

Configure a Modem

If you are connected to a network, you can access the most recent version of this information at:

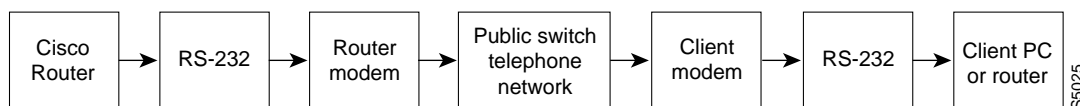
Cisco Connection Online (CCO):

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This page explains how to configure most popular modems to work on a Cisco routers console/AUX port.

RS-232 Cabling

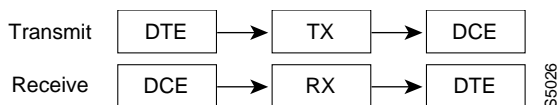
The end-to-end topology of a dialin connection looks like this:



The Cisco router and the client PC or router are generally called Data Terminal Equipment (DTE). The server and client modems are called Data Circuit-terminating Equipment (DCE).

To connect a modem to a Cisco 1000 series router, plug one end of the rolled RJ-45 cable into the router's console port and plug the other end into the modem.

TX/RX: Data Transfer



You set the transmit and receive speed on the modem using the TX/RX wire pair. The DCE transmits on RX and receives on TX. The speeds at which the two devices are communicating on the RS-232 must be the same. If there is a speed mismatch, either garbage or nothing appears on the screen when dialing into the modem.

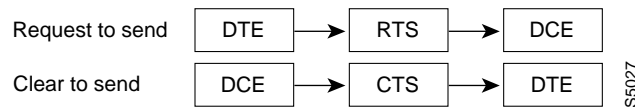
On the router, use the **speed** command to configure the data transfer speed.

On the modem, configuration commands vary. In the modem manual, look for topics such as port-rate adjust, buffered mode, or lock DTE. Often, just turning on error correction for the modem places it into buffered mode, which might lock the speed.

In order to lock the modem at a new speed, you might need to set the speed on the router first, then send an AT command to the modem with a reverse telnet. For more details, see the section “Connecting the Modem.”

RTS/CTS: Hardware Flow Control

This pair of wires controls the ability of a device to receive data. For example, when the DCE has a



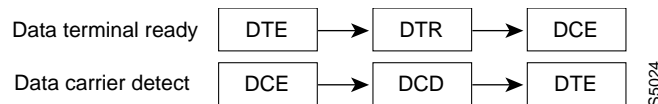
full data buffer and can no longer accept data from the DTE for transmitting, the DCE lowers the CTS signal. When the router can no longer accept data, it lowers the RTS signal.

Both the router and the modem must agree to hardware handshake with CTS/RTS, and they must be set for hardware flow control. If they do not agree on handshaking, they tend to overflow each other's buffers. Signs of a handshaking mismatch include dropped characters and packet errors.

On the router, use the **flowcontrol hardware** to configure hardware flow control.

On the modem, configuration commands vary modem. In the modem manual, look for topics such as hardware handshaking and RTS/CTS flow control.

DTR/DCD: Modem Control



This pair of wires initiates and receives calls between the DTE and the DCE. When the router is ready, DTR output is high. The router lowers DTR to drop any existing calls and return to the stored configuration. The modem uses DCD output to indicate that a call needing service by the router has arrived. The modem drops DCD to indicate loss of the call. The router and modem must agree on the function of DTR and DCD.

On the router, use the **modem inout** or **modem ri-is-cd** command to configure modem control. The **modem inout** command allows incoming and outgoing connections to the modem. The **modem ri-is-cd** command allows incoming connections only. Cabling other than what is suggested at the beginning of this page can cause modem control to fail because the modem DCD might not be wired.

On the modem, the configuration commands are usually &c1 and &d2. This functionality is often referred to as RS-232 standard operation.

Configuring the Router

To configure the Cisco router, the following line configuration usually works best:

```

line x
! where x = TTY #. AUX port is 1 on router.
speed 38400
! Set to highest speed in common between modem and port.
flow hard
! RTS/CTS flowcontrol.
modem inout
    
```

```
! Drop connection on loss of CD, Cycle DTR for connection close
```

Each line in this configuration assumes that the modem is set up using the information in the table in the section “Configuring Specific Modems.” Specifically, the configuration assumes you lock DTE speed, set hardware (RTS/CTS) flow control, set carrier detect to reflect the actual carrier state, and set the modem to hang up if it loses DTR.

If flow control is not available, use at 9600 baud.

Do not use the Cisco autobaud feature. Current modems do a much better job.

Connecting the Modem

To connect the modem, attach the modem to a port on the router and configure the modem using a reverse connection. To do this, issue the following command:

```
telnet x.x.x.x 20yy
```

`x.x.x.x` is any active, connected, and up interface on the router, and `yy` is the line number to which you want to connect. On the router, 01 is the AUX port. You can issue this **telnet** command from anywhere on the network that can ping `x.x.x.x`.

If you get a connection refused, either someone already has a connection to that port or there is an exec (prompt) running on that port. Clear the line from the console to try again by issuing the following command:

```
clear line yy
```

`yy` is the line number.

If the connection attempt still fails, make sure that you have set modem inout for that line. If you do not have modem control, issue the **no exec** command on the line before making the reverse connection. If you still get a connection refused, disconnect the modem, issue the following command, and then reconnect and reconfigure the modem:

```
telnet x.x.x.x 20yy
```

As a last resort, configure the modem using an external terminal. Be sure to clear the line before each connection attempt.

Configuring the Modem

Once you have attached to the modem at the same speed at which the Cisco router port is set (through a reverse telnet connection), you are ready to issue the AT commands. You can build the exact command string you need from the information in the table in the section “Configuring Specific Modems.” Follow these steps:

- Step 1** Configure your modem using the information in the table in the section “Configuring Specific Modems.” As a minimum, you must start with the information in the “Required for All” section of the table and then use the necessary EC/Compression pair (either Best or No). Use the Best pair for applications that are primarily file transfer. Use the No pair for connections that are primarily ARA, XRemote, or interactive packet-protocol (SLIP/PPP) traffic. Generally, we recommend Best. Adjust your configuration as your needs change.
- Step 2** If you have an AUX port (or no modem control), add the AUX PORT section. Remember to limit to 9600 bps if you have no flow control.
- Step 3** Finalize the string with an &W.

Configuring Specific Modems

The following table provides information about configuring specific modems. In this table, → means the command to the right handles the specified function, and ← means the command to the left handles the specified function.

Modem Brand	Required for All						EC/Compression			
	FD	AA	CD	DTR Hangup	RTS/CTS Flow	Lock DTE Speed	Best Error	Best Compression	No Error	No Compression
Codex 3260	&F	S0=1	&C1	&D3	*FL3	*SC1	*SM3	*DC1	*SM1	*DC0
USR Courier USR Sportster	&F	S0=1	&C1	&D3	&H1&R2	&B1	&M4	&K1	&M0	&K0
Global Village Teleport Gold	&F	S0=1	&C1	&D3	\Q3	\J0	\N7	%C1	\N0	%C0
AT&T Paradyne Dataport	&F	S0=1	&C1	&D3	\Q3	→	\N7	%C1	\N0	%C0
Hayes modems Accura/Optima	&F	S0=1	&C1	&D3	&K3	&Q6	&Q5	&Q9	&Q6	←
Microcom QX4232 series	&F	S0=1	&C1	&D3	\Q3	\J0	\N6	%C1	\N0	%C0
Motorola UDS FastTalk II	&F	S0=1	&C1	&D3	\Q3	\J0	\N6	%C1	\n)	%C0
Multitech MT1432, MT932	&F	S0=1	&C1	&D3	&E4	\$BA0	&E1	&E15	&E0	&E14
Viva 14.4/9642c	&F	S0=1	&C1	&D3	&K3	→	\N3	%M3	\N0	%M0
ZyXel U-1496E	&F	S0=1	&C1	&D3	&H3	&B1	&K4	←	&K0	←
Supra V.32bis/28.8	&F	S0=1	&C1	&D3	&K3	→	\N3	%C1	\N0	%C0
ZOOM 4.4	&F	S0=1	&C1	&D3	&K3	→	\N3	%C2	\N0	%C0
Practical Peripherals	&F	S0=1	&C1	&D3	&K3	→	&Q5	&Q9	&Q6	←
Megahertz	&F	S0=1	&C1	&D3	\Q3	\J0	\N6	%C1	\N0	%C0

Hints and Tricks

- If you dial up and connect but get no response, try ^U (clear line) and ^Q (XON) and a few returns to wake up the router.
- If you type **quit** and the modem does not hang up, the modem is not watching DTR or you have not configured the **modem inout** command on the router.
- If you find yourself in someone else's session when you dial in, the modem is not dropping CD on disconnect or you have not set up configured the **modem inout** command on the router.

- If you issue a `+++` on the dialing modem, followed by an `ATO` to reconnect and you find that you are frozen, this means the answering modem saw and interpreted the `+++` when it was echoed to you. This is a fairly common bug in the answering modem. Set `ATS2=255` or `ATS2=128` on the answering modem.
- If you have `autoselect` turned on for the line, enter a carriage return to see a prompt.
- If you do hardware flow control (which is recommended), make sure the router's line (DTE) and the modem (DCE) both have that feature enabled. Having one on and the other one off results in lost data.
- If you have an MDCE, we recommend that you turn it into an MMOD by moving pin 6 to pin 8 (most modems use CD and not DSR to indicate the presence of a carrier). Otherwise, some modems can be programmed to transmit carrier information via DSR. If you do not know what an MDCE is, disregard this paragraph.

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