



Text Part Number: 78-3890-02 Rev. A0

# Router Card (WS-X3011) Configuration Note

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This configuration note contains the following information for installing and configuring the router card (WS-X3011):

- Overview
- Safety Recommendations
- Preparing to Connect to a Network
- Installing the Router Card
- Connecting to a Network
- Configuring the Router Card
- Reading the LEDs
- Cable, Pinout, and Port Specifications
- Obtaining Service and Support
- Ordering Documentation

## Overview

The WS-X3011 router card must have software release 11.28 installed to fully support the WS-X3011 card. Cards with software release 11.0(11) can support the WS-X3011 card; however, the card will be identified as a Cisco 2503 unit instead of as a WS-X3011 card. For best results, upgrade to release 11.28 if your card is running a previous release. Your switch must be running software release 2.0(1) or higher.

Figure 1 shows the router card (WS-X3011).

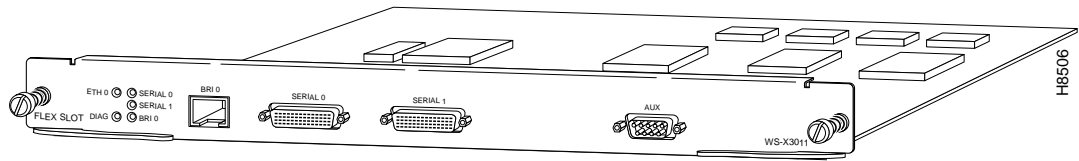
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**Figure 1 Model WS-X3011 Router Interface Card**



The specifications of the router card are listed in Table 1.

**Table 1 Router Card Specifications**

Description	Specification
Processor	20-MHz Motorola 68EC030
Memory	8-MB (minimum) dynamic random-access memory (DRAM) for main memory and shared memory
NVRAM	32-KB nonvolatile random-access memory (NVRAM) for storing configuration information
Flash	8-MB (minimum) flash memory for running the Cisco IOS software
Interfaces	1 Ethernet (IEEE <sup>1</sup> 802.3) (Internal) 2 Synchronous serial <sup>2</sup> (DB-60) 1 ISDN BRI (RJ-45) <sup>3</sup>
Safety	UL 1950, CSA 22.2-No. 950, Austel TS001, EN 60950, IEC 950
EMI	FCC Part 15 Class A, VCCI Class II, CISPR 22B, EN 55022 Class B, CE Marking, Canadian ICES-003 Class A

1 IEEE = Institute of Electrical and Electronic Engineers.  
 2 The synchronous serial interface supports the following standards in data terminal equipment (DTE) and data communications equipment (DCE) mode: EIA/TIA-232, EIA/TIA-449, V.35, and X.21. The EIA-530 standard is supported in DTE mode only.  
 3 External network terminal 1 (NT1) device required.

## Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- 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.



**Warning** This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide* for translations of the warnings in this document.



**Warning** Ultimate disposal of this product should be handled according to all national laws and regulations. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

## 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 weld the metal object to the terminals. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

- 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 switch by unplugging the power cord before doing the following:
  - Installing or removing a chassis
  - Working near power supplies



**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 translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)



**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 translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.



**Warning** Read the installation instructions before you connect the system to its power source. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, 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 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 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 between 1 to 10 megohms (Mohms).

## Preparing to Connect to a Network

When setting up your switch with a router card, consider distance limitations and potential electromagnetic interference (EMI) as defined by the EIA.



**Warning** The auxiliary ports contain safety extra-low voltage (SELV) circuits. BRI circuits are treated like telephone-network voltage (TNV) circuits. Avoid connecting SELV circuits to TNV circuits. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

## Console Port

The switch has a DB-9 console port that automatically detects baud rate. The default is 9600 baud; other supported baud rates are 1200, 2400, 4800, 19200, 38400, and 57600. Refer to the *Catalyst 3100 Installation and Configuration Guide* for detailed pin assignments for the cables you can use on the console port

## Console Pin Assignments

Table 4 and Table 5 and two figures (Figure 2 and Figure 3) detail pin-assignment information for the cables you can use on the console port of the switch.

## Terminal Connection

For a terminal connection, use a null-modem cable or a straight cable (EIA-232) with a null modem adapter attached. Refer to the *Catalyst 3100 Configuration and Installation Guide* for the EIA-232 cable description.

## Modem Connection

For a modem connection, use a standard modem (straight) cable.

## ISDN Connections

Use a BRI cable (not included) to connect the router directly to an ISDN port. (See Table 2.)



**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 translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)



**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 translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

Table 2 lists the specifications for ISDN BRI cables. Refer to the section “ISDN BRI Port and Cable Pinouts” for pinouts.

**Table 2** 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 (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)

<sup>1</sup> nF = nanoFarad.

## Synchronous Serial Connections

Before you connect a device to the synchronous serial port (labeled “SERIAL”), you will need to know the following:

- The type of device, DTE or DCE, you are connecting to the synchronous serial interface.
- The type of connector, male or female, required to connect to the device.
- The signaling standard required by the device.

## DTE or DCE

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 card. A DTE device does not provide a clock signal. DTE devices usually connect to DCE

devices. The documentation that came with the device should indicate whether it is a DTE or DCE device. (Some devices have a jumper to select either mode.) If you cannot find the information in the documentation, refer to Table 3 to help you select the proper device type.

**Table 3** Typical DTE and DCE Devices

Device Type	Gender	Typical Devices
DTE	Male <sup>1</sup>	Terminal PC Router
DCE	Female <sup>2</sup>	Modem CSU/DSU <sup>3</sup> 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.
- 3 CSU/DSU = Channel service unit/data service unit.

## Speed and 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 degrades significantly or is completely lost.

Table 4 lists the maximum speeds and distances for EIA/TIA-232 signals. This signaling standard supports unbalanced circuits at signal speeds up to 64 kbps.

**Table 4** EIA/TIA-232 Specifications

Data Rate (Baud)	Distance (Feet)	Distance (Meters)
2400	200	60
4800	100	30
9600	50	15
19200	50	15
38400	50	15
64000	25	7.6

Balanced drivers allow EIA/TIA-449 signals to travel greater distances than the EIA/TIA-232 signals. Table 5 lists the maximum speeds and distances for EIA/TIA-449, V.35, X.21, and EIA-530 signals.

**Table 5** EIA/TIA-449, V.35, X.21, and EIA-530 Specifications

Data Rate (Baud)	Distance (Feet)	Distance (Meters)
2400	4,100	1,250

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Data Rate (Baud)	Distance (Feet)	Distance (Meters)
4800	2,050	625
9600	1,025	312
19200	513	156
38400	256	78
56000	102	31

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**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.

## Signaling Standards

The synchronous serial port supports the following signaling standards: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530. You can order a DB-60 shielded serial transition cable that has the appropriate connector for the standard you specify. The router end of the shielded serial transition cable has a DB-60 connector, which connects to the serial port on the router card. The other end of the serial transition cable is available with the connector appropriate for the standard you specify. The documentation for the device you want to connect should indicate the standard used for that device. The synchronous serial port can be configured as DTE or DCE (except EIA-530, which is DTE only), depending on the attached cable.

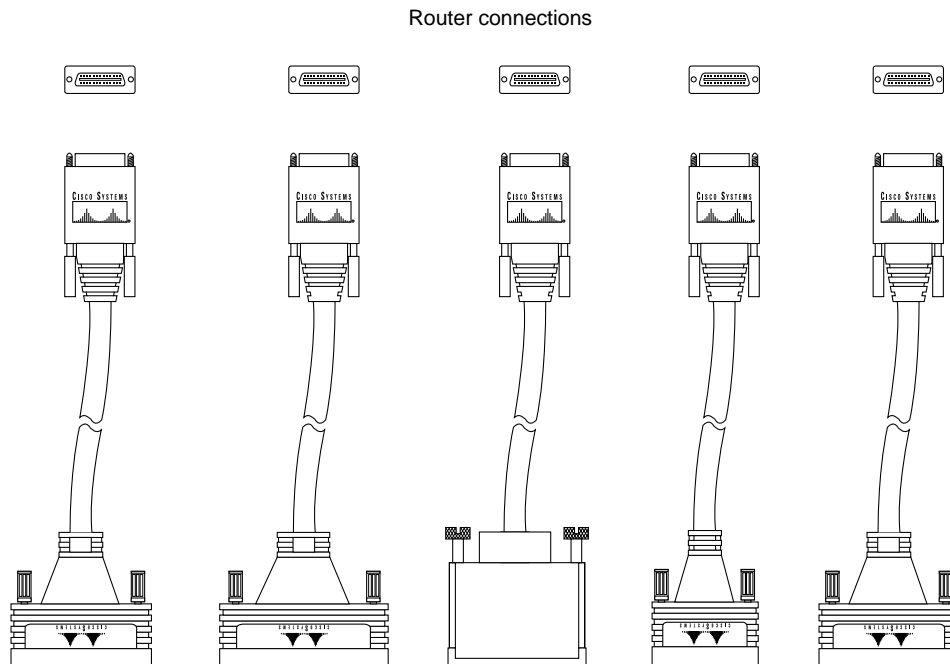
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**Note** All serial ports configured as DTE require external clocking from a CSU/DSU or other DCE device.

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Figure 2 shows the serial transition cables you can connect to the serial port on the router card.

Figure 2 Serial Transition Cables



Cisco does not recommend that you attempt to manufacture your own serial cables (because of the small size of the pins on the DB-60 serial connector). To order a cable, refer to the section “Obtaining Service and Support” at the end of this document. To manufacture your own cable, refer to the cable pinouts provided in the section “Cable, Pinout, and Port Specifications.”

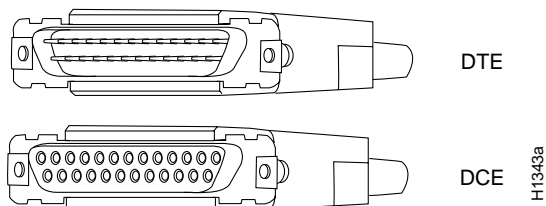
### EIA/TIA-232 Connections

The EIA/TIA-232 standard supports unbalanced circuits at signal speeds up to 64 kbps. The serial port (labeled “SERIAL”) supports *synchronous* connections. The console and auxiliary ports also use an EIA/TIA-232 connection; however, the console and auxiliary ports support *asynchronous* connections.

The network end of the EIA/TIA-232 serial transition cable (not included) provides a DB-25 connector, as shown in Figure 3. The end that connects to the serial port on the rear panel of the router has a DB-60 connector. EIA/TIA-232 serial transition cables are available with a DB-25 plug or receptacle in either DTE or DCE mode. To order a cable, refer to the section “Obtaining Service and Support.”



**Figure 3 EIA/TIA-232 Serial Transition Cable Connectors, Network End**

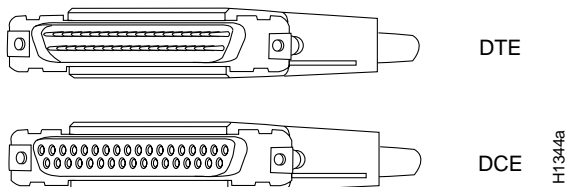


**EIA/TIA-449 Connections**

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

The network end of the EIA/TIA-449 serial transition cable (not included) provides a DB-37 connector, as shown in Figure 4. The end that connects to the serial port on the router card has a DB-60 connector. EIA/TIA-449 serial transition cables are available with a DB-37 plug or receptacle in either DTE or DCE mode. To order a cable, refer to the section “Obtaining Service and Support” at the end of this document.

**Figure 4 EIA/TIA-449 Serial Transition Cable Connectors, Network Ends**

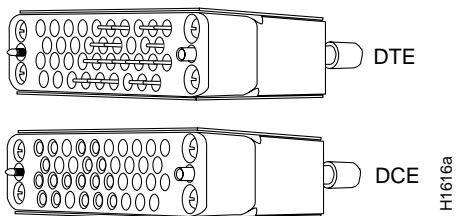


**V.35 Connections**

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

The network end of the V.35 serial transition cable (not included) provides a standard 34-pin Winchester-type connector, as shown in Figure 5. The end that connects to the serial port on the router card has a DB-60 connector. V.35 cables are available with a standard V.35 plug or receptacle in either DTE or DCE mode. To order a cable, refer to the section “Obtaining Service and Support” at the end of this document.

**Figure 5 V.35 Serial Transition Cable Connectors, Network Ends**

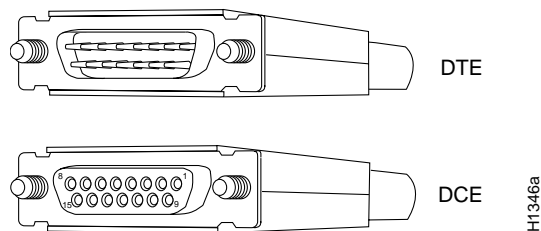


### X.21 Connections

The X.21 connector uses a 15-pin connector for balanced circuits and is commonly used in the United Kingdom to connect to the public data network. 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 serial transition cable (not included) is a standard DB-15 connector, as shown in Figure 6. The end that connects to the serial port on the router card has a DB-60 connector. X.21 cables are available with a plug or receptacle in either DTE or DCE mode. To order a cable, refer to the section “Obtaining Service and Support” at the end of this document.

**Figure 6 X.21 Serial Transition Cable Connectors, Network End**

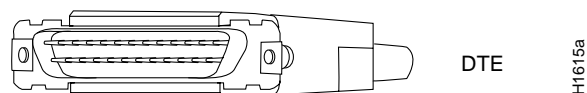


### EIA-530 Connections

The EIA-530 standard, 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 connector 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 speeds over short distances.

The EIA-530 serial transition cable (not included) 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, as shown in Figure 7. The end that connects to the serial port on the router card has a DB-60 connector. To order a cable, refer to the section “Obtaining Service and Support” at the end of this document.

**Figure 7 EIA-530 Serial Transition Cable Connector, Network End**



## Installing the Router Card

This section guides you through the installation of the router card and includes the following subsections:

- Required Tools and Equipment
- Connecting the Console Terminal
- Connecting to a Network

The Cisco configuration guide and command reference publications provide additional software configuration information. These publications are available in the CD ROM package that came with your switch, or you can order printed copies. Refer to the section “Ordering Documentation” at the end of this document.



**Warning** Only trained and qualified personnel should be allowed to install or replace this equipment. (To see translated versions of this warning, refer to the appendix “Translated Safety Warnings” in the *Catalyst 3100 Configuration and Installation Guide*.)

## Required Tools and Equipment

Installation requires some tools and equipment that are not provided as standard equipment with the router card. Following are the tools and parts required to install the router card:

- Flat-blade screwdrivers: small, 3/16-inch (0.476 cm) and medium, 1/4-inch (0.625 cm).
- ESD-preventive wrist strap.
- Cables for connection to the WAN ports:
  - Serial transition cable for connection to the synchronous serial port.
  - Cable for connection to the ISDN BRI port.

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**Note** For cable information, refer to the section “Preparing to Connect to a Network” in this document. For cable ordering information, refer to the section “Obtaining Service and Support” in this document.

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- CSU/DSU or other DCE device for connection to the synchronous serial interface.
- NT1 device for ISDN BRI WAN connections, if not supplied by your service provider.

## Connecting the Console

You must have a console connected to the switch to configure the router card after it is installed. If a console is connected to the switch already, proceed to the next section; otherwise, perform the following steps to connect a console to the switch:

- Step 1** Connect the switch to a PC or other DTE (Data Terminal Equipment) device using a straight, 25-pin to 9-pin EIA (RS)-232 cable and a null modem adapter. Refer to the section “Preparing to Connect to a Network” in this document for a description of the cables and adapters.
- Step 2** Connect the EIA-232 cable to the DB-9 connector (console) on the switch. The male DB-9 connector on the switch is configured as a DTE device.
- Step 3** Use Table 6 to set the configuration parameters on the console for communication with the switch.

**Table 6 Console Configuration Default Settings**

Console	Default
Baud rate	2400, 4800, 9600, 19.2K, 38.4K, 57.6K (default: 9600)
Parity	None

Data bits	8
Stop bits	1
Handshaking	None
Terminal emulation	VT100
Duplex	Full
Soft flow control (XON/XOFF)	Off (input and output)
Hard flow control (RTS/CTS)	Off
Autobaud upon break	On
Line wrap	On
Screen scroll	On
CR translation	CR
Backspace (BS) translation	Destructive
Break length (milliseconds)	350
Enquiry (ENQ)	Off
EGA/VGA true underline	Off
Terminal width	890
ANSI 7 or 8 bit commands	7
Microsoft Windows™, terminal emulation	Disable the “Use Function, Arrow, and Ctrl Keys for Windows” option, located in the Terminal Preference menu

**Step 4** Power on the switch.

At power on (cold boot), the switch performs a series of self-test diagnostics that verify that hardware components are functioning. The diagnostic self-test for the switch displays two different screens (lists of information), depending on whether you perform a cold boot (power on cycle with full diagnostics), or a warm boot (a reset without full diagnostics). For detailed information about these diagnostics, refer to the *Catalyst 3X00 Installation and Configuration Guide*.

At the end of the boot messages, you should be prompted to press RETURN. The Greeting screen of the switch Console Manager should appear, as shown in Figure 8.

If the diagnostic list does not appear, or the list is garbled, refer to the “Encountering Communication Problems” section in this document..

**Step 5** At the Greeting screen, press RETURN to enter the Main menu. The contents of the Main menu, instructions for setting a Password and all information within the menus and sub-menus are described in the *Catalyst 3X00 Installation and Configuration Guide*.

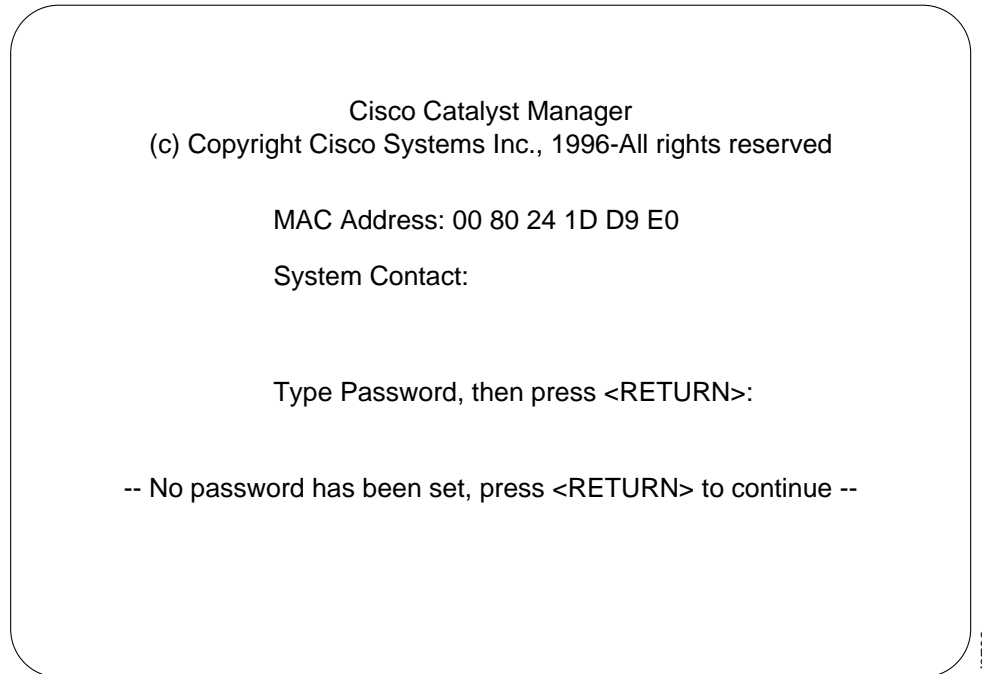
**Step 6** Access the router card command-line interface by pressing Ctrl-R from the switch Main menu.

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**Note** You can toggle back and forth between the two console interfaces by pressing Ctrl-R.

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**Figure 8** Greeting Screen



## Encountering Communication Problems

To adjust the baud rates between the console and the switch if the diagnostic list does not appear or the list is garbled, use the Autobaud routine within the switch. Press the Reset button on the switch and wait for the internal diagnosis to finish (the Diagnostic LED goes off). Resetting the switch resets the Autobaud routine to its default mode of enabled.

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**Note** Do not press the Reset button on the switch if it is connected to other switches in a Stack configuration. Pressing the Reset button will cause the switch to disconnect from the Stack and might cause Stack configuration information to change.

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The console command keys that initiate the Autobaud routine depend on the type of console. Four of the command keys are RETURN, the combination keys ALT-B, the BREAK key, or ESCAPE.

After the DIAG LED goes out, at the console press one of the command keys repeatedly. If there is no response, wait several seconds and again press it repeatedly. If there is still no response, perform the same routine using the other command keys.

If none of the command keys work but there is garbled output on the screen, push the SysReq button on the switch. As soon as garbled characters appear, press the console's RETURN key twice in rapid succession. (Again, try the other command keys as necessary.)

If there is still a problem, perform the following steps:

- Step 1** Check all of the cable connections.
- Step 2** Check the baud rate at the console's setup screen; make sure the baud rate is set to the default, 9600.
- Step 3** Set the console baud rate to different values up or down, pressing RETURN after each selection.
- Step 4** If you are using a terminal emulation program, try exiting the program and restarting.
- Step 5** If you still can not get the connection to work, contact a support person.

## Connecting to a Network

This section explains how to connect the router card to your network. The synchronous serial and ISDN ports are used to connect the router to a WAN.

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**Note** The Cisco WS-X3011 router card complies with Part 68 of the FCC rules. For information about this rule, see the section "FCC Part 68 Notice" at the end of this document.

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The cables required to connect the router card to a network are not provided with the card. For ordering information, refer to the section "Obtaining Service and Support" in this document. For cable pinouts, refer to the section "Cable, Pinout, and Port Specifications" in this document.



**Warning** Do not work on the system or connect or disconnect cables during periods of lightning activity. (To see translated versions of this warning, refer to the appendix "Translated Safety Warnings" in the *Catalyst 3X00 Configuration and Installation Guide*.)

Take the following steps to connect your router card to a network:

- Step 1** If you will be using AutoInstall to configure the router card, connect the synchronous serial port (DB-60) to a CSU/DSU or other DCE device, as shown in Figure 9. If you do not plan to use AutoInstall (or you are not sure what AutoInstall is) do not connect the WAN cable until after you have configured the router card.

If a WAN cable is connected when you power ON the switch with the router card for the first time, it will attempt to run AutoInstall to download a configuration file from a TFTP server. It can take several minutes for the router card to determine that the necessary files are not in place for AutoInstall to begin. For more information about AutoInstall, refer to the Cisco IOS configuration guide, which is available in the CD ROM package that came with your switch.

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**Note** Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more up to date than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at <http://www.cisco.com>, <http://www-china.cisco.com>, or <http://www-europe.cisco.com>.

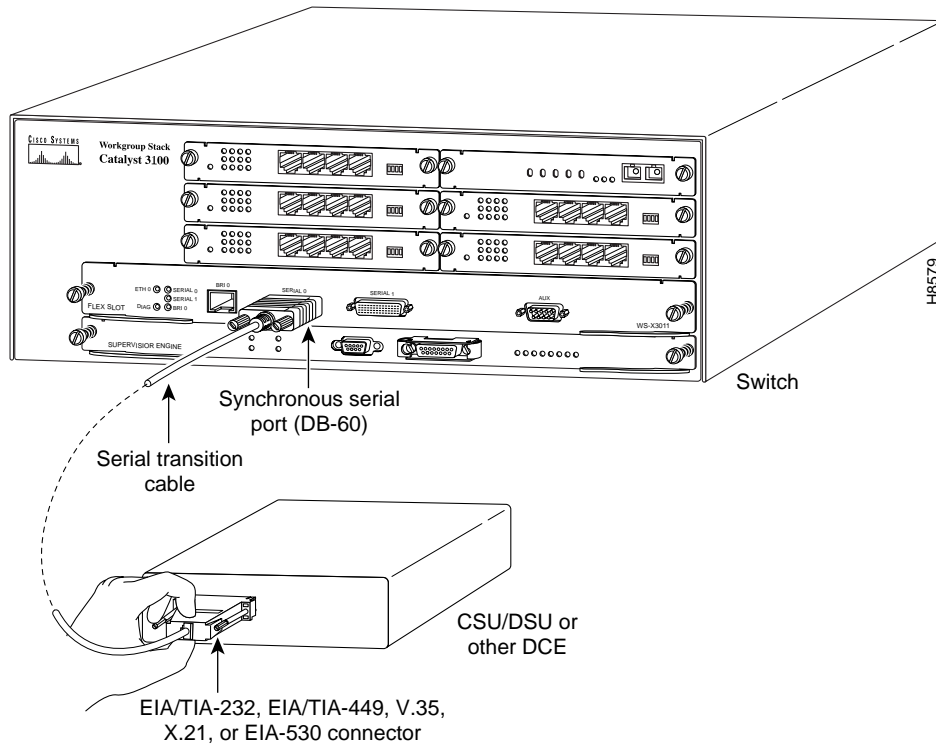
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**Note** The synchronous serial port supports the following signaling standards: EIA/TIA-232, EIA/TIA-449, V.35, X.21, and EIA-530.

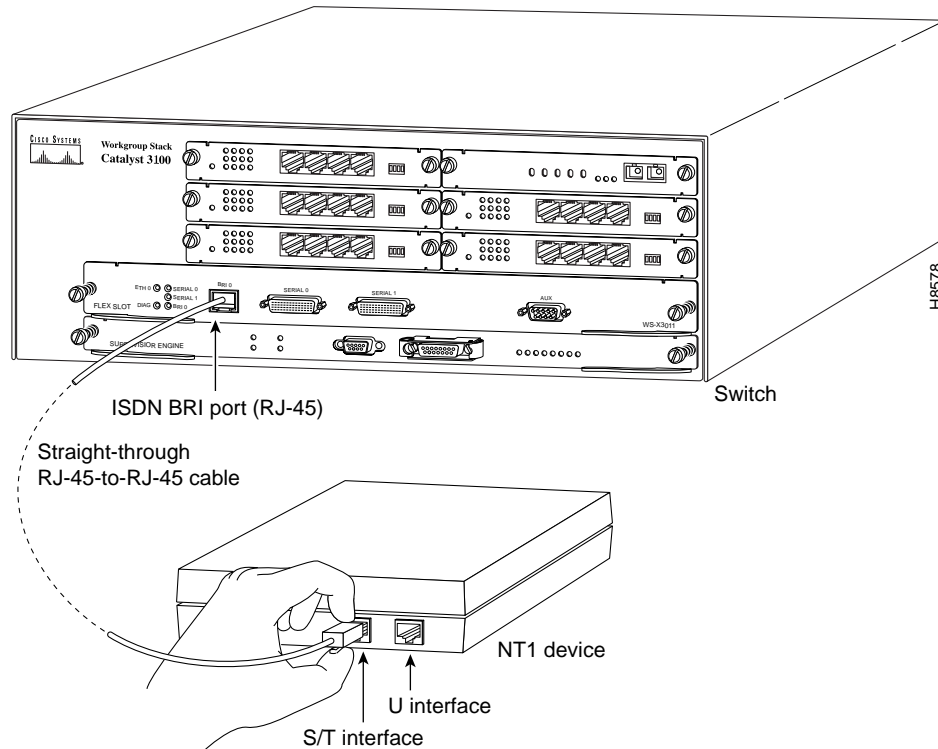
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**Figure 9** Connecting a CSU/DSU or Other DCE Device



- Step 2** Connect the ISDN BRI port (RJ-45) to an NT1 device. (See Figure 10.)
- Step 3** After you have installed the router card, connect the power cable to the switch and the power source and then power it ON. (If the switch does not power ON, refer to the appropriate manual for the switch.)

Figure 10 Connecting an NT1 Device



## Configuring the Router Card

This section describes how to configure the router card and contains the following topics:

- Booting the Switch with the Router Card for the First Time
- Configuring the Router Card for the First Time
- Cisco IOS Software Basics
- Configuring ISDN
- Verifying Network Connectivity
- Getting More Information

This section provides minimum software configuration information. Detailed software configuration information is available in the Cisco IOS configuration guide and command reference publications. These publications are available in the CD ROM package or you can order printed copies. Refer to the section “Ordering Documentation” at the end of this document.

## Access the Router Card Command-Line Interface

To access the router card command-line interface (CLI), perform the following steps:

- Step 1** Connect a console terminal to the console port on your switch. (For more information, refer to the “Connecting the Console” section in this document.)



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**Note** The default parameters for the internal console port on the router card are 9600 baud, 8 data bits, no parity, and 1 stop bit. This default baud rate matches the switch console baud rate. Do not change the default baud rate. If it has been changed, press **Ctrl-B** to toggle through the available baud rates to restore the default.

Although the router card CLI is based on the Cisco IOS CLI, pressing Ctrl-B does not function as a backspace key as it normally does in the Cisco IOS CLI; instead, it is used to change the console baud rate.

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**Step 2** Power ON the switch. The switch Greeting screen appears (Figure 8).

**Step 3** Access the router card CLI by pressing Ctrl-R from the switch Main menu.

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**Note** You can toggle back and forth between the two CLIs by pressing Ctrl-R.

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After about 30 seconds, messages are displayed, corresponding to the Cisco IOS release and feature set you selected. The screen displays in this section are for reference only and might not exactly reflect the screen displays on your console. Following is an example of the messages displayed:

```
System Bootstrap, Version X.X(XXXX) [XXXXX XX], RELEASE SOFTWARE
Copyright (c) 1986-199X by Cisco Systems
2500 processor with 4096 Kbytes of main memory
```

```
Notice: NVRAM invalid, possibly due to write erase.
```

```
F3: 5797928+162396+258800 at 0x3000060
Restricted Rights Legend
```

```
Use, duplication, or disclosure by the Government is
subject to restrictions as set forth in subparagraph
(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.
```

```
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706
```

```
Cisco Internetwork Operating System Software
IOS (tm) X000 Software (XXX-X-X), Version XX.X(XXXX) [XXXXX XXX]
Copyright (c) 1986-199X by Cisco Systems, Inc.
Compiled Fri 20-Oct-9X 16:02 by XXXXX
Image text-base: 0x03030FC0, data-base: 0x00001000
Cisco 25XX (68030) processor (revision A) with 4092K/2048K bytes of memory.
Processor board ID 00000000
Bridging software.
SuperLAT software copyright 1990 by Meridian Technology Corp).
X.25 software, Version X.X, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Basic Rate ISDN software, Version X.X.
1Ethernet/IEEE 802.3 interface.
2 Serial network interfaces.
1 ISDN Basic Rate interface.
32K bytes of non-volatile configuration memory.
8192K bytes of processor board System flash (Read ONLY)
```

```
Notice: NVRAM invalid, possibly due to write erase.
--- System Configuration Dialog ---
```

```
At any point you may enter a question mark '?' for help.
Refer to the 'Getting Started' Guide for additional help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '['].
Would you like to enter the initial configuration dialog? [yes]:
```

## Booting the Switch with the Router Card for the First Time

Each time you power on the switch, the router card performs the following boot sequence:

- 1 The router card performs power-on self-test diagnostics to verify basic operation of the CPU, memory, and interfaces.

- 2 The system bootstrap software (boot image) executes and searches for a valid Cisco IOS image (router operating system software). The source of the Cisco IOS image (Flash memory or a Trivial File Transfer Protocol [TFTP] server) is determined by the configuration register setting. The factory-default setting for the configuration register is 0x2102, which indicates that the router card should attempt to load a Cisco IOS image from Flash memory.
- 3 If after five attempts a valid Cisco IOS image is not found in Flash memory, the router card reverts to boot ROM mode (which is used to install or upgrade a Cisco IOS image).
- 4 If a valid Cisco IOS image is found, then the router card searches for a valid configuration file.
- 5 If a valid configuration file is not found in NVRAM, the router card runs the System Configuration Dialog so you can configure the card manually. For normal operation, there must be a valid Cisco IOS image in Flash memory and a configuration file in NVRAM.

The first time you boot your switch with the router card, you need to configure the router interfaces and then save the configuration to a file in NVRAM.

## Configuring the Router Card for the First Time

You can configure the router card using one of the following procedures. Each procedure is described in detail later in this section:

- Using the System Configuration Dialog—Recommended if you are **not** familiar with Cisco IOS commands.
- Configuration mode—Recommended if you **are** familiar with Cisco IOS commands.
- AutoInstall—Recommended for automatic installation if a router running Cisco IOS software is installed on the network. This configuration method must be set up by someone with experience using Cisco IOS software.



**Timesaver** Before you begin to configure the router card, obtain the correct network addresses from your system administrator or consult your network plan to determine the correct addresses.

Use the procedure that best fits the needs of your network configuration and Cisco IOS software experience level. If you will be using configuration mode or AutoInstall to configure the router card, and you would like a quick review of the Cisco IOS software, refer to the section “Cisco IOS Software Basics” later in this chapter. Otherwise, proceed with the next section, “Using the System Configuration Dialog.”

### Using the System Configuration Dialog

If you do **not** plan to use AutoInstall, make sure all the WAN cables are disconnected from the router card. This will prevent the router card from attempting to run the AutoInstall process. The router card will attempt to run AutoInstall whenever you power it ON, if there is a WAN connection on both ends and the router card does not have a configuration file stored in NVRAM. The router card can take several minutes to determine that AutoInstall is not connected to a remote TCP/IP host.

If your router card does not have a configuration (setup) file and you are not using AutoInstall, the router card will automatically start the setup command facility. An interactive dialog called the System Configuration Dialog appears on the console screen. This dialog helps you navigate through the configuration process, prompting you for the configuration information necessary for the router card to operate.

Many prompts in the System Configuration Dialog include default answers, which are included in square brackets following the displayed question. To accept a default answer, press **Return**; otherwise, enter your response.

This section gives an example configuration using the System Configuration Dialog. When you are configuring your router card, respond as appropriate for your network.

At any time during the System Configuration Dialog, you can request help by typing a question mark (?) at a prompt.

Before you begin to configure the router card, obtain the correct addresses and the number of bits in the subnet field (if applicable) of the router ports from you system administrator.

Take the following steps to configure the router card using the System Configuration Dialog:

**Step 1** When you are prompted to enter the initial dialog, enter **yes** or press **Return** to enter the initial dialog mode:

```
Would you like to enter the initial dialog? [yes]: yes
```

**Step 2** When the System Configuration Dialog asks whether you want to view the current interface summary, press **Return** or enter **yes**:

```
First, would you like to see the current interface summary? [yes]:
```

```
Any interface listed with OK? value "NO" does not have a valid configuration
```

Interface	IP-Address	OK?	Method	Status	Protocol
Ethernet0	unassigned	NO	not set	up	down
BRI0	unassigned	NO	not set	up	up
Serial0	unassigned	NO	not set	down	down
Serial1	unassigned	NO	not set	down	down

**Step 3** Configure the global parameters. A typical configuration follows:

```
Configuring global parameters:
```

```
Enter host name [Router]:
```

Next, you are prompted to enter an enable secret password. There are two types of privileged-level passwords:

- Enable secret password (a very secure, encrypted password)
- Enable password (a less secure, nonencrypted password)

The enable password is used when the enable secret password does not exist.

For maximum security, be sure the passwords are different. If you enter the same password for both, the router card will accept your entry, but will display a warning message indicating that you should enter a different password.

**Step 4** Enter an enable secret password:

```
The enable secret is a one-way cryptographic secret used instead of the enable password when it exists.
```

```
Enter enable secret: pa1l
```

```
The enable password is used when there is no enable secret and when using older software and some boot images.
```

**Step 5** Enter the enable and virtual terminal passwords:

```
Enter enable password: shovel
Enter virtual terminal password: vterm1
```

**Step 6** Press **Return** to accept Simple Network Management Protocol (SNMP) management, or enter **no** to refuse it:

```
Configure SNMP Network Management? [yes]: no
```

**Step 7** In the following example, the router card is configured for AppleTalk, Internet Protocol (IP), and Internetwork Packet Exchange (IPX). Configure the appropriate protocols for your router card:

```
Configure Vines? [no]:
Configure LAT? [no]:
Configure AppleTalk? [no]: yes
  Multizone networks? [no]: yes
Configure DECnet? [no]:
Configure IP? [yes]:
  Configure IGRP routing? [yes]:
    Your IGRP autonomous system number [1]: 15
Configure CLNS? [no]:
Configure bridging? [no]:
Configure IPX? [no]: yes
Configure XNS? [no]:
Configure Apollo? [no]:
```

**Step 8** Enter the ISDN BRI switch type. The switch type appropriate for the router depends on the ISDN service provider's equipment. Table 7 lists the ISDN switch types.

```
Enter ISDN BRI Switch Type [none]: basic-5ess
```

**Table 7** ISDN Switch Types

Country	ISDN Switch Type	Description
Australia	<b>basic-ts013</b>	Australian TS013 switches
Europe	basic-1tr6	German 1TR6 ISDN switches
	basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
	basic-net3	NET3 ISDN switches (UK and others)
	basic-net5	NET5 switches (UK and Europe)
	vn2	French VN2 ISDN switches
	vn3	French VN3 ISDN switches
Japan	ntt	Japanese NTT ISDN switches
New Zealand	basic-nznet3	New Zealand NET3 switches
North America	basic-5ess	AT&T basic rate switches
	basic-dms100	NT DMS-100 basic rate switches
	basic-ni1	National ISDN-1 switches

### Configuring the ISDN BRI Interface

The ISDN BRI interface is configured to allow connection to ISDN WANs. Determine which protocols to support on the ISDN BRI interface and enter the appropriate responses. In the following example, the router card is configured for IP, AppleTalk, and IPX:

```
Configuring interface BRI0:
Is this interface in use? [yes]
Configure IP on this interface? [yes]
IP address for this interface: 172.16.71.1
Number of bits in subnet field [0]: 8
Class B network is 172.16.0.0, 8 subnet bits; mask is
255.255.255.0
Configure AppleTalk on this interface? [no]: yes
Extended AppleTalk network? [no]: yes
AppleTalk starting cable range [0]: 1
AppleTalk ending cable range [1]: 2
AppleTalk zone name [myzone]:
AppleTalk additional zone name: otherzone
AppleTalk additional zone name:
Configure IPX on this interface? [no]: yes
IPX network number [1]: B000
```

After you have completed the entire initial router card interface configuration using the System Configuration Dialog, proceed to the section “Configuring ISDN” later in this document for additional ISDN configuration information.

### Configuring the Ethernet Interface

The Ethernet interface is configured to allow connection to a LAN. To configure the interface parameters, you need to know your Ethernet interface network addresses.

Take the following steps to configure an Ethernet interface to allow communication over a LAN:

**Step 1** Press **Return** or enter **yes** to configure the LAN interface:

```
Configuring interface Ethernet0:
Is this interface in use? [yes]:
```

**Step 2** Determine which protocols you want to support on the LAN interface and enter the appropriate responses. In the following example, the system is configured for IP, AppleTalk, and IPX:

```
Configure IP on this interface? [yes]:
IP address for this interface: 172.16.72.1
Number of bits in subnet field [8]: 8
Class B network is 172.16.0.0, 8 subnet bits; mask is
255.255.255.0
Configure AppleTalk on this interface? [no]: yes
Extended AppleTalk network? [no]: yes
AppleTalk starting cable range [0]: 3
AppleTalk ending cable range [1]: 3
AppleTalk zone name [myzone]:
AppleTalk additional zone name: otherzone
AppleTalk additional zone name:
Configure IPX on this interface? [no]: yes
IPX network number [1]: B001
```

### Configuring the Synchronous Serial Interfaces

The synchronous serial interfaces are configured to allow connection to WANs. After the Ethernet port has been configured, configure the synchronous serial interfaces as follows:

**Step 1** Press **Return** or enter **yes** to configure serial port 0:

```
Configuring interface Serial0:
Is this interface in use? [yes]:
```

**Step 2** Determine which protocols you want on the synchronous serial interface and enter the appropriate responses. In the following example, the system is configured for IP, AppleTalk, and IPX:

```
Configure IP on this interface? [yes]:
Configure IP unnumbered on this interface? [no]:
IP address for this interface: 172.16.73.1
Number of bits in subnet field [8]:
Class B network is 172.16.0.0, 8 subnet bits; mask is
255.255.255.0
Configure AppleTalk on this interface? [no]: yes
Extended AppleTalk network? [yes]:
AppleTalk starting cable range [2]: 4
AppleTalk ending cable range [3]: 4
AppleTalk zone name [myzone]: ZZ Serial
AppleTalk additional zone name:
Configure IPX on this interface? [no]: yes
IPX network number [2]: B002
```

**Step 3** Configure the second synchronous serial interface, for example, as follows:

```
Configuring interface Serial1:
Is this interface in use? [yes]:
Configure IP on this interface? [yes]:
Configure IP unnumbered on this interface? [no]:
IP address for this interface: 172.16.74.2
Number of bits in subnet field [8]:
Class B network is 172.16.0.0, 8 subnet bits; mask is
255.255.255.0
Configure AppleTalk on this interface? [no]: yes
AppleTalk starting cable range [3]: 5
AppleTalk ending cable range [4]: 5
AppleTalk zone name [myzone]: ZZ Serial
AppleTalk additional zone name:
Configure IPX on this interface? [no]: yes
IPX network number [3]: B003
```

**Step 4** The configuration you entered is now displayed and you are asked if you want to use the displayed configuration. If you enter **no**, you will lose the configuration information you just entered and you can begin the configuration again. If you enter **yes**, the configuration will be entered and saved in the startup configuration:

```
Use this configuration? [yes/no]: yes
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.
```

```
Press RETURN to get started!
```

Proceed to the section “Cisco IOS Software Basics” for more information about the Cisco IOS software.

### Using Configuration Mode

You can configure the router card manually if you do not want to use AutoInstall or the prompt-driven System Configuration Dialog. Perform the following steps to configure the router card manually:

- Step 1** When you are prompted to enter the initial dialog, enter **no** to enter the normal operating mode of the router card:

```
Would you like to enter the initial dialog? [yes]: no
```

- Step 2** After a few seconds you will see the user EXEC prompt (Router>). Enter the **enable** command to enter privileged EXEC mode. You can only make configuration changes in privileged EXEC mode:

```
Router> enable
```

The prompt changes to the privileged EXEC prompt:

```
Router#
```

- Step 3** Enter the **configure terminal** command at the privileged EXEC prompt to enter configuration mode:

```
Router# configure terminal
```

You can now enter any changes you want to the configuration. You will probably want to perform the following tasks:

- (a) Assign a host name for the router using the **hostname** command.
- (b) Enter an enable secret password using the **enable password** command.
- (c) Assign addresses to the interfaces using the *protocol* **address** command.
- (d) Specify which protocols to support on the interfaces.

Refer to the Cisco IOS configuration guide and command reference publications for more information about the commands you can use to configure the router card. These manuals are available on CD ROM and in printed form. Refer to the section “Ordering Documentation” at the end of this document for information about how to obtain these documents.

- Step 4** When you are finished configuring the router card, enter the **exit** command until you return to the privileged EXEC prompt (Router#).

- Step 5** To save the configuration changes to NVRAM, enter the **copy running-config startup-config** command at the privileged EXEC prompt.

```
Router# copy running-config startup-config  
*****
```

The router card will now boot with the configuration you entered.



## Using AutoInstall

The AutoInstall process is designed to configure the router card automatically after connection to your WAN. In order for AutoInstall to work properly, a Transmission Control Protocol/Internet Protocol (TCP/IP) host on your network must be preconfigured to provide the required configuration files. The TCP/IP host may exist anywhere on the network as long as the following two conditions are maintained:

- 1 The host must be on the remote side of the router card's synchronous serial connection to the WAN.
- 2 User Datagram Protocol (UDP) broadcasts to and from the router card and the TCP/IP host must be enabled.

This functionality is coordinated by your system administrator at the site where the TCP/IP host is located. You should not attempt to use AutoInstall unless the required files have been provided on the TCP/IP host. For more information, refer to the Cisco IOS configuration guide and command reference publications. These manuals are available on CD ROM and in printed form. Refer to the section "Ordering Documentation" at the end of this document for information about how to obtain these documents.

After powering on the switch, the router interface loads the operating system image from Flash memory. If the remote end of the WAN connection is connected and properly configured, the AutoInstall process begins automatically.

After AutoInstall completes successfully, enter the **copy running-config startup-config** command in privileged EXEC mode to write the configuration data to the router card's NVRAM:

```
Router# copy running-config startup-config
```

The configuration settings created by the AutoInstall process are saved in the router card's NVRAM. If you do not save the configuration to NVRAM, the configuration will be lost the next time you reload the router card.

## Router Card Configuration

Some parameters are configurable from the switch Main Menu. These parameters govern the bootup process, router reset, and router flow control and provide access to the router command line interface. To configure these parameters follow these steps:

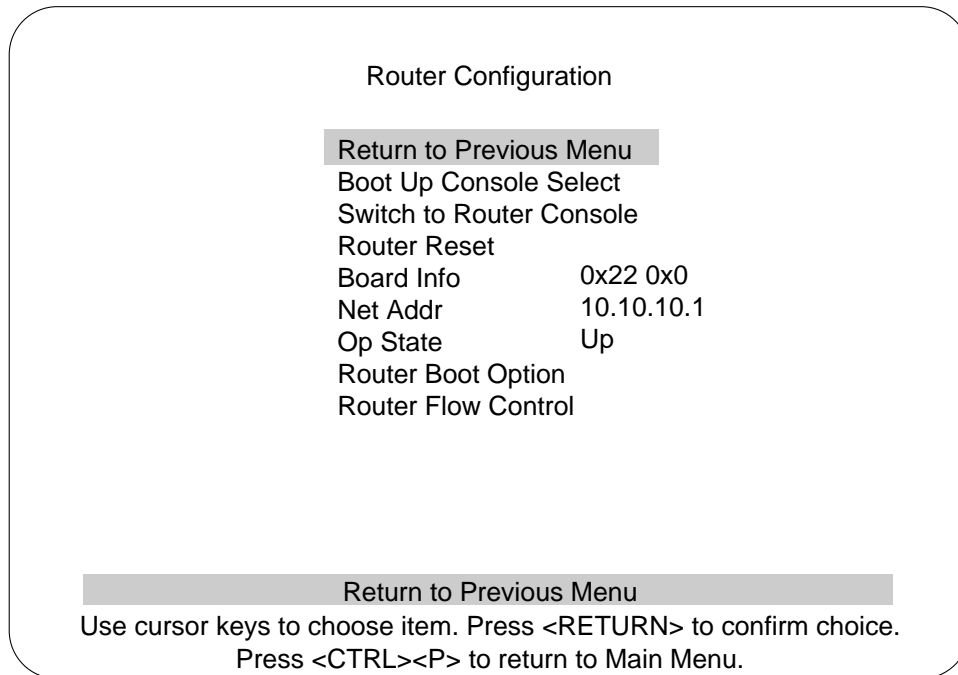
- Step 1** From the switch Main Menu, select **Configuration>Router Configuration**. The Router Configuration menu appears, as shown in Figure 11.
- Step 2** At the `Enter a port in box, port format (e.g. 2,15)` prompt, enter the number of the Catalyst box containing the router card and the number of the port.

---

**Note** If you do not know which port belongs to the router card, you can list a box's port assignments by selecting **Configuration>Port Configuration** from the switch Main Menu. The port designated WAN3011 is the correct port.

---

Figure 11 Router Configuration Menu



The options on the menu are as follows:

- Boot Up Console Select – Displays two boot-up choices: switch and router. You can set the default boot-up console to be either the switch Main Menu or the router command-line interface.
- Switch to Router Console – Provides access to the router command line interface. This option functions the same as pressing **^R**. To return to the switch menus from the router command line interface, press **^R**.
- Router Reset – Resets the router card without resetting the switch.
- Board Info – Displays information about the board.
- Net Addr – Displays the IP address of the Ethernet port (e0) that connects the router card to the switch.
- Op State – Displays the operational state of the router card.
- Router Boot Option – Displays two choices for the default bootup procedure: With Switch, and Leave Alone. Selecting With Switch forces the router card to reboot whenever the switch is rebooted. Selecting Leave Alone sets the router card to remain running whenever the switch is rebooted.
- Router Flow Control – Displays two choices: None, and Software Flow Control. The default is None. If characters are not displayed correctly on the router CLI, change the router flow control to software flow control.

## Cisco IOS Software Basics

This section provides you with some basic information about the Cisco IOS software, and includes the following topics:

- Cisco IOS Modes of Operation

- Getting Context-Sensitive Help
- Saving Configuration Changes

## Cisco IOS Modes of Operation

The Cisco IOS software provides access to several different command modes. Each command mode provides a different group of related commands.

For security purposes, the Cisco IOS software provides two levels of access to commands: user and privileged. The unprivileged user mode is called user EXEC mode. The privileged mode is called privileged EXEC mode and requires a password. The commands available in user EXEC mode are a subset of the commands available in privileged EXEC mode.

Table 8 describes some of the most commonly used modes, how to enter the modes, and the resulting prompts. Each prompt helps you identify which mode you are in and, therefore, which commands are available to you.

**Table 8 IOS Modes of Operation**

Mode of Operation	Usage	How to Enter the Mode	Prompt
User EXEC	User EXEC commands allow you to connect to remote devices, change terminal settings on a temporary basis, perform basic tests, and list system information. The EXEC commands available at the user level are a subset of those available at the privileged level.	Log in.	Router>
Privileged EXEC	Privileged EXEC commands set operating parameters. The privileged commands include those contained in user EXEC mode, and also the <b>configure</b> command through which you can access the remaining command modes. Privileged EXEC mode also includes high-level testing commands, such as <b>debug</b> .	From user EXEC mode, enter the <b>enable</b> EXEC command.	Router#
Global configuration	Global configuration commands apply to features that affect the system as a whole.	From global configuration mode, enter the <b>configure</b> privileged EXEC command.	Router(config)#
Interface configuration	Interface configuration commands modify the operation of an interface such as an Ethernet or serial port. Many features are enabled on a per-interface basis. Interface configuration commands always follow an interface global configuration command, which defines the interface type.	From global configuration mode, enter the <b>interface type number</b> command. For example, enter the <b>interface serial 0</b> command to configure the serial 0 interface.	Router(config-if)#

Mode of Operation	Usage	How to Enter the Mode	Prompt
ROM monitor	ROM monitor commands are used to perform low-level diagnostics. You can also use the ROM monitor commands to recover from a system failure and stop the boot process in a specific operating environment. <sup>1</sup>	From privileged EXEC mode, enter the <b>reload</b> EXEC command. Press Break during the first 60 seconds while the system is booting.	>

---

<sup>1</sup> You can modify the configuration register value using the config-reg configuration command. Refer to the Cisco IOS configuration guide for more information.

Almost every configuration command also has a **no** form. In general, use the no form to disable a feature or function. Use the command without the keyword **no** to reenab a disabled feature or to enable a feature that is disabled by default. For example, IP routing is enabled by default. To disable IP routing, enter the **no ip routing** command. Enter **ip routing** to reenab it. The Cisco IOS software command reference publication provides the complete syntax for the configuration commands and describes what the **no** form of a command does. This manual is available on CD ROM and in printed form. Refer to the section “Ordering Documentation” at the end of this document for information about how to obtain these documents.

### Getting Context-Sensitive Help

In any command mode, you can get a list of available commands by entering a question mark (?).

```
Router> ?
```

To obtain a list of commands that begin with a particular character sequence, type in those characters followed immediately by the question mark (?). Do not include a space. This form of help is called word help, because it completes a word for you.

```
Router# co?
configure connect copy
```

To list keywords or arguments, enter a question mark in place of a keyword or argument. Include a space before the question mark. This form of help is called command syntax help because it reminds you which keywords or arguments are applicable based on the command, keywords, and arguments you have already entered.

```
Router# configure ?
memory    Configure from NV memory
network   Configure from a TFTP network host
terminal  Configure from the terminal
<cr>
```

You can also abbreviate commands and keywords by entering just enough characters to make the command unique from other commands. For example, you can abbreviate the **show** command to **sh**.

### Saving Configuration Changes

Any time you make changes to the router configuration, you must save the changes to memory. If you do not, they will be lost in the event of a system reload or power outage. There are two types of configuration files: the running (current operating) configuration and the startup configuration. The running configuration is stored in RAM; the startup configuration is stored in NVRAM.

To display the current running configuration, enter the **show running-config** command. Enter the **copy running-config startup-config** command to save the current running configuration to the startup configuration file in NVRAM.

```
Router> enable
Router# copy running-config startup-config
```

To display the startup configuration, enter the **show startup-config** command. Enter the **copy startup-config running-config** command to write the startup configuration to the running configuration:

```
Router> enable
Router# copy startup-config running-config
```

To erase both configuration files (and start over), enter the **write erase** and **reload** commands:

```
Router> enable
Router# write erase
Router# reload
```



**Caution** This command sequence will erase the entire router configuration in RAM and NVRAM and reload the router.

## Configuring ISDN

This section describes a typical ISDN configuration for one or two B channels. In the examples that follow, the BRI port is configured for IP routing, Challenge Handshake Authentication Protocol (CHAP), and Point-to-Point Protocol (PPP) encapsulation.

For your reference, an example configuration follows in the next section, “Example ISDN Configuration.” You may want to refer to it during this procedure.

Take the following steps to configure the router for a basic ISDN PPP connection on a single B channel or two B channels, substituting the correct addresses and host names as appropriate for your network:

**Step 1** Enter privileged EXEC mode:

```
Router> enable
password: enablepassword
```

**Step 2** Enter the **configure terminal** command to enter global configuration mode. Then enter the host name of the current router, the user name of the target router (the router to which packets will be sent), and the password that the routers will use for CHAP caller identification. The user name and password are case sensitive and must match the host name and password of the target router (even if it is not a Cisco router):

```
Router# configure terminal
Router (config)# hostname currentrouter
Router (config)# username targetrouter password abc
```

**Step 3** Enter the **isdn switch-type** command to configure the ISDN switch type (such as basic-5ess, basic-dms100, or basic-ni1). Refer to Table 7, earlier in this chapter, for a list of ISDN switch types supported.

```
Router (config)# isdn switch-type switch-type
```

- Step 4** Configure the IP address and subnet mask for the LAN interface:

```
Router (config)# interface type port_number
Router (config-if)# ip address ipaddress subnetmask
```

- Step 5** Configure the IP address and subnet mask for the BRI interface:

```
Router (config-if)# interface bri port_number
Router (config-if)# ip address ipaddress subnetmask
```

- Step 6** If you are using an ISDN switch type (such as Basic NI1 or DMS-100) that requires a service profile identifier (SPID), enter the SPID and optional local directory number (LDN). The SPID and LDN are assigned by the ISDN service provider.

The SPID is a number that identifies the service to which you have subscribed. A SPID is not required for AT&T 5ESS service configured for a point-to-point connection.

The LDN is an optional seven-digit phone number for the channel.

```
Router (config-if)# isdn spid1 SPID_no [LDN]
Router (config-if)# isdn spid2 SPID_no [LDN]
```

- Step 7** Configure the router for PPP encapsulation and CHAP authentication:

```
Router (config-if)# encapsulation ppp
Router (config-if)# ppp authentication chap
```

- Step 8** Enter the **load-threshold** or **ppp multilink** command to set up a second B channel.

For bandwidth on demand, enter the **load-threshold** command to set the ISDN load threshold. The load threshold determines the percentage of network load at which the second ISDN B channel is activated. The value ranges from 1 to 255 (100 percent). In the following example, the value of 128 means that when the first B channel reaches 50 percent of its bandwidth capacity (128 equals 50 percent of 255), the second B channel will activate to assist with the bandwidth load:

```
Router (config-if)# dialer load-threshold 128
```

Alternatively, you can use Multilink PPP to activate a second ISDN line. For Multilink PPP to work, the router must be running Cisco IOS Release 11.0(3) or a later release, and both the current router and target router must support Multilink PPP:

```
Router (config-if)# ppp multilink
```

- Step 9** Enter the **dialer map** command to provide the information necessary to successfully route packets to the target router. Do not use periods or hyphens when entering the number to dial:

```
Router (config-if)# dialer map protocol targetBRIport_ipaddress name
targetrouter_number
```

- Step 10** Enter the **dialer-group** command to specify the number of the group permitted to access the router:

```
Router (config-if)# dialer-group groupnumber
```

- Step 11** Enter the **exit** command to exit interface configuration mode.

- Step 12** Enter the **dialer list** command to specify the groups and protocols permitted to access the router:

```
Router (config)# dialer-list groupnumber protocol protocol_type permit
```

- Step 13** Configure a static route to allow connection to the target router's LAN. Enter the IP address and subnet mask of the target router's LAN interface, and the IP address of the target router's BRI port:

```
Router (config)# ip route targetrouter_ipnetwork subnetmask
targetBRIport_ipaddress
```

- Step 14** Enter the **exit** command to exit global configuration mode.

- Step 15** Enter the **copy running-config startup-config** command to save the configuration to NVRAM.

### Example ISDN Configuration

For your reference, Table 9 shows an example configuration for a Catalyst 3100 switch with a router card installed, and a Cisco router using IP over ISDN. In the example, the router card (branch1) is at a remote site and the target router (main1) is at a central site.

**Table 9 Example Configuration**

Configuration for the Current Router	Configuration for the Target Router
<pre>Router&gt; enable password: paill Router# config term Router (config)# hostname branch1 branch1 (config)# username main1 password secret1 branch1 (config)# isdn switch-type basic-dms100 branch1 (config)# interface Ethernet 0 branch1 (config)# ip address 172.16.80.170 255.255.255.0 branch1 (config-if)# interface bri 0 branch1 (config-if)# ip address 172.16.71.1 255.255.255.0 branch1 (config-if)# isdn spid1 415988488501 9884885 branch1 (config-if)# isdn spid2 415988488602 9884886 branch1 (config-if)# dialer load-threshold 128 branch1 (config-if)# ppp multilink branch1 (config-if)# encapsulation ppp branch1 (config-if)# ppp authentication chap branch1 (config-if)# dialer map ip 172.16.71.2 name main1 9884883 branch1 (config-if)# dialer group 1 branch1 (config-if)# exit branch1 (config)# dialer-list 1 protocol ip permit branch1 (config-if)# ip route 172.16.0.0 255.255.0.0 172.16.71.2 branch1 (config-if)# ip route 0.0.0.0 172.16.71.2 branch1 (config)# exit branch1# copy running-config startup-config branch1#</pre>	<pre>Router&gt; enable password: paill2 Router# config term Router (config)# hostname main1 main1 (config)# username branch1 password secret1 main1 (config)# isdn switch-type basic-dms100 main1 (config)# interface Ethernet 0 main1 (config)# ip address 172.16.64.190 255.255.255.0 main1 (config-if)# interface bri 0 main1 (config-if)# ip address 172.16.71.2 255.255.255.0 main1 (config-if)# isdn spid1 415988488201 9884882 main1 (config-if)# isdn spid2 415988488302 9884883 main1 (config-if)# dialer load-threshold 128 main1 (config-if)# ppp multilink main1 (config-if)# encapsulation ppp main1 (config-if)# ppp authentication chap main1 (config-if)# dialer map ip 172.16.71.1 name branch1 9884885 main1 (config-if)# dialer group 1 main1 (config-if)# exit main1 (config)# dialer-list 1 protocol ip permit main1 (config-if)# ip route 172.16.80.0 255.255.0.0 172.16.71.1 main1 (config)# exit main1# copy running-config startup-config main1#</pre>

## Verifying Network Connectivity

After you have installed and configured the router, you can use the following commands in user EXEC mode to verify network connectivity:

- **telnet**—Logs in to a remote node
- **ping**—Sends a special datagram to the destination device, then waits for a reply datagram from that device
- **trace**—Discovers the routes that packets take when traveling from one router to another

If there is a problem with network connectivity, refer to the section “Reading the LEDs” later in this document. If there is still a problem, check the switch configuration. Refer to the *Catalyst 3X00 Installation and Configuration Guide*.

## Getting More Information

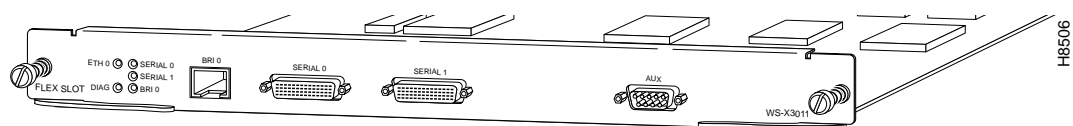
For more information about router software configuration, refer to the Cisco IOS configuration guide and command reference publications. These publications are available in the CD ROM that accompanied your switch, or you can order printed copies. Refer to the section “Ordering Documentation” at the end of this document.

## Reading the LEDs

The LEDs indicate the current operating condition of the router card. You can observe the LEDs, note any fault condition that the router card is encountering, and then contact your system administrator or customer service, if necessary. For information about how to contact customer service, refer to the section “Obtaining Service and Support.”

Figure 12 shows the location of the LEDs on the router card. The LEDs are labeled and indicate activity on a port by flickering. When there is heavy activity on a port, the LED might be ON constantly. If an LED is not ON when the port is active and the cable is connected correctly, there might be a problem with the port.

**Figure 12 Router Card (WS-X3011) LEDs**



## Cable, Pinout, and Port Specifications

This section contains the following information:

- Synchronous Serial Cable Assemblies and Pinouts
- ISDN BRI Port and Cable Pinouts



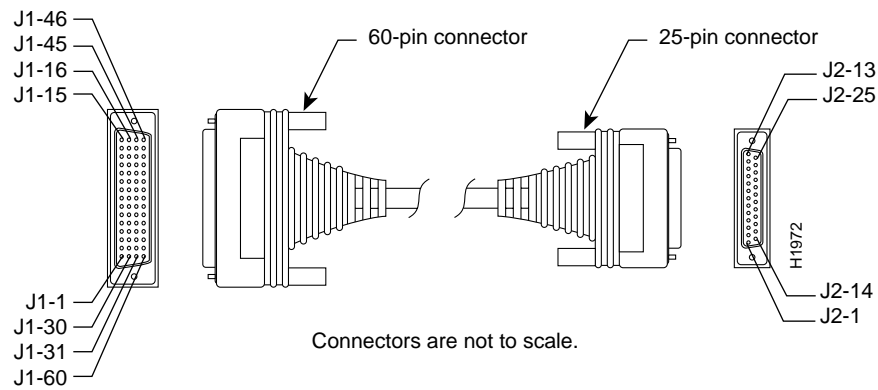
## Synchronous Serial Cable Assemblies and Pinouts

The illustrations and tables in this section provide assembly drawings and pinouts for the EIA-530 DCE, EIA/TIA-232, EIA/TIA-449, V.35, and X.21 DTE and DCE cables, which are used with the synchronous serial WAN port (labeled “SERIAL”).

### EIA-530

Figure 13 shows the EIA-530 serial cable assembly, and Table 10 lists the pinouts. Arrows indicate signal direction:  $\longrightarrow$  indicates DTE to DCE, and  $\longleftarrow$  indicates DCE to DTE.

**Figure 13 EIA-530 Serial Cable Assembly**



**Table 10 EIA-530 DCE, EIA/TIA-232, EIA/TIA-449, V.35, and X.21 DTE and DCE**

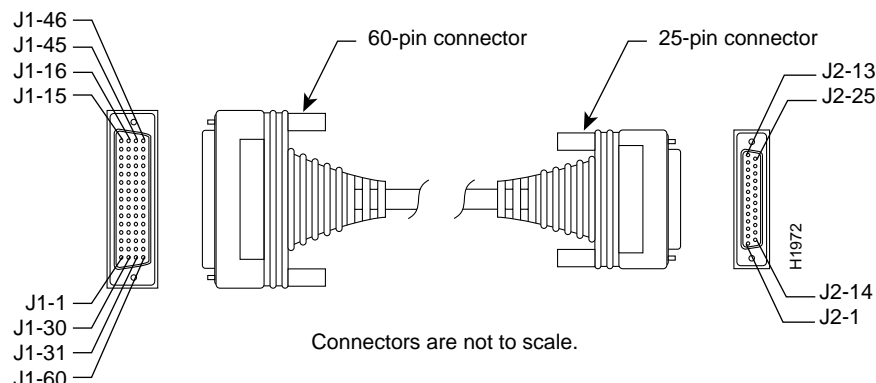
60 Pin	Signal	25 Pin	Signal	Direction	
				DTE	DCE <sup>1</sup>
J1-11	TxD/RxD+	J2-2	BA(A), TxD+	—>	
J1-12	TxD/RxD-	J2-14	BA(B), TxD-	—>	
J1-28	RxD/TxD+	J2-3	BB(A), RxD+	<—	
J1-27	RxD/TxD-	J2-16	BB(B), RxD-	<—	
J1-9	RTS/CTS+	J2-4	CA(A), RTS+	—>	
J1-10	RTS/CTS-	J2-19	CA(B), RTS-	—>	
J1-1	CTS/RTS+	J2-5	CB(A), CTS+	<—	
J1-2	CTS/RTS-	J2-13	CB(B), CTS-	<—	
J1-3	DSR/DTR+	J2-6	CC(A), DSR+	<—	
J1-4	DSR/DTR-	J2-22	CC(B), DSR-	<—	
J1-46	Shield_GND	J2-1	Shield		Shorted
J1-47	MODE_2	-	-		
J1-48	GND	-	-		Shorted
J1-49	MODE_1	-	-		
J1-5	DCD/DCD+	J2-8	CF(A), DCD+	<—	
J1-6	DCD/DCD-	J2-10	CF(B), DCD-	<—	
J1-24	TxC/RxC+	J2-15	DB(A), TxC+	<—	
J1-23	TxC/RxC-	J2-12	DB(B), TxC-	<—	
J1-26	RxC/TxCE+	J2-17	DD(A), RxC+	<—	
J1-25	RxC/TxCE-	J2-9	DD(B), RxC-	<—	
J1-44	LL/DCD	J2-18	LL	—>	
J1-45	Circuit_GND	J2-7	Circuit_GND	-	
J1-7	DTR/DSR+	J2-20	CD(A), DTR+	—>	
J1-8	DTR/DSR-	J2-23	CD(B), DTR-	—>	
J1-13	TxCE/TxC+	J2-24	DA(A), TxCE+	—>	
J1-14	TxCE/TxC-	J2-11	DA(B), TxCE-	—>	
J1-51	GND	—	—		Shorted
J1-52	MODE_DCE	—	—		

<sup>1</sup> The EIA-530 interface operates in DTE mode only. A DCE cable is not available for the EIA-530 interface.

### Cable Pinouts

#### EIA/TIA-232

Figure 14 shows the EIA/TIA-232 cable assembly. Table 11 lists the DTE pinouts. Table 12 lists the DCE pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

**Figure 14 EIA/TIA-232 Cable Assembly****Table 11 EIA/TIA-232 Cable Pinouts (DTE)**

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-50	MODE_0	Shorting group	—	—	—
J1-51	GND				
J1-52	MODE_DCE				
J1-46	Shield GND	Single	—	J2-1	Shield GND
J1-41	TxD/RxD	Twisted pair no. 5	—>	J2-2	TxD
Shield	—		—	Shield	—
J1-36	RxD/TxD	Twisted pair no. 9	<—	J2-3	RxD
Shield	—		—	Shield	—
J1-42	RTS/CTS	Twisted pair no. 4	—>	J2-4	RTS
Shield	—		—	Shield	—
J1-35	CTS/RTS	Twisted pair no. 10	<—	J2-5	CTS
Shield	—		—	Shield	—
J1-34	DSR/DTR	Twisted pair no. 11	<—	J2-6	DSR
Shield	—		—	Shield	—
J1-45	Circuit GND	Twisted pair no. 1	—	J2-7	Circuit GND
Shield	—		—	Shield	—
J1-33	DCD/LL	Twisted pair no. 12	<—	J2-8	DCD
Shield	—		—	Shield	—
J1-37	TxC/NIL	Twisted pair no. 8	<—	J2-15	TxC
Shield	—		—	Shield	—
J1-38	RxC/TxCE	Twisted pair no. 7	<—	J2-17	RxC
Shield	—		—	Shield	—
J1-44	LL/DCD	Twisted pair no. 2	—>	J2-18	LTST
Shield	—		—	Shield	—

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-43	DTR/DSR	Twisted pair no. 3	—>	J2-20	DTR
Shield	—		—	Shield	—
J1-39	TxCE/TxC	Twisted pair no. 6	—>	J2-24	TxCE
Shield	—		—	Shield	—

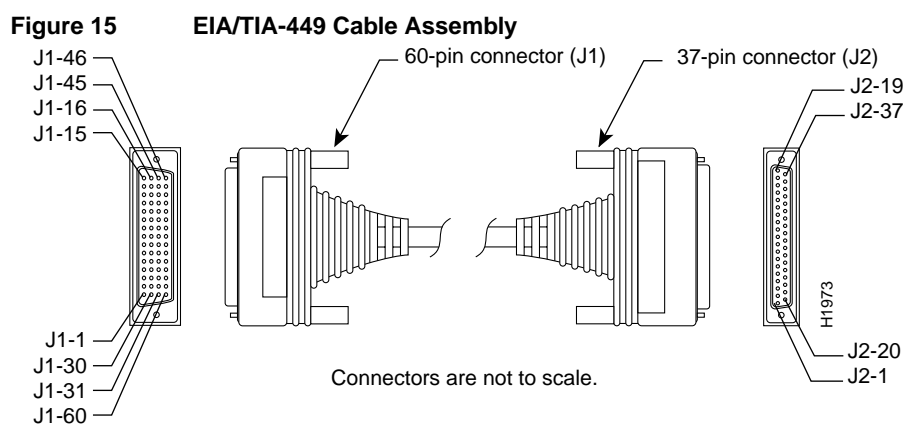
**Table 12 EIA/TIA-232 Cable Pinouts (DCE)**

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-50	MODE_0	Shorting group	—	—	—
J1-51	GND				
J1-46	Shield GND	Single	—	J2-1	Shield GND
J1-36	RxD/TxD	Twisted pair no. 9	<—	J2-2	TxD
Shield	—		—	Shield	—
J1-41	TxD/RxD	Twisted pair no. 5	—>	J2-3	RxD
Shield	—		—	Shield	—
J1-35	CTS/RTS	Twisted pair no. 10	<—	J2-4	RTS
Shield	—		—	Shield	—
J1-42	RTS/CTS	Twisted pair no. 4	—>	J2-5	CTS
Shield	—		—	Shield	—
J1-43	DTR/DSR	Twisted pair no. 3	—>	J2-6	DSR
Shield	—		—	Shield	—
J1-45	Circuit GND	Twisted pair no. 1	—	J2-7	Circuit GND
Shield	—		—	Shield	
J1-44	LL/DCD	Twisted pair no. 2	—>	J2-8	DCD
Shield	—		—	Shield	—
J1-39	TxCE/TxC	Twisted pair no. 7	—>	J2-15	TxC
Shield	—		—	Shield	—
J1-40	NIL/RxC	Twisted pair no. 6	—>	J2-17	RxC
Shield	—		—	Shield	—
J1-33	DCD/LL	Twisted pair no. 12	<—	J2-18	LTST
Shield	—		—	Shield	—

60 Pin	Signal	Description	Direction	25 Pin	Signal
J1-34	DSR/DTR	Twisted pair no. 11	←	J2-20	DTR
Shield	–		–	Shield	–
J1-38	RxC/TxCE	Twisted pair no. 8	←	J2-24	TxCE
Shield	–		–	Shield	–

## EIA/TIA-449

Figure 15 shows the EIA/TIA-449 cable assembly. Table 13 lists the DTE pinouts. Table 14 lists the DCE pinouts. Arrows indicate signal direction: → indicates DTE to DCE, and ← indicates DCE to DTE.



**Table 13 EIA/TIA-449 Cable Pinouts (DTE)**

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-49	MODE_1	Shorting group	–	–	–
J1-48	GND				
J1-51	GND	Shorting group	–	–	–
J1-52	MODE_DCE				
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-11	TxD/RxD+	Twisted pair no. 6	→	J2-4	SD+
J1-12	TxD/RxD–		→	J2-22	SD–
J1-24	TxC/RxC+	Twisted pair no. 9	←	J2-5	ST+
J1-23	TxC/RxC–		←	J2-23	ST–
J1-28	RxD/TxD+	Twisted pair no. 11	←	J2-6	RD+
J1-27	RxD/TxD–		←	J2-24	RD–
J1-9	RTS/CTS+	Twisted pair no. 5	→	J2-7	RS+
J1-10	RTS/CTS–		→	J2-25	RS–
J1-26	RxC/TxCE+	Twisted pair no. 10	←	J2-8	RT+
J1-25	RxC/TxCE–		←	J2-26	RT–
J1-1	CTS/RTS+	Twisted pair no. 1	←	J2-9	CS+
J1-2	CTS/RTS–		←	J2-27	CS–

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-44	LL/DCD	Twisted pair no. 12	—>	J2-10	LL
J1-45	Circuit_GND		-	J2-37	SC
J1-3	DSR/DTR+	Twisted pair no. 2	<—	J2-11	DM+
J1-4	DSR/DTR-		<—	J2-29	DM-
J1-7	DTR/DSR+	Twisted pair no. 4	—>	J2-12	TR+
J1-8	DTR/DSR-		—>	J2-30	TR-
J1-5	DCD/DCD+	Twisted pair no. 3	<—	J2-13	RR+
J1-6	DCD/DCD-		<—	J2-31	RR-
J1-13	TxCE/TxC+	Twisted pair no. 7	—>	J2-17	TT+
J1-14	TxCE/TxC-		—>	J2-35	TT-
J1-15	Circuit_GND	Twisted pair no. 9	-	J2-19	SG
J1-16	Circuit_GND		-	J2-20	RC

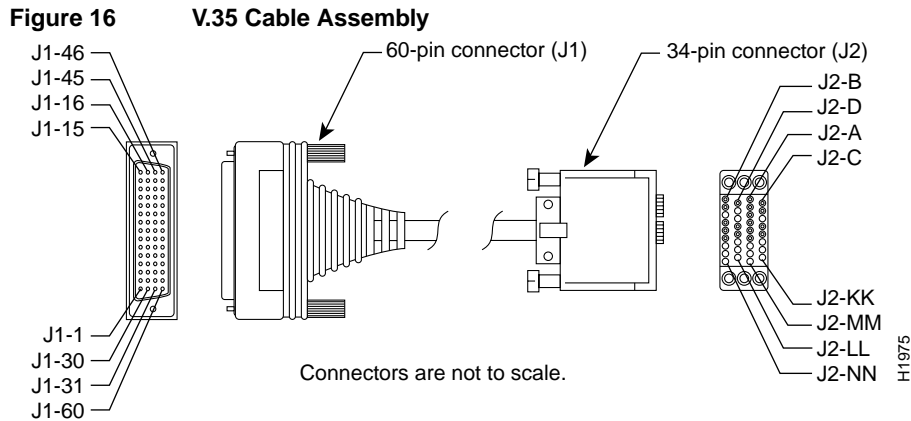
**Table 14 EIA/TIA-449 Cable Pinouts (DCE)**

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-49	MODE_1	Shorting group	-	-	-
J1-48	GND				
J1-46	Shield_GND	Single	-	J2-1	Shield GND
J1-28	RxD/TxD+	Twisted pair no. 11	<—	J2-4	SD+
J1-27	RxD/TxD-		<—	J2-22	SD-
J1-13	TxCE/TxC+	Twisted pair no. 7	—>	J2-5	ST+
J1-14	TxCE/TxC-		—>	J2-23	ST-
J1-11	TxD/RxD+	Twisted pair no. 6	—>	J2-6	RD+
J1-12	TxD/RxD-		—>	J2-24	RD-
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-7	RS+
J1-2	CTS/RTS-		<—	J2-25	RS-
J1-24	TxC/RxC+	Twisted pair no. 9	—>	J2-8	RT+
J1-23	TxC/RxC-		—>	J2-26	RT-
J1-9	RTS/CTS+	Twisted pair no. 5	—>	J2-9	CS+
J1-10	RTS/CTS-		—>	J2-27	CS-
J1-29	NIL/LL	Twisted pair no. 12	—>	J2-10	LL
J1-30	Circuit_GND		-	J2-37	SC
J1-7	DTR/DSR+	Twisted pair no. 4	—>	J2-11	DM+
J1-8	DTR/DSR-		—>	J2-29	DM-
J1-3	DSR/DTR+	Twisted pair no. 2	<—	J2-12	TR+
J1-4	DSR/DTR-		<—	J2-30	TR-
J1-5	DCD/DCD+	Twisted pair no. 3	—>	J2-13	RR+
J1-6	DCD/DCD-		—>	J2-31	RR-
J1-26	RxC/TxCE+	Twisted pair no. 10	<—	J2-17	TT+
J1-25	RxC/TxCE-		<—	J2-35	TT-

60 Pin	Signal	Description	Direction	37 Pin	Signal
J1-15	Circuit_GND	Twisted pair no. 8	—	J2-19	SG
J1-16	Circuit_GND		—	J2-20	RC

V.35

Figure 16 shows the V.35 cable assembly. Table 15 lists the DTE pinouts. Table 16 lists the DCE pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.



**Table 15 V.35 Cable Pinouts (DTE)**

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-49	MODE_1	Shorting group	—	—	—
J1-48	GND				
J1-50	MODE_0	Shorting group	—	—	—
J1-51	GND				
J1-52	MODE_DCE				
J1-53	TxC/NIL	Shorting group	—	—	—
J1-54	RxC_TxCE				
J1-55	RxD/TxD				
J1-56	GND				
J1-46	Shield_GND	Single	—	J2-A	Frame GND
J1-45	Circuit_GND	Twisted pair no. 12	—	J2-B	Circuit GND
Shield	—		—	Shield	—
J1-42	RTS/CTS	Twisted pair no. 9	—>	J2-C	RTS
Shield	—		—	Shield	—
J1-35	CTS/RTS	Twisted pair no. 8	<—	J2-D	CTS
Shield	—		—	Shield	—
J1-34	DSR/DTR	Twisted pair no. 7	<—	J2-E	DSR
Shield	—		—	Shield	—

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-33	DCD/LL	Twisted pair no. 6	←	J2-F	RLSD
Shield	–		–	Shield	–
J1-43	DTR/DSR	Twisted pair no. 10	→	J2-H	DTR
Shield	–		–	Shield	–
J1-44	LL/DCD	Twisted pair no. 11	→	J2-K	LT
Shield	–		–	Shield	–
J1-18	TxD/RxD+	Twisted pair no. 1	→	J2-P	SD+
J1-17	TxD/RxD–		→	J2-S	SD–
J1-28	RxD/TxD+	Twisted pair no. 5	←	J2-R	RD+
J1-27	RxD/TxD–		←	J2-T	RD–
J1-20	TxCE/TxC+	Twisted pair no. 2	→	J2-U	SCTE+
J1-19	TxCE/TxC–		→	J2-W	SCTE–
J1-26	RxC/TxCE+	Twisted pair no. 4	←	J2-V	SCR+
J1-25	RxC/TxCE–		←	J2-X	SCR–
J1-24	TxC/RxC+	Twisted pair no. 3	←	J2-Y	SCT+
J1-23	TxC/RxC–		←	J2-AA	SCT–

**Table 16 V.35 Cable Pinouts (DCE)**

60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-49	MODE_1	Shorting group	–	–	–
J1-48	GND				
J1-50	MODE_0	Shorting group	–	–	–
J1-51	GND				
J1-53	TxC/NIL	Shorting group	–	–	–
J1-54	RxC_TxCE				
J1-55	RxD/TxD				
J1-56	GND				
J1-46	Shield_GND	Single	–	J2-A	Frame GND
J1-45	Circuit_GND	Twisted pair no. 12	–	J2-B	Circuit GND
Shield	–		–	Shield	–
J1-35	CTS/RTS	Twisted pair no. 8	←	J2-C	RTS
Shield	–		–	Shield	–
J1-42	RTS/CTS	Twisted pair no. 9	→	J2-D	CTS
Shield	–		–	Shield	–
J1-43	DTR/DSR	Twisted pair no. 10	→	J2-E	DSR
Shield	–		–	Shield	–
J1-44	LL/DCD	Twisted pair no. 11	→	J2-F	RLSD
Shield	–		–	Shield	–
J1-34	DSR/DTR	Twisted pair no. 7	←	J2-H	DTR
Shield	–		–	Shield	–

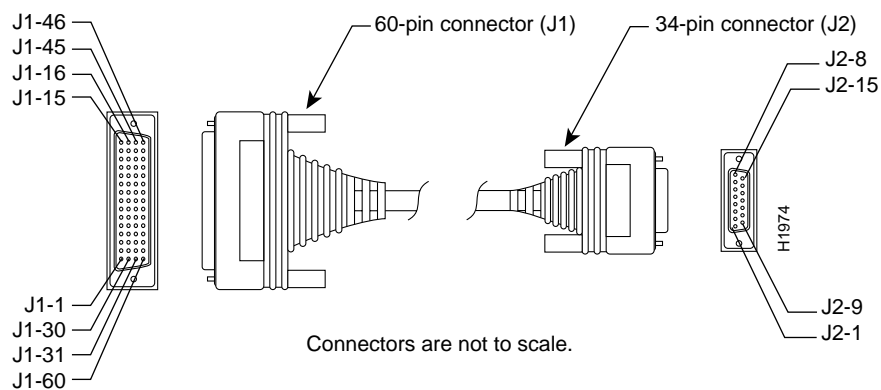


60 Pin	Signal	Description	Direction	34 Pin	Signal
J1-33	DCD/LL	Twisted pair no. 6	←	J2-K	LT
Shield	–		–	Shield	–
J1-28	RxD/TxD+	Twisted pair no. 5	←	J2-P	SD+
J1-27	RxD/TxD–		←	J2-S	SD–
J1-18	TxD/RxD+	Twisted pair no. 1	→	J2-R	RD+
J1-17	TxD/RxD–		→	J2-T	RD–
J1-26	RxC/TxCE+	Twisted pair no. 4	←	J2-U	SCTE+
J1-25	RxC/TxCE–		←	J2-W	SCTE–
J1-22	NIL/RxC+	Twisted pair no. 3	→	J2-V	SCR+
J1-21	NIL/RxC–		→	J2-X	SCR–
J1-20	TxCE/TxC+	Twisted pair no. 2	→	J2-Y	SCT+
J1-19	TxCE/TxC–		→	J2-AA	SCT–

## X.21

Figure 17 shows the X.21 cable assembly. Table 17 lists the DTE pinouts. Table 18 lists the DCE pinouts. Arrows indicate signal direction: → indicates DTE to DCE, and ← indicates DCE to DTE.

**Figure 17** X.21 Cable Assembly



**Table 17** X.21 Cable Pinouts (DTE)

60 Pin	Signal	Description	Direction	15 Pin	Signal
J1-48	GND	Shorting group	–	–	–
J1-47	MODE_2				
J1-51	GND	Shorting group	–	–	–
J1-52	MODE_DCE				
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-11	TxD/RxD+	Twisted pair no. 3	→	J2-2	Transmit+
J1-12	TxD/RxD–		→	J2-9	Transmit–

60 Pin	Signal	Description	Direction	15 Pin	Signal
J1-9	RTS/CTS+	Twisted pair no. 2	—>	J2-3	Control+
J1-10	RTS/CTS-		—>	J2-10	Control-
J1-28	RxD/TxD+	Twisted pair no. 6	<—	J2-4	Receive+
J1-27	RxD/TxD-		<—	J2-11	Receive-
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-5	Indication+
J1-2	CTS/RTS-		<—	J2-12	Indication-
J1-26	RxC/TxCE+	Twisted pair no. 5	<—	J2-6	Timing+
J1-25	RxC/TxCE-		<—	J2-13	Timing-
J1-15	Control_GND	Twisted pair no. 4	-	J2-8	Control GND
Shield	-		-	Shield	-

**Table 18 X.21 Cable Pinouts (DCE)**

60 Pin	Signal	Description	Direction	15 Pin	Signal
J1-48	GND	Shorting group	-	-	-
J1-47	MODE_2				
J1-46	Shield_GND	Single	-	J2-1	Shield GND
J1-28	RxD/TxD+	Twisted pair no. 6	<—	J2-2	Transmit+
J1-27	RxD/TxD-		<—	J2-9	Transmit-
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-3	Control+
J1-2	CTS/RTS-		<—	J2-10	Control-
J1-11	TxD/RxD+	Twisted pair no. 3	—>	J2-4	Receive+
J1-12	TxD/RxD-		—>	J2-11	Receive-
J1-9	RTS/CTS+	Twisted pair no. 2	—>	J2-5	Indication+
J1-10	RTS/CTS-		—>	J2-12	Indication-
J1-24	TxC/RxC+	Twisted pair no. 4	—>	J2-6	Timing+
J1-23	TxC/RxC-		—>	J2-13	Timing-
J1-15	Control_GND	Twisted pair no. 5	-	J2-8	Control GND
Shield	-		-	Shield	-

## ISDN BRI Port and Cable Pinouts

Table 19 lists the ISDN BRI port pinouts. The straight-through RJ-45-to-RJ-45 cable, used to connect to the ISDN BRI port, is not included.

**Table 19 ISDN BRI Port Pinouts**

RJ-45 8 Pin <sup>1</sup>	TE <sup>2</sup>	NT <sup>3</sup>	Polarity
3	Transmit	Receive	+
4	Receive	Transmit	+
5	Receive	Transmit	-
6	Transmit	Receive	-

- 1 Pins 1, 2, 7, and 8 are not used.
- 2 TE refers to terminal terminating layer 1 aspects of TE1, TA, and NT2 functional groups.
- 3 NT refers to network terminating layer 1 aspects of NT1 and NT2 functional groups.

## Obtaining Service and Support

For service and support for a product purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the information packet that shipped with your chassis.

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**Note** If you purchased your product from a reseller, you can access Cisco Connection Online (CCO) as a guest. CCO is Cisco Systems' primary, real-time support channel. Your reseller offers programs that include direct access to CCO's services.

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For service and support for a product purchased directly from Cisco, use CCO.

## Cisco Connection Online

CCO is Cisco Systems' primary, real-time support channel. SMARTnet customers and partners can self-register on CCO to obtain additional content and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously—a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: <http://www.cisco.com>.
- WWW: <http://www-europe.cisco.com>.
- WWW: <http://www-china.cisco.com>.
- Telnet: [cco.cisco.com](http://cco.cisco.com).
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact [cco-help@cisco.com](mailto:cco-help@cisco.com). For additional information, contact [cco-team@cisco.com](mailto:cco-team@cisco.com).

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**Note** If you need technical assistance with a Cisco product that is under warranty or covered by a Cisco maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or [tac@cisco.com](mailto:tac@cisco.com).

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Please use CCO to obtain general information about Cisco Systems, Cisco products, or upgrades. If CCO is not accessible, contact 800 553-6387, 408 526-7208, or [cs-rep@cisco.com](mailto:cs-rep@cisco.com).

## Ordering Documentation

Documentation for Cisco products is available in three forms: in a CD-ROM package, printed books, and on the World Wide Web. You have the option of subscribing to the CD ROM package through an update service. Or you can order printed documentation at an additional cost. Refer to the information packet included with the router for detailed ordering information. You can also access Cisco documentation on the World Wide Web URL <http://www.cisco.com>.

## FCC Part 68 Notice

The Cisco WS-X3011 router card complies with Part 68 of the FCC rules. On the bottom of this equipment is a label that contains, among other information, the FCC registration number. If requested, this information must be provided to the telephone company.

An FCC compliant cord and modular plug must be used with this equipment, designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant.

This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to State Tariffs.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

If trouble is experienced with this equipment, please contact us for repair and warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

It is recommended that the customer install an AC surge arrestor in the AC outlet to which this device is connected. This is to avoid damaging the equipment caused by local lightning strikes and other electrical surges.

This equipment uses USOC jacks as follows;

<b>Model Name</b>	<b>Facility Interface Code</b>	<b>Service Order Code</b>	<b>Jack Type</b>
WS-X3011	02IS5	6.0N	RJ-48S

## Canadian Notice

This product has Canadian label IC No. 2561 7826A.

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