



## Preparing to Install the Router

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This chapter describes important information to consider before you begin to install a Cisco 2600 series router, and includes the following sections:

- [Safety Recommendations, page 2-1](#)
- [General Site Requirements, page 2-3](#)
- [Preparing to Connect to a Network, page 2-5](#)

After you have completed this chapter, proceed to [Chapter 3, “Installing the Router”](#) for installation instructions.

## Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- Put the removed chassis cover in a safe place.
- Keep tools away from walk areas where you and others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

## Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.



Warning

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Read the installation instructions before you connect the system to its power source. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

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Warning

Only trained and qualified personnel should be allowed to install or replace this equipment. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Ultimate disposal of this product should be handled according to all applicable national laws and regulations. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface processors, or by the plastic panels on the front of the chassis. These handles were not designed to support the weight of the chassis. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

## Maintaining Safety with Electricity

Follow these guidelines when working on equipment powered by electricity:



Warning

Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or can weld the metal object to the terminals. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is OFF and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Incorrect connection of this or connected equipment to a general purpose outlet could result in a hazardous situation. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

**Warning**

This equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- Locate the emergency power off switch for the room in which you are working. Then, if an electrical accident occurs, you can act quickly to turn OFF the power.
- Power OFF the router and unplug the power cord before doing the following:
  - Installing or removing a chassis
  - Working near power supplies
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.

If an electrical accident occurs, proceed as follows:

- Use caution; do not become a victim yourself.
- Turn OFF power to the system.
- If possible, send another person to get medical aid. Otherwise, assess the condition of the victim and then call for help.
- Determine if the victim needs rescue breathing or external cardiac compressions; then take appropriate action.

## Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic components are improperly handled and can result in complete or intermittent failures.

Always follow ESD-prevention procedures when removing and replacing components. Ensure that the chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground. To properly guard against ESD damage and shocks, the wrist strap and cord must be used effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

**Caution**

For safety, periodically check the resistance value of the antistatic strap, which should be between 1 to 10 megohms (Mohm).

## General Site Requirements

This section describes the requirements your site must meet for safe installation and operation of your system. Ensure that your site is properly prepared before beginning installation.

## Site Environment

The router can be placed on a desktop or mounted in a rack. Single rack-unit (1RU) routers can also be mounted on a wall. The location of the chassis and the layout of your equipment rack or wiring room are extremely important for proper system operation. Placing equipment too close together, inadequate ventilation, and inaccessible panels can make system maintenance difficult or cause system malfunctions and shutdowns.

When planning your site layout and equipment locations, remember the precautions described in the next section, “[Preventive Site Configuration](#).” If you are experiencing shutdowns or unusually high errors with your existing equipment, these precautions might help you isolate the cause of failures and prevent future problems.

## Preventive Site Configuration

The following precautions will help you plan an acceptable operating environment for your router and help you avoid environmentally-caused equipment failures:

- Ensure that the room in which you operate your system has adequate air circulation. Electrical equipment generates heat. Ambient air temperature might not be able to cool equipment to acceptable operating temperatures without adequate circulation.
- Always follow the ESD-prevention procedures described in the “[Preventing Electrostatic Discharge Damage](#)” section on page 23 to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that the chassis cover is secure. The chassis is designed to allow cooling air to flow effectively inside it. An open chassis allows air leaks, which might interrupt and redirect the flow of cooling air from internal components.

## Configuring Equipment Racks

The following information will help you plan an acceptable equipment rack configuration:

- Enclosed racks must have adequate ventilation. Ensure that the rack is not overly congested because each unit generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the intake or the exhaust ports. If the chassis is installed on slides, check the position of the chassis when it is seated all the way into the rack.
- In an enclosed rack with a ventilation fan in the top, excessive heat generated by equipment near the bottom of the rack can be drawn upward and into the intake ports of the equipment above it in the rack. Ensure that you provide adequate ventilation for equipment at the bottom of the rack.
- Baffles can help to isolate exhaust air from intake air, which also helps to draw cooling air through the chassis. The best placement of the baffles depends on the airflow patterns in the rack, which can be found by experimenting with different arrangements.

## Power Supply Considerations

Check the power at your site to ensure that you are receiving “clean” power (free of spikes and noise). Install a power conditioner if necessary.

**Warning**

The device is designed to work with TN power systems. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

**Warning**

The telecommunications lines must be disconnected 1) before unplugging the main power connector and/or 2) while the housing is open. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

The router power supply includes the following features:

- Autoselects either 110V or 220V operation.
- All units include a 6-foot (1.8-meter) electrical power cord. (A label near the power cord indicates the correct voltage, frequency, current draw, and power dissipation for the unit.)

**Warning**

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors). To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

## Preparing to Connect to a Network

When setting up your router, consider distance limitations and potential electromagnetic interference (EMI) as defined by the applicable local and international regulations.

Network connection considerations are provided for several types of network interfaces and are described in the following sections:

- [Ethernet Connections, page 2-5](#)
- [Token Ring Connections, page 2-6](#)
- [Serial Connections, page 2-7](#)
- [ISDN BRI Connections, page 2-12](#)
- [56K/Switched-56-kbps DSU/CSU Connections, page 2-13](#)

**Warning**

The Ethernet 10BASE-T, Token Ring, console, and auxiliary ports contain safety extra-low voltage (SELV) circuits. Avoid connecting SELV circuits to TNV circuits. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

## Ethernet Connections

The IEEE has established Ethernet as standard IEEE 802.3. The most common Ethernet implementations are as follows:

- 100BASE-T—2-pair Category 5 or unshielded twisted-pair (UTP) straight-through RJ-45 cable.
- 10BASE2—Ethernet on thin coaxial cable, also known as thin Ethernet. The maximum segment distance is 607 feet (186 meters).
- 10BASE5—Ethernet on thick coaxial cable, also known as thick Ethernet. The maximum segment distance is 1,640 feet (500 meters).
- 10BASE-T—Ethernet on UTP cable. The maximum segment distance is 328 feet (100 meters). UTP cables look like the wiring used for ordinary telephones; however, UTP cables meet certain electrical standards that telephone cables do not meet.

[Table 2-1](#) lists the router models described in this guide and summarizes the LAN interfaces supported on each model.

**Table 2-1 Cisco 2600 Series LAN Connections**

Model	Ethernet (10BASE-T)	Token Ring (RJ-45)	Fast Ethernet (10/100)	Network Module Slot	WAN Interface Card Slots	Advanced Integration Module Slots
Cisco 2610	1	—	—	1	2	1
Cisco 2610XM	—	—	1	1	2	1
Cisco 2611	2	—	—	1	2	1
Cisco 2611XM	—	—	2	1	2	1
Cisco 2612	1	1	—	1	2	1
Cisco 2613	—	1	—	1	2	1
Cisco 2620	—	—	1	1	2	1
Cisco 2620XM	—	—	1	1	2	1
Cisco 2621	—	—	2	1	2	1
Cisco 2621XM	—	—	2	1	2	1
Cisco 2650	—	—	1	1	2	1
Cisco 2650XM	—	—	1	1	2	1
Cisco 2651	—	—	2	1	2	1
Cisco 2651XM	—	—	2	1	2	1
Cisco 2691	—	—	2	1	3	2

## Token Ring Connections

The Cisco 2612 provides both an Ethernet interface and a Token Ring shielded UTP interface. The Cisco 2613 provides a single Token Ring interface. (See [Table 2-1](#).)

The IEEE has established Token Ring as standard IEEE 802.5. Specifications indicate a maximum segment distance of 328 feet (100 meters) for UTP cabling.



### Note

To ensure agency compliance with FCC Class B electromagnetic emissions requirements (EMI), make sure that you use the shielded RJ-45 Token Ring cable when connecting your router to your Token Ring network.

Token Ring can operate at two different ring speeds: 4 and 16 Mbps. All devices on the Token Ring must use the same operating speed.

Use the provided Token Ring cable to connect the router to a switch. Refer to the section “Token Ring Port Pinouts” in the *Cisco Modular Access Router Cabling Specifications* online document for the Token Ring port pinouts. This document is on the Documentation CD-ROM that accompanied your router package, and on Cisco.com.

## Serial Connections

Serial connections are provided by WAN interface cards and network modules. The WAN interface cards can be installed in either slot of the 2-slot chassis; the network module can be installed in the Cisco 2600 series single network module slot. For more information on WAN interface cards, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*. For more information on network modules, refer to the *Network Modules Hardware Installation Guide*. Both of these documents are on the Documentation CD-ROM that accompanied your router package, and on Cisco.com.

- For information about installing WAN interface cards, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, located at: **Cisco Product Documentation > Access Servers and Access Routers > Modular Access Routers Cisco 2600 Routers > Hardware installation documents for Cisco 2600 series > Interface card installation**
- For information about installing network modules, refer to the *Cisco Network Modules Hardware Installation Guide*, located at: **Cisco Product Documentation > Access Servers and Access Routers > Modular Access Routers Cisco 2600 Routers > Hardware installation documents for Cisco 2600 series > Network module (netmod) installation**

Before you connect a device to a serial port, you need to know the following:

- Type of device, data terminal equipment (DTE) or data communications equipment (DCE), you are connecting to the synchronous serial interface
- Type of connector, male or female, required to connect to the device
- Signaling standard required by the device

## Configuring Serial Connections

The serial ports on the asynchronous/synchronous serial network modules and the serial WAN interface card use DB-60 connectors. (See [Figure 2-1](#) through [Figure 2-6](#).) Serial ports can be configured as DTE or DCE, depending on the serial cable used.

## Serial DTE or DCE Devices

A device that communicates over a synchronous serial interface is either a DTE or DCE device. A DCE device provides a clock signal that paces the communications between the device and the router. A DTE device does not provide a clock signal. DTE devices usually connect to DCE devices. The documentation that accompanied the device should indicate whether it is a DTE or DCE device. (Some devices have a jumper to select either DTE or DCE mode.) If you cannot determine the device type in the documentation, see [Table 2-2](#) to help you select the proper device type.

**Table 2-2** *Typical DTE and DCE Devices*

Device Type	Gender	Typical Devices
DTE	Male <sup>1</sup>	Terminal PC
DCE	Female <sup>2</sup>	Modem CSU/DSU Multiplexer

1. If pins protrude from the base of the connector, the connector is male.
2. If the connector has holes to accept pins, the connector is female.

## Signaling Standards Supported

The synchronous serial ports available for the router support the following signaling standards: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530. You can order a Cisco DB-60 shielded serial transition cable that has the appropriate connector for the standard you specify. The documentation for the device you want to connect should indicate the standard used for that device. The router end of the shielded serial transition cable has a DB-60 connector, which connects to the DB-60 port on a serial WAN interface card. The other end of the serial transition cable is available with a connector appropriate for the standard you specify.

The synchronous serial port can be configured as DTE or DCE depending on the attached cable (except EIA-530, which is DTE only). To order a shielded cable, contact customer service. See the [“Obtaining Technical Assistance”](#) section on page xiii.

**Note**

All serial ports configured as DTE require external clocking from a CSU/DSU or other DCE device.

Although manufacturing your own serial cables is not recommended (because of the small size of the pins on the DB-60 serial connector), cable pinouts are provided in the *Cisco Modular Access Router Cabling Specifications* document on Cisco.com and the Documentation CD-ROM that accompanied your router.

## Distance Limitations

Serial signals can travel a limited distance at any given bit rate; generally, the slower the data rate, the greater the distance. All serial signals are subject to distance limits, beyond which a signal significantly degrades or is completely lost.

**Note**

Only the serial WAN interface card supports bit rates above 128 Kbps.

[Table 2-3](#) lists the recommended maximum speeds and distances for each serial interface type; however, you might get good results at speeds and distances greater than those listed, if you understand the electrical problems that might arise and can compensate for them. For instance, the recommended maximum rate for V.35 is 2 Mbps, but 4 Mbps is commonly used.



**Table 2-3 Serial Signal Transmission Speeds and Distances**

Rate (bps)	EIA/TIA-232 Distance		EIA/TIA-449, X.21, V.35, EIA-530 Distance	
	Feet	Meters	Feet	Meters
2400	200	60	4100	1250
4800	100	30	2050	625
9600	50	15	1025	312
19200	25	7.6	513	156
38400	12	3.7	256	78
56000	8.6	2.6	102	31
1544000 (T1)	—	—	50	15

Balanced drivers allow EIA/TIA-449 signals to travel greater distances than EIA/TIA-232 signals. The recommended distance limits for EIA/TIA-449 shown in [Table 2-3](#) are also valid for V.35, X.21, and EIA-530. Typically, EIA/TIA-449 and EIA-530 can support 2-Mbps rates, and V.35 can support 4-Mbps rates.

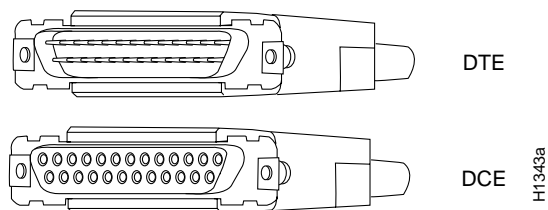
## Asynchronous/Synchronous Serial Module Baud Rates

The following baud-rate limitations apply to the slow-speed serial interfaces found in the asynchronous/synchronous serial modules:

- Asynchronous interface—Maximum baud rate is 115.2 kbps.
- Synchronous interface—Maximum baud rate is 128-kbps full duplex.

## EIA/TIA-232 Connections

EIA/TIA-232 supports unbalanced circuits at signal speeds up to 64 kbps. The network end of the adapter cable is a standard 25-pin D-shell connector known as a DB-25. (See [Figure 2-1](#).) The router console and auxiliary ports also use EIA/TIA-232 connections; however, the serial module ports support synchronous connections, and the console and auxiliary ports support asynchronous connections.

**Figure 2-1 EIA/TIA-232 Adapter Cable Connectors, Network End**

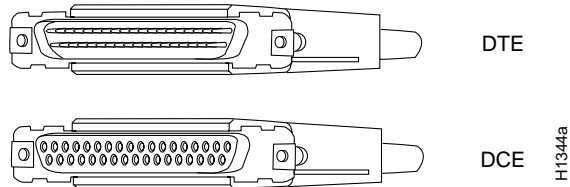
## EIA/TIA-449 Connections

EIA/TIA-449, which supports balanced (EIA/TIA-422) and unbalanced (EIA/TIA-423) transmissions, is a faster version of EIA/TIA-232 (up to 2 Mbps) that provides more functions and supports transmissions over greater distances.

The EIA/TIA-449 standard was intended to replace the EIA/TIA-232 standard, but it was not widely adopted primarily because of the large installed base of DB-25 hardware and because of the larger size 37-pin EIA/TIA-449 connectors, which limited the number of connections possible (fewer than with the smaller, 25-pin EIA/TIA-232 connector).

The network end of the EIA/TIA-449 adapter cable provides a standard 37-pin D-shell connector. (See [Figure 2-2](#).) EIA/TIA-449 cables are available as either DTE (DB-37 plug) or DCE (DB-37 receptacle).

**Figure 2-2 EIA/TIA-449 Adapter Cable Connectors, Network End**

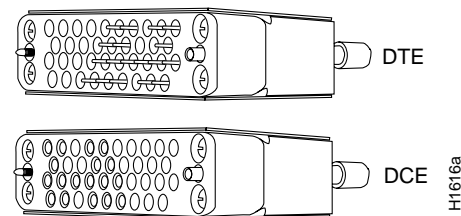


## V.35 Connections

The V.35 interface is recommended for speeds up to 48 kbps, although it is often used successfully at 4 Mbps.

The network end of the V.35 adapter cable provides a standard 34-pin Winchester-type connector. (See [Figure 2-3](#).) V.35 cables are available with a standard V.35 plug or receptacle in either DTE or DCE mode.

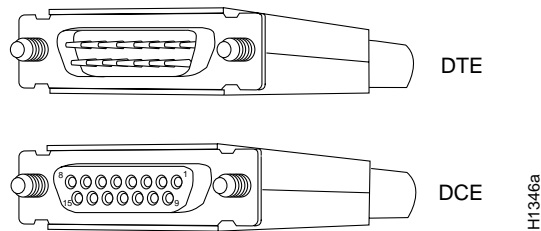
**Figure 2-3 V.35 Adapter Cable Connectors, Network End**



## X.21 Connections

The X.21 interface uses a 15-pin connection for balanced circuits and is commonly used in the United Kingdom to connect public data networks. X.21 relocates some of the logic functions to the DTE and DCE interfaces and, as a result, requires fewer circuits and a smaller connector than EIA/TIA-232.

The network end of the X.21 adapter cable is a standard DB-15 connector. (See [Figure 2-4](#).) X.21 cables are available as either DTE (DB-15 plug) or DCE (DB-15 receptacle).

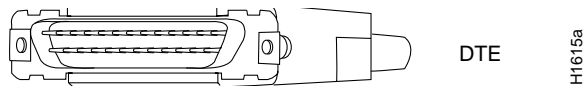
**Figure 2-4** X.21 Adapter Cable Connectors, Network End

## EIA-530 Connections

EIA-530, which supports balanced transmission, provides the increased functionality, speed, and distance of EIA/TIA-449 on the smaller DB-25 connector used for EIA/TIA-232, instead of the 37-pin connectors used for EIA/TIA-449. Like EIA/TIA-449, EIA-530 refers to the electrical specifications of EIA/TIA-422 and EIA/TIA-423. Although the specification recommends a maximum speed of 2 Mbps, EIA-530 is used successfully at 4 Mbps or faster over short distances.

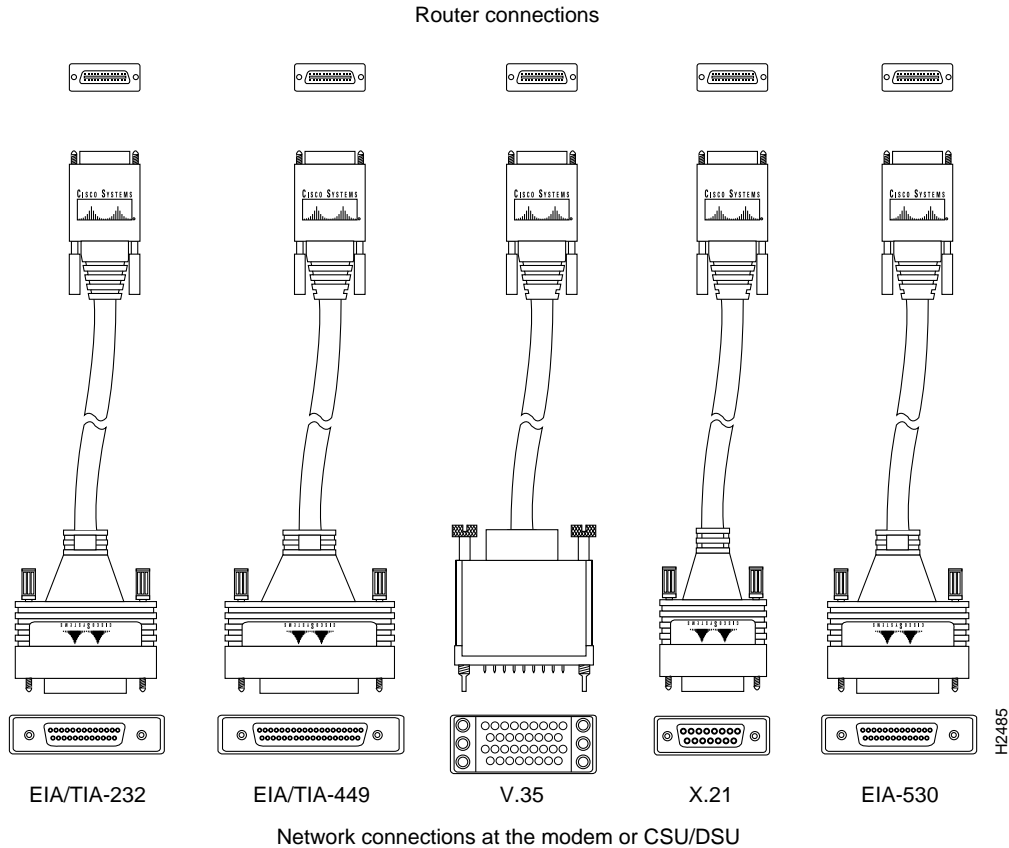
The EIA/TIA-530 adapter cable is available in DTE mode only. The network end of the EIA-530 adapter cable is a standard DB-25 plug commonly used for EIA/TIA-232 connections.

[Figure 2-5](#) shows the DB-25 connector at the network end of the adapter cable.

**Figure 2-5** EIA-530 Adapter Cable Connector, Network End

[Figure 2-6](#) shows the serial transition cables you can connect to the DB-60 port on the asynchronous/synchronous serial modules and serial WAN interface card.

Figure 2-6 Serial Interface Adapter Cables



## ISDN BRI Connections

The BRI WAN interface cards provide Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI) connections. The BRI modules and BRI WAN interface cards are available with either an S/T interface that requires an external Network Terminator 1 (NT1), or a U interface that has a built-in NT1.

You can install the BRI modules in any available slot in the chassis.



**Warning**

Network hazardous voltages are present in the BRI cable. If you detach the BRI cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages also are present on the system card in the area of the BRI port (RJ-45 connector), regardless of when power is turned OFF. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.



**Warning**

The ISDN connection is regarded as a source of voltage that should be inaccessible to user contact. Do not attempt to tamper with or open any public telephone operator (PTO)-provided equipment or connection hardware. Any hardwired connection (other than by a nonremovable, connect-one-time-only plug) must be made only by PTO staff or suitably trained engineers. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Use a BRI cable (not included) to connect the BRI WAN interface card directly to an ISDN. [Table 2-4](#) lists the specifications for ISDN BRI cables. Also, refer to the *Cisco Modular Access Router Cabling Specifications* online document for pinouts. This document is located on Cisco.com and the Documentation CD-ROM that accompanied your router package.

**Table 2-4** ISDN BRI Cable Specifications

Specification	High-Capacitance Cable	Low-Capacitance Cable
Resistance (at 96 kHz)	160 ohms/km	160 ohms/km
Capacitance (at 1 kHz)	120 nF <sup>1</sup> /km	30 nF/km
Impedance (at 96 kHz)	75 ohms	150 ohms
Wire diameter	0.024 in. (0.6 mm)	0.024 in. (0.6 mm)
Distance limitation	32.8 ft (10 m)	32.8 ft (10 m)

1. nF = nanoFarad

For more information on BRI WAN interface cards, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, located at: **Cisco Product Documentation > Access Servers and Access Routers > Modular Access Routers Cisco 2600 Routers > Hardware installation documents for Cisco 2600 series > Interface card installation**

## 56K/Switched-56-kbps DSU/CSU Connections

Switched-56-kbps connections are provided by the 56-kbps DSU/CSU WAN interface card.

For more information on Switched-56-kbps WAN interface cards, refer to the *Cisco WAN Interface Cards Hardware Installation Guide*, located at: **Cisco Product Documentation > Access Servers and Access Routers > Modular Access Routers Cisco 2600 Routers > Hardware installation documents for Cisco 2600 series > Interface card installation**

