



Cable Connection Procedures for Cisco 2800 Series Routers

This document describes how to connect your Cisco 2800 series integrated services router to a power source and to networks and external devices. It includes the following sections:

- [Power Connections, page 2](#)
- [Connecting WAN, LAN, and Voice Cables, page 9](#)
- [Connecting to a Console Terminal or Modem, page 12](#)



Note

To see translations of the warnings that appear in this publication, refer to the [Cisco 2800 Series and Cisco 3800 Series Integrated Services Routers Regulatory Compliance and Safety Information](#) document that accompanied this device.



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
Statement 1030



Warning

This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.
Statement 1017



Warning

Do not work on the system or connect or disconnect cables during periods of lightning activity.
Statement 1001

Power Connections

This section explains how to connect AC or DC power to Cisco 2800 series routers. It covers the following topics:

- [Connecting Routers to AC Power, page 2](#)
- [Connecting Routers to DC Power, page 2](#)
- [Connecting Routers to Backup Power, page 9](#)



Warning

Read the installation instructions before connecting the system to the power source. Statement 1004



Note

The installation must comply with all required electrical codes applicable at the installation site.

Connecting Routers to AC Power

If your router uses AC power, connect it to a 15 A, 120 VAC (10 A, 240 VAC) circuit with overcurrent protection. If backup power is required, see the “[Connecting Routers to Backup Power](#)” section on [page 9](#).



Note

The input voltage tolerance limits for AC power are 90 and 264 VAC.



Warning

AC connected units must have a permanent ground connection in addition to the power cable ground wire. NEBS-compliant grounding satisfies this requirement. Statement 284



Warning

This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations. Statement 1045



Warning

This product relies on the building’s installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 15A, 120VAC (10A, 240VAC). Statement 1005

Connecting Routers to DC Power



Note

The Cisco 2801 router does not support DC power.



Warning

This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations. Statement 1045

**Warning**

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 60 VDC, 20 A. Statement 1005

**Warning**

Use copper conductors only. Statement 1025

If your router has a DC-input power supply, follow the directions in this section for proper wiring. A router with a DC-input power supply has a terminal block for the DC power connections. If backup power is required, see the [“Connecting Routers to Backup Power”](#) section on page 9.

DC Wiring Requirements

A Cisco 2811, Cisco 2821, or Cisco 2851 router with a DC-input power supply requires copper wire and crimp-type terminals for the power connections. [Table 1](#) and [Table 2](#) summarize the wiring requirements.

You can connect a single DC power source to either the A input or the B input. If there are dual power sources, connect one source to the A input and one source to the B input; both sources must be the same polarity and voltage.

Table 1 DC Wiring Requirements for Cisco 2811 Routers

DC Power Input	DC Input Wire Size	Safety Ground Wire Size	Wire Terminal (Lug)	Overcurrent Protection
24–36 VDC, 8 A, positive or negative, single source or dual sources	AWG 14 (2.0 mm ²)	AWG 14 (2.0 mm ²), minimum	Amp/Tyco No. 32957 or equivalent	20 A maximum
36–60 VDC, 5 A, positive or negative, single source or dual sources				

Table 2 DC Wiring Requirements for Cisco 2821 and Cisco 2851 Routers

DC Power Input	DC Input Wire Size	Safety Ground Wire Size	Wire Terminal (Lug)	Overcurrent Protection
24–36 VDC, 12 A, positive or negative, single source or dual sources	AWG 14 (2.0 mm ²)	AWG 14 (2.0 mm ²), minimum	Amp/Tyco No. 32957 or equivalent	20 A maximum
36–60 VDC, 8 A, positive or negative, single source or dual sources				

Wiring Procedure for DC Input

To connect a router to a DC power source, perform the following steps:

- Step 1** Remove power from the DC circuit. To ensure that power is removed from the DC circuit, locate the circuit breaker for the DC circuit, switch the circuit breaker to the OFF position, and tape the circuit-breaker switch in the OFF position.



Warning

Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003



Tip

Secure all power cabling when installing this unit to avoid disturbing field-wiring connections.



Warning

When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations should be the appropriate size for the wires and should clamp both the insulation and conductor. Statement 1002

- Step 2** Strip the wires to the appropriate length for the terminals. The strip length is 3/16 to 1/4 inch (5 to 6 mm) for Amp/Tyco No. 32957 terminals.

- Step 3** Crimp the terminals to the power input and safety ground wires.

- Step 4** Remove the plastic covers from the terminal block. Save the covers for reinstallation after you finish wiring.

- Step 5** Connect the wires to the terminal block, starting with the safety ground wire. Connect each wire to the appropriate terminal as shown in [Figure 1](#). Tighten the terminal screws to 8.0 ± 0.5 in-lb (0.9 ± 0.05 N-m).



Warning

The illustration shows the DC power supply terminal block. Wire the DC power supply as illustrated. The proper wiring sequence is ground to ground, positive to positive, and negative to negative. The ground wire should always be connected first and disconnected last. Statement 239



Warning

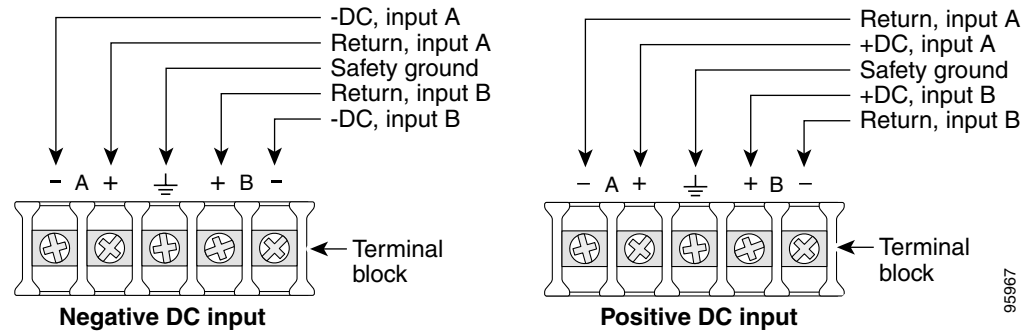
An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the terminal block plug. Statement 122



Caution

Do not overtorque the terminal block contact screws. Recommended torque is 8.0 ± 0.5 in-lb (0.90 ± 0.05 N-m).

Figure 1 DC Power Connections for Cisco 2800 Series Routers



Step 6 Install the plastic covers over the terminals. (See [Figure 2](#) or [Figure 3](#).)



Warning

The safety cover is an integral part of the product. Do not operate the unit without the safety cover installed. Operating the unit without the cover in place will invalidate the safety approvals and pose a risk of fire and electrical hazards. Statement 117

Step 7 Organize and secure the wires using cable ties as shown in [Figure 2](#) or [Figure 3](#). Make sure that the wires do not project above or below the front panel of the router.

Step 8 Turn on power to the DC circuit. Be sure to remove tape used to secure the circuit-breaker switch in the OFF position.

Figure 2 Wire Routing and Attachment for Cisco 2811 Routers

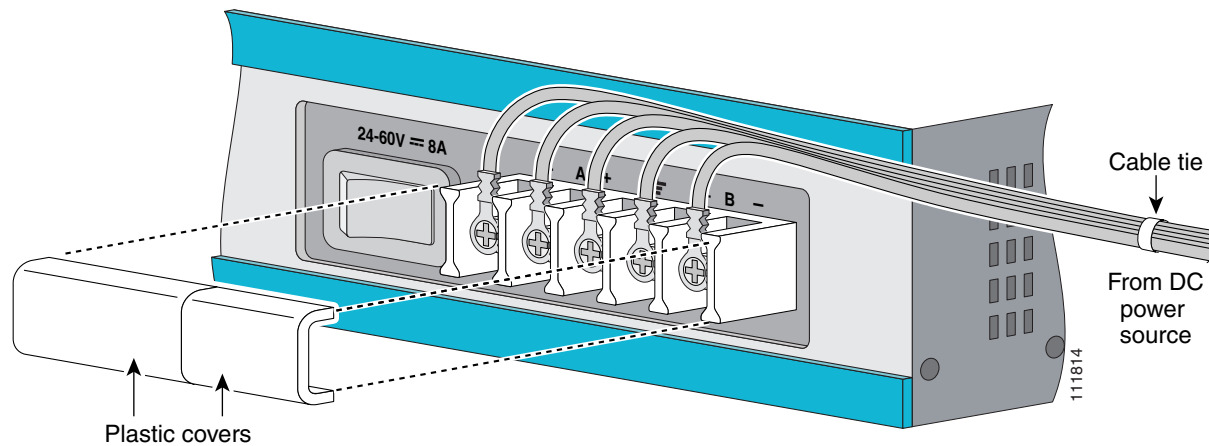
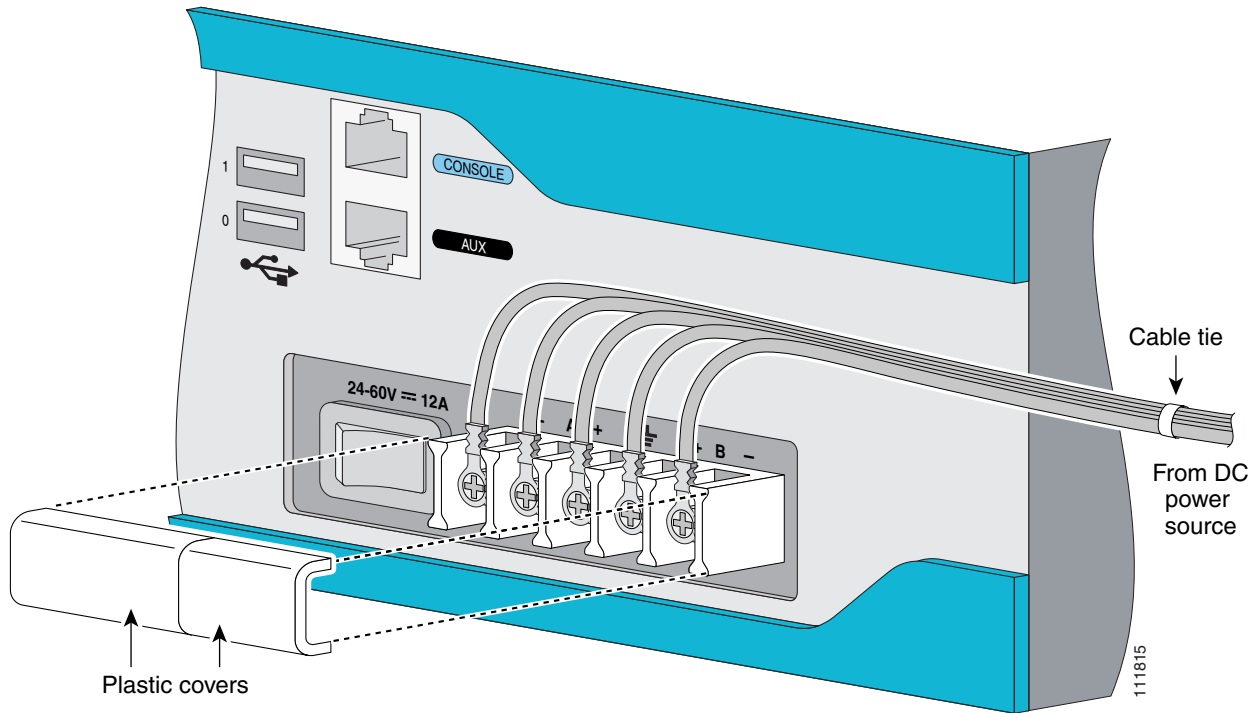


Figure 3 Wire Routing and Attachment for Cisco 2821 and Cisco 2851 Routers



Approved Scenarios and Scenarios Not Approved for Dual DC Power Supply Configuration in Cisco 2800 Routers

You can connect a single DC power source to either the A input or the B input. If there are dual power sources, connect one source to the A input and one source to the B input. Both sources must be the same polarity (with respect to ground) and voltage (within 0.25 volts). Do not connect –DC grounded and +DC grounded dual sources to Cisco 2811, Cisco 2821, and Cisco 2851 routers.

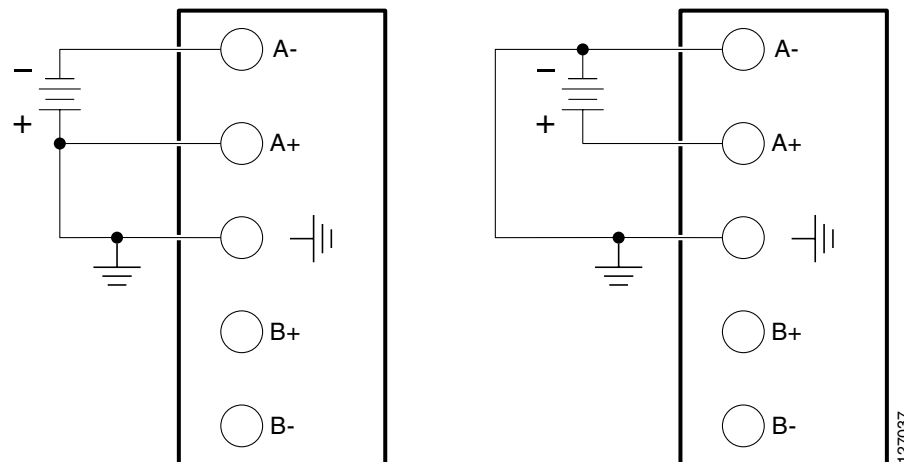


Caution

Dual sources with opposite-polarity grounding damage equipment.

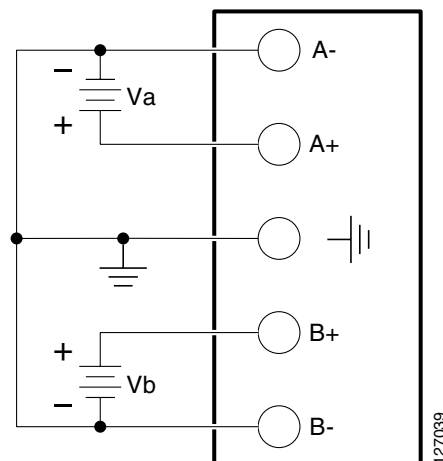
In [Figure 4](#), either the positive source terminal or the negative source terminal is tied to ground.

Figure 4 Connecting to One Source Only—Source A or Source B



In [Figure 5](#), source A and source B share common negative terminal connections.

Figure 5 Connecting Source A and Source B with Common Negative Terminals



In [Figure 6](#), source A and source B share common positive terminal connections. This is allowed only if V_a equals V_b (within 0.25 V).

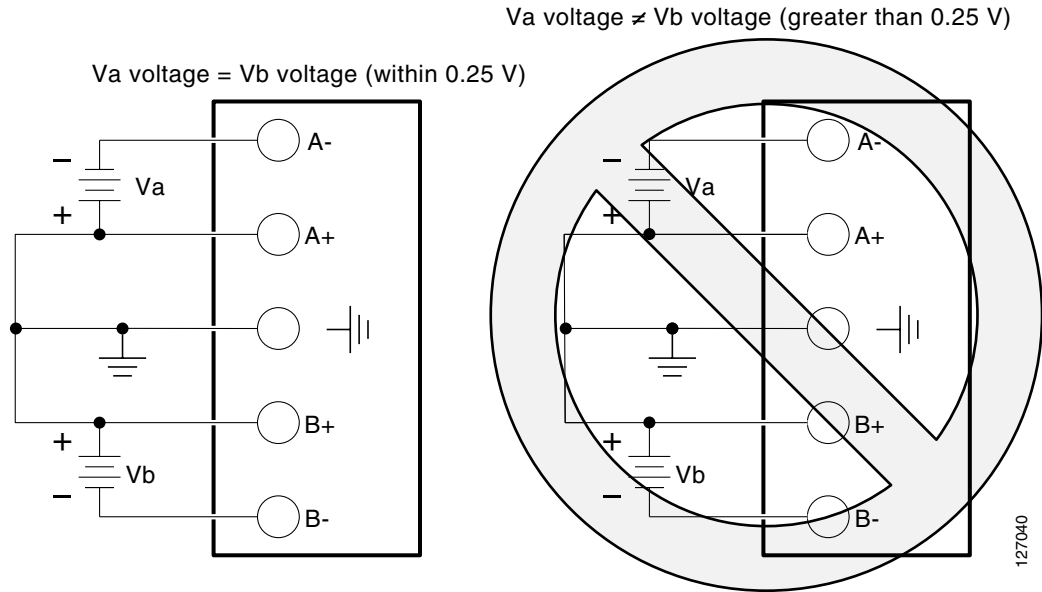
Caution

When connecting source A and source B with common positive terminals, if source A and source B voltages are unequal by more than 0.25 V, the higher-voltage source can discharge into the lower-voltage source through the A- and B- input terminals. Excessive discharging currents through these terminals can cause one or both of the dual input DC power supply's internal A- or B- fuses to open, resulting in lack of redundancy or system failure. When source A and source B are within 0.25 V, discharge current is minimal.

Note

When source A and source B are wired with common negative terminals, as in [Figure 5](#), discharging does not occur and there is no restriction requiring that source A and source B voltages be equal.

Figure 6 Connecting Source A and Source B with Common Positive Terminals

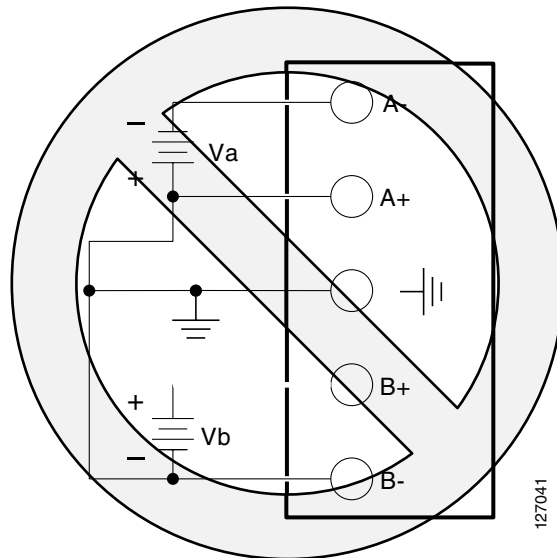


In [Figure 7](#), source A and source B are wired with opposite polarity grounds. *Do not* use this configuration.


Caution

Do not use the DC input configuration shown in [Figure 7](#).

Figure 7 Source A and Source B Wired with Opposite-Polarity Grounds



Connecting Routers to Backup Power

If your router uses the Cisco Redundant Power System (RPS), refer to the *Cisco Redundant Power System Hardware Installation Guide* for instructions about the power connections. You can access this document at:

<http://www.cisco.com/univercd/cc/td/doc/product/access/rpsbk/rpshim/index.htm>.

**Caution**

Before connecting the RPS to the router, make sure that either the RPS is in standby mode or the RPS AC power is disconnected. Connecting the RPS to AC power automatically places the RPS in active mode.

**Note**

The Cisco 2801 router does not support an RPS.

Connecting WAN, LAN, and Voice Cables

This section describes how to connect the WAN, LAN, and voice interface cables. It covers the following topics:

- [Ports and Cabling, page 10](#)
- [Connection Procedures and Precautions, page 12](#)

**Note**

One or two Ethernet cables are typically provided with the router. Additional cables and transceivers can be ordered from Cisco. For ordering information, contact customer service. For cable pinouts, refer to the *Cisco Modular Access Router Cable Specifications* document.

**Warning**

Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001

**Warning**

To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables. Statement 1021

**Warning**

Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. Statement 1026

Ports and Cabling

Table 3 summarizes some typical WAN, LAN, and voice connections for Cisco 2800 series routers. The connections summarized here are also described in detail in the following documents:

- *Cisco Modular Access Router Cable Specifications*
- *Cisco Network Modules Hardware Installation Guide*
- *Cisco Interface Cards Installation Guide*

Table 3 WAN, LAN, and Voice Connections

Port or Connection	Port Type, Color ¹	Connection:	Cable
Ethernet	RJ-45, yellow	Ethernet hub or Ethernet switch	Category 5 or higher Ethernet
T1/E1 WAN xCE1T1-PRI	RJ-48C/CA81A RJ-48S, tan	T1 or E1 network External T1 CSU or other T1 equipment	RJ-48 T1/E1 RJ-48S to RJ-48S TE RJ-48S to RJ-48S NT RJ-48S to RJ-48S T1 RJ-48S to bare RJ-48S to BNC RJ-48S to twinaxial cable RJ-48S to DB-15 RJ-48S to DB-15 null
T3/DS3/E3 WAN	BNC connector	T3 network, CSU/DSU, or other T3/DS3 equipment	75-ohm coaxial cable
Cisco serial	60-pin D-sub, blue	CSU/DSU and serial network or equipment	Cisco serial transition cable that matches the signaling protocol
Cisco Smart serial	Cisco Smart compact connector, blue	CSU/DSU and serial network or equipment	(EIA/TIA-232, EIA/TIA-449, V.35, X.21, or EIA-530) and the serial port operating mode (DTE or DCE). ²
ADSL	RJ-11C/CA11A, lavender	Network demarcation device for service provider DSL interface	RJ-11 straight-through
SHDSL	RJ-11C/CA11A, lavender, RJ-14	Network demarcation device for service provider DSL interface	RJ-11 straight-through for 2-wire RJ-14 straight-through for 4-wire
T1/E1 digital voice	RJ-48C/CA81A, tan	Digital PBX, ISDN network, CSU/DSU	RJ-48 T1/E1
Analog voice FXS	RJ-11, gray	Telephone, fax	RJ-11; RJ21 if using NM-HDA, straight-through
Analog voice FXO	RJ-11, pink	Central office, analog PBX	
Analog voice E&M	RJ-45, brown	Analog PBX	RJ-45
BRI S/T WAN (external NT1)	RJ-45/CB-1D, orange	NT1 device or private integrated network exchange (PINX)	RJ-45 straight-through
BRI U WAN (built-in NT1)	RJ-49C/CA-A11, red	ISDN network	RJ-48 straight-through
56/64-kbps DSU/CSU	8-pin modular, blue	RJ-48S interface in subrate device or network	RJ-48 straight-through
T1/FT1 DSU/CSU	8-pin modular, blue	RJ-48C interface	RJ-48 straight-through
Gigabit Ethernet SFP, optical	LC, color according to optical wavelength	1000BASE-SX, -LX, -LH, -ZX, -CWDM	Optical fiber as specified on applicable data sheet
Gigabit Ethernet SFP, copper	RJ-45	1000BASE-T	Category 5, 5e, 6 UTP

1. Cable color codes are specific to Cisco cables.

2. See the [Cisco Modular Access Router Cable Specifications](#) document for information about choosing these cables.

Connection Procedures and Precautions

Connect each WAN, LAN, and voice cable to the appropriate connector on the chassis or on a network module or interface card.

- Position the cables carefully, so that they do not put strain on the connectors.
- Organize cables in bundles so that cables do not intertwine.
- Inspect the cables to make sure that the routing and bend radiuses are satisfactory. Reposition cables, if necessary.
- Install cable ties in accordance with site requirements.

For cable pinouts, refer to the [Cisco Modular Access Router Cable Specifications](#) document.

Connecting to a Console Terminal or Modem

Your router has asynchronous serial console and auxiliary ports for system management. These ports provide administrative access to your router either locally (with a console terminal or PC) or remotely (with a modem).

Cisco provides the following cables for connecting your router to a console terminal, PC, or modem:

- One console cable (RJ-45-to-DB-9, blue)
- One modem cable (RJ-45-to-DB-25, black) (Cisco 2811, Cisco 2821, and Cisco 2851 only)
- One DB-9-to-DB-25 adapter (Cisco 2801 only)

This section describes how to connect a console terminal or PC to the console port and how to connect a modem to the auxiliary port. [Table 4](#) summarizes the system management connections.

Table 4 System Management Connections

Port	Color	Connected To:	Cable
Console	Light blue	PC or ASCII terminal communication port (usually labeled COM)	RJ-45-to-DB-9 console cable
Auxiliary	Black	Modem for remote access	RJ-45-to-DB-25 modem cable or RJ-45-to-DB-9 console cable with a DB-9-to-DB25 adapter

For information about cable pinouts, refer to the [Cisco Modular Access Router Cable Specifications](#) document.

Connecting to the Console Port

If a console terminal or PC is connected to the console port, you can configure the router locally. To connect a console terminal or a PC running HyperTerminal or similar terminal emulation software to the console port on the router, perform the following steps:

Step 1 Use the blue RJ-45-to-DB-9 console cable to connect the router to a terminal.



Note On the Cisco routers, the console port is color-coded blue.

Step 2 Configure your terminal or terminal emulation software for 9600 baud (default), 8 data bits, 1 stop bit, no parity, and flow control set to “none.”



Note Because hardware flow control is not possible on the console port, do not connect modems to the console port. Connect modems only to the auxiliary port.

Connecting to the Auxiliary Port

If a modem is connected to the auxiliary port, a remote user can dial in to the router and configure it. To connect a modem to the auxiliary port on the router, perform the following steps:

Step 1 Use the black RJ-45-to-DB-25 modem cable or the RJ-45-to-DB-9 console cable with a DB-9 to DB-25 adapter to connect the router to a modem.

Step 2 Make sure that your modem and the router auxiliary port are configured for the same transmission speed (up to 115200 bps is supported) and hardware flow control with data carrier detect (DCD) and data terminal ready (DTR) operations.

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