Z DX MultiModem™

Model MT5600ZDX
Data/Fax Modem

Model MT5600ZDXV
Voice/Data/Fax Modem

User Guide

MultiTech® Systems

User Guide
Model MT5600ZDX / MT5600ZDXV
PN S0000134 Revision C

Revision	Date	Description
A	01/14/97	Manual released
B	09/15/98	Added #V, Class 2 fax, and V.90 information
C	01/22/01	Added descriptions of more AT commands, FCC Part 15 regulations, and installation in Linux operating systems

Trademarks

MultiModem, Multi-Tech, and the Multi-Tech logo are trademarks of Multi-Tech Systems, Inc. Adobe and Acrobat are trademarks of Adobe Systems Incorporated. MNP and Microcom Network Protocol are trademarks of Microcom, Inc. K56flex is a registered trademark of Rockwell International Corporation and Lucent Technologies Corporation. Microsoft, Windows, Windows 95, Windows 98, Windows NT, and Windows 2000 are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. All other brand and product names mentioned in this publication are trademarks or registered trademarks of their respective companies.

Patents

This device is covered by one or more of the following patents: 6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; D394,250; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; D374,222; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; D361,764; D355,658; D355,653; D353,598; D353,144; 5,355,365; 5,309,562; 5,301,274. Other patents pending.

Notice

Though these modems are capable of 56K bps download performance, line impairments, public telephone infrastructure and other external technological factors currently prevent maximum 56K bps connections.

Contents

Chapter 1: Introduction

Introduction

Congratulations on your purchase of the MultiModemZDX or the MultiModemZDXV modem. You have acquired one of the finest intelligent data/fax or voice/data/fax modems available today from one of the world's oldest modem manufacturers: Multi-Tech Systems, Inc. This manual will help you install, configure, test, and use your modem.

Product Description

The MultiModemZDX and MultiModemZDXV modems incorporate the K56flex™ and V.90 protocols, both of which enable Internet connections at data rates up to 56K bps over standard phone lines. These protocols are able to send data downstream to your computer at high speeds by taking advantage of the fact that data on the phone network normally is converted from digital to analog only once before it reaches your modem. Upstream transmissions and transmissions between client modems have a maximum data rate of 33.6K bps. Line conditions may cause modems to connect at speeds lower than the stated data rate maximums.

The MultiModemZDX and MultiModemZDXV modems offer interactive automatic dialing and command mode configuration. You can store four command lines or phone numbers of up to 31 characters each in the modem's nonvolatile memory. The modem pulse-dials or tone-dials, and recognizes dial tones and busy signals for reliable call-progress detection. It can also detect AT&T calling card tones. It is FCC-registered for connection to phone networks without notification to the phone company.

Features

General Features

- Complies with major ITU-T, TIA, and EIA international standards to ensure compatibility with other modems.

- Uses DTMF and tone detection to distinguish data and fax calls when used with software that supports these features.

- Supports serial port speeds to 230.4K bps with compatible serial ports.

- Supports Caller ID (North American versions only).

Data Features

- Supports ITU-T V.90 and K56flex™ speeds plus 33.6K, 31.2K, 28.8K, 26.4K, 24K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, 9.6K, 7.2K, 4.8K, 2.4K, 1.2K, and 0–300 bps.

Note: Under the 56K bps standards, you can asymmetrically download data from an ISP at speeds up to 53K bps, but upload only at speeds up to 33.6K bps. Client-to-client operation is also limited to 33.6K bps.

- Supports automatic fallback to slower speeds in noisy line conditions, and fall forward to faster speeds as conditions improve.

- Supports ITU-T V.42 LAP-M and MNP Class 3 and 4 error correction.

- Supports ITU-T V.42bis (4-to-1) and MNP 5 (2-to-1) data compression.

- Automatically disables compression when transferring already-compressed files.

- Can autodial, redial, pulse (rotary) and touch-tone dial.

- Detects dial tones and busy signals for reliable call-progress detection.

- Compatible with the standard AT command set used by most communication programs.

- Supports the H.324 protocol (videophone ready).

- Supports Plug and Play (PnP).

- Routes voice, data, or fax calls on a single phone line using distinctive rings.

- Can be flash upgraded.

Fax Features

- Supports V.17, Class 1, Class 2, and Group 3 fax standards, allowing the MultiModem fax to communicate with other fax modems as well as with fax machines.

- Sends and receives faxes from your computer at 14,400 bps, 9600 bps, 7200 bps, 4800 bps, 2400 bps, or 300 bps.

Voice Features (Model ZDXV only)

- Supports full-duplex speakerphone. Can record and play back answering machine messages using optional microphone and speaker.

- Supports telephone answering machine (TAM) including voice mail control, record/playback, and call screening with the included communications program.

Software Considerations for the MT5600ZDXV: You will need data communications (datacomm) software, fax communications software, and an appropriate application to access the Personal Voice Mail features of the MT5600ZDXV. You will need Microsoft Windows 3.1 or higher to run these programs. Then you can use the MT5600ZDXV to:
- speed dial
- mute a phone call
- place a call on hold
- forward or transfer a call
- three-way or conference call
- fax from any Windows application
- record phone conversations

Communications Program Features

Included on the CD with your modem is a communications program. After installing this program, you can:

- Upload and download data files.
- Send faxes at preset times.
- Upload and download data files.
- Store incoming voice messages and faxes.
- Retrieve stored messages, faxes, and phone numbers (phone number retrieval requires Caller ID service from your phone company).
- Print a received fax.

For detailed information about operating your modem under the included communications program, refer to the CD containing the User Guide.

What's In Your Modem Package?

Your modem package has several components. Make sure you have all of them before trying to operate your modem. Your package includes:

- An MT5600ZDX data/fax modem or an MT5600ZDXV voice/data/fax modem
- A DC power transformer
- One RJ11 phone cable
- A printed *Quick Start Guide*
- A system CD containing modem drivers and this User Guide
- A CD containing a communications program and other programs.
- Four vinyl gripper feet for the bottom of the modem
- Brochure with warranty registration card

If any of these items are missing, please contact Multi-Tech Systems or your dealer/distributor (see Appendix D for information on contacting Multi-Tech via telephone, fax, or the Internet).

Related Manuals

The following manuals are available from the Multi-Tech Web site and FTP site.

82076200   *MT56XX Fax Class 1 Developer's Guide*
               ftp://ftp.multitech.com/manuals/pdf/developers%20kits/5600fax.pdf

82006502   *Fax Class 2 Developers's Kit*
               ftp://ftp.multitech.com/manuals/pdf/developers%20kits/82006502.pdf
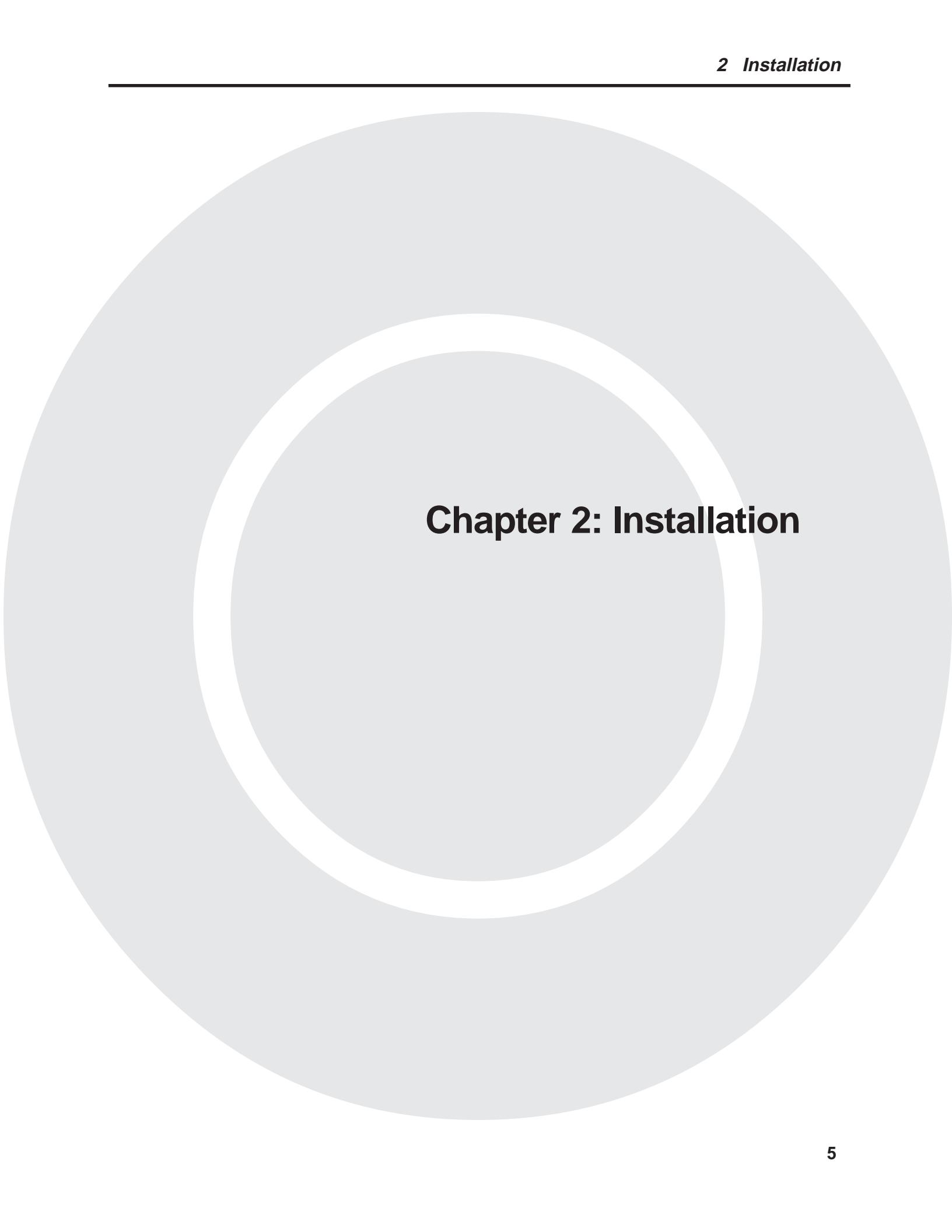
Chapter 2: Installation

Introduction

This chapter shows you step-by-step how to set up your Multi-Tech modem, test it, and make your first calls.

What You Will Need

Before starting, make sure you have everything you will need.

We supply

✓ An MT5600ZDX data/fax modem or a MT5600ZDXV voice/data/fax modem

✓ A DC power transformer

✓ One RJ11 phone cable

✓ A printed *Quick Start Guide*

✓ An system CD containing modem drivers and this User Guide

✓ A CD containing a communications program and other programs

✓ Four vinyl gripper feet for the bottom of the modem

You supply

✓ A computer with an available serial port. The processor speed should be at least 75 MHz in order to take full advantage of the ZDXV's telephony features.

✓ A shielded RS232 serial cable with a male DB-25 connector on one end and a connector to match your computer's serial port on the other end.

✓ A nearby AC power outlet

✓ A nearby phone jack

✓ (Optional) If you want speakerphone functions along with the ability to record sound or .WAV files through the sound card at the same time, you will need:

  • One stereo PC microphone

  • One stereo male to male patch cord

  • One sound card

  • Speakers

Safety Warnings

• Use this product only with UL- and CUL-listed computers.

• Never install phone wiring during a lightning storm.

• Never install a phone jack in a wet location unless the jack is specifically designed for wet locations.

• Never touch uninsulated phone wires or terminals unless the phone line has been disconnected at the network interface.

• Use caution when installing or modifying phone lines.

• Avoid using a phone (other than a cordless type) during an electrical storm; there is a risk of electrical shock from lightning.

• Do not use a phone in the vicinity of a gas leak.

• To reduce the risk of fire, use only 26 AWG or larger telephone line cord.

Connecting the Modem to Your System

Connections for the MT5600ZDX

Turn off your computer. Placing the modem in a convenient location, connect it to your computer's serial port, to the phone line, to AC power, and to your phone.
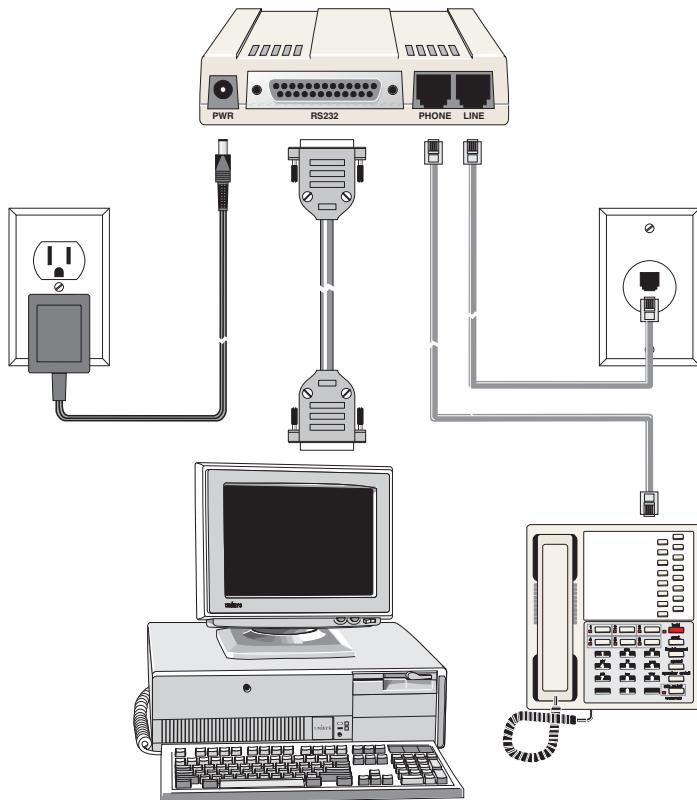
Figure 2–1. MT5600ZDX Connections.

1. Connect the Modem to Your PC (RS-232 Connection)

Plug one end of the RS-232 serial cable into the RS-232 connector on the modem, and plug the other end into a serial port connector on your computer, such as COM1 or COM2. You supply the RS-232 cable.

2. Connect the Modem to the Phone Jack (Line Connection)

Plug one end of the phone cable into the modem's LINE jack and the other end into a phone wall jack. The phone cable is included with your modem.

Note: The LINE jack is not interchangeable with the PHONE jack. Do not plug the phone into the LINE jack or the line cable into the PHONE jack.

3. (Optional) Connect the Modem to the Phone

For voice-only calls, plug a phone into the modem's PHONE jack.

4. Connect the Modem to the AC Power Outlet

Plug the DC power transformer into an AC power outlet or power strip. Plug the DC power transformer into the POWER jack on the modem.

Note: Use only the DC power transformer supplied with the modem. Use of any other transformer voids the warranty and can damage the modem.

A Note About Power Connection, Surge Protectors, and Lightning

Power surges and other transient voltages on power lines, such as those caused by lightning strikes, can damage or destroy your modem. Therefore, we recommend that you plug the modem into a surge protector rather than directly into a wall outlet, preferably a surge protector that provides protection against electrical spikes on the phone line as well as on the power line. Note that not even a surge protector can guard against damage from a nearby lightning strike. During an electrical storm, it is safest to unplug your computer equipment from both the power outlet and the phone line.

Power-On Test

Test the modem by turning it on (an on-off switch is located on the side panel). When you apply power, the modem performs a diagnostic self-test. The 56 indicator lights; and if a terminal program is running, the TR indicator also lights. If this does not happen, check that the power switch is on, the power supply is solidly connected, and the AC outlet is live. If these measures do not work, see Chapter 5, *Troubleshooting*.

Note: The Federal Communications Commission (FCC) and Industry Canada impose certain restrictions on equipment connected to public phone systems. For more information, see Appendix A.

Using Your Modem

Right now the modem is set up for the most typical user application, that is, the modem is set to make dial-up calls to remote installations where the calls are answered automatically. Therefore, you shouldn't need to change the current default configuration.

You will likely use your data communications software to:

- Launch a data communications session through a set of modem configurations which you select and then associate with a target phone number. Once you have created, saved, and named this set of information according to your connection needs and your data communications software's conventions, the software then simplifies your dialing. You need not reconfigure the modem nor run the risk of mistakenly keying-in incorrect information, or

- Enter terminal mode, where you can issue **AT** commands .

Connections for the MT5600ZDXV
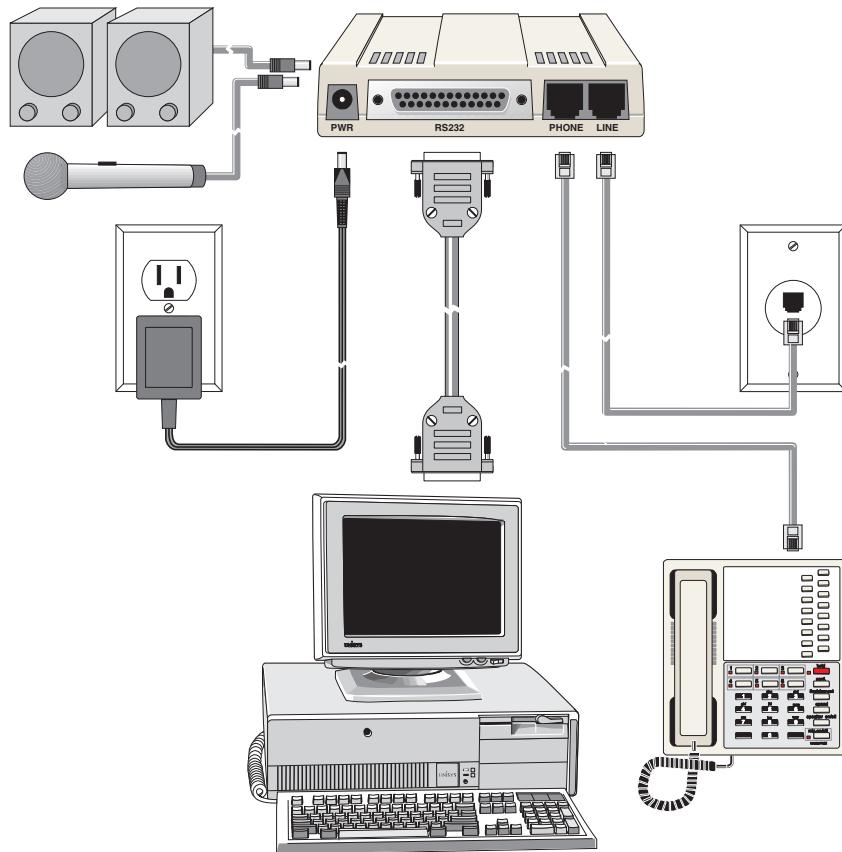
Figure 2–2.   MT5600ZDXV Connections

1. Follow All of the Connection Directions for the MT5600ZDX

The add these steps:

2. Connect the Microphone

For voice mail or speakerphone applications, plug an unamplified microphone into the MIC jack on the side of the modem. The microphone should have a stereo 1/8-inch mini plug. Do not use a monophonic microphone.

3. Connect the Speaker

For speakerphone or voice mail applications, use a 1/8-inch-plug male-to-male stereo patch cord to connect the SPKR jack on the side of the modem to the LINE IN jack on your sound card. If your sound card does not have a LINE IN jack, use its MIC jack. The stereo male-to-male patch cord can be purchased at a local PC retail store.

If you do not have a sound card, you can plug an amplified speaker directly into the SPKR jack.

Installing the Modem Driver

If you use Windows 95/98/2000 or Windows NT 4.0, you must install the modem driver. The modem driver is used by Windows to control the modem. If you use Windows 3.1 or another operating system, skip this step and go to Chapter 3. If you are using a Linux operating system, see Appendix F.

1. Make sure your modem is connected properly, and then turn on your computer. Windows should detect your new modem and open the **Install New Modem** wizard.

   Note: If Windows cannot find a modem, your modem may be turned off, it may be plugged into the wrong connector on your computer, or the serial cable may be faulty. See "None of the LEDs Light When the Modem Is Turned On" and "The Modem Does Not Respond to Commands" in Chapter 5, "Troubleshooting."

2. In the **Install New Modem** wizard, select **Don't detect my modem; I will select it from a list**, and then click **Next**. A dialog box with a list of manufacturers and a list of modem models appears.

3. Insert the system CD, and then click **Have Disk**.

4. In the **Install from Disk** dialog box, select the drive the system disk is in, and then click **OK**.

5. A list of modems appears. Select your modem, and then click **Next**.

6. Select the port the modem is connected to, and then click **Next**.

7. Windows installs and configures the modem.

8. Click **Finish** to exit.

Removing an Old Modem Driver

When your new modem replaces another modem, the old modem driver remains in Windows, and the old modem driver is still selected in HyperTerminal and other Windows applications. Though you can change the application connection descriptions one at a time, it is easier to force the Windows applications to use the new modem by removing the old modem driver from Windows.

1. Click the **Start** button, point to **Settings**, and click **Control Panel**.

2. Double-click the Modems icon to open the **Modems Properties** dialog box.

3. In the list box, select the old modem.

4. Click **Remove**, and then click **Close**.

5. The next time you dial a HyperTerminal connection, it will select your new modem and ask you to confirm the selection.

Installing Your Data Communications Software

Data communications software is designed to send and receive messages. Multi-Tech includes a data communications program with your modem. However, the modem will work with any data communications software. To install the data communications software provided with this modem, insert the CD into the CD-ROM drive. The software will then install automatically if you have Windows 95/98/2000 or Windows NT 4.0.

For other operating systems, insert the CD into your CD-ROM drive, click the **Start** button, and then click **Run**. Type **D:\setup.exe**, and then click **OK**. If your CD-ROM drive uses a different drive letter, type that letter in place of D. The setup wizard on the CD guides you through the installation.

Note: Data communications software running in a Windows operating system normally do not have to be configured since they use the Plug and Play configuration supplied by the Windows modem driver. Data communications software running in DOS or other operating systems may need to be manually configured. See Chapter 3, Advanced Options.

Connecting to the Internet

Your Multi-Tech modem is your gateway to the Internet and the World Wide Web. To access the Internet and Web via your modem, you must establish a dial-up account with an Internet service provider (ISP). To locate an ISP near you, look in a local directory or computer publication. Your ISP should provide you with the following information:

- User name (also called user ID)
- Password
- Access number (the number you call to connect to the server)
- Host name and/or domain name
- Domain Name Server (DNS) server address

If, besides the Web, you use the Internet for e-mail and newsgroups, your ISP should also provide you with the following information:

- E-mail or POP mail address
- POP server address
- Mail or SMTP address
- News or NNT server address

Dial-Up Networking

Whether you use the Internet for e-mail or browsing the Web, to connect to it through your modem, you must first set up a dial-up networking program. The one in Windows 95, 98, 2000, and Windows NT 4.0 is called Dial-Up Networking. Dial-Up Networking establishes your connection to the ISP's server, which is the shared computer that manages calls from clients (your computer) to the Internet. Most, if not all, Windows browsers start Dial-Up Networking automatically when you open them.

Installing Dial-Up Networking in Windows 95/98

To install and run Dial-Up Networking in Windows 95 or 98

Install a NetWare client or Client for Microsoft Networks on the your computer. Microsoft Client for Netware Networks, Microsoft Client for Microsoft Networks, and two Novell Netware clients are included with Windows 95/98.

1. Insert the Windows compact disc into the CD-ROM drive.
2. In Windows, click the **Start** button, then select **Settings**, **Control Panel**, and **Add/Remove Programs**.
3. Click the **Windows Setup** tab.
4. Check **Communications** in the **Components** list.
5. Click the **Details** button.
6. Check **Dial-up Networking** in the **Components** list.
7. Click **OK**. Dial-Up Networking is installed from the Windows compact disc.
8. When the installation is complete, reboot the computer.

To create a connection entry

1. Double-click the **My Computer** icon.
2. Double-click the **Dial-Up Networking** icon.
3. Double-click the **Make New Connection** icon, and follow the directions in the wizard to create a connection entry.
4. Your computer should now be ready to dial up your ISP's server.

To dial your Internet access provider

1. Double-click the **My Computer** icon.
2. Double-click the **Dial-Up Networking** icon.
3. Double-click the icon with your ISP's name.
4. Type your name and password if they are not already entered.
5. Click **Connect**.
6. Follow the instructions provided by your ISP for browsing the the Internet, reading e-mail, and accessing information.

For further information on Dial-Up Networking or Microsoft Client for NetWare Networks, see Windows Help.

Installing Dial-Up Networking in Windows 2000

Dial-Up Networking installs automatically in Windows 2000. The following instructions describe Dial-Up Networking connection options under Windows 2000, and guide you in setting up a Dial-Up Networking connection to an Internet service provider (ISP).

Note: Make sure TCP/IP is installed on your computer.

1. To set up a Dial-Up Networking connection in Windows 2000, select **Start | Settings | Network and Dial-up Connections**.

2. In the **Network and Dial-up Connections** dialog box, double-click the **Make New Connection** icon. The **Network Connection Wizard** dialog box appears. Click **Next**.

3. In the **Network Connection Type** dialog box, select **Dial-up to the Internet**. Click **Next**. The **Internet Connection Wizard** dialog box appears.

4. In the **Internet Connection Wizard** dialog box, select the appropriate option for the type of connection you are making to the Internet. Click **Next**. The rest of this procedure assumes you selected **I want to set up my Internet connection manually,** or **I want to connect through a local area network**

5. In the **Setting up your Internet connection** dialog box, select **I want to connect through a phone line** and modem. Click **Next**.

6. If you have only one modem installed on your computer, proceed to the next step. If you have more than one modem installed, select your Multi-Tech modem from the list. Click **Next**.

7. In the **Step 1 of 3: Internet account connection information** dialog box, type the area code, telephone number, and country/region name and code for your Internet service provider's access number.

8. Click the **Advanced** tab to access options for selecting your connection type and logon procedures. Your ISP should provide this information to you. If you are not sure which connection type to choose, try **PPP**.
   Though many ISPs automatically provide an IP address for your machine and their domain name server (DNS) each time you connect to them, some ISPs do not. If your ISP-provided IP addresses to you, click the **Addresses** tab. In the **IP Address** section, select **Always use the following**, and then enter the IP addresses into the appropriate boxes. Click **OK** to return to **Step 1 of 3: Internet account connection**. Click **Next**.

   Note: If your machine has a network adapter installed, do not enter the network IP address of this device.

9. In the **Step 2 of 3: Internet account logon information** dialog box, type the user name and password you will use for your Internet account. Click **Next**.

10. In the **Step 3 of 3: Configuring your computer** dialog box, enter a descriptive name for this connection. Click **Next**.

11. Next, you are asked if you would like to set up an Internet mail account. You may select **Yes** or **No**. If you select **Yes**, you will be asked to provide specific information about your mail service. Click **Next**.

12. When the **Completing the Internet Connection Wizard** appears, click **Finish**.

For further information on Dial-Up Networking, see Windows 2000 Help.

Installing Dial-Up Networking in Windows NT 4.0

To install Dial-Up Networking

1. Double-click the **My Computer** icon, and then double-click the **Dial-Up Networking** icon. If Dial-Up Networking is not installed, you will see an **Install** button in the **Dial-Up Networking** dialog box.

2. Insert the Windows NT 4.0 compact disc into the CD-ROM drive.

3. Click **Install** in the **Dial-Up Networking** dialog box.

4. In the **RAS Device** dialog box, choose the modem to use with **Dial-Up Networking**, and then click **OK**.

5. In the **Remote Access Setup** dialog box, click **Configure**.

6. In the **Configure Port Usage** dialog box, click **Dial out only**, and then click **OK**.

7. In the **Remote Access Setup** dialog box, click **Network**.

8. In the **Network Configuration** dialog box, make sure that only **TCP/IP** is selected, and then click **OK**.

9. If there is a network interface card that does not have TCP/IP bound to it, the Microsoft TCP/IP Properties window appears. Click **Cancel** to close the window.

10. Click **Continue**, and then click **Restart** to finish the installation.

11. When the installation is complete, reboot the computer.

To create a connection entry

1. Double-click the **My Computer** icon, and then double-click the **Dial-Up Networking** icon.

2. In the **Dial-Up Networking** dialog box, click the **New** button.

3. In the **New Phonebook Entry** wizard, follow the directions to create a connection entry.

4. Your computer should now be ready to dial up your ISP's server.

To dial your Internet access provider

1. Double-click the **My Computer** icon.

2. Double-click the **Dial-Up Networking** icon.

3. Click the connection in **Phonebook entry to dial**.

4. Click **Dial**.

5. Follow the instructions provided by your ISP for browsing the the Internet, reading e-mail, and accessing information.

For further information on Dial-Up Networking, see Windows NT Help.

Sending a Fax

With your data communications software, you can use your modem to send and receive faxes directly from your computer. The following steps show you how to fax a document directly from a Windows application without opening the data communications program.

1. Create a document in a Windows application, such as Word, a graphics editor, or a spreadsheet. Keep the application and the document open, and select **Print** from the **File** menu.

2. Select **CAPTURE FAX BVRP** as the printer driver, and then click **OK**. The **Send Fax** wizard appears.

3. In the **Recipient** section, type the required information or extract it from the Phone Book by clicking this icon.

4. In the **Template** section, optionally select a cover page and type a cover message.

5. Select the document to be sent. The default file when sending from within a Windows application is **Capture.dgr**.

6. Select the date and time to send the document, if you do not want to send it immediately.

7. Click **Finish** to start the transmission.

About the LED Indicators

The modem has ten LED indicators on the front panel that indicate status and activity:

Figure 2–3. Front panel

TR **Transmit Data**

Flashes when the modem is transmitting data to another modem.

RD **Receive Data**

Flashes when the modem is receiving data from another modem.

CD **Carrier Detect**

Lights when the modem detects a valid carrier signal from another modem. It is on when the modem is communicating with the other modem, and off when the link is broken.

56 **56K Mode (56,000–28,000 bps)**

Lights whenever the modem is set for or connects using either the K56flex or the V.90 protocol. The actual connection speed depends on the ISP server capabilities and line conditions.

28 **V.34 Mode**

Lights when the modem in connected in V.34 mode.

14 **V.32 bis**

Lights when the modem is connected in V.32 bis mode.

OH **Off-Hook**

Lights when the modem is off-hook, which occurs when the modem is dialing, online, or answering a call. The LED flashes when the modem pulse-dials.

TR **Terminal Ready**

Lights when a communication program is using the modem. It means the modem is ready for an outgoing or incoming call. It goes off when the communication program disconnects the serial port. When it goes off, a connected modem will disconnect.

EC **Error Correction**

Lights when the modem is set for V.42 error correction. It flashes on and off when data compression is activated.

FX **Fax**

Lights when the modem is connected in fax mode.

Note: When you turn on the modem, the **56** indicator lights; and if a terminal program is running, the TR indicator also lights. After a call, the indicator for the connection's speed protocol remains lit until another call is made or the modem is reset. On reset the 56 indicator lights again.

References

The World Wide Web is an excellent source of information about modems in general and modem installation, configuration, and troubleshooting in particular. The following Web sites are good places to start:

- Costmo's Other Resources Page:
  http://modems.rosenet.net/or/

- Curt's High Speed Modem Page:
  http://www.teleport.com/~curt/modems.html

- Data Communications FAQ:
  http://www.best.com/~malch/comfaq.html

- Multi-Tech Systems, Inc.:
  http://www.multitech.com/
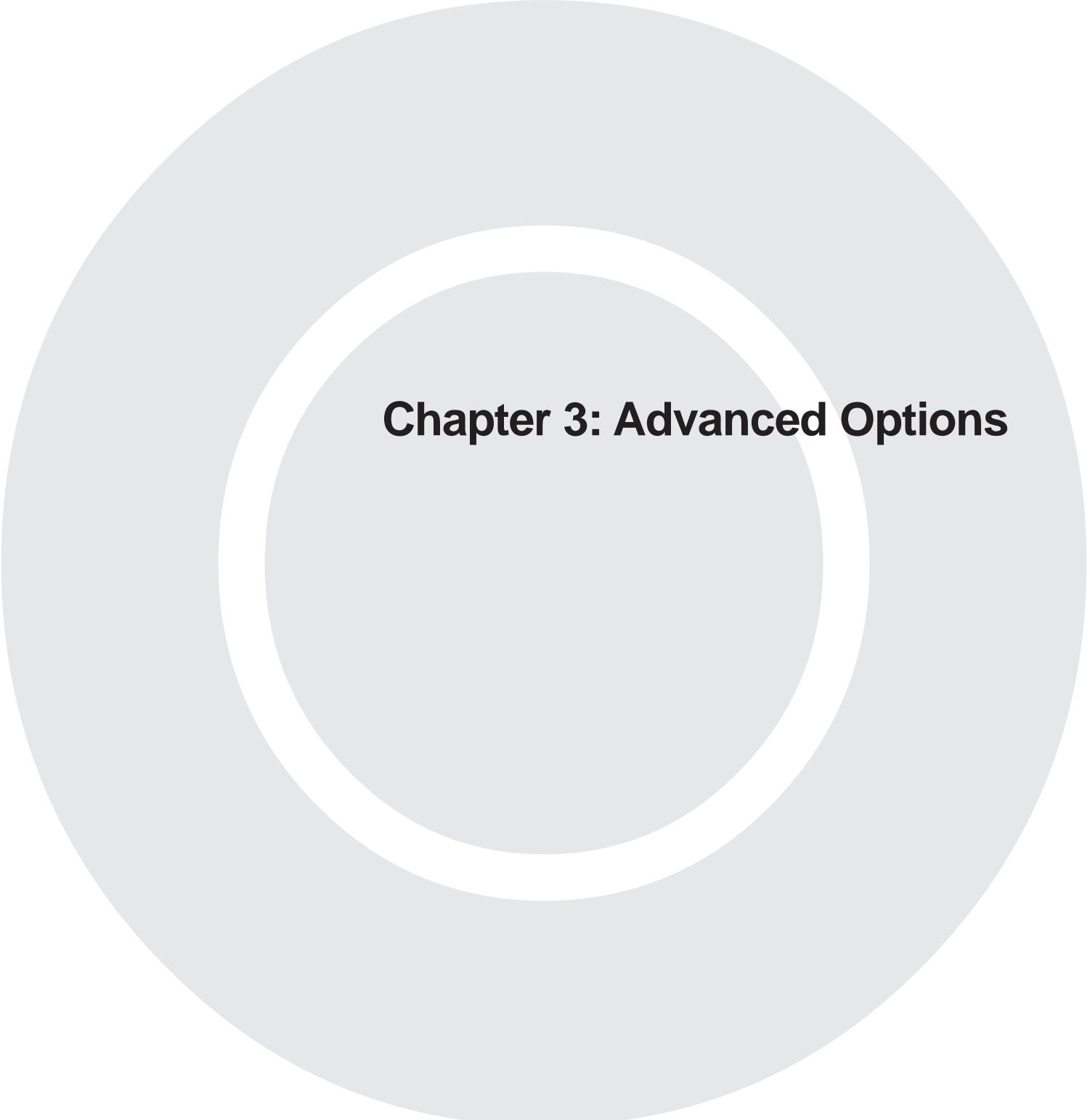
Chapter 3: Advanced Options

Introduction

Like any modem, your Multi-Tech modem operates only under the control of a communications program, such as the communications program included with the modem. It also operates under other general-purpose data communication programs, such as Windows Terminal and HyperTerminal. For information on how to use the modem with the communications program of your choice, please refer to the documentation provided with the data communications program.

An experienced modem user can configure the program's software to change the way the software interacts with a modem and configure the modem to change the way it operates.

Configuring Your Software

For Windows 95/98/2000 and Windows NT:
Communication programs designed for these operating systems normally do not need to be manually configured, since they use the Plug and Play configuration of the Windows modem driver.

For DOS and Other Operating Systems:
Communication programs designed for DOS and other operating systems, however, may need to be manually configured to work with your modem. Though each communications program is different, the following procedure should work with most of them.

1. Turn on your computer and run your communications program.

2. Find the dialog box or menu that lets you select your modem. (In Windows Terminal select **Settings** | **Modem Commands**; in HyperTerminal select **File** | **Properties** | **Phone Number**; and in the communications program select **Configure** | **General Configuration** | **Communication** | **Change Modem**.

3. Choose your modem from the program's modem list. If it isn't listed, choose a generic modem and modify the settings as necessary.

4. Change the modem initialization string, if necessary. The factory default configuration works well for most purposes. To load the factory default configuration, use **AT&F**. To load a custom configuration that was saved using the **&W** command, use **ATZ**. Note that the **Z** command must be in a command string by itself. For a Macintosh, the initialization string should include the **&D0** command. If you do not want the modem to always answer the phone, add **S0=0** to the string. To use Caller ID with the modem, add **S0=2** to the string (Caller ID information is sent between the first and second rings, so the phone must ring at least twice before the modem picks up the line). Depending on the software, you might have to end the string with a carriage return character (**^M**).

Note: To change the modem's default configuration, type new commands in the communication program's terminal window, adding the **&W** command to store them in the modem's nonvolatile memory. For instance, to create a default configuration for a Macintosh computer that turns off autoanswer, type **AT&F&D0S0=0&W**. The new configuration loads automatically whenever the modem is turned on or receives the **ATZ** command.

---

5. Select the port the modem is connected to (normally COM1 or COM2).

6. Select your serial port speed. This can be labeled "maximum speed," "DTE bps," or "baud rate." Ideally, if you use data compression, you should set your serial port baud rate to four times the modem's maximum transmission speed or faster; however, few files can be compressed enough to require speeds that high, and not all serial ports can handle speeds that high.

    *   Set the serial port baud rate to 115,200 bps if your computer has a high speed serial port with a 16550AFN UART or equivalent and Windows 95 or NT 4.0

    *   Set it to 57,600 bps if it has Windows 3.1x. If you have an older computer with a 14550 UART, set it to 19,200 bps.

    *   Older Macintosh computers can use a serial port baud rate of 57,600 bps; newer ones can use a serial port baud rate of 115,200 bps or 230,400 bps.

    To see what UART your serial port uses if you have Windows 3.1x, in Program Manager select **File** | **Run**, type **MSD**, and press ENTER. Select **COM Ports** to see the UART type. If you have Windows 95 or 98, select **Start** | **Settings** | **Control Panel**, and double-click on the Modems icon. In the **Modems Properties** dialog box, click the **Diagnostics** tab, click the port the modem is connected to, and click **More Info** to see the UART type. Note that both programs will identify a 14550 UART as an 8250A UART. If you have an 80386 or later computer, your UART is most likely a 14550 or 16550AFN.

7. If the communication program has an autobaud selection, make sure it is disabled. Autobaud applies only to older modems, and can cause problems if enabled.

8. If the program allows you to edit the no-connect messages (*NO CARRIER, BUSY, NO ANSWER, NO DIALTONE*), make sure there is no space between *DIAL* and *TONE* in *NO DIALTONE*.

9. Refer to the program manual or online help for other configuration choices. In most cases you can accept the default values.

Configuring Your Modem

Your modem normally is configured through Windows or through the communication program you are using. The default settings work best for most purposes. However, you also can configure your modem by sending **AT** commands to the modem. See Chapter 4 for a list of **AT** commands and how to use them.

Chapter 4: AT Commands, S-Registers, and Result Codes

Using *AT* Commands to Configure Your Modem

AT commands are used to control the operation of your modem. They are so called because each command must be preceded by the characters *AT* to get the *AT*tention of the modem.

AT commands can be issued only when the modem is in command mode or online command mode. The modem is in *command mode* whenever it is not connected to another modem. The modem is in *data mode* whenever it is connected to another modem and ready to exchange data. *Online command mode* is a temporary state in which you can issue commands to the modem while connected to another modem. To put the modem into online command mode from data mode, you must issue an *escape sequence* (+++) followed immediately by the *AT* characters and the command, e.g., +++**ATH** to hang up the modem. To return to data mode from online command mode, you must issue the command **ATO**.

To send AT commands to the modem you must use a communications program, such as the HyperTerminal applet in Windows 95, 98, NT 4.0 and Windows 2000, or the communications program included with this modem. You can issue commands to the modem either directly, by typing them in the terminal window of the communications program, or indirectly, by configuring the operating system or communications program to send the commands automatically. Fortunately, communication programs make daily operation of modems effortless by hiding the commands from the user. Most users, therefore, need to use AT commands only when reconfiguring the modem, e.g., to turn autoanswer on or off.

The format for entering an AT command is **AT*Xn***, where *X* is the command and *n* is the value for the command, sometimes called the command *parameter*. The value is always a number. If the value is zero, you can omit it from the command; thus, **AT&W** is equivalent to **AT&W0**. Most commands have a *default* value, which is the value that is set at the factory. The default values are shown in the "AT Commands Reference" section, which begins on the next page.

You must press ENTER to send the command to the modem. Any time the modem receives a command, it sends a response known as a *result code.* The most common result codes are *OK*, *ERROR*, and the *CONNECT* messages that the modem sends to the computer when it is connecting to another modem. For a table of valid result codes, see "Result Codes" at the end of this chapter.

You can issue several commands in one line, in what is called a command *string.* The command string begins with **AT** and ends when you press ENTER. Spaces to separate the commands are optional; they are ignored by the command interpreter. The most familiar command string is the *initialization string,* which is used to configure the modem when it is turned on or reset, or when your communications program calls another modem.

AT Commands Reference

Command:	**AT**	**Attention Code**
Values:		n/a
Description:		The attention code precedes all command lines except **A/** and the escape sequence.

Command:	**ENTER**	**Key**
Values:		n/a
Description:		Press the ENTER or RETURN key to execute most commands.

Command:	**A**	**Answer**
Values:		n/a
Description:		Answers an incoming call before the final ring.

Command:	**A/**	**Repeat Last Command**
Values:		n/a
Description:		Repeats the last command string. Do not precede this command with **AT**. Do not press ENTER to execute.

Command: **B***n*   **Communication Standard Setting**
Values: $n = 0$ or 1
Default: 1
Description:
B0   Selects ITU-T V.22 mode when the modem is at 300 or 1200 bps.
B1   Selects Bell when the modem is at 300 or 1200 bps.

Command: **D***s*   **Dial**
Values: *s* = dial string (phone number and dial modifiers)
Default: none
Description: Dials telephone number *s*, where *s* may be up to 40 characters long and include the following dial string modifiers.

0–9   Digits 0 through 9
*   The "star" digit (tone dialing only)
#   The "pound" digit (tone dialing only)
A–D   A, B, C, and D tone digits. Country specific; some countries may prohibit these digits.
L   Redial last number. (Must be placed immediately after **ATD**.)
P   Select pulse-dialing until a **T** is encountered. Affects current and subsequent dialing.
T   Select tone-dialing until a **P** is encountered. Affects current and subsequent dialing.
W   Wait for a new dial tone before continuing to dial. (**X2** or **X4** must be selected.)
S=n   Dial a telephone number previously stored using the &Zn=x command (see &Zn=x command for more information). The range of n is 0-3.
,   Pause during dialing for time set in register *S8*.
;   Return to command mode after dialing. (Place at end of dial string.)
!   Hook flash. Causes the modem to go on-hook for the time specified in *S29*, then off-hook again .

@ Wait for quiet answer. Causes the modem to wait for a ringback, then 5 seconds of silence, before processing the next part of the command. If silence is not detected, the modem returns a NO ANSWER code.

& Wait for credit card dialing tone before continuing with the dial string (wait contingent on S7 setting). The character should follow the phone number and precede the user's call card number, e.g., **ATDT10288061278535000$123456789**.

^ Toggle data calling tone on or off. Applies only to current dialing attempt.

Command:	**DS=n**	**Dial Stored Telephone Number**
Values:	n = 0–3	
Default:	none	
Description:	Dial a number previously stored in directory number *n* by the **&Zy=n** command. Example: **ATDS=3**.	

Command:	**En**	**Echo Command Mode Characters**
Values:	n = 0 or 1	
Default:	1	
Description:	E0	Do not echo keyboard input to the terminal.
	E1	Do echo keyboard input to the terminal.

Command:	**Hn**	**Hook Control**
Values:	n = 0 or 1	
Default:	0	
Description:	H0	Go on-hook (hang up) and terminate any **&T** test in progress.
	H1	Go off-hook (makes phone line busy); enters command mode.

Command:	**In**	**Information Request**
Values:	n = 0–6	
Default:	None	
Description:	I0	Display the product code. Example: *MT5600ZDX*.
	I1	Calculate the ROM checksum and display the least significant byte in decimal format.
	I2	Displays **OK**.
	I3	Display the firmware version and application codes.
	I4	Display the OEM-defined identifier string in either binary or ASCII format.
	I5	Display the country code. Example: *098*.
	I6	Display the modem data pump model and internal code version.

Command:	**L5**	**Lists Current Operating Parameters**
Values:	See Description	
Default:	none	
Description:	Lists the current values of error correction, flow control, data compression, and serial port speed. Example:	

```
at
OK
atl5
&E2 &E3 &E15 $SB115200
OK
```

Command: **M***n*   Monitor Speaker Mode
Values: *n* = 0, 1, 2, or 3
Default: 1
Description: M0   Speaker is always off.
   M1   Speaker is on until the carrier signal is detected.
   M2   Speaker is always on when the modem is off-hook.
   M3   Speaker is off when receiving carrier and during dialing, but on during answering.

Command: **N***n*   **Modulation Handshake**
Values: *n* = 0 or 1
Default: 1
Description: N0   Disables automode. The modem attempts a handshake at the speed set by **S37** or, if **S37=0**, at the most recently sensed serial port speed.
   N1   Enables automode. The modem attempts a handshake at the speed set by **S37** or, if **S37=0**, at the highest possible speed. During the handshake, fallback to a lower speed can occur.

> **Note:** Setting the **N** command automatically sets the *<automode>* parameter of the *+MS* command. **N** and **S37** are provided only for compatibility with existing software. *+MS* is the recommended command.

Command: **O***n*   **Return Online to Data Mode**
Values: 0 or 1
Default: None
Description: O0   Exit online command mode and return to online data mode without a retrain. Normally used after a +++ escape (see *+++AT<CR>* escape sequence).
   O1   Exit online command mode and return to online data mode after a retrain.

Command: **P**   **Sets Pulse Dial as Default**
Values: P, T
Default: T
Description: The command forces pulse dialing until the next **T** dial modifier or **T** command is received.

Command: **Q***n*   **Result Codes Enable/Disable**
Values: *n* = 0 or 1
Default: 0
Description: Q0   Enable result codes.
   Q1   Disable result codes.

Command: **S***r*   **Select Register**
Values: *r* = S-register number
Default: None
Description: Selects register S*r* as the last register accessed; e.g., **S0**. The command **AT?** can then be used to read the register, and command **AT=***n* can then be used to set the register to value *n*.

Command: **S*r*=*n* Set Register Value**
Values: *r* = S-register number; *n* varies
Default: None
Description: Sets value of register S*r* to *n*, where *n* is entered in decimal format.

Command: **S*r?* Read Register Value**
Values: *r* = S-register number
Default: None
Description: Reads value of register S*r* and displays it in 3-digit decimal format; e.g., **S2?** gives the response 043. If the short form **AT?** is used, the last accessed S-register is read.

Command: **T   Tone Dialing**
Values: P, T
Default: T
Description: Forces DTMF (tone) dialing until a *P* command or *P* dial modifier is received.

Command: **V*n*   Result Code Format**
Values: *n* = 0 or 1
Default: 1
Description: V0   Displays result codes as digits (terse response).
                         V1   Displays result codes as words (verbose response).

Command: **W*n*   Connect Message Control**
Values: *n* = 0, 1, or 2
Default: 0
Description: W0   Upon connection, the modem reports DTE speed only (e.g., CONNECT 56000). Other response are disabled.
                         W1   Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed.
                         W2   Upon connection, the modem reports DCE speed only (e.g., CONNECT 28800). Other responses are disabled.

Note: See also the *V* command

Command: **X*n*   Result Code Selection**
Values: *n* = 0–4
Default: 4
Description: This command selects which subset of the result messages will be used by the modem to inform the computer of the results of commands.
                         X0   Sends *OK, CONNECT, RING, NO CARRIER, ERROR* and *NO ANSWER*; does not look for dial tone or busy signal.
                         X1   Sends *X0* messages and connect speed; does not look for dial tone or busy signal.
                         X2   Sends *X1* messages with *NO DIALTONE*; does not look for busy signal.

X3   Sends *X1* messages with *BUSY*; does not look for dial tone.

X4   Sends all messages, including *NO DIALTONE* and *BUSY*.

Note: If the modem is in fax mode, the only message sent to indicate a connection is *CONNECT* without a speed indication. See also the *\V* command.

Command:	**Y***n*	**Long Space Disconnect**
Values:		*n* = 0 or 1
Default:		0
Description:	Y0	Disables sending or responding to a long space break signal on disconnect.
	Y1	Enables long space disconnect. In non-error correction mode, the modem sends a long space of four seconds prior to going on-hook. In non-error correction mode, the modem responds to the receipt of a long space (i.e., a break signal greater than 1.6 seconds) by going on-hook.

Command:	**Z***n*	**Modem Reset**
Values:		*n* = 0 or 1
Default:		None
Description:		The modem performs a soft reset and restores (recalls) the configuration profile according to the parameter supplied. If no parameter is specified, zero is assumed.
	Z0	Resets modem and restores Profile 0.
	Z1	Resets modem and restores Profile 1.

Note: See also the *&F* and *&W* commands.

Command:	**&C***n*	**Data Carrier Detect (DCD) Control**
Values:		*n* = 0, 1, 2, 3
Default:		3
Description:	&C0	Forces the DCD circuit to always be high.
	&C1	Forces the DCD to go high when the remote modem's carrier signal is detected, and go low when the carrier signal is not detected.
	&C2	Forces the DCD to go high in .5 seconds after the connect message is displayed
	&C3	Forces the DCD to go high at the same time the connect message is displayed

Command:	**&D***n*	**Data Terminal Ready (DTR) Control**
Values:		*n* = 0, 1, 2, or 3
Default:		2
Description:		This command interprets the high to low transition of the DTR signal sent by the computer according to the supplied parameter. The action taken depends on the current *&Q* setting.
	&DO	Modem ignores the true status of the DTR signal and responds as if it is always on.

&D1 When DTR drops while in online data mode, the modem enters command mode, issues an OK, and remains connected.

&D2 When DTR drops while in online data mode, the modem hangs up.

&D3 When DTR drops, the modem hangs up and resets as if an **ATZ** command were issued.

Command:	**&E*n***	**V.42 Error Correction Modes**
Values:		*n* = 0, 1, or 2
Default:		1
Description:	&E0	V.42 non-error correction mode (V.42 disabled).
	&E1	V.42 auto-reliable mode.
	&E2	V.42 reliable mode (V.42 enabled).

Note: See also the *\N* and *L5* commands.

Command:	**&E*n***	**Modem-Initiated Flow Control**
Values:		*n* = 3, 4, or 5
Default:		4
Description:	&E3	Flow control disabled.
	&E4	CTS/RTS hardware flow control.
	&E5	XON/XOFF software flow control.

Note: See also the *&K* command.

Command:	**&E*n***	**Data Compression**
Values:		*n* = 14, 15
Default:		15
Description:	&E14	Disables data compression.
	&E15	Enables data compression.

Command:	**&F*n***	**Load Factory Settings**
Values:		*n* = 0 or 1
Default:		None
Description:	&F0	Load factory configuration 0.
	&F1	Load factory configuration 1.

Note: See also the *L5* and *Z* commands.

Command:	**&G*n***	**V.22bis Guard Tone Control**
Values:		*n* = 0, 1, or 2
Default:		varies by country
Description:	&G0	Disables guard tone.
	&G1	Sets guard tone to 550 Hz.
	&G2	Sets guard tone to 1800 Hz.

Note: The *&G* command is not used in North America, and may not be permitted in some countries.

27

Command: &J **Telephone Jack Control**
Description: This command is supported for compatibiltiy only and performs no function in this modem.

Command: **&K***n* **Flow Control Selection**
Values: *n* = 0, 3, 4, 5, or 6
Defaults: 3 (data modem mode)
6 (fax modem and voice modes)
Description: &K0 Disables flow control.
&K3 Enables CTS/RTS hardware flow control.
&K4 Enables XON/XOFF software flow control.
&K5 Enables transparent XON/XOFF flow control.
&K6 Enables both RTS/CTS and XON/XOFF flow control.

Note: See also the **&E** command

Command: **&P***n* **Make/Break Dial Ratio**
Values: 0, 1, 2, 3
Default: None
Description: &P0 Make/Break dial ratio of 39/61 at 10 pps
&P1 Make/Break dial ratio of 33/67 at 10 pps
&P2 Make/Break dial ratio of 39/61 at 20 pps
&P3 Make/Break dial ratio of 33/67 at 20 pps

Command: **&Q***n* **Asynchronous Communications Mode**
Values: *n* = 0, 5, 6
Default: 5
Description: This command is used to control which connection modes are permitted. It is used in conjunction with **S36** and **S48**. (See also the **\N** command).
&Q0 Selects asynchronous operation with no data buffering and no error correction. Same as **N0**.
&Q4 Selects Auto Sync operation. The value 100b is written to S27 bits 3, 1, and 0, respectively. Auto Sync operation, when used in conjunction with compatible software in the DTE, provides synchronous communication capability from an asynchronous terminal.
Starting Auto Sync: Set registers S19, S20, and S25 to the desired values before selecting Auto Sync operation with **&Q4**. After the CONNECT message is issued, the modem waits the period of time specified by S25 before examining DTR. If DTR is on, the modem enters the synchronous operating site; if DTR is off, the modem terminates the line connection and returns to the aysnchronous command state.
Stopping Auto Sync: Auto Sync operation is stopped upon loss of carrier or the on-to-off transition of DTR. Loss of carrier will cause the modem to return to the asynchronous command state. An on-to-off transition of DTR will cause the modem to return to the aysnchronous command state and either not terminate the line connection (**&D1** active) or terminate the line connection (any other **&D***n* command active).

28

&Q5 Selects asynchronous operation with data buffering and error correction. Same as **N3.**

&Q6 Selects asynchronous operation with data buffering and no error correction. Same as **N0.**

Command:	**&S***n*	**Data Set Ready (DSR) Control**
Values:	*n* = 0 or 1	
Default:	0	
Description:	&S0	Force DSR high (on) at all times.
	&S1	Let DSR go high only during a connection.

Command:	**&T***n*	**V.54 Test Commands**
Values:	*n* = 0, 1, 3, 4, 5, 6, 7, or 8	
Default:	None	
Description:		The modem can perform selected test and diagnostic functions. A test can be run only when the modem is operating in non-error-correction mode (normal or direct mode). For tests 3, 6, and 7, a connection between the two modems must first be established. To terminate a test in progress, the escape sequence (+++**AT**) must be entered first, except for parameters 7 and 8. If *S18* is non-zero, a test terminates automatically after the time specified by *S18* and displays the *OK* message. See also Appendix C.

&T0 Abort. Stop any test in progress.

&T1 Start local analog loopback, V.54 Loop 3. If a connection exists when this command is issued, the modem hangs up. A CONNECT message is displayed at the start of the test.

&T3 Start local digital loopback, V.54 Loop 2. If no connection exists, *ERROR* is returned.

&T4 Enables acknowledgment for remote digital loopback request.

&T5 Ignores acknowledgment for remote digital loopback request.

&T6 Requests a remote digital loopback, V.54 Loop 2, without self-test. If no connection exists, *ERROR* is returned. The *CONNECT XXXX* message is displayed at the start of the test.

&T7 Requests a remote digital loopback, V.54 Loop 2, with self-test. (In self-test, a test pattern is looped back and checked by the modem.) If no connection exists, *ERROR* is returned. When the test is terminated, the number of detected errors is reported to the computer.

&T8 Starts local analog loopback, V.54 Loop 3, with self-test. If a connection exists, the modem hangs up before the test begins. When the test is terminated, the number of detected errors is reported to the computer.

Command: **&V** **Display Current Configuration**
Values: 0
Default: None
Description: Displays the current (active) settings. Example of an active profile:

B1 E1 L1 M1 N1 Q0 T V1 W0 X4 Y0 &C1 &D2 &G2 &J0 &K3 &Q5 &R1 &S0 &T5 &X0 &Y0
S00:001 S01:000 S02:043 S03:013 S04:010 S05:008 S06:003 S07:055 S08:002 S09:006
S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S36:007 S37:000 S38:020 S46:138
S48:007 S95:000

Command: **&V1** **Display Last Connection Statistics**
Values: 1
Default: None
Description: Displays the statistics for the last connection. Example of last connnection statistics:

```
TERMINATION REASON......LOCAL REQUEST
LAST TX rate.................  21600 BPS
HIGHEST TX rate..............  21600 BPS
LAST RX rate.................  45333 BPS
HIGHEST RX rate..............  45333 BPS
PROTOCOL.....................  LAPM
COMPRESSION..................  V42Bis
Line QUALITY.................  031
Rx LEVEL.....................  015
Highest Rx State .............  67
Highest TX State.............  67
EQM Sum......................  00D3
RBS Pattern..................  00
Rate Drop....................  00
Digital Loss.................  3F07
Local Rtrn Count.............  00
Remote Rtrn Count............  00
V90
```

Note: Not available in all versions.

Command: **&W***n* **Store Current Configuration**
Values: *n* = 0 or 1
Default: None
Description: &W0 Stores current modem settings in nonvolatile memory as Profile 0. Profile 0 is loaded instead of the factory defaults at power-on (if *&Y0* is set) and by the **ATZ** command.
&W1 Stores current modem settings in nonvolatile memory as Profile 1. Profile 1 is loaded instead of the factory defaults at power-on (if *&Y1* is set) and by the **ATZ1** command.

Note: See also the *Z*, *&F*, and *&Y* commands.

Command:	**&Y***n*	**Select Profile for Hard Reset**
Values:		*n* = 0 or 1
Default:		None
Description:	&Y0	Select profile 0 to be loaded on power-up.
	&Y1	Select profile 1 to be loaded on power-up.

Note: See also the *&W* and *Z* commands.

Command:	**&Z***y=x*	**Store Telephone Number**
Values:		*n* = 0, 1, 2, 3
		x = Dialing command
Default:		None
Description:		Stores telephone dial string *x* in memory location *y*. Each telephone number dial string can contain up to 30 digits. Dial the stored number using the *DS=y* command.

Note: DTR dialing uses the number stored in memory location 0.

Command:	**%C***n*	**Data Compression Control**
Values:		*n* = 0, 1, 2, or 3
Default:		3
Description:		Enables or disables data compression negotiation. The modem can only perform data compression on an error-corrected link.
	%C0	Disables data compression.
	%C1	Enables MNP 5 data compression negotiation.
	%C2	Enables V.42bis data compression negotiation.
	%C3	Enables both V.42bis and MNP 5 data compression negotiation.

Command:	**%E***n*	**Line Quality Monitor**
Values:		*n* = 0, 1, or 2
Default:		2
Description:		Controls whether or not the modem will automatically monitor the line quality and request a retrain (*%E1*) or fall back to a lower speed when line quality is insufficient and fall forward to a faster speed when line quality is sufficient (*%E2*).
	%E0	Disable line quality monitor and auto-retrain.
	%E1	Enable line quality monitor and auto-retrain.
	%E2	Enable line quality monitor and fallback/fall forward.

Command:	**%L**	**Line Signal Level**
Values:		None
Default:		None
Description:	%L	Returns a value that indicates the received signal level in dBm. The value returned is a direct indication (DAA-dependent) of the receive level at the MDP, not at the telephone line connector. Examples: 009 = -9 dBm, 043 = -43 dBm, and so on.

Command:	%Q	**Line Signal Quality**
Values:		None
Default:		None
Description:	%Q	Reports line signal quality (DAA-dependent) as a three-digit number. Returns the higher order byte of the EQM value. Based on the EQM value, retrain or fallback/fall forward may be initiated if enabled by *%E1* or *%E2*.

Command:	%U	**PCM Code Selection**
Values:		n = 0 or 1
Default:		0
Description:		Specifies the PCM code type for 56K modulation. Note, however, that the modem automatically selects the code type if the server sends the proper ID.
	%U0	Selects μ-Law coding—used in North America and Japan.
	%U1	Selects A-Law coding—used outside North America and Japan.

Note: See also the *+MS=* command.

Command:	\A*n*	**Select Maximum MNP Block Size**
Values:		*n* = 0, 1, 2, or 3
Default:		1
Description:		The modem will operate an MNP error corrected link using a maximum block size controlled by the parameter supplied.
	\A0	64-character maximum block size.
	\A1	128-character maximum block size.
	\A2	192-character maximum block size.
	\A3	256-character maximum block size.

Command:	\B*n*	**Transmit Break**
Values:		*n* = 0–9 in 100 ms units
Default:		3
Description:		In non-error-correction mode only, sends a break signal of the specified length to a remote modem. Works in conjunction with the *K* command.

Command:	\K*n*	**Break Control**
Values:		*n* = 0–5
Default:		5
Description:		Controls the response of the modem to a break received from the computer, the remote modem, or the *B* command. The response is different for each of three different states.

Data mode. The modem receives the break from the computer:
- \K0 Enter online command mode; no break sent to the remote modem.
- \K1 Clear data buffers and send break to the remote modem.
- \K2 Same as *K0*.
- \K3 Send break immediately to the remote modem .
- \K4 Same as *K0*.
- \K5 Send break to the remote modem in sequence with the transmitted data.

Data mode. The modem receives the break from the remote modem during a non-error-corrected connection:

\K0   Clear data buffers and send break to the computer.
\K1   Same as *\K0*.
\K2   Send break immediately to the computer.
\K3   Same as *\K2*.
\K4   Send break to the computer in sequence with the received data.
\K5   Same as *\K4*.

Online command mode. The modem receives a *\Bn* command from the computer:

\K0   Clear data buffers and send break to the remote modem.
\K1   Same as *\K0*.
\K2   Send break immediately to the remote modem.
\K3   Same as *\K2*.
\K4   Send break to the remote modem in sequence with the transmitted data.
\K5   Same as *\K4*.

Command:	**\N***n*	**Error Correction Mode Selection**
Values:		*n* = 0–5
Default:		3
Description:	\N0	Normal (non-error correction) mode with data buffering. Same as &Q6.
	\N1	Direct mode.
	\N2	V.42/MNP reliable (error-correction) mode; failure to make a reliable connection causes the modem to hang up.
	\N3	Similar to N2, but failure to make reliable connection causes the modem to fall back to normal mode.
	\N4	V.42 (LAPM) reliable mode; failure to make an LAPM connection causes the modem to hang up.
	\N5	MNP reliable mode; in the MNP error correction mode, failure to make a reliable connection causes the modem to hang up.

Command:	**\V***n*	**Single Line Connect Message**
Values:		*n* = 0 or 1
Default:		0
Description:	\V0	Disables single line connect message. Connect messages are controlled by the *X*, *W*, and *S95* settings.
	\V1	Enables single line connect messages in the format: *CONNECT <Serial Port Speed></Modulation></Protocol></Compression> </Line Speed>/<Voice and Data>*. Connect messages are displayed in the single line format subject to the commands *V* and *Q*. In non-verbose mode (*V0*), single line connect messages are disabled and a single numeric result code is generated for *CONNECT*.

Note: The effect of *Wn* is disabled when *\V1* is set.

Command: +MS= Modulation Selection
Values: See description.
Default: See description.
Description: This extended-format command selects modulation and, optionally, enables or disables automode, specifies the lowest and highest connection rates, selects μ-Law or A-Law codec type, and specifies the highest transmit rate using one to five subparameters.

The command format is
+**MS**=[*mod*][,[*automode*][,[*min_RX_rate*][,[*max_RX_rate*][,[*x_law*][,[*reserved*][,[*max_TX_rate*]]]]]]]<CR>

Subparameters that are not entered retain their current value. Commas separate optional subparameters, and should be inserted to skip a subparameter. Example: +**MS**=,**0**,<**CR**> disables automode and keeps all other settings at their current values.

+MS?   Reports current options in the format *mod,automode,min_RX_rate,max_RX_rate,x_law,reserved,max_TX_rate.* Example: 56,1,300,56000,0,0,33600.

+MS=? Reports supported options in the format (list of supported *mod* values),(list of supported *automode* values),(list of supported *min_RX_rate* values),(list of supported *max_RX_rate* values), (list of supported *x_law* values), (list of supported *reserved* values),(list of supported *max_TX_rate* values). Example: (0,1,2,3,9,10,11,56,64,69),(0,1),(300-33600),(300-56000),(0,1),(0,1),(300-33600).

Subparameters

mod A decimal number that specifies the preferred modulation (automode enabled) or the modulation to use in originating or answering a connection (automode disabled). See the table on the next page.

automode An optional numeric value that enables or disables automatic modulation negotiation using V.8 bis/V.8 or V.32 bis Annex A. The options are:
0 = Disable automode
1 = Enable automode (default)

min_RX_rate An optional number that specifies the lowest rate at which the modem may establish a receive connection. The value is decimal coded in units of bps, e.g., 2400 specifies the lowest rate to be 2400 bps. See "Possible rates" in the *mod* table. The default is 300 for 300 bps.

max_RX_rate An optional number that specifies the highest rate at which the modem may establish a receive connection. The value is decimal coded in units of bps, e.g., 28800 specifies the highest rate to be 28800 bps. See "Possible rates" in the *mod* table. The default is 56000, for 56000 bps.

<mod>	Modulation	Possible rates (bps)[1]
0	V.21	300
1	V.22	1200
2	V.22bis	2400 or 1200
3	V.23	1200
9	V.32	9600 or 4800
10	V.32bis	14400, 12000, 9600, 7200, or 4800
11	V.34	33600, 31200, 28800, 26400, 24000, 21600,19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
12[2]	V.90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333. 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, or 28000
56[3]	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, or 32000
64	Bell 103	300
69	Bell212	1200

Notes:
1. See optional <automode>, <min_RX_rate>, <max_RX_rate>, and <max_TX_rate> subparameters.
2. Selects V.90 modulation as first priority. If a V.90 connection cannot be established, the modem attempts K56flex, V.34, V.32bis, etc. (Default.)
3. Selects K56flex modulation as first priority. If a K56flex connection cannot be established, the modem attempts V.90, V.34, V.32bis, etc.

x_law An optional number that specifies the PCM code type for 56K modulation. The options are:

0 = μ-Law—used in North America and Japan (default)

1 = A-Law—used outside North America and Japan

The modem automatically selects A-Law or μ-Law if the server sends the Conexant ID. Note that the **ATZ** command restores the *x_law* value from NVRAM. You can also manually select A-Law or μ-Law using the *%U* command.

reserved Must not be changed from the default value of 0.

max_TX_rate An optional number that specifies the highest rate at which the modem may establish a transmit connection. The value is decimal coded in units of bps, e.g., 33600 specifies the highest rate to be 33600 bps. See "Possible rates" in the *mod* table. The default is 33600, for 33600 bps.

Command: +++AT<CR> Escape Sequence

Values: n/a

Description: Puts the modem in command mode (and optionally issues a command) while remaining online. Type +++**AT** and up to ten command characters, and then press ENTER. Used mostly to issue the hang-up **Command: +++ATH<CR>**.

Command: **-K***n*   **MNP Extended Services**

Values: *n* = 0, 1, or 2

Default: 0

Description: Enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection.

                -K0   Disables V.42 LAPM to MNP10 conversion.

-K1   Enables V.42 LAPM to MNP10 conversion.

-K2   Enables V.42 LAPM to MNP10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

Command: -Q*n*   **MNP10 Enable Fallback to V.22 *bis*/V.22**
Values: *n* = 0 or 1
Default: n/a
Description: This command is included only for compatibility and performs no function.

-Q0, -Q1 n/a

Command: -SDR=*n* **Distinctive Ring Control**
Values: 0–7
Default: 0
Description: This command enables or disables detection and reporting of distinctive ring. One, two, or three distinctive ring types can be simultaneously enabled depending upon the value of *n*. The detected ring type is reported in the verbose result code by appending the ring type number to the end of the *RING* message.

-SDR=0 Disables distinctive ring. Any valid ring detected is reported as *RING.*

-SDR=1 Enables distinctive ring type 1.

-SDR=2 Enables distinctive ring type 2.

-SDR=3 Enables distinctive ring types 1 and 2.

-SDR=4 Enables distinctive ring type 3.

-SDR=5 Enables distinctive ring types 1 and 3.

-SDR=6 Enables distinctive ring types 2 and 3.

-SDR=7 Enables distinctive ring types 1, 2, and 3.

The supported ring types and ring cadence detection criteria are shown in the following table:

Distinctive ring type	Ring cadence detection criteria
1	2.0 sec. on, 4.0 sec. off
2	0.8 sec. on, 0.4 sec. off, 0.8 sec. on, 0.4 sec. off
3	0.4 sec. on, 0.2 sec. off, 0.4 sec. on, 0.2 sec. off, 0.8 sec. on, 0.4 sec. off

Command: **-SEC=*n***Enable/Disable MNP10-EC**
Values: *n*= -SDR
Default: n/a
Description: -SEC=0 Disables MNP 10-EC
     -SEC=1 Enables MNP 10-EC. -SEC=1, [<tx level>] where <tx level> is an optional transmit level subparameter. Transmit level range is 0 dBm to -30 dBm and is specified by a set S 91 value.

Command: ****n**   **Flash Memory Download**
Description: Downloads at the last sensed speed.

Command: ***B**   **View Numbers in Blacklist**
Values: *n/a*
Description: If blacklisting is in effect, *%B* displays the numbers for which the last call attempted in the previous two hours failed. In countries that do not require blacklisting, the *ERROR* result code is displayed.

Command: ***D**   **View Delayed Numbers**
Values: n/a
Description: This command displays a list of delayed numbers as defined in the **B* command together with their delay times. If no numbers are delayed, only the *OK* result code is displayed.

Command: #CID=*n* Caller ID
Values: *n* = 0, 1, or 2
Default: 0
Description: Enables or disables Caller ID recognition and reporting.

       #CID=0   Disables Caller ID.
       #CID=1   Enables formatted Caller ID reporting of ICLID SDM (Single Data Message) and MDM (Multiple Data Message) packets.
       #CID=2   Enables unformatted Caller ID reporting of any ICLID packet received after the first *RING* cycle, including SDM, MDM, or call waiting packets.
       #CID?   Retrieves the current Caller ID mode from the modem.
       #CID=?   Returns the mode capabilities of the modem in a list with each element separated by commas.

Command: **@M*n***   **MNP10 Initial Cellular Power Level Setting**
Values: *n* = 0–30
Default: n/a
Description: This command is included only for compatibility and performs no function.
       @M0–@M30 n/a

Command: **)M*n***   **Enable MNP10 Cellular Power Level Adjustment**
Values: *n* = 0, 1, or 2
Default: n/a
Description: This command is included only for compatibility and performs no function.
)M0–)M2 n/a

Command: ***H*n***   **MNP10 Link Negotiation Speed**
Values: *n* = 0, 1, or 2
Default: n/a
Description: This command is included only for compatibility and performs no function.
)H0–)H2 n/a

Command: **:E***n*   **MNP10 Compromise Equalizer Enable**
Values: *n* = 0 or 1
Default: n/a
Description: This command is included only for compatibility and performs no function.
:E0–:E1 n/a

Command: **$SB***n*   **Serial Port Baud Rate**
Values: *n* = speed in bits per second
Default: 57600
Description: $SB300   Set serial port to 300 bps.
    $SB1200   Set serial port to 1200 bps.
    $SB2400   Set serial port to 2400 bps.
    $SB4800   Set serial port to 4800 bps.
    $SB9600   Set serial port to 9600 bps.
    $SB19200   Set serial port to 19200 bps.
    $SB38400   Set serial port to 38400 bps.
    $SB57600   Set serial port to 57600 bps.
    $SB115200   Set serial port to 115200 bps.
    $SB230400   Set serial port to 230400 bps.

Note: See also the *L5* command.

S-Registers

Certain modem values, or parameters, are stored in memory locations called S-registers. Use the **S** command to read or alter the contents of S-registers (see previous section for the S*n* command).

Register	Unit	Range	Default	Description
S0	1 ring	0–255	1	Sets the number of rings before the modem answers. **ATS0=0** disables autoanswer completely. The Range changes by country.
S1	1 ring	0–255	0	Counts the rings that have occurred.
S2	decimal	0–255	43 (+)	Sets ASCII code for the escape sequence character. Values greater than 127 disable escape.
S3	decimal	0–127	13 (^M)	Sets the ASCII code for the carriage return character.
S4	decimal	0–127	10 (^J)	Sets the ASCII code for the line feed character.
S5	decimal	0–32	8 (^H)	Sets the ASCII code for the backspace character. Values greater than 32 disable backspace.
S6	seconds	2–255	2	Sets the time the modem waits after it goes off-hook before it begins to dial the phone number.
S7	seconds	1–255	50	Sets the time the modem waits for a carrier signal before aborting a call. Also sets the wait for silence time for the @ dial modifier, and the time the modem waits for the dial tone after encountering **W** in the dial string.
S8	seconds	0–255	2	Sets the length of the pause caused by a comma character in a dialing command.
S9	tenths/second	1–255	6	Sets the time, in tenths of a second, that the carrier must be present before the modem considers it valid.
S10	tenths/second	1–255	14	Sets how long a carrier signal must be lost before the modem disconnects.
S11	1 ms	50–255	95	Sets spacing and duration of dialing tones.
S12	20 ms	0–255	50	Defines the maximum period, in fiftieths of second, allowed between receipt of the last character of the three escape character sequence from the computer and the sending of the OK result code to the computer. (Escape code guard time).

Register	Unit	Range	Default	Description
S18	seconds	0–255	0	Sets the number of seconds that the modem conducts an *&T* test before it returns to the command mode. If the value is zero, the test must be terminated from command mode by issuing an *&T0* or *H* command. When *S18* is non-zero, the modem returns the *OK* message upon test termination.
S19	decimal	0–255	0	Auto Sync Bit Mapped Options: Defines the options for Auto Sync operation (see the *&Q4* command). *S19* must be set to the desired value before *&Q4* is issued.

				0 Reserved
				1 SBC/HDLC format select
				    0 =BSC selected (Default)
				    1 =HDLC selected
				2 Address detection enable/disable
				    0 =Disable (Default)
				    1 =Enabled
				3 NRZI/NZI
				    0 =ZRZI (Default)
				    1 =NZI
				4 Idle indicator select
				    0 =Mark idle (Default)
				    1 =Flag or sync idle
				5–7 Reserved

S20	decimal	0–255	0	Auto Sync HDLC Address or BSC Sync Character: Defines the HDLC a address (*S19* bit 1 = 1) or DSC Sync Character (*S19* bit 1 = 0) for Auto Sync operation (see *&Q4* command). *S20* must be set to the desried value before *&Q4* is issued.
S25	hundreths of a second (async)	0–255	5	Sets the length of time that the modem ignores DTR while taking the action specified by *&D*.
S29	10 ms	0–255	70	Sets the length of time that the modem goes on-hook when it encounters a flash dial modifier (!) in the dial string.
S30	10 ms	0–255	0	Sets the length of time that the modem waits before disconnecting when no data is sent or received. A value of zero disables the timer. Applies to asynchronous operation only.
S32	decimal	0–255	17	Sets the ASCII code for the XON character.
S33	decimal	0–255	19	Sets the ASCII code for the XOFF character.

Register	Unit	Range	Default	Description

S36	decimal	0–7	7	LAPM Failure Control. Specifies the fall-back action to take in the event of an LAPM negotiation failure. These fallback options are initiated immediately upon connection if *S48* is set to 128. If an invalid number is entered, *S36* acts as if the default value has been entered. (See *S48*.)
				Bitmap values - default 0000 0111
				  0 Modem disconnects.
				  1 Modem stays online and a direct mode connection is established.
				  2 Reserved.
				  3 Modem stays on-line and a normal mode connection is established.
				  4 An MNP connection is attempted and if it fails, the modem disconnects.
				  5 An MNP connection is attempted and if it fails, a direct mode connection is established.
				  6 Reserved.
				  7 An MNP connection is attempted and if it fails, a normal modem connection is established.

S37	decimal	0–12	0	Sets the maximum V.34 speed at which the modem attempts to connect. The default value attempts an automode connection. If *N0* is active, connection is attempted at the most recently sensed serial port speed (*+MS=* command settings are updated to the appropriate values). If *N1* is active, connection is attempted at the highest possible speed. (*+MS=* settings are updated to 11,1,300,33600 to reflect V.34, automode, 300 bps minimum speed, and 33600 bps maximum speed). Supported only for compatibility with existing software; use the *+MS=* command instead.
S38	seconds	0–255	20	Sets the delay between the modem's receipt of the *H* command to disconnect (or high-to-low transition of DTR if the modem is programmed to follow the signal), and the disconnect operation. Applies only to error-correction connections. This register can be used to ensure that data in the modem buffer is sent before the modem disconnects. If *S38* is set to a value between 0 and 254, the modem waits for the remote modem to acknowledge all data in the modem buffer before disconnecting. If *S38* is set to 255, the

Register	Unit	Range	Default	Description
				modem does not time out, and continues to attempt to deliver data in the buffer until the connection is lost or the data is delivered.
S46	decimal	136, 138	138	Enables or disables data compression:
				136 Error correction without compression.
				138 Error correction with compression.
S48	decimal	0, 7, 128	7	Enables or disables LAPM negotiation. An invalid value is treated as a 128 value.
				0 Disables negotiation and proceeds with LAPM.
				7 Enables negotiation.
				128 Disables negotiation and proceeds at once with the fallback action specified in *S36*. Can be used to force MNP.
S86	decimal	0, 3-23	21	When the modem issues a *NO CARRIER* result code, a value is written to this register to help determine the reason for the failed connection. *S86* records the first event that contributes to a *NO CARRIER* message. Use the *S86?* command to read the value.
				0 Normal disconnect; no error occurred.
				3 Call Waiting caused disconnect.
				4 Physical carrier loss.
				5 No error correction at the other end.
				6 No response to feature negotiation.
				7 This modem is async only; the other is sync only.
				8 No framing technique in common.
				9 No protocol in common.
				10 Bad response to feature negotiation.
				11 No sync information from remote.
				12 Normal disconnect initiated by the remote modem.
				13 Retransmission limit reached.
				14 Protocol violation occurred.
				15 Lost DTR.
				15 3 RETRAINS OREXCESSIVE RETRANSMISSIONS WHEN NO DTR.
				16 Received GSTN cleardown.
				17 Inactivity time out.
				18 Speed not supported.
				19 Long space disconnect.
				20 Key abort disconnect.
				21 Clears previous disconnect reason.
				22 No connection established.
				23 Disconnect after 3 retrains.

Register	Unit	Range	Default	Description
S95	decimal	0–15	0	The bits in this register can be set to override some of the *W* command options. A bit set to a 1 in this register enables the corresponding result code regardless of the *W* setting.

Bit 0   CONNECT result code indicates DCE speed instead of DTE speed.

Bit 1   Append /ARQ to CONNECT XXX result code in error-correction mode.

Bit 2   Enable CARRIER XXXX result code.

Bit 3   Enable PROTOCOL XXXX result code.

Bit 4   Reserved.

Bit 5   Enable COMPRESSION result code.

Bit 6   Reserved.

Bit 7   Reserved.

Result Codes

In command mode your modem can send the following responses, called *result codes*, to your computer. Result codes are used by communications programs and can also appear on your monitor.

Terse	Verbose	Description
0	*OK*	Command executed
1	*CONNECT*	Modem connected to line
2	*RING*	Ring signal detected
3	*NO CARRIER*	Carrier signal lost or not detected
4	*ERROR*	Invalid command
5	*CONNECT 1200*	Connected at 1200 bps
6	*NO DIALTONE*	No dial tone detected
7	*BUSY*	Busy signal detected
8	*NO ANSWER*	No answer at remote end
9	*CONNECT 0600*	Connected at 600 bps
10	*CONNECT 2400*	Connected at 2400 bps
11	*CONNECT 4800*	Connected at 4800 bps
12	*CONNECT 9600*	Connected at 9600 bps
13	*CONNECT 7200*	Connected at 7200 bps
14	*CONNECT 12000*	Connected at 12000 bps
15	*CONNECT 14400*	Connected at 14400 bps
16	*CONNECT 19200*	Connected at 19200 bps
17	*CONNECT 38400*	Connected at 38400 bps
18	*CONNECT 57600*	Connected at 57600 bps
19	*CONNECT 115200*	Connected at 115200 bps
20	*CONNECT 230400*	Connected at 230400 bps
22	*CONNECT 75TX/1200RX*	V.23 connection in originate mode
23	*CONNECT 1200TX/75RX*	V.23 connection in answer mode
24	*DELAYED*	Delay is in effect for the dialed number
32	*BLACKLISTED*	Dialed number is blacklisted
33	*FAX*	Connected in fax mode
35	*DATA*	Connected in data mode
40	*CARRIER 300*	0-300 bps data carrier detected
44	*CARRIER 1200/75*	V.23 backward channel detected
45	*CARRIER 75/1200*	V.23 forward channel detected
46	*CARRIER 1200*	1200 bps data carrier detected
47	*CARRIER 2400*	2400 bps data carrier detected
48	*CARRIER 4800*	4800 bps data carrier detected
49	*CARRIER 7200*	7200 bps data carrier detected
50	*CARRIER 9600*	9600 bps data carrier detected
51	*CARRIER 12000*	12000 bps data carrier detected
52	*CARRIER 14400*	14400 bps data carrier detected
53	*CARRIER 16800*	16800 bps data carrier detected
54	*CARRIER 19200*	19200 bps data carrier detected
55	*CARRIER 21600*	21600 bps data carrier detected
56	*CARRIER 24000*	24000 bps data carrier detected
57	*CARRIER 26400*	26400 bps data carrier detected
58	*CARRIER 28800*	28800 bps data carrier detected
59	*CONNECT 16800*	Connected at 16800 bps

Terse	Verbose	Description
61	*CONNECT 21600*	Connected at 21600 bps
62	*CONNECT 24000*	Connected at 24000 bps
63	*CONNECT 26400*	Connected at 26400 bps
64	*CONNECT 28800*	Connected at 28800 bps
66	*COMPRESSION CLASS 5*	Connected with MNP Class 5 data compression
67	*COMPRESSION V.42 bis*	Connected with V.42 bis data compression
69	*COMPRESSION NONE*	Connected without data compression
70	*PROTOCOL NONE*	Connected without any protocol
77	*PROTOCOL LAPM*	Connected in V.42 LAPM mode
78	*CARRIER 31200*	56000 bps data carrier detected
79	*CARRIER 33600*	33600 bps data carrier detected
80	*PROTOCOL ALT*	Connected in MNP mode
81	*PROTOCOL ALT-CELLULAR*	Connected in MNP 10 mode
84	*CONNECT 33600*	Connected at 33600 bps
91	*CONNECT 31200*	Connected at 31200 bps
150	*CARRIER 32000*	32000 bps data carrier detected
151	*CARRIER 34000*	34000 bps data carrier detected
152	*CARRIER 36000*	36000 bps data carrier detected
153	*CARRIER 38000*	38000 bps data carrier detected
154	*CARRIER 40000*	40000 bps data carrier detected
155	*CARRIER 42000*	42000 bps data carrier detected
156	*CARRIER 44000*	44000 bps data carrier detected
157	*CARRIER 46000*	46000 bps data carrier detected
158	*CARRIER 48000*	48000 bps data carrier detected
159	*CARRIER 50000*	50000 bps data carrier detected
160	*CARRIER 52000*	52000 bps data carrier detected
161	*CARRIER 54000*	54000 bps data carrier detected
162	*CARRIER 56000*	56000 bps data carrier detected
165	*CONNECT 32000*	Connected at 32000 bps
166	*CONNECT 34000*	Connected at 34000 bps
167	*CONNECT 36000*	Connected at 36000 bps
168	*CONNECT 38000*	Connected at 38000 bps
169	*CONNECT 40000*	Connected at 40000 bps
170	*CONNECT 42000*	Connected at 42000 bps
171	*CONNECT 44000*	Connected at 44000 bps
172	*CONNECT 46000*	Connected at 46000 bps
173	*CONNECT 48000*	Connected at 48000 bps
174	*CONNECT 50000*	Connected at 50000 bps
175	*CONNECT 52000*	Connected at 52000 bps
176	*CONNECT 54000*	Connected at 54000 bps
177	*CONNECT 56000*	Connected at 56000 bps
180	*CONNECT 28000*	Connected at 28000 bps (V.90 mode)
180	*CARRIER 28000*	28000 bps data carrier detected (V.90 mode)
181	*CONNECT 29333*	Connected at 29333 bps (V.90 mode)
181	*CARRIER 29333*	29333 bps data carrier detected (V.90 mode)
182	*CONNECT 30667*	Connected at 30667 bps (V.90 mode)
182	*CARRIER 30667*	30667 bps data carrier detected (V.90 mode)
183	*CONNECT 33333*	Connected at 33333 bps (V.90 mode)
183	*CARRIER 33333*	33333 bps data carrier detected (V.90 mode)
184	*CONNECT 34667*	Connected at 34667 bps (V.90 mode)

Terse	Verbose	Description
184	*CARRIER 34667*	34667 bps data carrier detected (V.90 mode)
185	*CONNECT 37333*	Connected at 37333 bps (V.90 mode)
185	*CARRIER 37333*	37333 bps data carrier detected (V.90 mode)
186	*CONNECT 38667*	Connected at 38667 bps (V.90 mode)
186	*CARRIER 38667*	38667 bps data carrier detected (V.90 mode)
187	*CONNECT 41333*	Connected at 41333 bps (V.90)
187	*CARRIER 41333*	41333 bps data carrier detected (V.90)
188	*CONNECT 42667*	Connected at 42667 bps (V.90)
188	*CARRIER 42667*	42667 bps data carrier detected (V.90)
189	*CONNECT 45333*	Connected at 45333 bps (V.90)
189	*CARRIER 45333*	45333 bps data carrier detected (V.90)
190	*CONNECT 46667*	Connected at 46667 bps (V.90)
190	*CARRIER 46667*	46667 bps data carrier detected (V.90)
191	*CONNECT 49333*	Connected at 49333 bps (V.90)
191	*CARRIER 49333*	49333 bps data carrier detected (V.90)
192	*CONNECT 50667*	Connected at 50667 bps (V.90)
192	*CARRIER 50667*	50667 bps data carrier detected (V.90)
193	*CONNECT 53333*	Connected at 53333 bps (V.90)
193	*CARRIER 53333*	53333 bps data carrier detected (V.90)
194	*CONNECT 54667*	Connected at 54667 bps (V.90)
194	*CARRIER 54667*	54667 bps data carrier detected (V.90)
+F4	*+FCERROR*	V.21 signal received/high speed fax expected (V.27, V.29, V.33 or V.17).

Chapter 5: Troubleshooting

Introduction

Your modem was thoroughly tested at the factory before it was shipped. If you are unable to make a successful connection, or if you experience data loss or garbled characters during your connection, check the list of troubleshooting procedures before calling Multi-Tech.

- None of the LEDs light when the modem is on.
- The modem does not respond to commands.
- The modem dials but is unable to make a connection.
- The modem disconnects while online.
- The modem cannot connect when answering.
- File transfer is slower than it should be.
- Data is being lost.
- There are garbage characters on the monitor.
- The modem doesn't work with Caller ID.
- Fax and data software can't run at the same time.

If you experience problems, please check the following possibilities before calling Technical Support (see Appendix D).

None of the Indicators Light

When you turn on the modem, the 56 indicator and the terminal turn on. If the LEDs remain off, the modem is probably not receiving power.

✓ Make sure the modem's power switch is on, especially if you normally turn the modem on by turning on a power strip.

✓ If the modem is plugged into a power strip, make sure the power strip is plugged in and its power switch is on.

✓ Make sure the transformer module is firmly connected to the modem and to the wall outlet or power strip.

✓ If the power strip is on and the modem switch is on, try moving the transformer module to another outlet on the power strip.

✓ Test that the outlet is live by plugging another device, such as a lamp, into it.

✓ The modem or the DC power transformer may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem or the DC power transformer may be defective. Call Technical Support for assistance.

CAUTION: Do not under any circumstances replace the transformer module with one designed for another product; doing so can damage the modem and void your warranty.

The Modem Does Not Respond to Commands

✔ Make sure the modem is plugged in and turned on. (See "None of the Indicators Light.")

✔ Make sure you are issuing the modem commands from the data communications program, either manually in terminal mode or automatically by configuring the software. (You cannot send commands to the modem from the DOS prompt.)

✔ Make sure you are in terminal mode in your data communications program, then type **AT** and press ENTER. If you get an *OK* response from your modem, your connections are good and the problem likely is in the connection setup in your communications program.

✔ Try resetting your modem by turning it off and on. If you are using DOS or Windows 3.1 communications program, make sure the initialization string includes **&F** as the first command, to cancel any "leftover' command that could affect the modem's operation.

✔ If you don't get an *OK*, the problem may still be in the communications program. Make sure you have done whatever is necessary in your software to make a port connection. Not all communication programs connect to the COM port automatically. Some connect when the software loads and remain connected until the program terminates. Others can disconnect without exiting the program. The modem's TR indicator lights to show that the software has taken control of the modem through the COM port.

✔ Your communications program settings may not match the physical port the modem is connected to. The serial cable might be plugged into the wrong connector—check your computer documentation to make sure. Or you might have selected a COM port in your software other than the one the modem is physically connected to—compare the settings in your software to the physical connection.

✔ If the modem is on, the cable is plugged into the correct port, the communications program is configured correctly, and you still don't get an *OK*, the fault might be in the serial cable. Make sure it is firmly connected at both ends.

✔ Is this the first time you have used the cable? If so, it may not be wired correctly. Check the cable description on the packaging to make sure the cable is the right one for your computer.

✔ Peripheral expansion cards, such as sound and game cards, might include a serial port preconfigured as COM1 or COM2. The extra serial port, or the card itself, may use the same COM port, memory address, or interrupt request (IRQ) as your communication port. Be sure to disable any unused ports.

Windows 3.1x: To look for address or IRQ conflicts, in Program Manager select **File | Run**, type **MSD**, and press ENTER. Then select **Mouse**, **COM Ports**, and **IRQ Status**, and note the addresses and IRQs that are in use. If you find an IRQ conflict, note which IRQs are not being used, then change one of the conflicting devices to use one of the unused IRQs. If you find an address conflict, change the address of one of the conflicting devices.

To change a port address or IRQ in Windows 3.1x, double-click the Control Panel icon, then the Ports icon. Click on the port you want to change, click **Settings**, click **Advanced**, and select the new port address and/or interrupt. If you wish to use COM3 or COM4, note that COM3 shares an IRQ with COM1, as does COM4 with COM2, so you should change their IRQs to unused ones, if possible.

Windows 9x and 2000: Right-click on My Computer, select **Properties** from the menu, click on the **Device Manager** tab, double-click on **Ports**, then double-click on the communication port your modem is connected to. In the port's **Properties** sheet, click on the **Resources** tab to see the port's input/output range and interrupt request. If another device is using the same address range or IRQ, it appears in the **Conflicting Device List**. Uncheck **Use automatic settings** to change the port's settings so they do not conflict with the other device, or select the port the conflicting device is on and change it instead. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device's documentation.

Windows NT 4.0: To look for address or IRQ conflicts, click Start, Programs, Administrative Tools (Common), and Windows NT Diagnostics. In the **Windows NT Diagnostics** dialog box, click the **Resources** tab to see which input/output ranges and interrupt requests are in use. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device's documentation.

✓ The serial port might be defective. If you have another serial port, install the modem on it, change the COM port setting in your software, and try again.

✓ The modem may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem may be defective. Call Technical Support for assistance (see Appendix D).

The Modem Dials But Cannot Connect

There can be several reasons the modem fails to make a connection. Possibilities include:

* lack of a physical connection to the telephone line.
* a wrong dial tone.
* a busy signal.
* a wrong number.
* no modem at the other end.
* a faulty modem, computer, or software at the other end.
* incompatibility between modems.

You can narrow the list of possibilities by using extended result codes. Extended result codes are enabled by default. If they have been disabled, include **V1X4** in the modem's initialization string, or in terminal mode enter **ATV1X4** and press ENTER. When you dial again, the modem reports the call's progress.

✓ If the modem reports *NO DIALTONE*, check that the modem's phone line cable is connected to both the modem's LINE jack (not the PHONE jack) and the phone wall jack. If the cable looks secure, try replacing it. If that doesn't work, the problem might be in your building's phone installation. To test the building

installation, plug a phone into your modem's phone wall jack and listen for a dial tone. If you hear a dial tone, your modem might be installed behind a corporate phone system (PBX) with an internal dial tone that sounds different from the normal dial tone. In that case, the modem might not recognize the dial tone and might treat it as an error. Check your PBX manual to see if you can change the internal dial tone; if you can't, change your modem's initialization string to replace **X4** with **X3**, which will cause the modem to ignore dial tones (note, however, that **X3** is not allowed in some countries, such as France and Spain).

✓ If the modem reports BUSY, the other number might be busy, in which case you should try again later, or it might indicate that you have failed to add a **9,** prefix to the phone number if you must dial *9* for an outside line.

If you must dial *9* to get an outside line, the easiest way to dial it automatically is to include it in the modem's dial prefix, e.g., **ATDT9,**. Note the comma, which inserts a pause before the number is dialed. By inserting **9,** into the dial prefix, you do not have to include it in each directory entry.

To change the dial prefix in Windows 95 HyperTerminal, select **Connect** from the **Call** menu, click **Dialing Properties**, and type **9** in the local and long distance boxes in **How I dial from this location**.

✓ If the modem reports *NO ANSWER*, the other system has failed to go off-hook, or you might have dialed a wrong number. Check the number.

✓ If the modem reports *NO CARRIER*, the phone was answered at the other end, but no connection was made. You might have dialed a wrong number, and a person answered instead of a computer, or you might have dialed the correct number but the other computer or software was turned off or faulty. Check the number and try again, or try calling another system to make sure your modem is working. Also, try calling the number on your telephone. If you hear harsh sounds, then another modem is answering the call, and the modems might be having problems negotiating because of modem incompatibilities or line noise. Try connecting at a lower speed.

The Modem Disconnects While Online

✓ If you have Call Waiting on the same phone line as your modem, it can interrupt your connection when someone tries to call you. If you have Call Waiting, disable it before each call. In most phone areas in North America, you can disable Call Waiting by preceding the phone number with ***70** (check with your local phone company).

You can automatically disable Call Waiting by including the disabling code in the modem's dial prefix (e.g., **ATDT*70,**—note the comma, which inserts a pause before the number is dialed). To change the dial prefix in Windows Terminal, select **Settings | Modem Commands**. To change it in HyperTerminal, select **Connect** from the **Call** menu, click **Dialing Properties**, check **This location has Call Waiting**, and select the correct code for your phone service.

✓ If you have extension phones on the same line as your modem, you or someone else can interrupt the connection by picking up another phone. If this is a frequent problem, disconnect the extension phones before using the modem, or install another phone line especially for the modem.

✓ Check for loose connections between the modem and the computer, the phone jack, and AC power.

✓ You might have had a poor connection because of line conditions or the problem might have originated on the other end of the line. Try again.

✓ If you were online with a BBS or an online service like CompuServe, it might have hung up on you because of lack of activity on your part or because you exceeded your time limit for the day. Try again.

The Modem Cannot Connect When Answering

✓ The default DTR Control command (**&D2**) inhibits autoanswer. To enable autoanswer, change the DTR Control to **&D0,** and make sure **&Q0, &Q1, &Q5,** or **&Q6** is also set. For more information, see the **&D** command in Chapter 4. For information on changing the modem's default configuration, see Chapter 3.

✓ Autoanswer might be disabled. Turn on autoanswer in your data communications program or send the command **ATS0=1** (**ATS0=2** if you have Caller ID service) to your modem in terminal mode.

File Transfer Is Slower Than It Should Be

✓ You might have an older UART. For best throughput, install a 16550AFN UART or a Multi-Tech ISI serial port card. See the "Advanced Options" chapter for information on how to identify your UART.

✓ If you are running under Windows 3.1 and have a 16550AFN UART, you must replace the Windows serial driver, COMM.DRV, to take full advantage of the UART's speed.

✓ If you are using a slow transfer protocol, such as Xmodem, try Zmodem or Ymodem/G instead.

✓ Is your line noisy? If there is static on your line, the modem has to resend many blocks of data to insure accuracy. You must have a clean line for maximum speed.

✓ Are you downloading a compressed file with MNP 5 hardware compression enabled? Since hardware data compression cannot compress a file already compressed by an archiving program, the transfer can be marginally slower with data compression enabled than with it disabled.

✓ Does your Internet service provider (ISP) use the same 56K protocol as your modem? The default setting of your modem is to connect using either the K56flex or the V.90 protocol, depending on which one the ISP modem is using. If your ISP uses the X2 protocol, the maximum speed you will be able to connect at is 33,600 bps. Check with your ISP to see which protocols it supports, and check the Multi-Tech Web site for the latest developments in V.90.

✓ Try entering the **&V1** command to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

Data Is Being Lost

✓ If you are using data compression and a high speed serial port, set the serial port baud rate to four times the data rate.

✓ Your UART might not be reliable at serial port speeds over 9600 bps or 19,200 bps. Turn off data compression, reset your serial port speed to a lower rate, or replace your serial port with a faster one.

✓ Make sure the flow control method you selected in software matches the method selected in the modem. If you are using the modem with a Macintosh, you might have the wrong cable for hardware flow control.

✓ If you are running under Windows 3.1 and have a 16550AFN UART, you might need to turn on the 16550's data buffers and/or replace the Windows serial driver, COMM.DRV.

✓ Try entering the **&V1** command to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

There Are Garbage Characters on the Monitor

✓ Your computer and the remote computer might be set to different word lengths, stop bits, or parities. If you have connected at 8-N-1, try changing to 7-E-1, or vice-versa, using your communications program.

✓ You might be experiencing line noise. Enable error correction, if it is disabled, or hang up and call again; you might get a better connection the second time.

✓ At speeds above 2400 bps, the remote modem might not use the same transmission or error correction standards as your modem. Try connecting at a slower speed or disabling error correction. (With no error correction, however, line noise can cause garbage characters.)

✓ Try entering the **&V1** command to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

The Modem Doesn't Work with Caller ID

✓ Caller ID information is transmitted between the first and second rings, so if autoanswer is turned off (**S0=0**) or if the modem is set to answer after only one ring (**S0=1**), the modem will not receive Caller ID information. Check your initialization string, and if necessary change it to set the modem to answer after the second ring (**S0=2**).

✓ Make sure that you have Caller ID service from your telephone company.

Fax and Data Software Can't Run at the Same Time

✓ Communication devices can be accessed by only one application at a time. Under DOS or Windows 3.1x, you can run either your fax software or your data communications program, but not both at the same time, unless you have a special communication device management application. In Windows 95, 98, and NT 4.0, you can have data and fax communication programs open at the same time, but they cannot use the same modem at the same time.
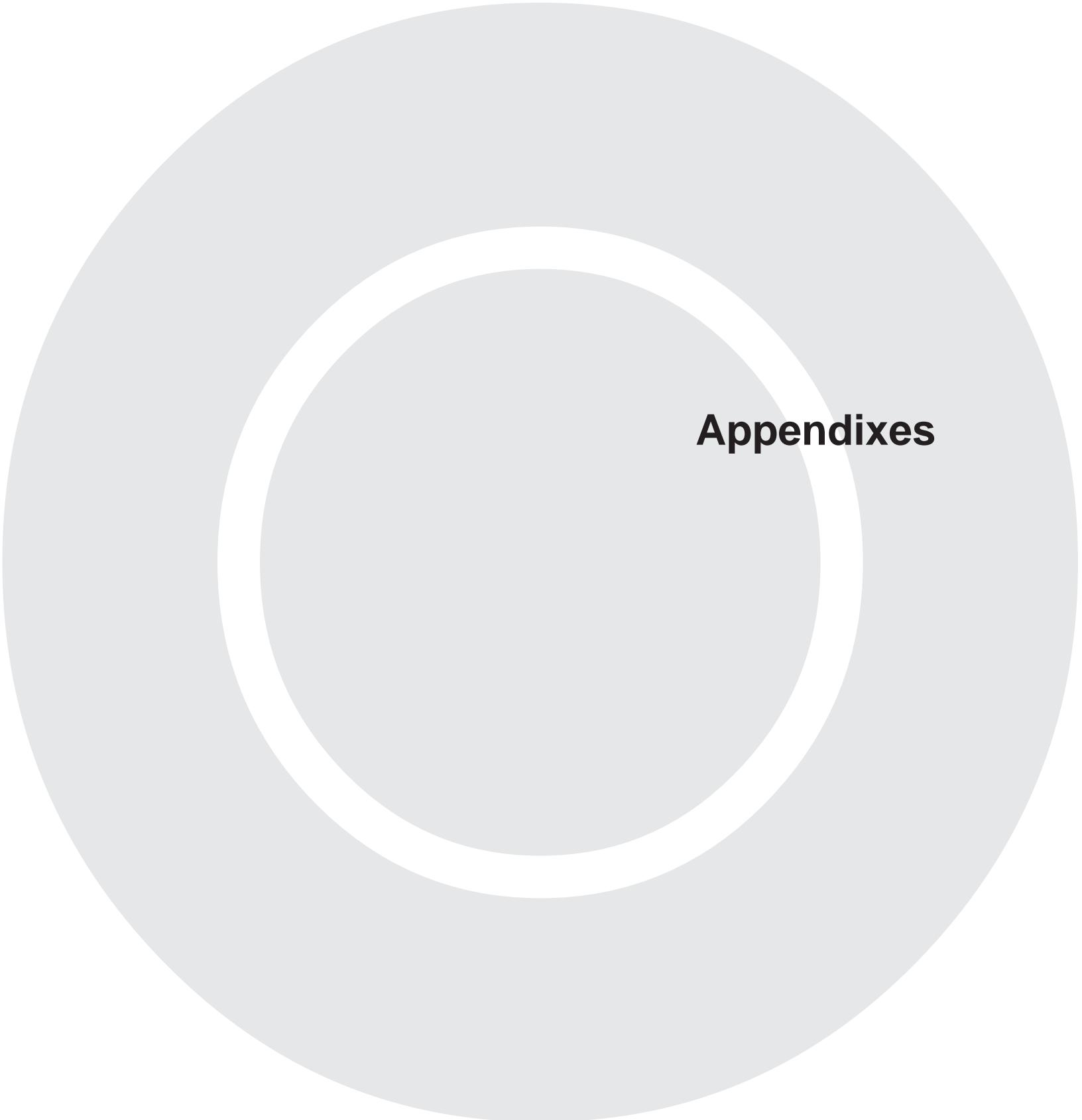
Appendixes

Appendix A: Regulatory Compliance

Note: Each regulation may not apply to every version of the MultiModemZDX.

FCC Part 15

This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC rules. Operation of this device is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Reglement Canadien sur le matériel brouilleur.

FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.

2. The suitable USOC jack (Universal Service Order Code connecting arrangement) for this equipment is shown below. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.

3. An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See installation instructions for details.

4. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed 5.0. To be certain of the nuber of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company.

5. 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. But if advance notice is not practical, the telephone company will notify you 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.

6. 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 necessary modifications in order to maintain uninterrupted service.

7. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. 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.

8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.

9. This equipment should not be used on party lines or coin lines.

10. If so required, this equipment is hearing-aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Trade Name:	MultiModem
Model Number:	MT5600ZDX, MT5600ZDXe, MT5600ZDXV, or MT5600ZDXVe
FCC Registration No:	AU7USA-24713-M5-E
Ringer Equivalence No:	0.3B
Modular Jack (USOC):	RJ11C or RJ11W (single line)
Service Center in USA:	Multi-Tech Systems, Inc. 2205 Woodale Drive Mounds View, MN 55112 U.S.A. (763) 785-3500 (763) 785-9874 Fax

Fax Branding Statement

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device, including fax machines, to send any message unless such message clearly contains the following information:

- Date and time the message is sent

- Identification of the business or other entity, or other individual sending the message

- Telephone number of the sending machine or such business, other entity, or individual

This information is to appear in a margin at the top or bottom of each transmitted page or on the first page of the transmission. (Adding this information in the margin is referred to as *fax branding*.)

Since any number of fax software packages can be used with this product, the user must refer to the fax software manual for setup details. Typically the fax branding information must be entered via the configuration menu of the software.

Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada label does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment or equipment malfunctions may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

International Modem Restrictions

Some dialing and answering defaults and restrictions may vary for international modems. Changing settings may cause a modem to become non-compliant with national telecom requirements in specific countries. Also note that some software packages may have features or lack restrictions that may cause the modem to become non-compliant.

EMC, Safety, and R&TTE Directive Compliance

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;

  and

- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;

  and

- Council Directive 1999/5/EC of 9 March on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

New Zealand Telecom Warning Notice

1. The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.

   This equipment is not capable under all operating conditions of correct operation at the higher speed which it is designated. 33.6 kbps and 56 kbps connections are likely to be restricted to lower bit rates when connected to some PSTN implementations. Telecom will accept no responsibility should difficulties arise in such circumstances.

2. Immediately disconnect this equipment should it become physically damaged, and arrange for its disposal or repair.

3. This modem shall not be used in any manner which could constitute a nuisance to other Telecom customers.

4. This device is equipped with pulse dialing, while the Telecom standard is DTMF tone dialing. There is no guarantee that Telecom lines will always continue to support pulse dialing.

Use of pulse dialing, when this equipment is connected to the same line as other equipment, may give rise to 'bell tinkle' or noise and may also cause a false answer condition. Should such problems occur, the user should not contact the Telecom Faults Service.

The preferred method of dialing is to use DTMF tones, as this is faster than pulse (decadic) dialing and is readily available on almost all New Zealand telephone exchanges.

5. Warning Notice: No '111' or other calls can be made from this device during a mains power failure.

6. This equipment may not provide for the effective hand-over of a call to another device connected to the same line.

7. Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom's Specifications:

   For repeat calls to the same number:

   - There shall be no more than 10 call attempts to the same number within any 30-minute period for any single manual call initiation, and

   - The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt.

   For automatic calls to different numbers:

   - The equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another.

   For automatically answered incoming calls:

   - The equipment shall be set to ensure that calls are answered between 3 and 30 seconds of receipt of ringing.

8. For correct operation, total of the RN's of all devices connected to a single line at any time should not exceed 5.

South African Notice

This modem must be used in conjunction with an approved surge protection device.

Appendix B: Technical Specifications

The MultiModemZDX modem meets the following specifications:

Trade Name	MultiModemZDX™
Model Number	MT5600ZDX, MT5600ZDXe, MT5600ZDXV, and MT5600ZDXVe
Client-to-Server Data Rates	K56flex or V.90 speeds when accessing a K56flex or V.90 server (actual speed depends on server capabilities and line conditions)*
Client-to-Client Data Rates	33,600; 31,200; 28,800; 26,400; 24,000; 21,600; 19,200; 16,800; 14,400; 12,000; 9600; 7200; 4800; 2400; 1200; 0-300 bps
Fax Data Rates	14,400; 9600; 7200; 4800; 2400; 300 bps
Data Format	Serial, binary, asynchronous
Commands	AT, V.25*bis,* TIA/EIA TR.29, Class 2
Command Buffer	60 characters
Modem Compatibility	V.90, K56flex, V.42, V.42bis, V.34, V.34bis, V.32, V.32bis, V.32terbo, V.25bis, V.22, V.22bis, V.21 & V.23 in international versions, Bell 212A and 103/113
Fax Compatibility	Group 3, Class 1 and 2, T.30, T.4, V.29, V.27ter, V.21, V.17, and TIA/EIA TR29.2
Error Correction	V.42 (LAP-M or MNP 3 and 4)
Data Compression	V.42bis (4:1 throughput), MNP 5 (2:1 throughput)
Speed Conversion	Serial port data rates adjustable to 300; 1200; 2400; 4800; 9600; 19,200; 38,400; 57,600; 115,200; and 230,400 bps
Mode of Operation	Fax online modes, full duplex over dial-up, AT command mode
Flow Control	XON/XOFF (software), RTS/CTS (hardware)
Intelligent Features	Plug and play, AT command compatible, autodial, redial, repeat dial, pulse or tone dial, dial pauses, auto answer, caller ID, adaptive line probing; automatic symbol and carrier frequency during start-up, retrain and rate renegotiation, DTMF detection, call status display, auto-parity and data rate selection, keyboard-controlled modem options, non-volatile memory, storage of up to four command strings or telephone numbers up to 31 characters each

*Though these modems are capable of 56K bps download performance, line impairments, public telephone infrastructure and other external technological factors currently prevent maximum 56K bps connections.

Data Modulation	FSK at 300 bps
	PSK at 1200 bps
	QAM at 2400, 4800, and 9600 bps (non-trellis);
	QAM with trellis-coded modulation (TCM) at 9600; 12,000;
	      14,400; 16,800; 19,200; 21,600; 24,000; 26,400; 28,800;
	      31,200; 33,600; and 56,000 bps

Fax Modulation	V.21 CH2 FSK at 300 bps (half duplex) V.27ter DPSK at 4800 and 2400 bps V.29 QAM at 9600 and 7200 bps V.17TCM at 14400, 12000, 9600, and 7200 bps
Carrier Frequencies *V.34*	1600, 1646, 1680, 1800, 1829, 1867, 1920, 1959, 2000 Hz
Carrier Frequencies *V.32, V.32bis, V.32terbo*	1800 Hz

Carrier Frequencies
  V.22,V.22bis or
  Bell 212A Standard
  (2400 &1200 bps)
	Transmit originate: 1200 Hz
	Transmit answer: 2400 Hz
	Receive originate: 2400 Hz
	Receive answer: 1200 Hz

Carrier Frequencies
  V.23 (1200 bps)
	Transmit originate: 390 Hz mark
	                    450 Hz space
	Receive originate: 1300 Hz mark
	                 2100 Hz space
	Transmit answer: 1300 Hz mark
	                 2100 Hz space
	Receive answer: 390 Hz mark
	                   450 Hz space

Carrier Frequencies
  V.21 (0-300 bps)
	Transmit originate: 980 Hz mark
	                 1180 Hz space
	Receive originate: 1650 Hz mark
	                 1850 Hz space
	Transmit answer: 1650 Hz mark
	                 1850 Hz space
	Receive answer: 980 Hz mark
	                 1180 Hz space

Carrier Frequencies
  Bell 103/113
  (0–300 bps)
	Transmit originate: 1270 Hz mark
	                 1070 Hz space
	Receive originate: 2225 Hz mark
	                 2025 Hz space
	Transmit answer: 2225 Hz mark
	                 2025 Hz space
	Receive answer: 1270 Hz mark
	                 1070 Hz space

Fax Carrier
Frequencies
	V.21 Ch2 (half duplex):
	      1650 Hz mark, 1850 Hz space for transmit originate
	      1650 Hz mark, 1850 Hz space for transmit answer
	V.27ter: 1800 Hz originate/answer
	V.29 QAM: 1800 Hz originate/answer
	V.17 TCM: 1800 Hz originate/answer

Transmission Level	-11 dBm or -12 dBm (dial-up; -11 or -12 determined by country)

Frequency Stability	±0.01%
Receiver Sensitivity	-43 dBm under worst-case conditions
AGC Dynamic Range	43 dB
Interface	RS-232C/V.24/V.28
Connectors	DB25F RS-232C connector, one RJ-11 phone jack, power connector
Cables	One modular telephone cable (USA); country-specific cord for UK and International models; one 9-pin to 25-pin serial cable for UK and International models; external power transformer and cord
	Note: Any cables connected to the computer should be shielded to reduce interference.
Diagnostics	Power-on self test, local analog loop, local digital loop, remote digital loop
Indicators	LEDs for Transmit Data, Receive Data, Carrier Detect, various speed indicators, Off Hook, Terminal Ready, Error Correction, and Fax
Speaker	1-inch speaker for call progress monitoring
Speaker and Microphone Jacks	MultiModemZDXV and MultiModemZDXVe
Manual Controls	Power switch
Operating Temperature	Temperature range 0°–50°C (32°–120°F); humidity range 20–90% (non-condensing)
Power Requirement	115 VAC, 60 Hz, 16 W; 230V/50 Hz optional (international)
Power Consumption	5 Watts
Dimensions	cm: 14.8 long × 10.8 wide × 2.6 high inches: 5.7 long × 4.25 wide × 1.15 high
Weight	grams: 224 ounces: 8
Limited Warranty	10 years

Appendix C: Loopback Tests

Introduction

Each time you turn on your modem, it performs an automatic self-test to ensure proper operation. Your modem also has three diagnostic tests: local analog loopback, remote digital loopback, and local digital loopback. These ITU-T V.54 loopback tests isolate telephone circuit and transmission problems.

In a loopback test, data from your computer loops through the circuits of your modem and/or a remote modem before it appears on your monitor. When the loop has been completed, the data on your PC's monitor should match the original data.

The local analog loopback test allows you to verify that the modem's transmitter and receiver circuits are functioning properly.

The local digital loopback allows you to verify that the local computer or terminal, the two modems, and the transmission line between them are functioning properly.

The remote digital loopback test allows you to verify that the remote computer or terminal, the remote modem, the serial ports, the telephone line, and the local modem are functioning properly.

Note: All loopback tests should be run at 9600 bps without error correction.

Local Analog Loopback Test (V.54 Loop 3)

In this test, data from your computer or terminal is sent to your modem's transmitter, converted into analog form, looped back to the modem's receiver, converted into digital form, and then sent to your monitor for verification. No connection to the phone line is required.
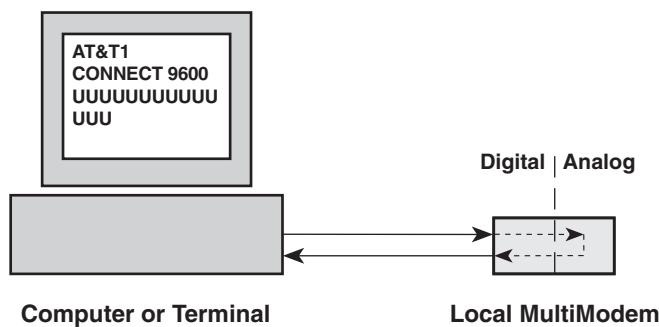
Figure C–1. Local analog loopback test.

Test Procedure

1. Connect the modem to your computer. Using your communication program, set the desired baud rate and go into terminal mode.

2. Type **AT** and press ENTER; you should get an *OK* message. Type **AT\N** and press ENTER to disable error correction.

3. Type **AT&T1** and press ENTER. This places your modem in analog loopback mode in the originate mode. A *CONNECT* message should appear on your display. The modem is now out of command mode and in a pseudo-online mode.

4. Note that the CD indicator is on. If it is not on, there could be a problem with your modem.

5. Enter characters from your keyboard. For this test, typing multiple uppercase *U* characters is a good way to send an alternating test pattern of binary ones and zeros. The characters entered should be displayed on your monitor.

6. To exit the test, type the escape sequence **+++AT** and press ENTER. This puts the modem in online command mode. Then type either **AT&T** or **ATH** to return to command mode.

7. Your modem passes this test if the data received on your monitor is the same as the data entered from your keyboard. If different data appears on your monitor, your modem is probably causing the problem, though it could also be your computer. If your modem passes this test, but you are receiving errors while on line, the remote modem or the phone line could be at fault.

Remote Digital Loopback Test (V.54 Loop 2)

The remote digital loopback test tests the phone lines and the circuits of both your modem and a remote modem. In this test, your modem must be on line with another modem that is set up to respond to a request for remote digital loopback. (Note that some modems might not support remote digital loopback or might have it disabled.) Data from your computer or terminal is transmitted through your modem and over the phone line to the remote modem, where it is then looped back to your modem.
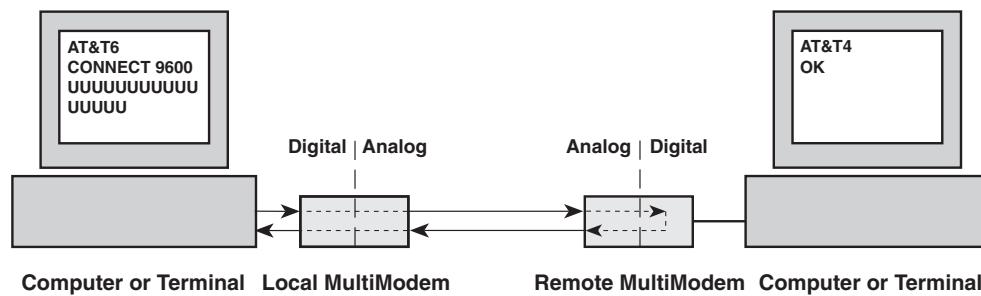
Figure C–2. Remote digital loopback test.

Test Procedure

1. Arrange to have **&T4** set on the remote test modem. This command enables the remote modem to respond to an **&T6** request for a remote digital loopback test from the local modem.

2. Open your communications software and go into terminal mode. Type **AT** and press ENTER; you should get an *OK* message. Type **AT\N** and press ENTER to disable error correction. Type **AT+MS=9,1,9600,9600** and press Enter to set the local modem to V.32 mode at 9600 bps.

3. Dial the remote modem and establish your online connection.

4. Type the escape sequence +++**AT** and press ENTER to bring your modem into online command mode.

5. Type **AT&T6** and press ENTER. The local modem responds to this command by transmitting an unscrambled marking signal, which causes the remote modem to place itself in digital loopback mode. Then the local modem exits online command mode and enters data mode.

6. Enter data from your keyboard. For this test, typing multiple uppercase *U* characters is a good way to send an alternating test pattern of binary ones and zeroes. Data received by the remote modem enters its analog receiver, is converted to digital data, is reconverted into analog, and then is transmitted back to your modem. Your modem passes this test if the data received on your monitor is the same as the data entered from your keyboard.

7. To exit the test, type the escape sequence +++**AT** and press ENTER. This puts the modem in online command mode. The modem should respond with an *OK* message. If you wish to stay on line with the remote modem for normal data transmission, type **AT&T** and press ENTER to exit the test, then type **ATO** and press ENTER to return on line. If you wish to terminate the call, type **ATH** and press ENTER to hang up.

Local Digital Loopback Test (V.54 Loop 2)

The local digital loopback test is identical to the remote digital loopback test with one exception. Instead of using your modem to signal a remote modem to place itself in digital loopback mode, your modem is placed in digital loopback mode while the remote modem is not. Data is entered and transmitted from the remote modem, sent across the phone line to your modem, and looped back to the remote modem.
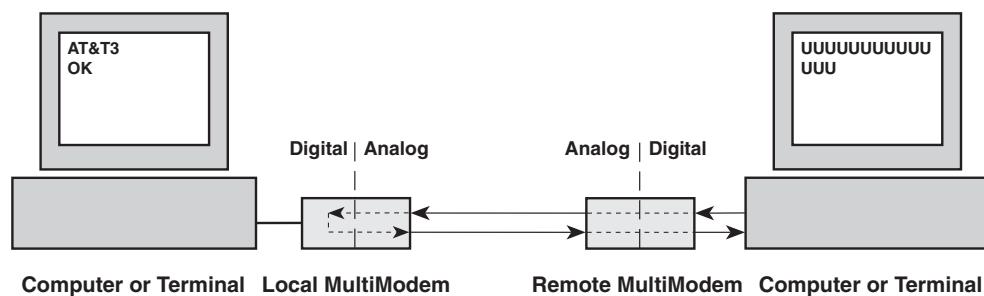
Figure C–3. Local digital loopback test.

Test Procedure

1. Open your communications software and go into terminal mode. Type **AT** and press ENTER; you should get an *OK* message. Type **AT\N** and press ENTER to disable error correction. Type **AT+MS=9,1,9600,9600** and press Enter to set the local modem to V.32 mode at 9600 bps.

2. Dial the remote modem and establish your online connection.

3. Type the escape sequence +++**AT** and press ENTER to bring your modem into online command mode.

4. Type **AT&T3** and press ENTER. Once you receive an *OK* message from your modem (if responses are enabled), your modem is placed in digital loopback mode.

5. Have someone enter data from the remote keyboard. For this test, typing multiple uppercase *U* characters is a good way to send an alternating test pattern of binary ones and zeros. The data received by your modem enters its analog receiver, is converted to digital data, is reconverted into analog, and then is transmitted back to the remote modem. Your modem passes this test if the data received on the remote monitor is the same as the data entered from the remote keyboard.

6. To exit the test, turn off the modem.

Appendix D: Warranty, Service, and Technical Support

Limited Warranty

Multi-Tech Systems, Inc. (MTS) warrants that this product will be free from defects in material or workmanship for a period of ten years from the date of purchase or, if date of purchase is not provided, ten years from the date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products that have been damaged by lightning storms, water, or power surges, or that have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products that prove to be defective within the warranty period, or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory with transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DE-FECTIVE PRODUCTS.

Online Warranty Registration

If you have access to the World Wide Web, you can register your Multi-Tech product online at the following URL:

http://www.multitech.com/register/

Service

North American Products

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota, factory. Please send modems that require repairs to the following address:

> **Multi-Tech Systems, Inc.**
> **2205 Woodale Drive**
> **Mounds View, MN 55112**
> **U.S.A.**
> *Attn: Repairs, Serial #_____*

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS. Please include inside the shipping box a description of the problem, a return shipping address (must have street address, not P.O. Box), a telephone number, and if the product is out of warranty, a check or purchase order for repair charges.

Extended two-year overnight replacement agreements are available for selected products. Please refer to our Overnight Replacement Agreement at *http://www.multitech.com/PROGRAMS/orc/* for details on rates and coverages. Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at 800 972-2439.

Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at 800 328-9717 or 763 785-3500.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

International Products

Your distributor should contact Amex, Inc., for information about repairs for your Multi-Tech product:

> **Amex, Inc.**
> **2724 Summer Street NE**
> **Minneapolis, MN 55413**
> **U.S.A.**
>
> **Tel: +612 331-3251**
> **Fax: +612 331-3180**

Please direct questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you, listed at *http://www.multitech.com/COMPANY/offices/DEFAULT.ASP*. When calling the U.S., please direct questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at 763 785-3500.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Replacement Parts

SupplyNet, Inc. can supply you with replacement power supplies, cables, and connectors for select Multi-Tech products. You can place an order with SupplyNet via mail, phone, fax, or the Internet at the following addresses:

Mail: SupplyNet, Inc.
            613 Corporate Way
            Valley Cottage, NY 10989

Phone: 800- 826-0279

Fax: 914-267-2420

Email: *info@thesupplynet.com*

Internet: *http://www.thesupplynet.com*

Technical Support

Multi-Tech Systems has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, please call 800 972-2439 (USA and Canada) or 763 785-3500 (international and local). Please have modem information available. You can also contact Technical Support by e-mail at the following addresses:

U.S., Canada, and Europe: *support@multitech.com*

France: *support@multitech.fr*

India: *support@multitechindia.com*

U.K.: *support@multitech.co.uk*

Recording Modem Information

Complete the following information about your Multi-Tech modem before calling Technical Support.

Modem Model No.:_____

Modem Serial No.:_____

The model and serial numbers are printed on the bottom of the modem.

Note the status of the modem before calling Technical Support. The status includes information about LED indicators, screen messages, diagnostic test results, problems with a specific application, etc.

Internet Sites

Multi-Tech has a Web site at:
http://www.multitech.com

and an ftp site at:
ftp://ftp.multitech.com

Appendix E: Upgrading the Modem

Introduction

Your modem is controlled by semi-permanent software, called *firmware*, which is stored in flash memory. Firmware is nonvolatile; that is, it remains stored in memory when the modem is turned off. However, it can be changed by either the manufacturer or the user as bugs are fixed or new features are added.

Since the firmware in your modem is stored in flash memory, you can upgrade it yourself in a few minutes by using the following procedures.

Upgrade Overview

The upgrade procedure consists of the following steps, which are described in greater detail in the following sections.

1. Identify the model number and firmware version of your modem.

2. Identify the current version of the firmware at the Multi-Tech Web site. If your modem already has the current firmware, there is no need to update it.

3. Download the upgrade file for your modem.

4. Extract the firmware .HEX file and the appropriate flash upgrade program from the file you downloaded.

5. Document and clear your stored parameters.

6. Upgrade the modem's firmware using the .HEX file and the flash upgrade program.

7. Restore your parameters.

Step 1: Identify the Modem Firmware

You must know the model number and firmware version of your Multi-Tech modem to know whether or not you should update it.

1. Run your favorite terminal program. If you are using Windows 95, 98, 2000 or Windows NT, you can use HyperTerminal. If you are using Windows 3.1, you can use Windows Terminal.

2. In the program's terminal window, type **AT&F**. Even if you cannot see the **AT&F** command on your screen, be sure to type it completely, and then press ENTER. If the modem does not respond with *OK*, repeat the **AT&F** command.

3. Now type **ATI3** and record your results. The firmware version should appear first in the response, which should look **similar** to the following:

```
V2.300G-V90_2M_DLS
```

Step 2: Identify the Current Firmware Version

Identify the current version of the firmware at the Multi-Tech Web site. If your modem already has the current firmware, there is no need to update it.

1. Using your favorite Web browser, go to http://www.multitech.com/support/ MultiModemZDX/firmware.asp.

2. Scroll down the table to your modem model number.

3. Look at the firmware version number for your modem.

4. If the firmware version number matches the firmware version number found in "Step 1: Identify the Modem Firmware," your modem has the current firmware version, and does not need to be updated.

5. If the firmware version number is greater than the firmware version number found in "Step 1: Identify the Modem Firmware," your modem has an older firmware version. Continue with "Step 3: Download the Upgrade File."

   Warning: The first digit of the new firmware must match the first digit of the old firmware, or the modem may not work properly; e.g., if your current firmware version is 4.16, replace it only with 4.xx firmware, not 6.xx firmware.

Step 3: Download the Upgrade File

1. If you are not already at the MultiModemZDX firmware page of the Multi-Tech Web site, follow the procedure in "Step 2: Identify the Current Firmware."

2. Download the upgrade file for your modem by clicking its name, and save the file in a temporary folder on your hard disk.

3. In the same section of the Web page, download the Flash Wizard utility for your operating system by clicking it, and save it in the same folder.

Step 4: Extract the Upgrade Files

1. Install the Flash Wizard utility by double-clicking the file name in Windows Explorer.

2. Extract the upgrade files by double-clicking the file name. The extracted files include a .HEX file, which contains the upgrade data, and a Readme file.

3. Copy the upgrade .HEX file into the Flash Wizard folder, which, in a default installation, is at C:\Program Files\MultiTech Systems\Flash Wizard\.

Step 5: Clear Your Stored Parameters

Before you flash your modem, you should record the parameters that are currently stored in it, so you can reprogram it after flashing. After you have recorded them, send the **AT&F** command to the the modem to clear the stored parameters.

1. Run your favorite terminal program. If you are using Windows 95, 98, 2000, or Windows NT, you can use HyperTerminal.

2. In the program's terminal window, type **AT&V** and press ENTER to list your modem's current parameters.

3. Record your parameters by saving the screens and sending them to your printer.

4. Type **AT&F** and press E<small>NTER</small> to clear your stored parameters and reset your modem to factory default.

5. Close the terminal program.

Step 6: Upgrade the Modem's Firmware

Before you begin the following procedure, read the README.TXT file extracted from the upgrade archive file. Note the file name for the boot code (e.g., 2MBPFL11.S37) and the file name for the new firmware (e.g., BkQg300G.hex).

Warning: Never install an older version of firmware over a newer version. Doing so will destroy the Flash PROM! If the Flash PROM is destroyed, the modem must be sent in for repair.

---

1. Run Flash Wizard by double-clicking its icon or file name, or by selecting it from the Start menu. The **Identifying Devices** dialog box is displayed as Flash Wizard locates and identifies the devices connected to your system.

   Note: If the message *ERROR: No valid devices detected* is displayed, verify that the device is powered on and that all cables are correctly and securely attached.

   ---

2. Click the modem to be upgraded, and then click **Next** to proceed.

3. Select the port to be upgraded from the **Port** list, select the appropriate .HEX file from the **Hex File** list, and then click **Next** to continue.

   Note: Do not use FLASHLDR.HEX. This file is used internally by Flash Wizard.

   ---

4. The **Progress** dialog box appears, showing a status bar that indicates the progress of the upgrade.

   Caution: Any disruption of the program during this stage of the upgrade can cause your modem to become inoperable. Wait for the **Next** button to become active before proceeding.

   ---

8. When the flash upgrade is complete, the message *Programming Complete* appears. Click **Next** to continue.

9. The **Results** dialog box appears next. Click **Finish** to exit Flash Wizard.

Step 7: Restore Your Parameters

Your modem has been updated. You can now open your terminal program to reprogram your modem parameters or to confirm the update by typing **ATI3** in the terminal window and pressing E<small>NTER</small>.

Appendix F: Installing a Modem in Linux

Introduction

This appendix explains how to install a modem on a PC operating under the RedHat Linux 6.2 operating system. Other versions of RedHat and other Linux operating systems should be similar. Briefly, in Linux, you do not need drivers for most standard external modems and most internal ISA bus modems. Programs in Linux commonly call upon the port, rather than the modem.

Standard Linux Serial Port Definitions

Port	Linux Port
Com 1	ttyS0
Com 2	ttyS1
Com 3	ttyS2
Com 4	ttyS3

Installation

Connect the external modem to an available serial port.

Setup

This section describes how to make sure Linux can talk to the modem and be able to dial up to the Internet.

Using the terminal program Minicom to verify operation

1. At the command prompt, type **minicom –s** and press ENTER.

2. Select **Serial port setup** and press ENTER.

3. From **Serial port setup**, use the A key to access **Serial Device**, and then press ENTER.

4. Press ESC.

5. You are now in the Minicom terminal. Type **AT** and press ENTER. The screen should display OK to verify the operation. Alternately, dial a phone number to verify line operation

6. To leave Minicom, press CTRL + A, and then press Z.

7. On the help menu, press X to exit.

Using the modem to call the Internet

Linux allows different graphic user interfaces (GUI). In the following steps, we'll use the Gnome Desktop GUI and assume that the Internet Service Provider (ISP) you are calling assigns you the Domain Name Service (DNS) and Internet Protocol (IP) addresses. For more information on DNS or IP, see the Linux OS owner's manual or contact your ISP.

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.

2. Select **Internet** from the menu.

3. Select **Dialup Configuration Tool**.

4. Select **Add**, and then click **Next**.

5. Enter the connection name and phone number, and then click **Next**.

6. Enter your user name and password, and then click **Next**.

7. Select **Normal ISP** if your ISP is not listed, and then click **Next**.

8. Click **Finish**.

Calling the ISP

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.

2. Select **Internet** from the menu.

3. Select **RH PPP Dialer**.

4. Select the connection name you entered in step 5 of the previous section.

5. Click **OK**.

That's basically it. Linux can use different programs and desktops depending on who made the Linux operating system and what version it is. The above procedures use the most commonly installed components of Red Hat 6.2. More details can be found in in the Linux OS owner's manual.

To use the system for answering calls, Linux requires other programs to be installed, such as Mgetty, Mgetty+Sendfax and others, depending what you require. Each vendor of Linux usually has more than adequate information on installing these programs.

Index