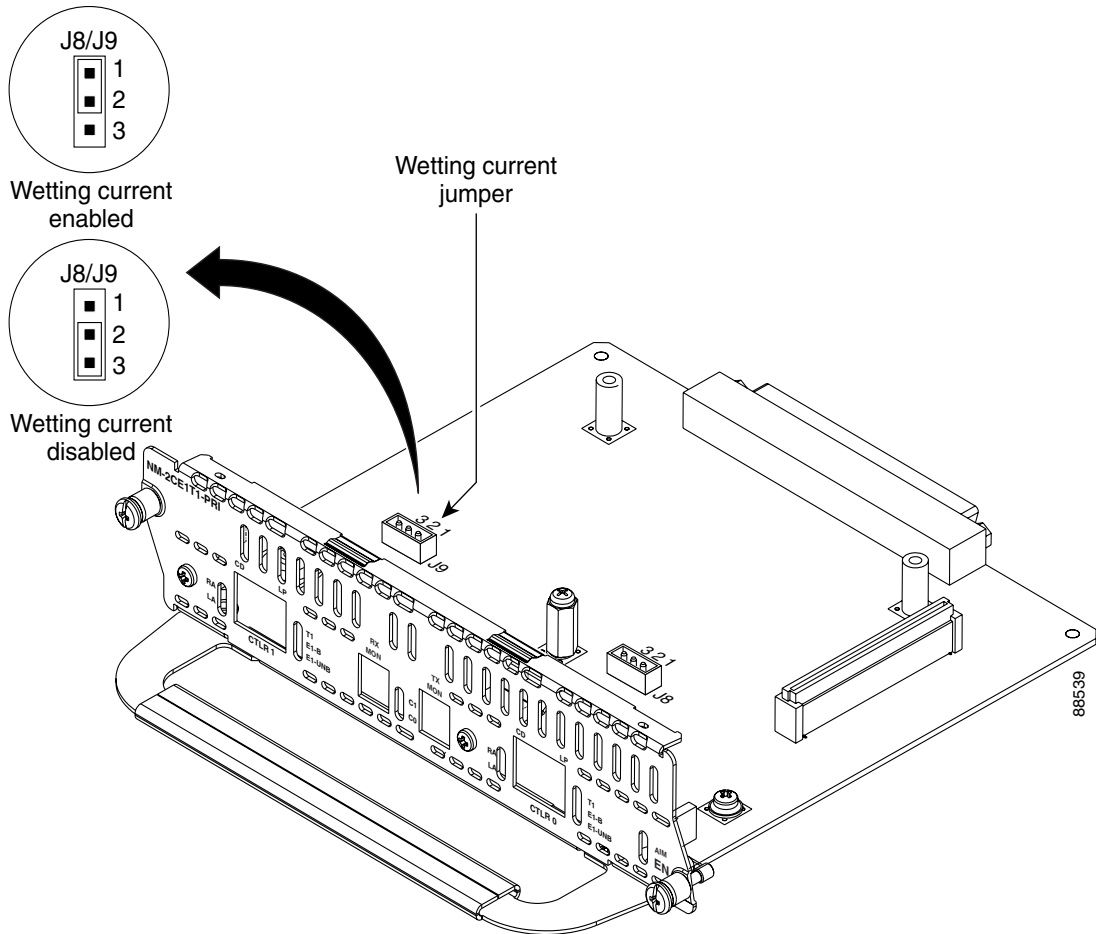
Wetting current is a small amount of electrical current (60 to 140 milliamps) sent from the central office to the card to prevent the corrosion of electrical contacts in the module network connection.

The wetting current feature can be enabled or disabled by the end user. It is controlled by the location of a jumper on the J8 (CTLR 0) and J9 (CTLR 1) connectors on the network module. (See Figure 3.)

To enable the wetting current feature, connect pins 1 and 2 on the J8 and J9 connectors with the jumper. To disable the wetting current feature, either remove the jumper completely, or use the jumper to connect pins 2 and 3 on the J8 and J9 connectors.

The card is shipped with the jumper connecting pins 2 and 3 on the J8 and J9 connectors, disabling the wetting current feature.

**Figure 3** Wetting Current Jumper Locations on Channelized T1/E1 PRI Network Modules with G.703



## Connecting Channelized T1/E1 PRI Network Modules with G.703 to a Network



### Warning

For connections outside the building where the equipment is installed, the following ports must be connected through an approved network termination unit with integral circuit protection: T1 Statement 1044

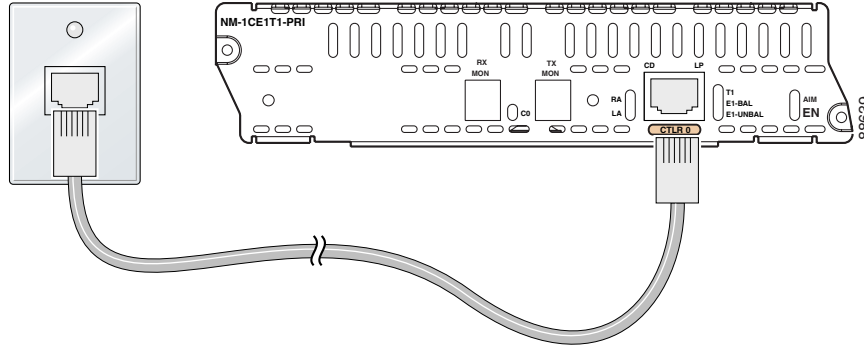
Figure 4 shows a connection between a channelized T1/E1 PRI network module with G.703 and a networking device.



**Caution**

To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the 1-port T1/E1 channelized PRI network modules with G.703 (NM-1CE1T1-PRI) and 2-port T1/E1 channelized PRI network modules with G.703 (NM-2CE1T1-PRI) only to intrabuilding or nonexposed wiring or cabling. The intrabuilding cable must be shielded and the shield must be grounded at both ends.

**Figure 4** Connecting a Channelized T1/E1 PRI Network Module with G.703 to a Networking Device

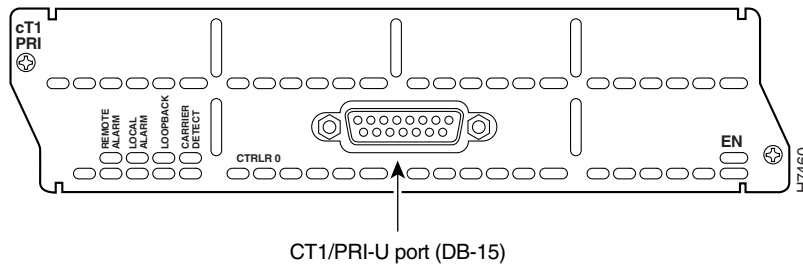


## Channelized T1/ISDN PRI Network Modules

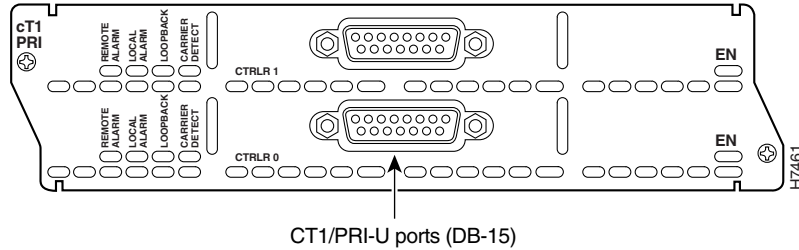
This section provides information about the following network modules for Cisco modular routers:

- 1-port channelized T1/ISDN PRI network module (NM-1CT1 or CPANM-1CT1) (see [Figure 5](#)). This module is also referred to as the *1-port CT1/PRI network module*.
- 2-port channelized T1/ISDN PRI network module (NM-2CT1 or CPANM-2CT1) (see [Figure 6](#)). This module is also referred to as the *2-port CT1/PRI network module*.

**Figure 5** 1-Port Channelized T1/ISDN PRI Network Module



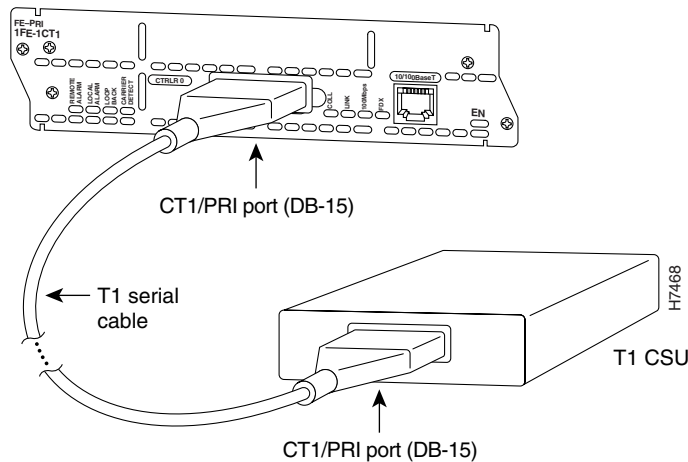
**Figure 6** 2-Port Channelized T1/ISDN PRI Network Module



## Connecting CT1/PRI Modules to the Network

To connect a CT1/PRI module to the network, use a DB-15-to-DB-15 T1 serial cable to connect the CT1/PRI port to a T1 channel service unit (CSU). (See [Figure 7](#).) These ports are color-coded tan.

**Figure 7** Connecting a CT1/PRI Module to a T1 CSU

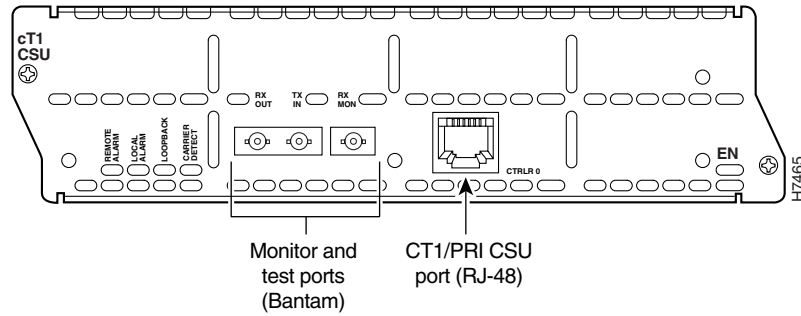


## Channelized T1/ISDN PRI with CSU Network Modules

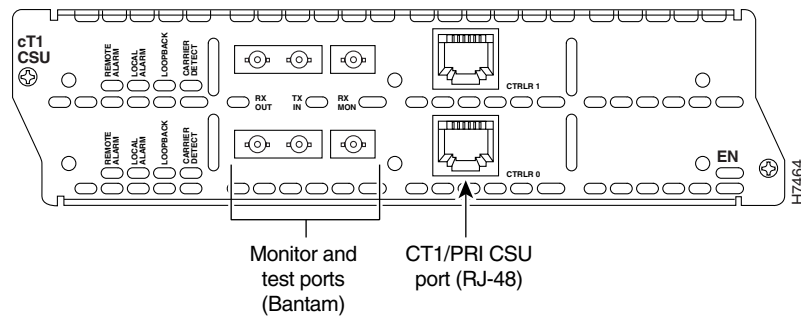
This section provides information about the following network modules for Cisco modular routers:

- 1-port channelized T1/ISDN PRI with CSU network module (NM-1CT1-CSU or CPANM-1CT1-CSU) (see [Figure 8](#)). This module is also referred to as the *1-port CT1/PRI CSU network module*.
- 2-port channelized T1/ISDN PRI with CSU network module (NM-2CT1-CSU or CPANM-2CT1-CSU) (see [Figure 9](#)). This module is also referred to as the *2-port CT1/PRI CSU network module*.

**Figure 8** 1-Port Channelized T1/ISDN PRI with CSU Network Module



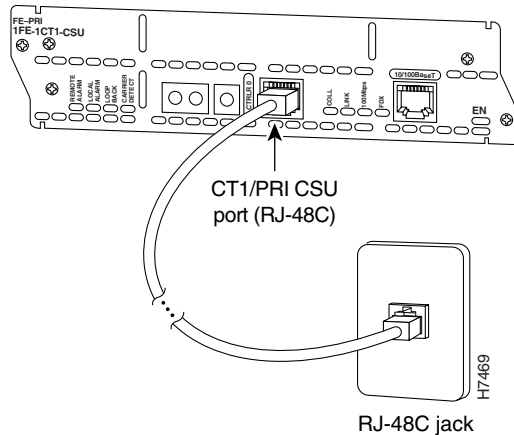
**Figure 9** 2-Port Channelized T1/ISDN PRI with CSU Network Module



## Connecting CT1/PRI CSU Modules to the Network

To connect a CT1/PRI CSU module to the network, use a straight-through RJ-48C-to-RJ-48C cable to connect the RJ-48C port to an RJ-48C jack (see [Figure 10](#)). These ports are color-coded tan.

**Figure 10** Connecting a CT1/PRI CSU Module to an RJ-48C Jack

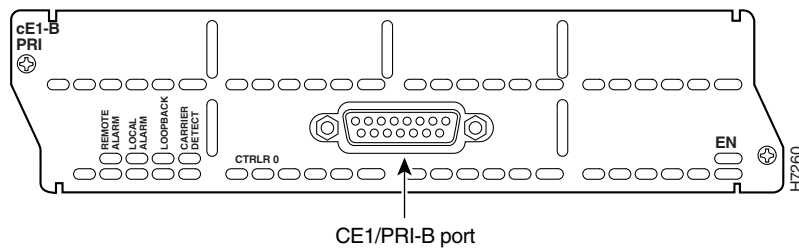


# Channelized E1/ISDN PRI Balanced (120-Ohm) Network Modules

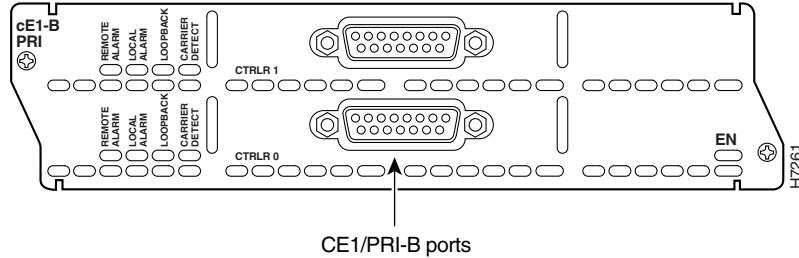
This section provides information about the following network modules for Cisco modular routers:

- 1-port channelized E1/ISDN PRI balanced (120-ohm) network module (NM-1CE1B or CPANM-1CE1B) (see [Figure 11](#)). This module is also referred to as the *1-port CE1/PRI-B network module*.
- 2-port channelized E1/ISDN PRI balanced (120-ohm) network module (NM-2CE1B or CPANM-2CE1B) (see [Figure 12](#)). This module is also referred to as the *2-port CE1/PRI-B network module*.

**Figure 11** 1-Port Channelized E1/ISDN PRI Network Module (Balanced)



**Figure 12** 2-Port Channelized E1/ISDN PRI Network Module (Balanced)



CE1/PRI modules are available with one or two E1 ports and with balanced or unbalanced interfaces. These modules receive and transmit data bidirectionally at the E1 rate of 2.048 Mbps, and provide up to 30 virtual channels per E1 port. Each channel can be configured individually as a serial interface.

## CE1/PRI Module Jumper Settings

Jumpers on CE1/PRI modules can be used to connect or disconnect receive shield to ground. (See [Table 2](#).) The default setting for balanced, 120-ohm CE1/PRI-B modules disconnects receive shield to ground. The default setting for unbalanced, 75-ohm CE1/PRI-U modules connects receive shield to ground. If you are experiencing ground loop problems with E1 cabling, you may want to try changing the jumper settings for the module.



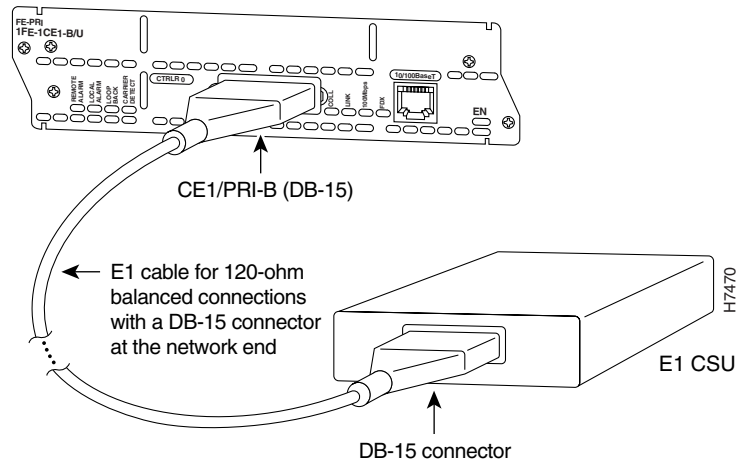
**Table 2** CE1/PRI Module Jumpers

CE1/PRI Module Type	Default Setting	Function
Balanced, 120-ohm	2 and 3	Disconnects receive shield from ground
Unbalanced, 75-ohm	1 and 2	Connects receive shield to ground

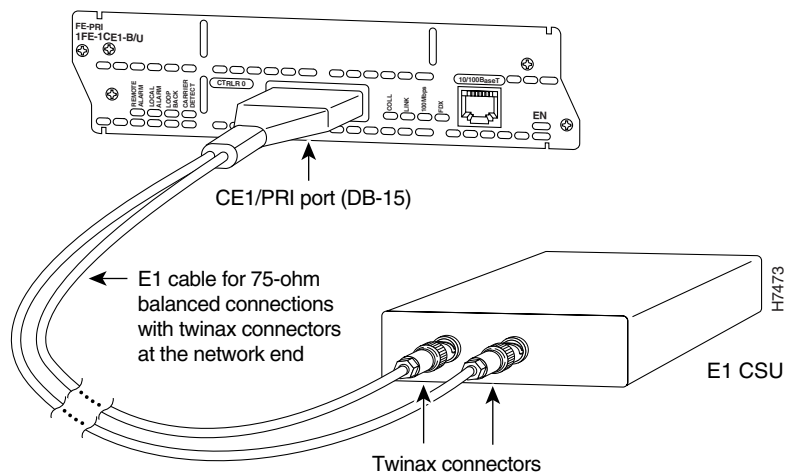
## Connecting CE1/PRI-B Modules to the Network

To connect a CE1/PRI-B (120-ohm) module to the network, use the appropriate cable to connect the CE1/PRI-B port to an E1 CSU. (See [Figure 13](#), [Figure 14](#), and [Figure 15](#), showing DB-15, twinax, and RJ-45 CSUs, respectively.) These ports are color-coded tan.

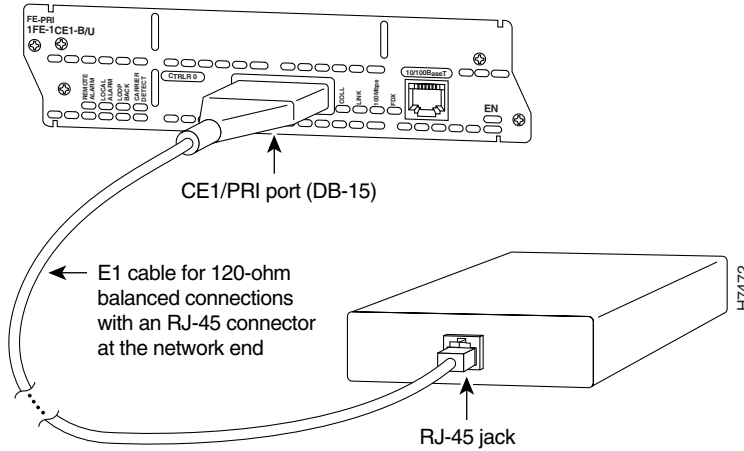
**Figure 13** Connecting a 120-ohm CE1/PRI-B Module to an E1 CSU (DB-15-to-DB-15 Connectors)



**Figure 14** Connecting a 120-ohm CE1/PRI-B Module to an E1 CSU (DB-15-to-Twinax Connectors)



**Figure 15** Connecting a 120-ohm CE1/PRI-B Module to an E1 CSU (DB-15-to-RJ-45 Connectors)

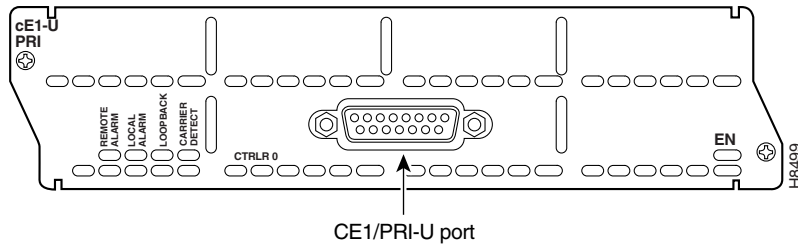


## Channelized E1/ISDN PRI Unbalanced (75-Ohm) Network Modules

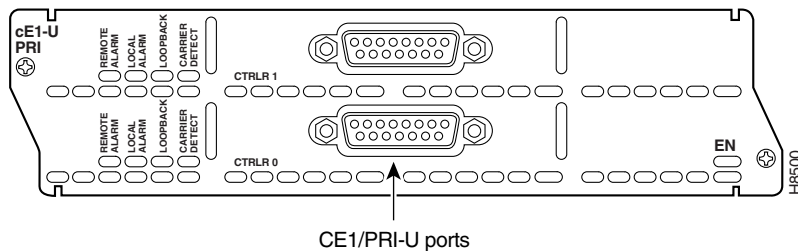
This section provides information about the following network modules for Cisco modular routers:

- 1-port channelized E1/ISDN PRI unbalanced (75-ohm) network module (NM-1CE1U or CPANM-1CE1U) (see Figure 16). This module is also referred to as the *1-port CE1/PRI-U network module*.
- 2-port channelized E1/ISDN PRI unbalanced (75-ohm) network module (NM-2CE1U or CPANM-2CE1U) (see Figure 17). This module is also referred to as the *2-port CE1/PRI-U network module*.

**Figure 16** 1-Port Channelized E1/ISDN PRI Network Module (Unbalanced)



**Figure 17** 2-Port Channelized E1/ISDN PRI Network Module (Unbalanced)



## CE1/PRI Module Jumper Settings

Jumpers on CE1/PRI modules can be used to connect or disconnect receive shield to ground (see [Table 3](#)). The default setting for balanced, 120-ohm CE1/PRI-B modules disconnects receive shield to ground. The default setting for unbalanced, 75-ohm CE1/PRI-U modules connects receive shield to ground. If you are experiencing ground loop problems with E1 cabling, you may want to try changing the jumper settings for the module.

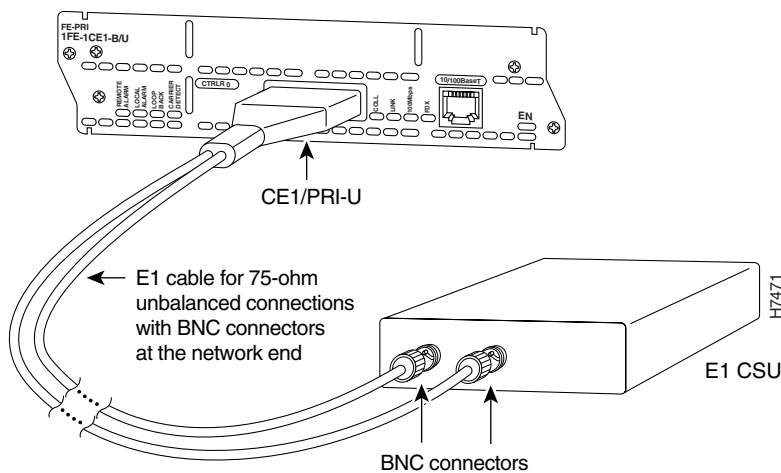
**Table 3** CE1/PRI Module Jumpers

CE1/PRI Module Type	Default Setting	Function
Balanced, 120-ohm	2 and 3	Disconnects receive shield from ground
Unbalanced, 75-ohm	1 and 2	Connects receive shield to ground

## Connecting CE1/PRI-U Modules to the Network

To connect a CE1/PRI-U (75-ohm) module to the network, use the appropriate cable to connect the CE1/PRI-U port to an E1 CSU (see [Figure 18](#)). These ports are color-coded tan. The illustration shows a CSU with BNC connectors.

**Figure 18** Connecting a CE1/PRI-U Module to an E1 CSU (DB-15-to-BNC Connectors)



## PRI Module LEDs

All network modules have an enable (EN) LED. This LED indicates that the module has passed its self-tests and is available to the router.

All PRI modules display four additional LEDs for each port. These LEDs are described in [Table 4](#).

**Table 4** ISDN PRI Network Module LEDs

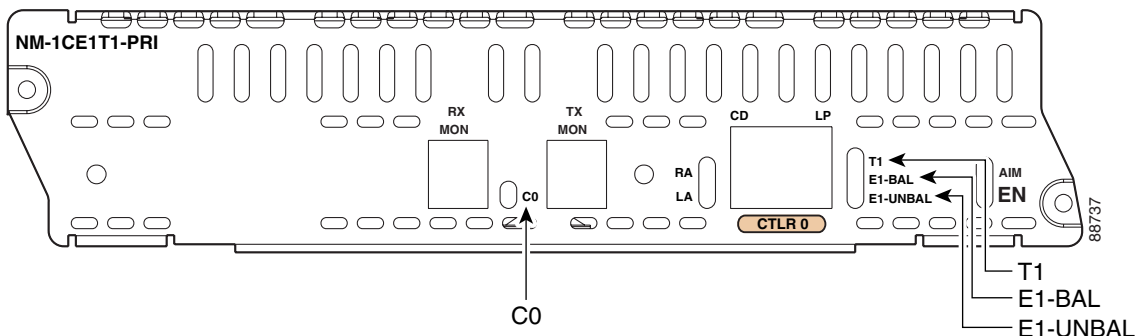
LED	Meaning
RA	Local alarm at remote end of connection
LA	Loss of signal, loss of frame, or unavailability because of excessive errors
LP	Loopback mode
CD	Carrier received on telco link

## Channelized T1/E1 PRI Network Module with G.703 LEDs

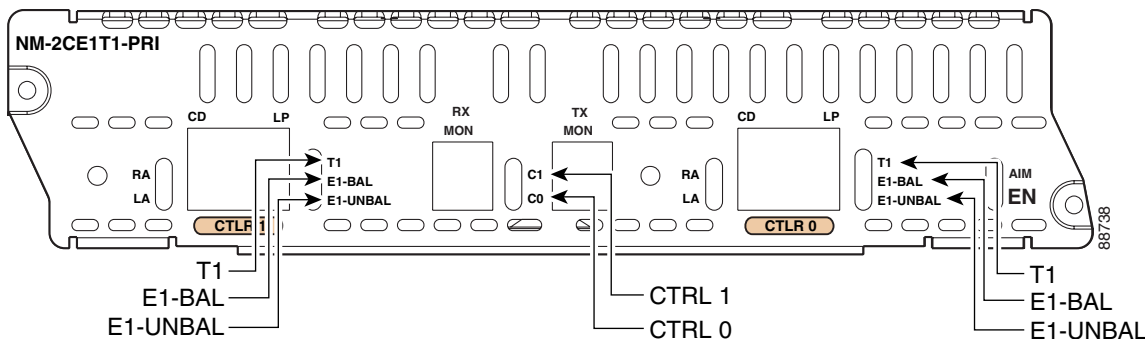
Figure 19 and Figure 20 show channelized T1/E1 PRI network module with G.703 LEDs. See Table 5 for LED definitions.

For LEDs found on all PRI network modules, see Table 4.

**Figure 19** 1-Port Channelized T1/E1 PRI Network Module with G.703 LEDs



**Figure 20** 2-Port Channelized T1/E1 PRI Network Module with G.703 LEDs



**Table 5** Channelized T1/E1 PRI Network Module with G.703 LEDs

LED	Color	Meaning
T1	Green	Interface is configured for balanced T1.
E1-BAL	Green	Interface is configured for balanced E1.

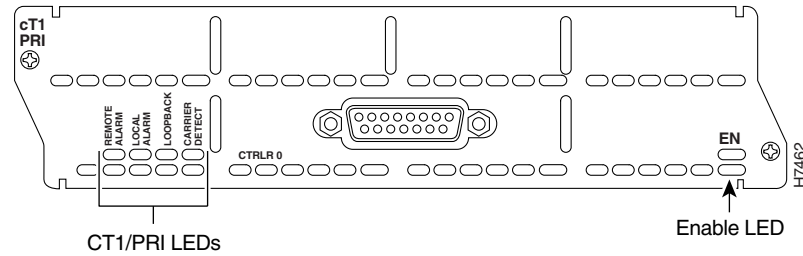
**Table 5** Channelized T1/E1 PRI Network Module with G.703 LEDs

LED	Color	Meaning
E1-UNBAL	Green	Interface is configured for unbalanced E1.
C0	Green	Port 0 is connected to the bantam monitor connector.
C1	Green	Port 1 is connected to the bantam monitor connector.
AIM	Green	An advanced integration module (AIM) is installed on the network module.

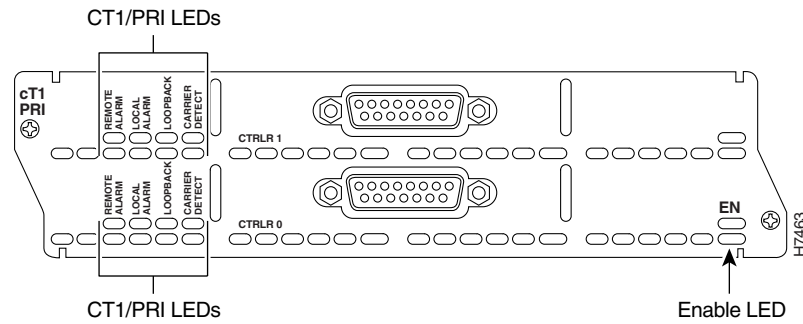
## CT1/PRI Network Module LEDs

Figure 21 and Figure 22 show CT1/PRI network module LEDs.

**Figure 21** 1-Port CT1/PRI Network Module LEDs



**Figure 22** 2-Port CT1/PRI Network Module LEDs



## CT1/PRI CSU Network Module LEDs

Figure 23 and Figure 24 show CT1/PRI CSU module LEDs.

Figure 23 1-Port CT1/PRI CSU Network Module LEDs

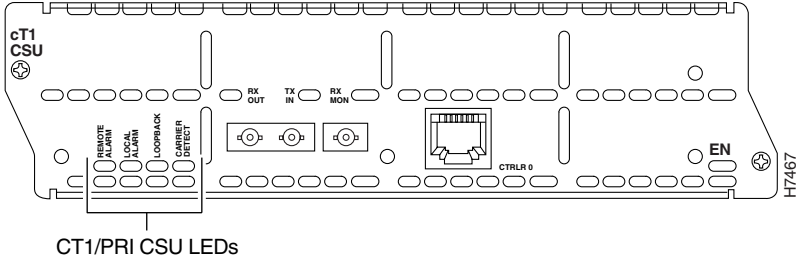
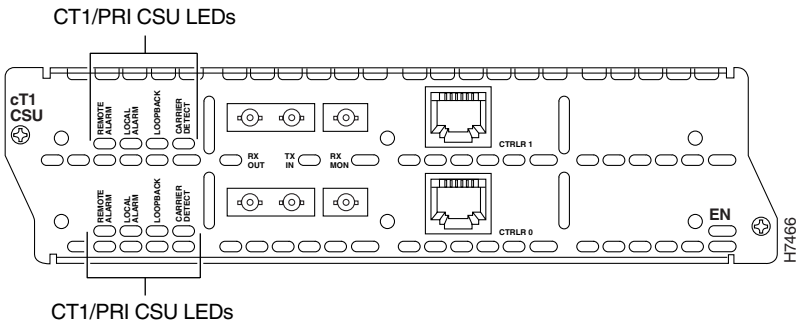


Figure 24 2-Port CT1/PRI CSU Network Module LEDs



### CE1/PRI Network Module LEDs

Figure 25 and Figure 26 show CE1/PRI module LEDs. These LEDs are the same for balanced and unbalanced modules.

Figure 25 1-Port CE1/PRI Network Module LEDs

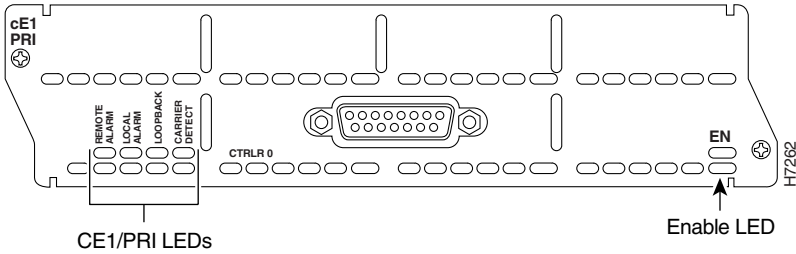
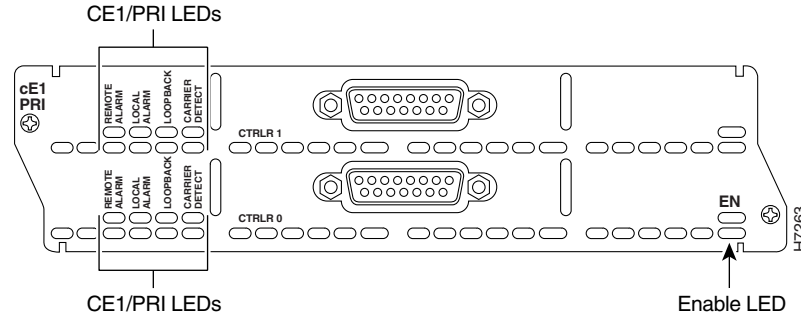


Figure 26 2-Port CE1/PRI Network Module LEDs



## Online Insertion and Removal with a Cisco PRI Network Module (Cisco 3660 and Cisco 3745 Only)

Some Cisco modular access routers allow you to replace network modules without switching off the router or affecting the operation of other interfaces. This feature is called online insertion and removal (OIR). OIR of network modules provides uninterrupted operation to network users, maintains routing information, and ensures session preservation.



### Note

To determine if your router supports OIR, see the hardware installation guide for your router.



### Caution

Cisco routers support OIR with similar modules only. If you remove a network module, install another module exactly like it in its place. If you remove a network module with an installed interface card, expansion module, or AIM, the replacement module should have the same hardware installed.

For a description of informational and error messages that may appear on the console during this procedure, refer to the hardware installation guide for your type of router.

## Upgrading ISDN PRI Network Modules

If your Cisco 3600 series router contains a legacy ISDN PRI network module and a digital modem network module (product numbers NM-6DM, NM-12DM, NM-18DM, NM-24DM, or NM-30DM), your ISDN PRI network module may need to be upgraded to revision level -03 or higher. Earlier revisions of ISDN PRI network modules cannot send modem calls to the digital modem network module.



### Note

Channelized T1/E1 PRI network modules with G.703 provide full support for Cisco digital modem network modules.

If your PRI module is the wrong revision, you see a message similar to the following message when the router boots:

```
The PRI network module in slot 0 is incompatible with the digital modems installed in the router.
```

To determine the revision level, you can examine the network module itself (outside the router) or use the Cisco IOS **show diag** command. The label on the module board should show a part number beginning with 800- and ending with the revision level.

The output of the **show diag** command looks similar to the following:

```
Port adapter is analyzed
Port adapter insertion time unknown
Hardware revision 1.0          Board revision A0
Serial number 4152626         Part number 800-01236-01
Test history 0x0              RMA number 00-00-00
EEPROM format version 1
EEPROM contents (hex):
0x20: 01 26 01 00 00 3F 5D 32 50 04 CC 01 00 00 00 00
0x30: 50 00 00 00 96 11 04 17 FF FF FF FF FF FF FF FF
```

## Related Documents

For additional information, see the following documents and resources.

Related Topic	Document Title
Regulatory compliance and safety information	<i>Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information</i> <a href="http://www.cisco.com/en/US/docs/routers/access/interfaces/rcsi/IOHrcsi.html">http://www.cisco.com/en/US/docs/routers/access/interfaces/rcsi/IOHrcsi.html</a>
Cisco IOS software website and reference documentation	<i>Cisco IOS Software</i> <a href="http://www.cisco.com/web/psa/products/index.html?c=268438303">http://www.cisco.com/web/psa/products/index.html?c=268438303</a>

## Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

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