CHAPTER 2

Preparing for Installation

This chapter describes the tasks you must perform *before* starting actual system installation.

Sections of this chapter follow:

- Safety Recommendations
- General Site Requirements
- System Operation Prerequisites
- Installation Checklist
- Creating a Site Log
- Preparing to Make Connections
- Distance Limitations
- Interference Considerations
- Console and Auxiliary Port Considerations
- Network Connection Considerations
- Inspecting the System

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.

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.

- 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.
- Before working on the system, turn off the power and unplug the power cord.
- Disconnect all power before doing the following:
  - Installing or removing a chassis
  - Working near power supplies
  - Performing a software upgrade
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- 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 person 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 chassis frame surface to safely channel unwanted ESD voltages to ground. To properly guard against ESD damage and shocks, the wrist strap and cord must operate 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 within the range of 1 and 10 megohms (Mohms).

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.

The router can be used as desktop, rack-mounted, or wall-mounted equipment in a data processing or lab environment.

Caution The rubber feet on the chassis bottom protect the chassis and provide a nonskid surface. Removing the feet reduces the space below the chassis and might affect the ventilation around the chassis. Inadequate ventilation could result in damage to the equipment. With the feet attached, more ventilation is provided around the chassis.

Site Environment

The location of individual chassis and the layout of your equipment rack or wiring room are extremely important for proper system operation. Equipment placed too close together, inadequate ventilation, and inaccessible panels can cause system malfunctions and shutdowns, and can make system maintenance difficult.

When planning your site layout and equipment locations, use the following precautions to help avoid equipment failures and reduce the possibility of environmentally caused shutdowns. If you are currently experiencing shutdowns or unusually high errors with your existing equipment, these precautions may 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 will help you avoid environmentally caused equipment failures:

- Remember that electrical equipment generates heat. Ambient air temperature might not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Ensure that the room in which you operate your system has adequate air circulation.
- Always follow the ESD-prevention procedures in the section “Preventing Electrostatic Discharge Damage” earlier in this chapter 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 within. An open chassis allows air leaks, which may interrupt and redirect the flow of cooling air across internal components.

Configuring Equipment Racks

The following tips 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 using slide rails, check the position of the chassis when it is seated all the way into the rack.
- In an enclosed rack with a ventilation fan at 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.
- 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 are found by experimenting with different arrangements.
- When equipment installed in a rack fails, particularly in an enclosed rack, try operating that equipment only, if possible. Turn off other equipment in the rack (and in adjacent racks) to allow the unit under test a maximum of cooling air and "clean" power (free of spikes and noise).

Power Supply Considerations

Check the power at your site to ensure that you are receiving clean power. Install a power conditioner if necessary.

Caution To avoid damage from lightning and power surges, install proper grounding.

Features of the router power supply follow:

- Autoselects either 110-volt (V) 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 your unit.)

System Operation Prerequisites

The router models are designed to run system code from Flash memory single inline memory modules (SIMMs). With the proper system code image, the router also can be run from dynamic random-access memory (DRAM); however, this operation requires a 4-MB memory upgrade (installation of a 1 MB x 36 DRAM SIMM). Additionally, operating system code from DRAM can result in a 25-percent decrease in system performance.

Operating the system code from Flash memory is the default and is recommended for optimum performance of the router.

Installation Checklist

The Installation Checklist (see Figure 2-1) lists the procedures for initial hardware installation of new systems. Make a copy of this checklist and mark the entries as you complete each procedure. Include a copy of the checklist for each system in your Site Log (refer to the “Site Log” section).

Figure 2-1 Installation Checklist

Installation Checklist

for site

_____

Task	Verified by	Date
Installation checklist copied		
Background information placed in Site Log		
Environmental specifications verified		
Site power voltages verified		
Installation site prepower check completed		
Required tools available		
Additional equipment available		
Router received		
Warranty package received		
UniverCD received, or ordered printed documentation received		
Chassis components verified		
Software version verified		
Initial electrical connections established		
ASCII terminal attached to console port		
Modem attached to console port (for remote configuration)		
Signal distance limits verified		
Startup sequence steps completed		
Initial system operation verified		

Router name _____

Router serial number _____

Notes

Creating a Site Log

The Site Log provides a historical record of all actions relevant to the system. Keep it in a common place near the chassis where anyone who performs tasks has access to it. Use the Installation Checklist to verify steps in the installation and maintenance of your system. Site Log entries might include the following:

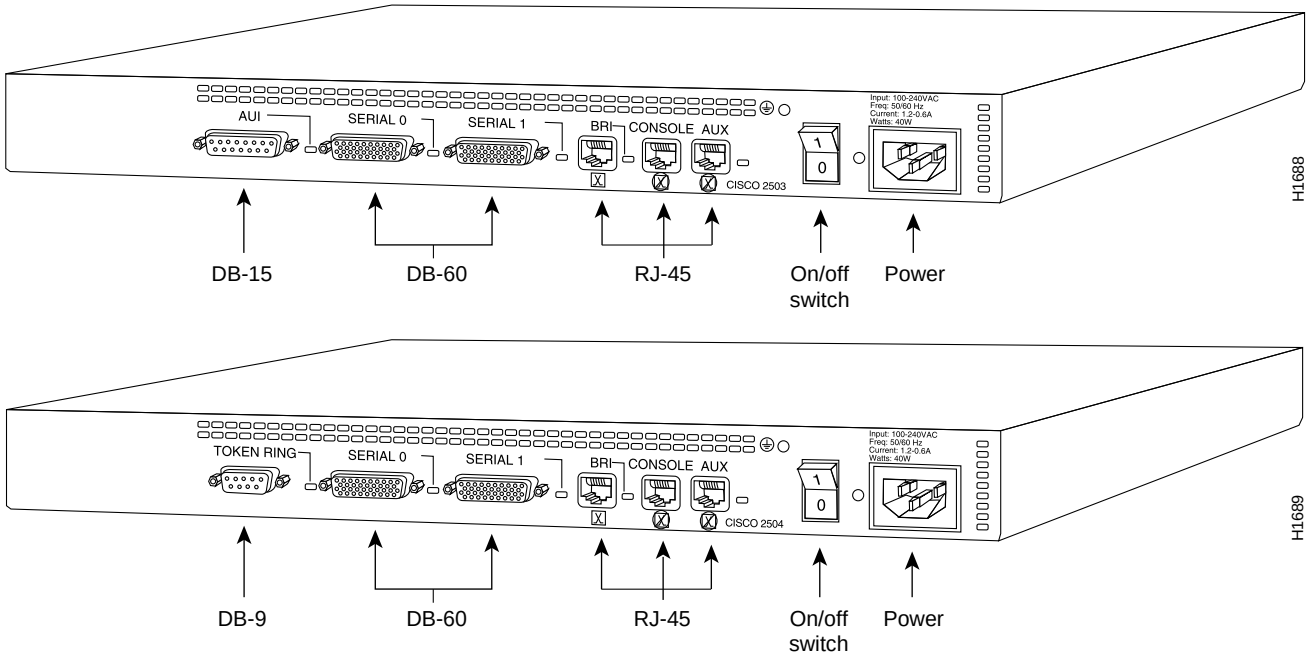
- Installation progress—Make a copy of the Installation Checklist and insert it into the Site Log. Make entries on the checklist as you complete each procedure.
- Upgrades and maintenance procedures—Use the Site Log as a record of ongoing system maintenance and expansion history. Each time a procedure is performed on the system, update the Site Log to reflect the following:
  - Configuration changes
  - Maintenance schedules and requirements
  - Corrective maintenance procedures performed
  - Intermittent problems
  - Related comments/notes

Preparing to Make Connections

When viewed from the rear, the power-cable input and power switch are located on the right side of the chassis rear panel. (See Figure 2-2.) The ports for the Ethernet, Token Ring, synchronous serial, Basic Rate Interface (BRI), console, and auxiliary (AUX) connections are located to the left of the power connector and switch. The interface configuration depends on the model.

Models 2501, 2502, 2513, 2514, and 2515 do not have a BRI port. Models 2514 and 2515 have two LAN ports. Model 2513 has both a Token Ring and an Ethernet port. Otherwise, all models are identical to models 2503 and 2504, shown in Figure 2-2.

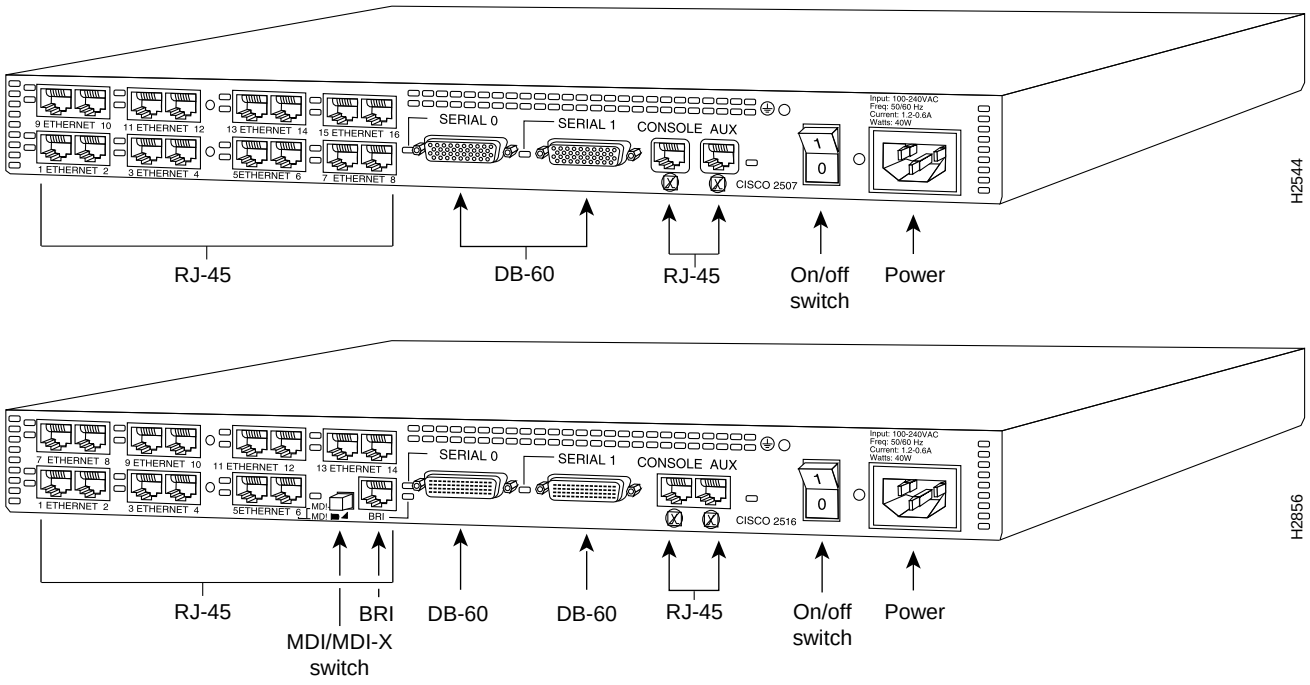
Figure 2-2 Router Rear View—Models 2503 and 2504



On the hub models, Ethernet RJ-45, BRI, synchronous serial, console, and auxiliary (AUX) connections are located to the left of the power connector and switch. The interface configuration depends on the model.

The model 2505 has 8 instead of 16 RJ-45 ports, and is otherwise identical to the model 2507, which is shown in Figure 2-3. The model 2516 has 14 RJ-45 ports with a BRI port (also shown in Figure 2-3).

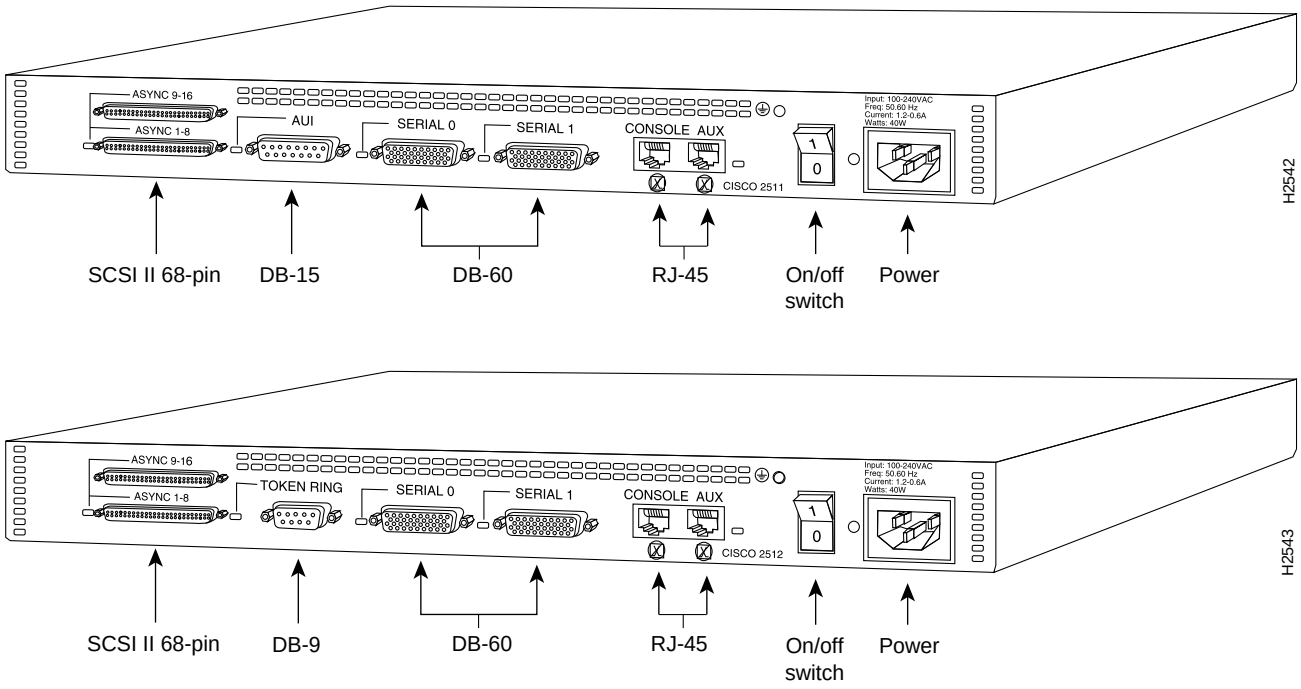
Figure 2-3 Hub Rear View — Models 2507 and 2516



On the access server models, the ports for the Ethernet, Token Ring, asynchronous serial, synchronous serial, console, and auxiliary (AUX) connections are located to the left of the power connector and switch. The interface configuration depends on the model.

The models 2509 and 2510 have 8 rather than 16 asynchronous ports, delivered through a breakout cable which connects to a single 68-pin SCSI instead of two 68-pin SCSI ports, but are otherwise identical to the models 2511 and 2512, which are shown in Figure 2-4.

Figure 2-4 Access Server Rear View — Models 2511 and 2512



Distance Limitations

When setting up your router, consider distance limitations and potential electromagnetic interference (EMI) as defined by the Electronic Industries Association (EIA). Following are the distance limitation specifications for Ethernet, serial, and BRI interfaces.

Limitations on Ethernet Connections

The distance limitations for the IEEE 802.3 (10Base5 coaxial cable) specification indicate a maximum segment distance of 1,640 feet (500 m) at a transmission rate of 10 megabits per second (Mbps).

Limitations on Token Ring Connections

The distance limitations for the IEEE 802.5 specification indicate a maximum segment distance of 1,640 feet (500 m) at a transmission rate of 4 or 16 megabits per second (Mbps).

Limitations on Serial Connections

As with all signaling systems, EIA/TIA-232 signals can travel a limited distance at any given bit rate; generally, the slower the data rate, the greater the distance. Table 2-1 shows the standard relationship between baud rate and maximum distance.

Table 2-1 EIA/TIA-232 Speed and Distance Limitations

Data Rate (Baud)	Distance (Feet)	Distance (Meters)
2400	200	60
4800	100	30
9600	50	15
19,200	25	7.6
38,400	12	3.7

Caution EIA/TIA-232 is often used at greater distances than specified in Table 2-1. If you understand the electrical problems that can arise and can compensate for them, you might still be able to get good results, however, do so at your own risk. We recommend that you stay within the standard-defined distance.

The use of balanced drivers allow EIA/TIA-449 signals to travel greater distances than the EIA/TIA-232 standard. Table 2-2 lists the standard relationship between baud rate and maximum distance for EIA/TIA-449 signals. These limits are also valid for V.35 and X.21.

Table 2-2 EIA/TIA-449 Speed and Distance Limitations

Baud Rate	Distance (Feet)	Distance (Meters)
2400	4100	1250
4800	2050	625
9600	1025	312
19200	513	156
38400	256	78
56000	102	31
T1	50	15

Caution The EIA/TIA-449 and V.35 interfaces support data rates up to 2.048 Mbps. Exceeding this maximum could result in loss of data and is not recommended; *do so at your own risk*.

Limitations on BRI Connections

The specifications for the BRI cable are given in Table 2-3.

Table 2-3 BRI Cable Specifications

Specification	High-Capacitance Cable	Low-Capacitance Cable
Resistance (@ 96 kHz[1])	160 ohms/km	160 ohms/km
Capacitance (@ 1 kHz)	120 nF/km[2]	30 nF/km
Impedance (@ 96 kHz)	75 ohms	150 ohms
Wire diameter	0.024" (0.6 mm)	0.024" (0.6 mm)
Distance limitation	32.8' (10 m)	32.8' (10 m)

1. kHz = kilohertz.
2. nF = nanoFarad.

Interference Considerations

When you run cables for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the cables. This fact has two implications for the construction of terminal plant cabling:

- Plant cabling can emanate radio interference if it is unshielded for too long a distance.
- Strong electromagnetic interference (EMI), especially as caused by lightning or radio transmitters, can destroy the EIA/TIA-232 drivers and receivers in the server.

If you use twisted-pair cables with a good distribution of grounding conductors in your plant cabling, emitted radio interference is unlikely. If you exceed the maximum distances, ground the conductor for each data signal; however, this practice is not recommended.

If you have cables exceeding recommended distances, or if you have cables that pass between buildings, give special consideration to the effect of lightning strikes or ground loops. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If your site has experienced this type of problem, consult experts in lightning suppression and shielding.

Most data centers cannot resolve the infrequent, but potentially catastrophic problems just described without pulse meters and other special equipment. Take precautions to avoid these problems by providing a properly grounded and shielded environment, and electrical surge suppression.

To prevent electromagnetic interference, consult experts in radio-frequency interference (RFI).

Console and Auxiliary Port Considerations

Before connecting the console and auxiliary ports, read the following sections.

Console Port Connections

An RJ-45 console asynchronous serial port is included on all router units. This port connects to a terminal using an RJ-45-to-RJ-45 cable and an RJ-45-to-DB-25 adapter or RJ-45-to-DB-9 adapter (labeled “Terminal”). To use the port with a console device (an ASCII terminal or PC running terminal emulation software), use a DCE RJ-45-to-DB-25 adapter or DCE RJ-45-to-DB-9 adapter.

Table A-1 in the appendix "Cabling Specifications" lists the pinouts for the console port. The default parameters for the console port are as follows: 9600 baud, 8 data bits, no parity generated or checked, and 2 stop bits. The console port does not support hardware flow control.

Auxiliary Port Connections

An RJ-45 auxiliary asynchronous serial port is included on all router units. This port connects to a channel service unit/digital service unit (CSU/DSU) or protocol analyzer for network access, using an RJ-45-to-DB-25 adapter. Depending on the adapter used, it turns this port into a data communications equipment (DCE) device or a data terminal equipment (DTE) device. For connection to a CSU/DSU or protocol analyzer, you should use a DTE RJ-45 to DB-25 adapter. Table A-2 in the appendix "Cabling Specifications" lists the pinouts for this auxiliary port.

Network Connection Considerations

Read this section to prepare for your network connections.

Ethernet Connections

On models with an AUI Ethernet port, the Ethernet port is located on the far left of the rear panel. The port is labeled *AUI* (for attachment unit interface). Use standard 15-pin Ethernet transceiver cables or IEEE 802.3 AUI cables (neither are supplied) to connect the router directly to the network.

Three configurations are possible on the Ethernet AUI port (Ethernet cables are not shipped as standard):

- An Ethernet transition cable with slide-latch connectors can be used to connect the router directly to the media attachment unit (MAU) or transceiver.
- An Ethernet transition cable can be used as a flexible extension of the router Ethernet port. An Ethernet transition cable (802.3 AUI cable) will mate with the female end of a second Ethernet transition cable.
- An Ethernet transition cable with jackscrew connectors can be connected directly to the router Ethernet port.

On Ethernet Hub models (models 2505, 2516, and 2507) 8, 14, or 16 RJ-45 connectors are located at the extreme left side of the rear panel in one or two rows. The RJ-45 connectors are arranged in two rows, one above the other in 14 and 16 port models, or one row in 8 port models. The ports are labeled Ethernet 1 through 8 on the bottom row, and 9 through 16 on the top row on models 2505 and model 2507, and Ethernet 1 through 6 on the bottom row and 7 through 14 on the top row of the model 2516. Use standard 10BaseT cables for the network connections.

There is a switch to allow cross connection to another hub located below Ethernet port 14. The switch provides normal hub operation in the MDI position. Reset the switch to the MDI X position if cross connection to another hub is desired.

Token Ring Connections

On models with a Token Ring port (2502 and 2504), the Token Ring port is located on the far left of the rear panel. The port is labeled *TOKEN RING*. Use a standard 9-pin Token Ring lobe cable (not supplied) to connect the router directly to a media attachment unit (MAU).

Synchronous Serial Connections

The serial interface ports are located on the rear of the router to the right of the Ethernet or Token Ring connector. The ports are labeled *SERIAL 0* and *SERIAL 1*. (Read from left to right when facing the rear panel.) The serial ports are 60-pin, D-type subconnectors. All serial interfaces except the EIA-530 can be configured as DCE, using a DCE cable. All DTE serial ports require that external clocking be provided by a CSU/DSU or modem.

You must use a special serial cable to connect the router to a modem or CSU/DSU. This cable is available from us and is usually ordered with the system. The cable uses a DB-60 connector on the chassis end. See the appendix "Cabling Specifications"for cable pinouts. For ordering information, contact a customer service representative.

Note Because of the small size of the pins on the DB-60 serial connector, attempting to manufacture your own serial cables is not recommended.

Asynchronous Serial Connections

The asynchronous serial ports are located on the left side of the router rear panel to the left of the Token Ring or Ethernet port connector. The asynchronous serial ports are 68-pin SCSI connectors, one above the other (depending on model). Each of the two small computer system interface (SCSI) ports provide connections for eight asynchronous ports. The ports are labeled Async 1-8 on the lower port, and Async 9-16 on the upper port. Breakout cables that divide into eight RJ-45 connectors each are connected to the SCSI ports.

RJ-45 to DB-25 adapters are used to connect to external devices. RJ-45 to DB-25 adapters are available for either DTE or DCE connections. The adapter uses an RJ-45 connector on the chassis end. For ordering information contact a customer service representative.

BRI Connections

On models with a Basic Rate Interface (BRI) port, it is an RJ-45 8-pin connector located between the serial and console ports on model 2503 and model 2504, or between the serial and Ethernet ports on model 2516. Use an appropriate cable to connect the system directly to the Integrated Services Digital Network (ISDN) through the NT1. The common carrier will provide the NT1 connection worldwide, except in North America, where the NT1 is customer owned.

Warning Network hazardous voltages are accessible 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 accessible on the system card in the area of the BRI port (RJ-45 connector), regardless of whether power is turned off.

Inspecting the System

Do not unpack the router until you are ready to install it. If the final installation site will not be ready for some time, keep the chassis in its shipping container to prevent accidental damage. When you have determined where you want the router installed, proceed with the unpacking.

The router, cables, UniverCD or printed publications, and any optional equipment you ordered might be shipped in more than one container. When you unpack each shipping container, check the packing list to ensure that you received all of the following items:

- Router
- 6-foot (1.8-meter) power cord
- Jackscrews for the AUI connector
- Console cable (RJ-45 to RJ-45) with RJ-45-to-DB-25 and RJ-45-to-DB-9 adapters
- Rubber feet for desktop installation
- Optional equipment (such as network interface cables, asynchronous breakout cables, auxiliary cable, and so forth)
- Warranty package
- UniverCD and optional printed publications (including this publication), as specified by your order

Inspect all items for shipping damage. If anything appears damaged, or if you encounter problems when installing or configuring your system, contact a customer service representative.