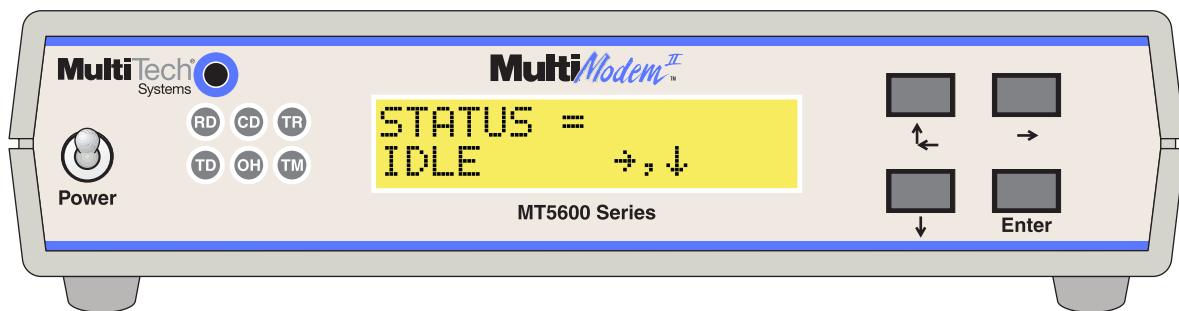


MultiModem^{II}_{TM}



Model MT5600BA Model MT5600BL

Data/Fax Modem

User Guide

MultiModemII User Guide

Models MT5600BA and MT5600BL

P/N S0000129 Revision C

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Record of Revisions

<i>Revision</i>	<i>Date</i>	<i>Description</i>
C	6/1/01	Manual revised to add the MT5600BA/BL System CD, patent numbers, new commands, and menu options; delete BBS references and digital loopback tests; and update phone numbers, regulatory agency statements, firmware upgrade instructions, Web links, and modem package components list.

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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.

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FCC Part 15

NOTE: 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 Règlement Canadien sur le matériel brouilleur.

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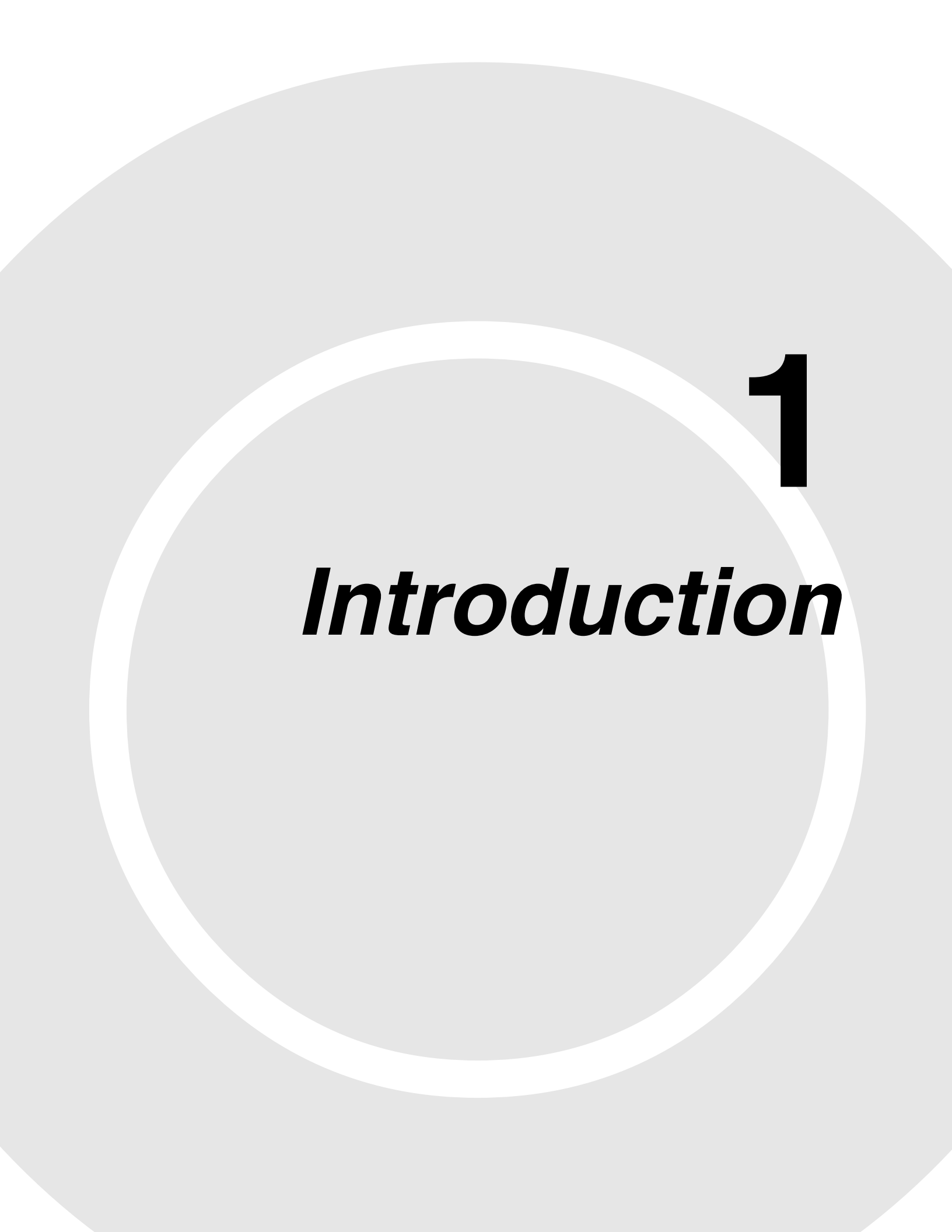
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1

Introduction

Introduction

Congratulations on your purchase of the MultiModemII modem. You have acquired one of the finest intelligent data/fax modems available today from one of the world's oldest modem manufacturers: Multitech Systems, Inc. This user guide will help you install, configure, test and use your modem.

Product Description

The MultiModemII MT5600BA and MT5600BL modems incorporate the K56flex™ and V.90 protocols, both of which enable Internet connections at data rates up to 53K bps* over standard telephone 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 telephone network normally is converted from digital to analog only once before it reaches your modem. Upstream transmissions and transmissions between client modems are limited to data rates of 33.6K bps, as are downstream transmissions that are converted more than once on the telephone network.

Both models support two-wire leased line operation. The MT5600BL model also supports four-wire leased line operation with dial backup and automatic leased line restoral. Please note that, because leased line operation consists of two client modems connected to each other, the maximum leased line data rate is 33.6K bps.

The MultiModemII offers interactive automatic dialing. You can store four command lines or telephone numbers of up to 30 characters each in the modem's nonvolatile memory. The modem pulse- 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 telephone networks without notification to the telephone company.

The MultiModemII front panel includes a liquid crystal display and four buttons, which together can be used to either display the current connection status of the modem or to configure the modem. The MultiModemII also can be configured through standard AT commands.

Features

General

- 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).
- Displays status and configuration information on a front panel LCD.

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

Data

- Supports K56flex™ and ITU-T V.90 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, including leased line 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.
- Supports both synchronous and asynchronous data transfer.
- Both models support two-wire leased line operation. The BL model also supports four-wire leased line operation with dial backup and leased line restoral.
- Supports callback security and remote configuration.
- Supports AS400 applications.
- 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).
- Can be flash upgraded.

Fax

- Supports V.17, Class 1, Class 2, and Group 3 fax standards, allowing it to communicate with other fax modems as well as with fax machines.
- Sends and receives faxes from your computer at 14,400 bps, 12,000 bps, 9600 bps, 7200 bps, 4800 bps, 2400 bps, or 300 bps.

What Is in Your Modem Package?

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

- An MT5600BA or MT5600BL modem
- A power transformer
- Country-specific telephone cordage
- A 9-pin to 25-pin serial cable (international modem kits only)
- A printed *Quick Start Guide*
- A CD containing data communications and other programs
- A CD containing modem drivers and this *User Guide*

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 World Wide Web and FTP sites.

82076200 *MT56XX Fax Class 1 Developer's Guide*

<ftp://ftp.multitech.com/manuals/pdf/developers%20kits/5600fax.pdf>

82006502 *Fax Class 2 Developer's Kit*

<ftp://ftp.multitech.com/manuals/pdf/developers%20kits/82006502.pdf>



2

Installation

Introduction

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

What You Will Need

Before starting, please make sure you have everything you need:

We supply

- ✓ An MT5600BA or MT5600BL modem
- ✓ A power transformer
- ✓ Country-specific telephone cordage
- ✓ A 9-pin to 25-pin serial cable (international modem kits only)
- ✓ A printed *Quick Start Guide*
- ✓ An installation CD containing modem drivers and this *User Guide*
- ✓ A CD containing data communications and other programs

You supply

- ✓ A computer with an unused serial port
- ✓ A shielded RS-232 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 (North America only)
- ✓ A nearby AC power outlet
- ✓ A nearby telephone line jack
- ✓ A nearby leased line jack or terminals (optional)

Safety Warnings

- Use this product only with UL- and CUL-listed computers.
- To reduce the risk of fire, use only 26 AWG or larger telephone wiring.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm; there is a risk of electrical shock from lightning.
- Do not use a telephone in the vicinity of a gas leak.

Step 1: Connect the Modem to Your System

Turn off your computer. Placing the modem in a convenient location, connect it to your computer's serial port, to the telephone line, to your leased line, to AC power, and, optionally, to your telephone.

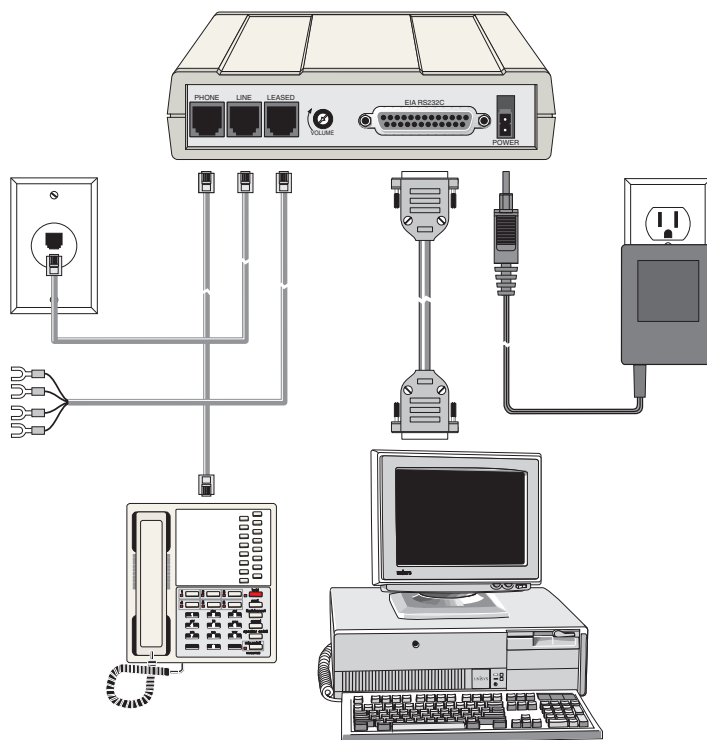


Figure 2-1. MT5600BL connections.

RS232 Connection

Plug one end of the serial cable into the RS232 connector on the modem, and the other end into a serial port connector on your computer, such as COM1 or COM2.

Dialup Connection

Plug one end of the modular phone cable into the modem's LINE jack, and the other end into a public switched telephone network (PSTN) wall jack.

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.

Note: Regulatory agencies may impose certain restrictions on equipment connected to public telephone systems. For more information, see Appendix A.

Two-Wire Leased Line Connection

MT5600BA: Plug one end of a two-wire phone cable into the modem's LINE jack, and connect the other end to a leased line wall jack or terminals.

MT5600BL: Plug one end of a two-wire phone cable into the modem's LEASED jack, and connect the other end to a leased line wall jack or terminals.

Four-Wire Leased Line Connection

On an MT5600BL only, plug one end of a four-wire phone cable into the modem's LEASED jack, and connect the other end to a four-wire leased line wall jack or terminals. For dial backup operation, plug one end of the modular phone cable into the modem's LINE jack, and the other end into a PSTN wall jack.

Phone Connection

For voice-only calls, plug a telephone into the modem's PHONE jack (optional).

Power Connection

Plug the power transformer into an AC power outlet or power strip. Plug the power transformer's cable into the POWER jack on the modem.

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

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 telephone line.

Power-On Test

Test the modem by turning it on (a power switch is located on the front panel). When you apply power, the modem performs a diagnostic self-test, indicated by the TM indicator lighting for a few seconds, after which the LCD should light. If this does not happen, check that the power switch is on, the power transformer is solidly connected, and the AC outlet is live. If these measures do not work, see Chapter 8, "Solving Problems."

Step 2: Install the Modem Driver

If you use Windows 95, Windows 98, Windows Me, Windows NT 4.0, or Windows 2000, you must install the modem driver. (If you use Windows 3.1 or another operating system, skip this step and go to Step 3.)

Installing the ModemDriver

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, “Solving Problems.”

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 installation CD into your CD-ROM drive, and then click **Have Disk**.
4. In the **Install from Disk** dialog box, select the drive the CD is in, and then click **OK**.
5. A list of modems appears. Select your modem from the list, 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 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.

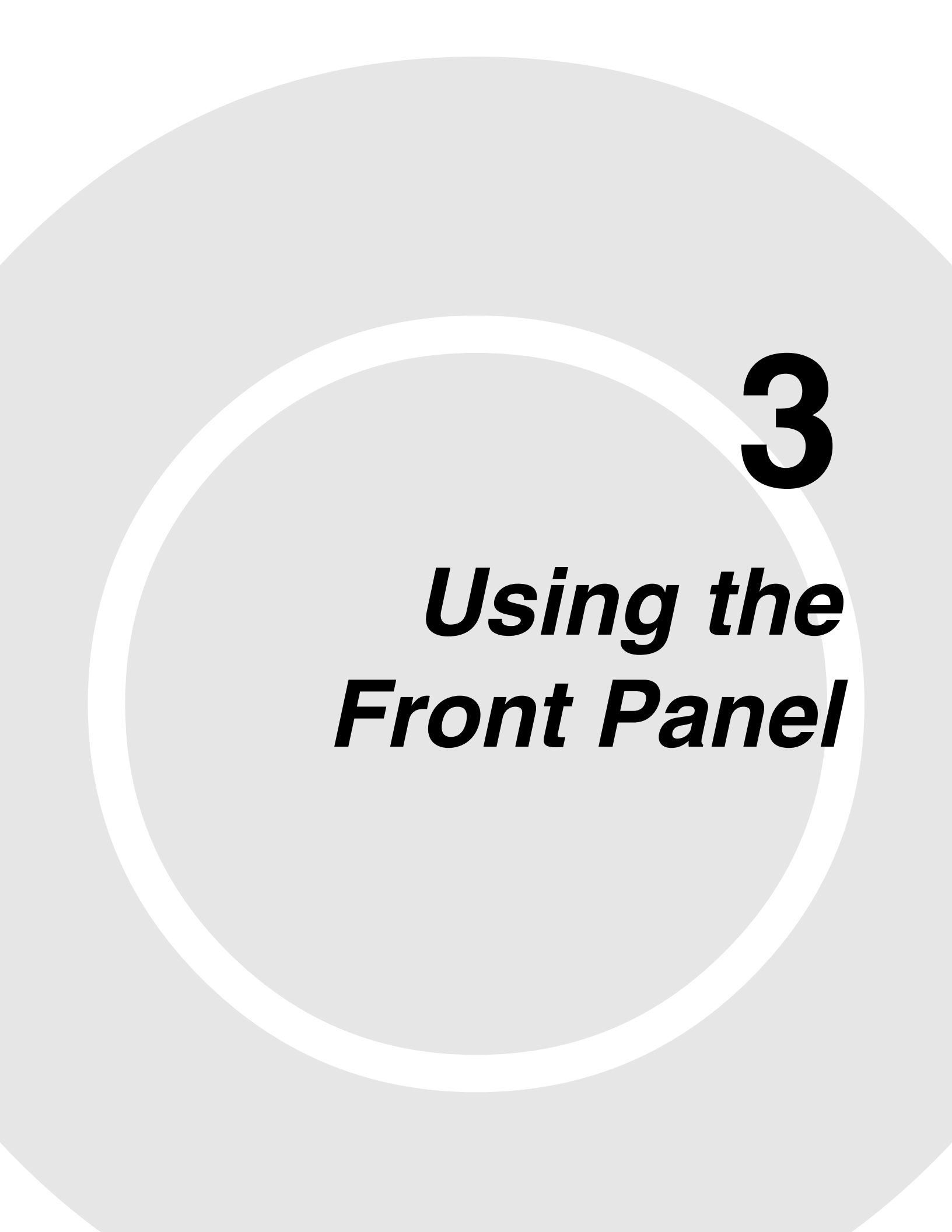
Step 3: Install and Configure Your Software

You may use either the communication program included with your modem or a third-party program. Communication programs designed for Windows 95/98/Me and Windows NT/2000 normally do not need to be manually configured, since they use the Plug and Play configuration supplied by the Windows modem driver. Communication programs designed for DOS and other operating systems, however, may need to be manually configured to work with your modem. Though each communication program is different, the following procedure should work with most of them.

1. Turn on your computer and run your communication 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 PhoneTools 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.
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.



3

***Using the
Front Panel***

Introduction

Like any modem, your Multi-Tech modem operates only under the control of a communication program, such as the Phone Tools 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 communication program of your choice, please refer to the program's documentation.

Modem Configuration

Your modem normally is configured through Windows or through the communication program you are using. The default settings work best for most purposes. See "Step 3: Install and Configure Your Software" in Chapter 2 for help in setting up your communication program.

You also can configure your modem either through the front panel or by sending AT commands to the modem. This chapter describes how to configure it using the front panel. To configure it using AT commands, see Chapter 4.

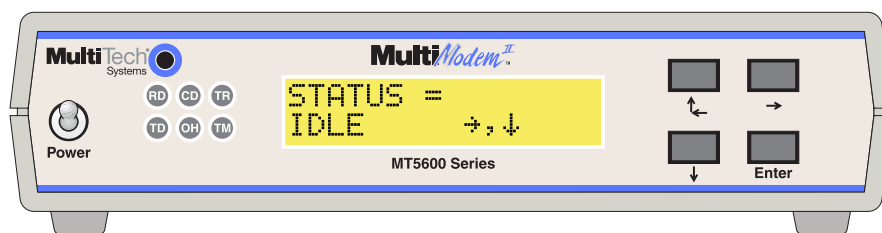


Figure 3-1. Front panel

LED Indicators

The MT5600BA/BL has six LED indicators on the front panel that indicate status and activity:

- RD** **Receive Data.** The RD indicator flashes when the modem is receiving data.
- TD** **Transmit Data.** The TD indicator flashes when the modem is transmitting data.
- CD** **Carrier Detect.** The CD indicator 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.
- OH** **Off-Hook.** The OH indicator 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.** The TR indicator 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.

TM **Test Mode.** The TM indicator lights when the modem is in test mode.

Liquid Crystal Display (LCD)

The MultiModemII's backlit liquid crystal display (LCD) has two functions: to display the current status of the modem and to display configuration menus, which are selected using the four pushbuttons on the front panel.

Option Selection

To select most configuration options, simply display the option in the LCD, and then press the **Enter** button to select it. An **OPTION SET** message appears to confirm the selection. To exit the **OPTION SET** message, press any button.

Some options, such as password options and phone number options, require you to enter a character string. To select a character, press the $\uparrow\leftarrow$ and $\downarrow$ buttons. To go to the next character position, press the $\rightarrow$ button. To backspace, press the $\rightarrow$ button before selecting a character. To exit without saving, press the $\rightarrow$ button several times. To save a character string, press the **Enter** button.

Menu Structure

The LCD menus have a tree structure with multiple trunks, limbs, branches, and twigs. For a schematic view, refer to the menu map on the next page.

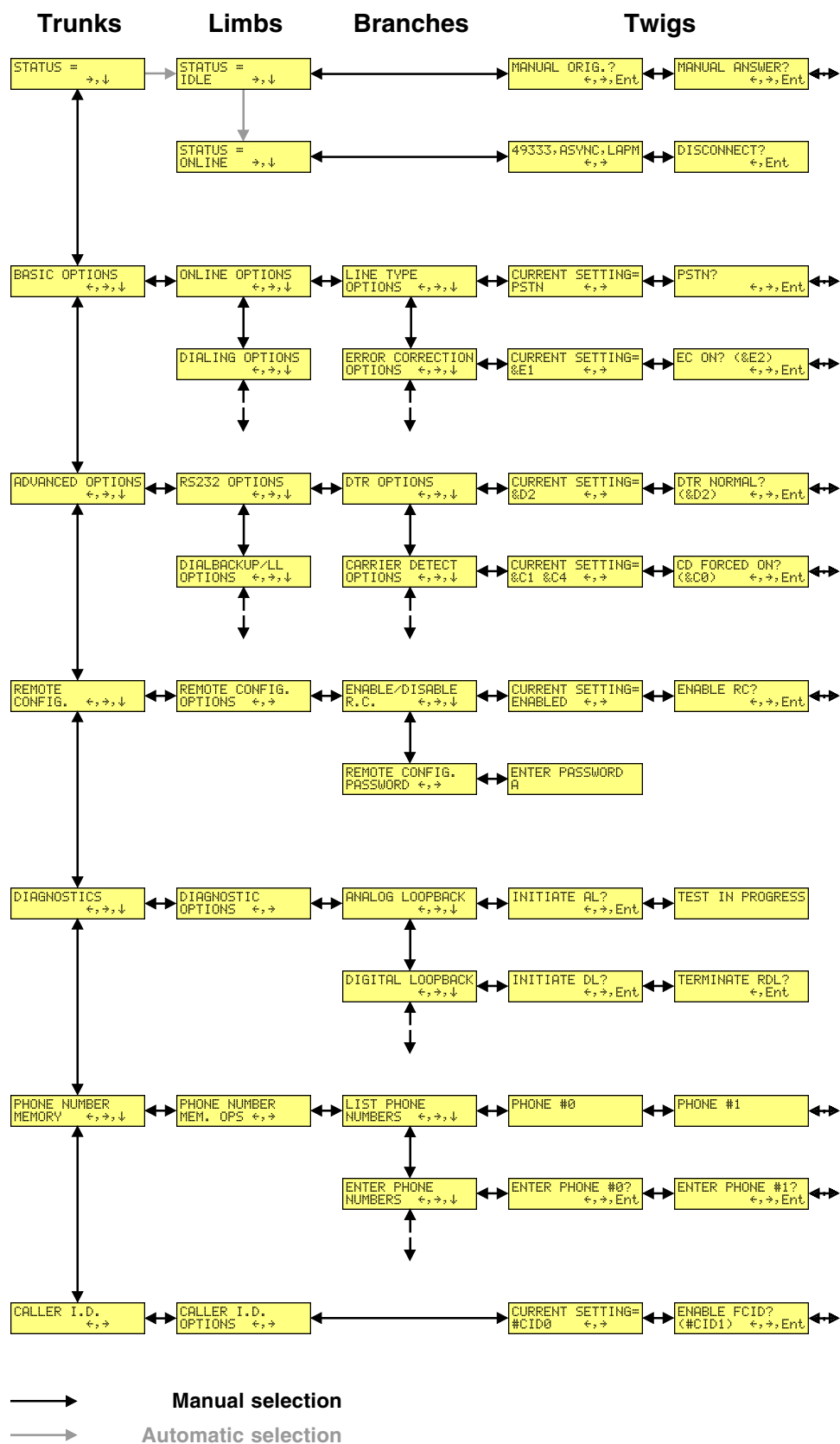
Trunks are the major divisions of the menu tree. There are seven trunks: Status, Basic Options, Advanced Options, Remote Configuration, Diagnostics, Phone Number Memory, and Caller ID. Use the $\uparrow\leftarrow$ and $\downarrow$ buttons to move between trunks.

Limbs are subdivisions of trunks. Use the $\rightarrow$ button to move from a trunk onto its first limb, and the $\uparrow\leftarrow$ and $\downarrow$ buttons to move between limbs on the trunk.

Branches are subdivisions of limbs. Use the $\rightarrow$ button to move from a limb onto its first branch, and the $\uparrow\leftarrow$ and $\downarrow$ buttons to move between branches on the limb.

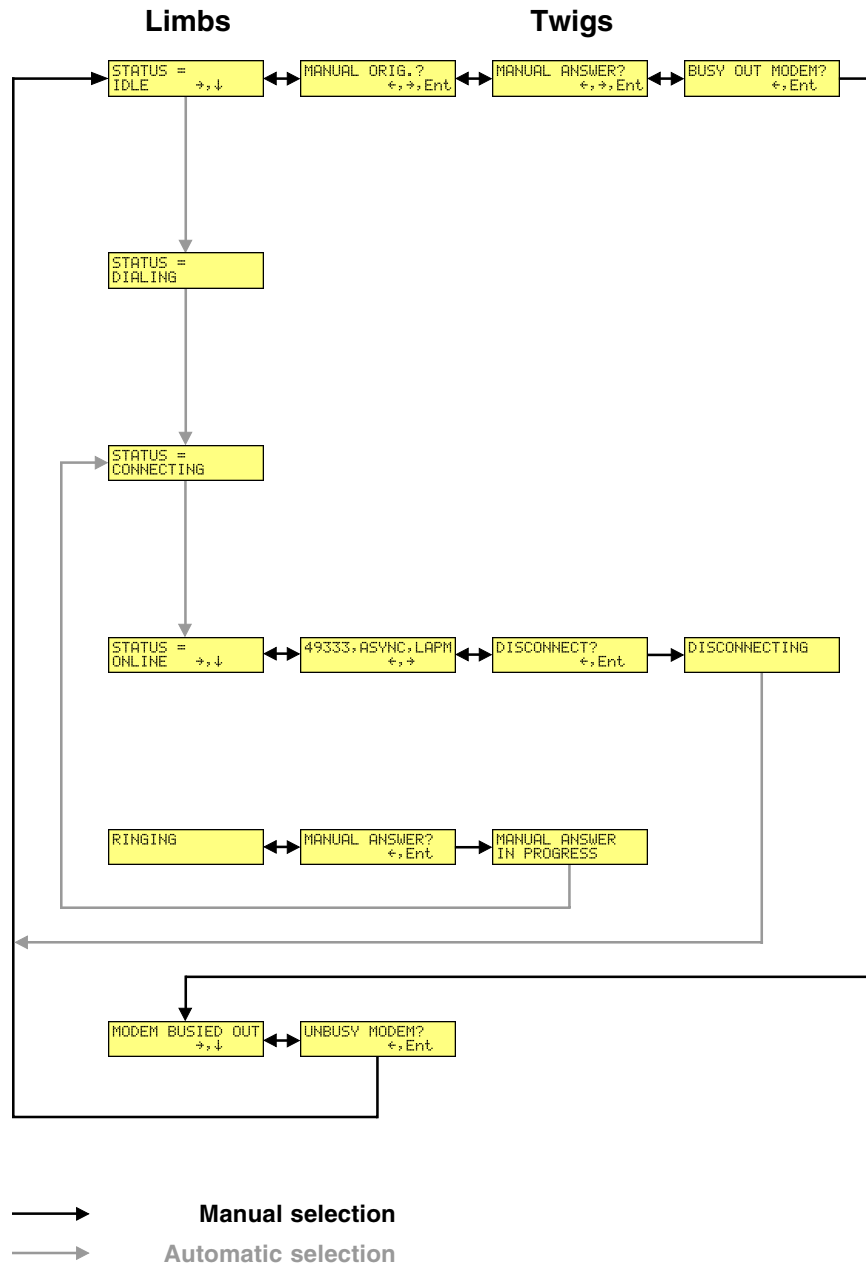
Twigs are status screens and options that are accessible only from branches. Use the $\rightarrow$ button to move from a branch to its first status screen or option; then press the $\rightarrow$ and $\rightarrow$ buttons to move between options, and press the **Enter** button to select an option.

Menu Overview



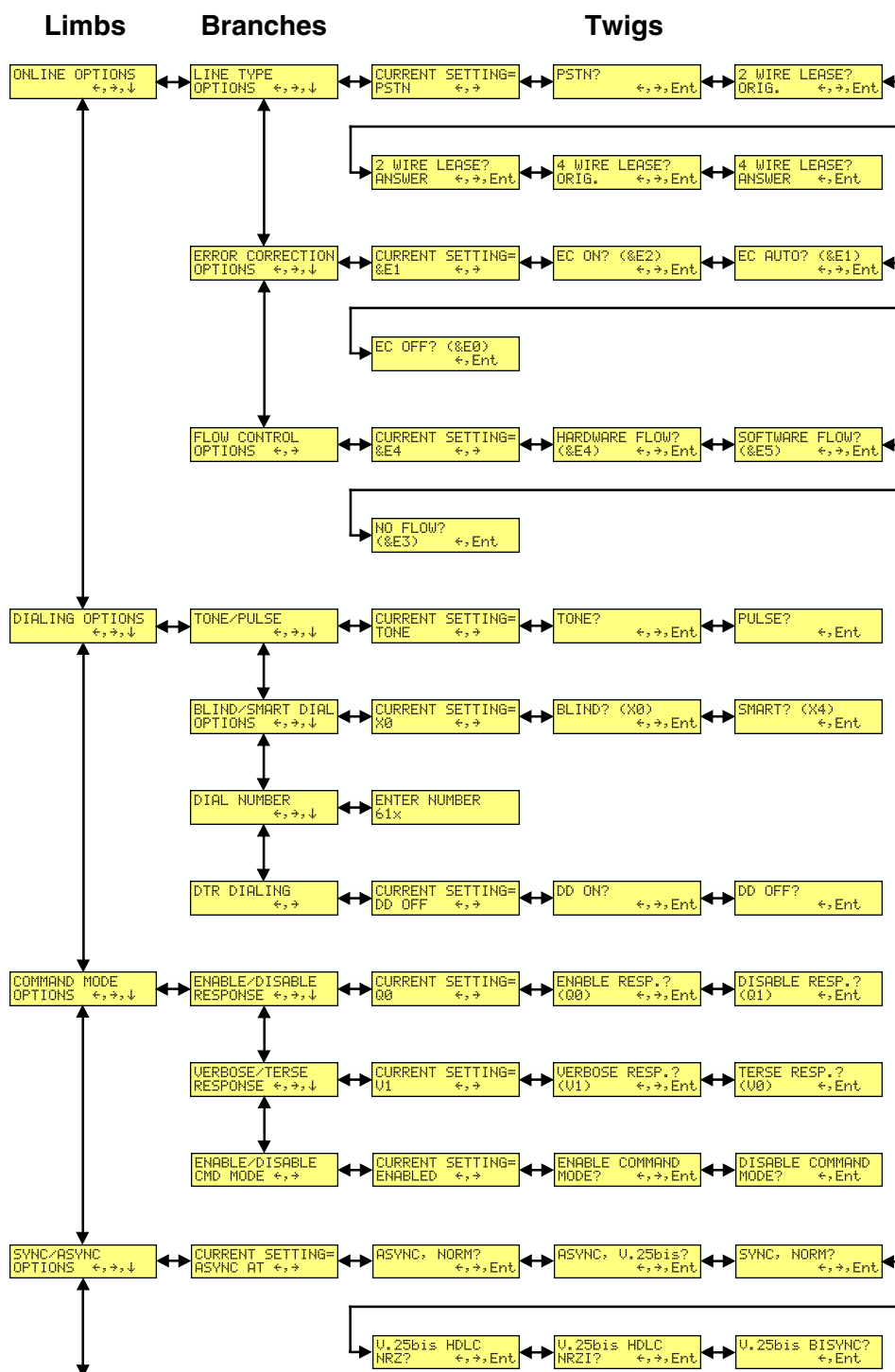
Status Trunk

The Status Trunk shows the current operating status of the modem. Limb changes are automatic, but certain options can be accessed by pressing the → button. Note that when the modem is online, pressing the → button shows the connect status, including the data speed, connection type, and compression type.



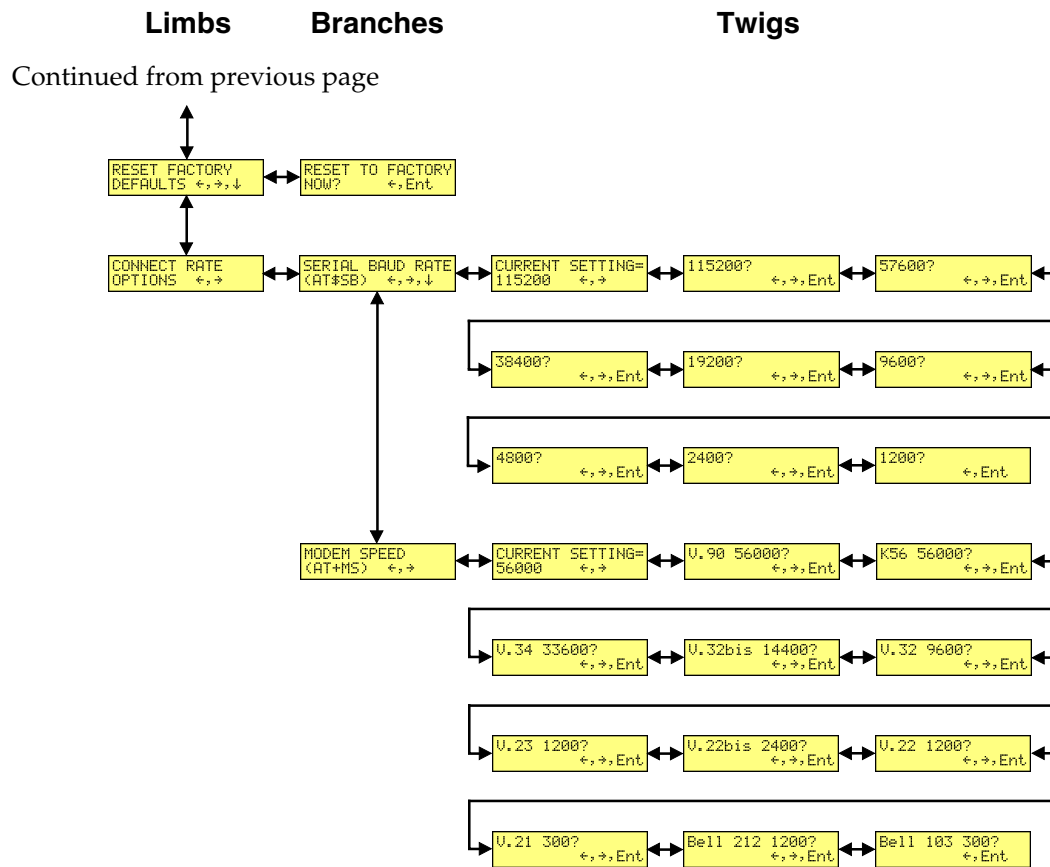
Basic Options Trunk

Use the Basic Options Trunk to configure the modem's basic operating conditions. When entering a number, use the $\uparrow\leftarrow$ and $\downarrow$ buttons to scroll through a list of digits and characters. To go to the next position, press the $\rightarrow$ button. To back up or to exit without dialing, press the $\rightarrow$ button several times.



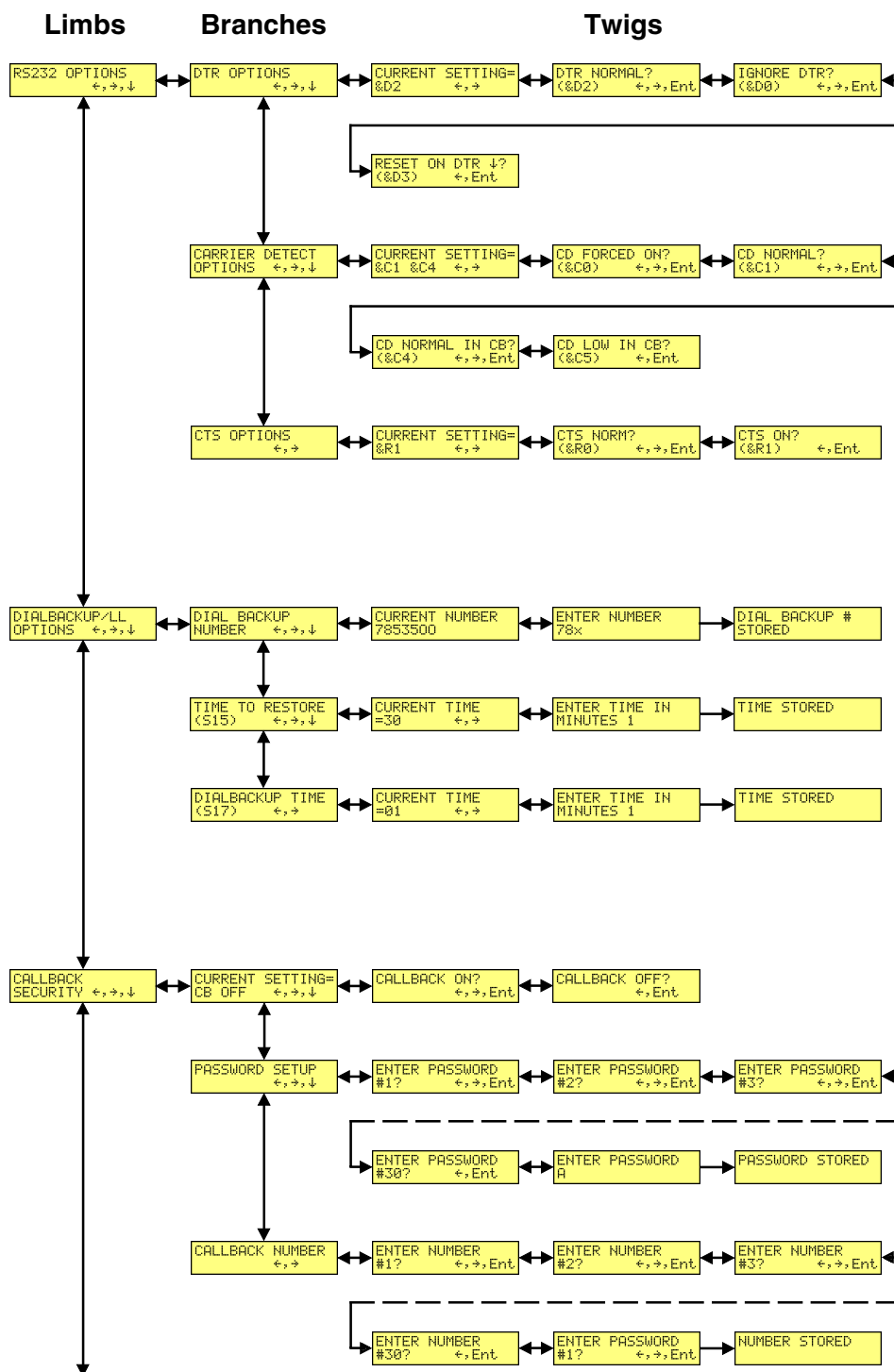
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Basic Options Trunk, continued

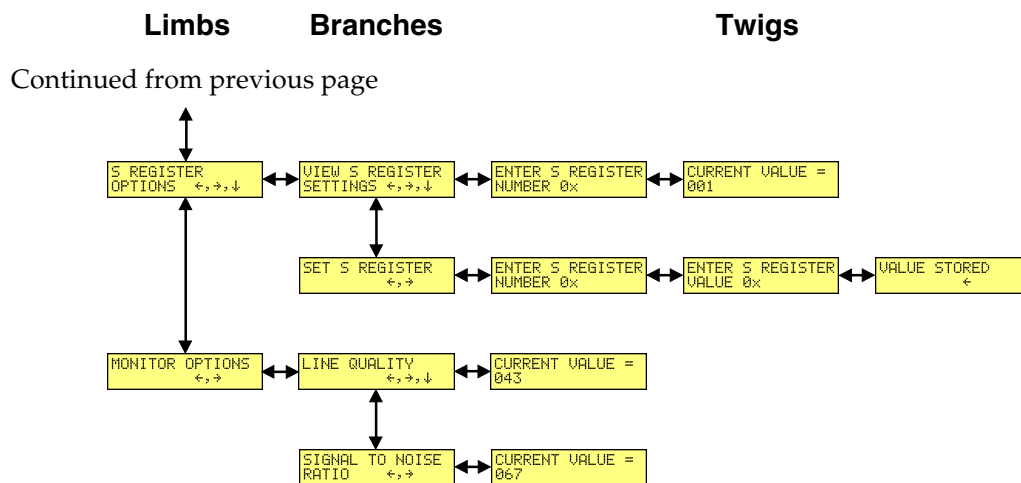


Advanced Options Trunk

Use the Advanced Options Trunk to configure RS-232, dial backup, and callback security options. When entering a number or password, use the $\uparrow\leftarrow$ and $\downarrow$ buttons to select a character or digit. To go to the next position, press the $\rightarrow$ button. To back-space or to exit, press the $\rightarrow$ button several times.

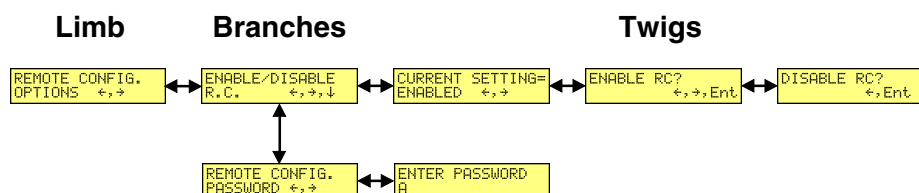


Continued on next page

Advanced Options Trunk, continued

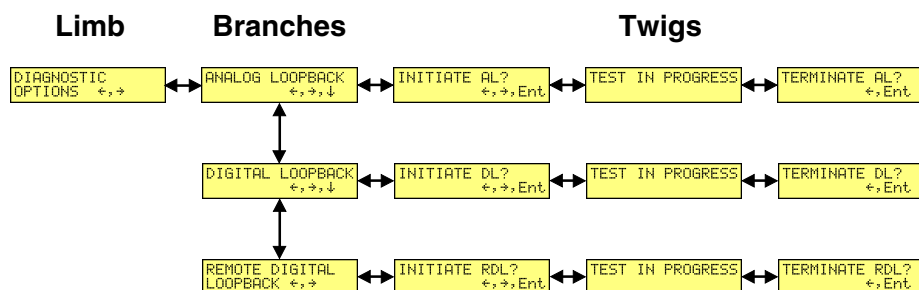
Remote Configuration Options Trunk

Use the Remote Configuration Options Trunk to enable or disable remote configuration on the modem, and to change the password. When entering the password, use the $\uparrow$ and $\downarrow$ buttons to scroll through the alphabet. To go to the next character position, press the $\rightarrow$ button. To backspace or to exit, press the $\rightarrow$ button several times.



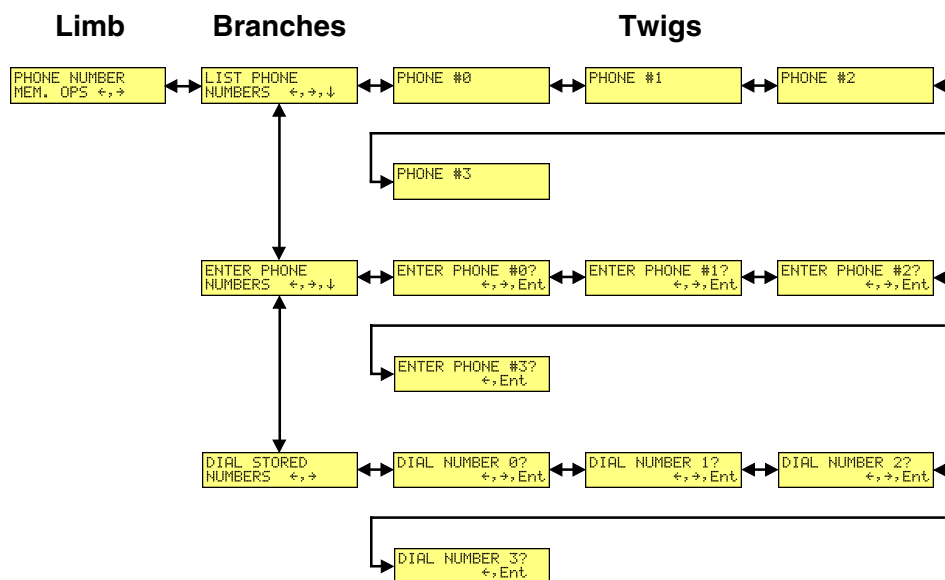
Diagnostic Options Trunk

Use the Diagnostic Options Trunk to run loopback tests on the modem. When a test is in progress, the TM indicator lights.



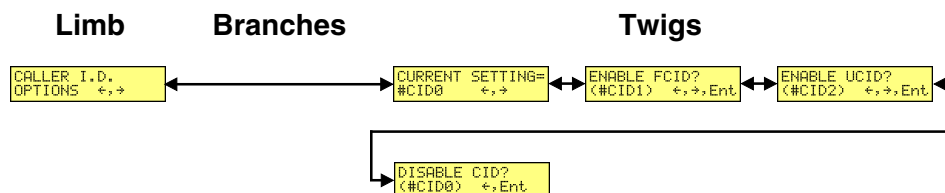
Phone Number Memory Options Trunk

The MultiModemII can store up to four telephone numbers for speed dialing. Use the Phone Number Memory Options Trunk to store, list, and dial these numbers. When entering a number, use the $\uparrow\leftarrow$ and $\downarrow$ buttons to scroll through the available digits and dialing commands. To go to the next position, press the $\rightarrow$ button. To backspace or to exit, press the $\rightarrow$ button several times.



Caller ID Options Trunk

Use the Caller ID Options Trunk to enable or disable Caller ID operation.



Menu Options

This section describes important LCD screens and options. Many, but by no means all, of the options have AT command equivalents.

Status

Status screens display the current status of the modem. Though limb changes are automatic, certain options can be selected by pressing the → button.

```
STATUS =
IDLE      →,↓
```

STATUS = IDLE. The modem is ready but inactive. This screen appears when the modem is first turned on, and is the starting point for accessing all other screens.

Three options are available from this screen by pressing the → button:

```
MANUAL ORIG.?
←,→,Ent
```

MANUAL ORIG.? Places the modem in originate mode for the time specified by register S7. Use this option to connect to a remote modem by manually dialing the number on a phone connected to the local modem. When the remote modem answers, press the **Enter** button to establish a connection with the remote modem. You can also use this option to temporarily place the modem in originate mode for back-to-back testing.

```
MANUAL ANSWER?
←,→,Ent
```

MANUAL ANSWER? Places the modem in answer mode for the time specified by register S7. You can use this option to temporarily place the modem in answer mode for back-to-back testing.

```
BUSY OUT MODEM?
←,Ent
```

BUSY OUT MODEM? Takes the modem out of service by putting it into an off-hook state so that a calling modem receives a busy signal.

```
MODEM BUSIED OUT
→,↓
```

MODEM BUSIED OUT. Shows that the modem is busied out. To return the modem to normal service, press →, **Enter**.

```
STATUS =
ONLINE    →,↓
```

STATUS = ONLINE. The modem is connected to another modem. Two options are available from this screen by pressing the → button:

```
49333,ASYNC,LAPM
←,→
```

Connect Status. Shows the connect speed, connection type, and error correction being used.

```
DISCONNECT?
←,Ent
```

DISCONNECT? Press the **Enter** button to force the modem to hang up. Same as the **ATH** command.

```
RINGING
```

RINGING. A remote modem or caller is attempting to establish a connection. One option is available from this screen by pressing the → button:

```
MANUAL ANSWER?
←,Ent
```

MANUAL ANSWER? Forces the modem to answer the phone. You can use this option to establish a connection if autoanswer is turned off (**S0=0**). Same as the **ATA** command.

Basic Options

The following screens are used to configure the modem's basic operating conditions.

ONLINE OPTIONS
←, →, ↓

ONLINE OPTIONS. The following screens are used to configure the online operation of the modem:

LINE TYPE
OPTIONS ←, →, ↓

LINE TYPE OPTIONS. Use the → and **Enter** buttons to select from the following line types: dial-up (PSTN), two-wire leased line originate or answer, and four-wire leased line originate or answer.

ERROR CORRECTION
OPTIONS ←, →, ↓

ERROR CORRECTION OPTIONS. Use the → and **Enter** buttons to turn error correction on or off, or to select automatic error correction. Same as the &E0, &E1, and &E2 commands.

FLOW CONTROL
OPTIONS ←, →

FLOW CONTROL OPTIONS. Use the → and **Enter** buttons to select no flow control, hardware flow control, or software flow control. Same as the &E3, &E4, and &E5 commands.

DIALING OPTIONS
←, →, ↓

DIALING OPTIONS. The following screens are used to configure dialing options or to dial manually.

TONE/PULSE
←, →, ↓

TONE/PULSE. Use the → and **Enter** buttons to select between DTMF tone dialing and pulse dialing. Same as the *T* and *P* commands.

BLIND/SMART DIAL
OPTIONS ←, →, ↓

BLIND/SMART DIAL OPTIONS. Use the → and **Enter** buttons to select blind dialing, in which the modem sends the *OK*, *CONNECT*, *RING*, *NO CARRIER*, *ERROR* and *NO ANSWER* messages to the computer and does not look for a dial tone or busy signal, or smart dialing, in which the modem sends all messages to the computer, including *NO DIALTONE* and *BUSY*. Same as the *X0* and *X4* commands.

DIAL NUMBER
←, →, ↓

DIAL NUMBER. Use the front panel buttons to enter a phone number and dial it. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without dialing, press the → button several times. To dial the number, press the **Enter** button. Same as the *D* command.

DTR DIALING
←, →

DTR DIALING. Use the → and **Enter** buttons to enable or disable DTR dialing. DTR dialing is popular in synchronous applications. In DTR dialing, the modem automatically dials the number stored in memory location 0 when it detects a high DTR (Data Terminal Ready) signal on the RS-232 interface. The DTR signal must remain high for the duration of the call. To store the DTR dialing number, use the &Z0= command or the **ENTER PHONE #0** menu option.

Note: Plug and Play does not function if DTR dialing is enabled. DTR is used during Plug and Play, and DTR dialing interferes with it.

**COMMAND MODE
OPTIONS** ←,→,↓

COMMAND MODE OPTIONS. The following screens are used to configure result code responses.

**ENABLE/DISABLE
RESPONSE** ←,→,↓

ENABLE/DISABLE RESPONSE. Use the → and **Enter** buttons to enable or disable the sending of result codes to the computer. Same as the **Q0** and **Q1** commands.

**VERBOSE/TERSE
RESPONSE** ←,→,↓

VERBOSE/TERSE RESPONSE. Use the → and **Enter** buttons to select verbose or terse result codes. Same as the **V0** and **V1** commands.

**ENABLE/DISABLE
CMD MODE** ←,→

ENABLE/DISABLE CMD MODE. Use the → and **Enter** buttons to enable or disable the modem's ability to accept AT commands.

**SYNC/ASYNC
OPTIONS** ←,→,↓

SYNC/ASYNC OPTIONS. Use the → and **Enter** buttons to select the method of data transmission.

ASYNC, NORM?
←,→,Ent

ASYNC, NORM? Normal asynchronous transmission using the AT command set.

ASYNC, V.25bis?
←,→,Ent

ASYNC, V.25bis? Asynchronous transmission using the V.25bis command set.

SYNC, NORM?
←,→,Ent

SYNC, NORM? Normal synchronous transmission using any command set.

**V.25bis HDLC
NRZ?** ←,→,Ent

V.25bis HDLC NRZ? V.25bis synchronous transmission using NRZ encoding. *Not implemented.*

**V.25bis HDLC
NRZI?** ←,→,Ent

V.25bis HDLC NRZI? V.25bis synchronous transmission using NRZI encoding. *Not implemented.*

V.25bis BISYNC?
←,Ent

V.25bis BISYNC? V.25bis bisynchronous transmission. *Not implemented.*

**RESET FACTORY
DEFAULTS** ←,→,↓

RESET FACTORY DEFAULTS. Use the → and **Enter** buttons to reset Profile 0 and the modem's active configuration to the factory defaults. Same as the **AT&F&W** command string.

**CONNECT RATE
OPTIONS** ←,→

CONNECT RATE OPTIONS. Use the → and **Enter** buttons to change the modem's serial port and data transmission speeds.

**SERIAL BAUD RATE
(AT\$SB)** ←,→,↓

SERIAL BAUD RATE. Use the → and **Enter** buttons to select the modem's serial port speed. The valid range is 1200 to 115200 bps. Same as the **\$SB** commands.

**MODEM SPEED
(AT+MS)** ←,→

MODEM SPEED. Use the → and **Enter** buttons to select the modulation protocol to use in originating or answering a connection. This also selects the maximum transmission speed at which the modem can operate. Same as the **+MS=[mod]** command.

Advanced Options

RS232 OPTIONS
←, →, ↓

RS232 OPTIONS. The following screens are used to configure the RS-232 interface.

DTR OPTIONS
←, →, ↓

DTR OPTIONS. Use the → and **Enter** buttons to select how the modem responds to the high to low transition of the DTR signal sent by the computer. **DTR NORMAL** causes the modem to hang up; **IGNORE DTR** allows operation with computers that do not provide DTR; and **RESET ON DTR ↓** causes the modem to perform a soft reset as if the **Z** command were received. Same as the **&D0**, **&D2**, and **&D3** commands.

CARRIER DETECT
OPTIONS ←, →, ↓

CARRIER DETECT OPTIONS. Use the → and **Enter** buttons to select whether CD will be forced high (**CD FORCED ON**) or whether it will go high when the remote modem's carrier signal is detected, and go low when the carrier signal is not detected (**CD NORMAL**). Same as the **&C0** and **&C1** commands. When using callback security on UNIX systems, select **CD LOW IN CB** to force CD low until the proper callback security password has been entered or until a disconnect occurs. This prevents the UNIX login prompt from being displayed before the callback security **ENTER PASSWORD** prompt appears. Select **CD NORMAL IN CB** to disable this feature. Same as the **&C5** and **&C4** commands.

CTS OPTIONS
←, →

CTS OPTIONS. Use the → and **Enter** buttons to select whether the CTS state will follow the RTS state when on line (**CTS NORM**) or whether CTS will always be high (**CTS ON**). Same as the **&R0** and **&R1** commands.

DIALBACKUP/LL
OPTIONS ←, →, ↓

DIALBACKUP/LL OPTIONS. The following screens are used to configure dial backup for four-wire leased line operation. For more information, see Chapter 7, "Leased Line Operation."

DIAL BACKUP
NUMBER ←, →, ↓

DIAL BACKUP NUMBER. Use to enter a dial backup number. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the number, press the **Enter** button. Note: Only 16 characters can be displayed at a time. To see characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

TIME TO RESTORE
(S15) ←, →, ↓

TIME TO RESTORE (S15). Sets how frequently leased line restoral attempts occur when the modems are in dial backup mode. The restore time interval can be set from 10 to 255 minutes in one minute increments. A value of 0 disables dial backup. Same as the **S15=** command.

DIALBACKUP TIME
(S17) ←, →

DIALBACKUP TIME (S17). Use to set how long the modem waits after a leased line failure before it attempts a dial backup connection. The timer can be set from 1 to 255 minutes in one minute increments. Same as the **S17=** command.

CALLBACK
SECURITY ←, →, ↓

CALLBACK SECURITY. Use the → and **Enter** buttons to turn callback security on or off. Same as the **#DB0** and **#DB1** commands. For more information about callback security, see Chapter 6, "Callback Security."

PASSWORD SETUP
←, →, ↓

PASSWORD SETUP. Use to enter callback security passwords in memory locations 1–30. Each password must be six to ten characters in length. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the password, press the **Enter** button. Same as the **#CBP=** command.

CALLBACK NUMBER
←, →

CALLBACK NUMBER. Use to enter callback security phone numbers in memory locations 1–30. Each number can be up to 30 characters long. Same as the **#CBN=** command. Note: Only 16 characters can be displayed at a time. To see characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

S REGISTER
OPTIONS ←, →, ↓

S-REGISTER OPTIONS. Use the →, ↓, and **Enter** buttons to display the current S-register values and enter new values. Same as the **Sr?** and **Sr=n** commands.

VIEW S REGISTER
SETTINGS ←, →, ↓

VIEW S-REGISTER SETTINGS. Use the →, ↓, ↑←, and **Enter** buttons to select the number of the S-register whose value you want displayed. To scroll through a list of digits, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To display the value, press the **Enter** button. Same as the **Sr?** command.

SET S REGISTER
←, →

SET S-REGISTER. Use the →, ↓, ↑←, and **Enter** buttons to select the number of the S-register whose value you want to change, and the value you want to enter. To scroll through a list of digits, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. Same as the **Sr=n** command.

MONITOR OPTIONS
←, →

MONITOR OPTIONS. Use the →, ↓, and **Enter** buttons to display line quality and the line signal-to-noise ratio.

LINE QUALITY
←, →, ↓

LINE QUALITY. Use the → and **Enter** buttons to display line signal quality as a three-digit number. The higher order byte of the EQM value is displayed. Based on the EQM value, retrain or fallback/fall forward may be initiated if enabled by **%E1** or **%E2**. Same as the **%Q** command.

SIGNAL TO NOISE
RATIO ←, →

SIGNAL TO NOISE RATIO. Use the → and **Enter** buttons to display the line signal-to-noise ratio in dB.

Remote Configuration Options

REMOTE CONFIG.
OPTIONS ←, →

The following screens are used to configure remote configuration options. For more information about remote configuration, see Chapter 5, "Remote Configuration."

ENABLE/DISABLE
R.C. ←, →, ↓

ENABLE/DISABLE R.C. Use the → and **Enter** buttons to turn remoteconfiguration on or off.

REMOTE CONFIG.
PASSWORD ←, →

REMOTE CONFIG. PASSWORD. Use to enter the remote configuration password. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the password, press the **Enter** button.

Diagnostic Options

DIAGNOSTIC
OPTIONS ←, →

Use the following screens to turn loopback tests on and off. For information about how to apply these tests, see Appendix C, "Loopback Tests."

ANALOG LOOPBACK
←, →, ↓

ANALOG LOOPBACK. Press the → and **Enter** buttons to start the analog loopback test. The **TEST IN PROGRESS** screen appears. To stop the test, press the → and **Enter** buttons again.

DIGITAL LOOPBACK
←, →, ↓

DIGITAL LOOPBACK. Press the → and **Enter** buttons to start the local digital loopback test. The **TEST IN PROGRESS** screen appears. To stop the test, press the → and **Enter** buttons again. Same as the **&T3** command.

REMOTE DIGITAL
LOOPBACK ←, →

REMOTE DIGITAL LOOPBACK. Press the → and **Enter** buttons to start the remote digital loopback test. The **TEST IN PROGRESS** screen appears. To stop the test, press the → and **Enter** buttons again. Same as the **&T6** command.

Phone Number Memory Options

PHONE NUMBER
MEM. OPS ←, →

Use the following screens to list, enter, and dial stored phone numbers. Up to four phone numbers can be stored. The number in memory location 0 is used for DTR dialing, if DTR dialing is enabled. Note: Only 16 characters can be displayed at a time. To display characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

LIST PHONE
NUMBERS ←, →, ↓

LIST PHONE NUMBERS. Press the → button several times to display the phone number stored in each memory location.

ENTER PHONE
NUMBERS ←, →, ↓

ENTER PHONE NUMBERS. Use to store up to four phone numbers in memory locations 0–3. Each number can have up to 30 characters. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the number, press the **Enter** button. Same as the **&Z=** commands.

DIAL STORED
NUMBERS ←, →

DIAL STORED NUMBERS. Press the → and **Enter** buttons to dial a stored phone number. Same as the **DS=** commands.

Caller ID Options

CALLER I.D.
OPTIONS ←, →

Press the → and **Enter** buttons to enable formatted (**FCID**) or unformatted (**UCID**) Caller ID, or to disable Caller ID altogether. Same as the **#CID=0**, **#CID=1**, and **#CID=2** commands.

Note: Because Caller ID information is sent between the first and second ring, register **S0** must be set to 2 or more rings for the modem to receive Caller ID information.

4

AT Commands, S-Registers & Result Codes

Introduction

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, and NT 4.0, or the Trio communications program included with your 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, communications 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 **ATXn**, 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” 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 software calls another modem.

AT Commands

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.

MANUAL ANSWER?
↵, Ent

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: **Bn** **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 212A when the modem is at 300 or 1200 bps.

ENTER NUMBER
61x

Command: **Ds** **Dial**
 Values: s = dial string (phone number and dial modifiers)
 Default: none
 Description: Dials telephone number s , where s may 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.)
- ,** 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 silence. Causes the modem to wait for 5 seconds of silence before processing the next part of the command. If silence is not detected within the time set in register *S7*, the modem returns a NO ANSWER or BUSY code.
- ^ Toggle data calling tone on or off. Applies only to current dialing attempt.
- & Detect credit card “bong” tone. If the tone is not detected within the time specified by *S7* (US models), the modem aborts the rest of the sequence and hangs up. The character should follow the phone number and precede the user’s call card number, e.g., **ATDT1028806127853500&123456789**.

DIAL NUMBER 0?
←, →, Ent
DIAL NUMBER 1?
←, →, Ent
DIAL NUMBER 2?
←, →, Ent
DIAL NUMBER 3?
←, Ent

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

DISCONNECT?
←, Ent

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

Command: **In** **Information Request**
 Values: *n* = 0–6
 Default: None
 Description: I0 Display the product code. Example: *MT5600BA*.
 I1 Calculate the ROM checksum and display the least significant byte in decimal format.
 I2 Calculate the ROM checksum and compare it to the prestored checksum, displaying *OK* if they match, or *ERROR* if they do not.
 I3 Display the controller firmware version (F), the basic model (V90), the application code (A), and the interface type code (I) in the format VF.FFF-V90_AI. The application codes are *D* for desktop and *L* for low power (PCMCIA). The interface codes are *S* for serial and *P* for parallel. Example: *V2.210-V90_2M_DLS*.
 I4 Display the OEM-defined identifier string in either binary or ASCII format.
 I5 Display the country code. Example: *022*.
 I6 Display the modem data pump model and internal code version. Example: *RCV56DPF-PLL L8571A Rev 29.00/29.00*.

Command: **L*n*** **Monitor Speaker Volume**

Values: *n* = 1

Default: 1

Description: L1 Select low volume.

Note: Use the *M* command to turn the speaker on or off.

Command: **L5** **Display Legacy Parameters**

Value: 5

Default: None

Description: Displays the current values for the error correction, flow control, data compression, and serial port speed commands.

Example:

at15

&E2 &E3 &E15 \$SB115200

OK

Note: Use the *&V* command to display the other parameters.

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: On	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.
PULSE? (P) ←, →, Ent	Command: P	Pulse Dialing
	Values:	P, T
	Default:	T
	Description:	Forces pulse (non-touch-tone) dialing until a T command or T dial modifier is received.
ENABLE RESP.? (Q0) ←, →, Ent	Command: Qn	Result Codes Enable/Disable
DISABLE RESP.? (Q1) ←, →, Ent	Values:	n = 0 or 1
	Default:	0
	Description:	Q0 Enable result codes.
		Q1 Disable result codes.
	Command: Sr	Select Register
	Values:	r = S-register number
	Default:	None
	Description:	Selects register Sr as the last register accessed. E.g., S0. The command AT? can then be used to read the register, and the command AT=n can then be used to set the register to value n.
SET S REGISTER (S) ←, →	Command: Sr=n	Set Register Value
	Values:	r = S-register number; n varies
	Default:	None
	Description:	Sets value of register Sr to n, where n is entered in decimal format. E.g., S0=1. If the short form AT=n is used, the value is written to the last accessed S-register.
VIEW S REGISTER SETTINGS ←, →, ↓	Command: Sr?	Read Register Value
	Values:	r = S-register number
	Default:	None
	Description:	Reads value of register Sr and display 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.
TONE? (T) ←, →, Ent	Command: T	Tone Dialing
	Values:	P, T
	Default:	T
	Description:	Forces DTMF (touch-tone) dialing until a P command or P dial modifier is received.
TERSE RESP.? (V0) ←, →, Ent	Command: Vn	Result Code Format
VERBOSE RESP.? (V1) ←, →, Ent	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: **Wn** **Connect Message Control**
 Values: $n = 0, 1, \text{ or } 2$
 Default: 0
 Description: W0 The *CONNECT* result code reports the serial port speed only.
 W1 The *CONNECT* result code reports the line speed, the error correction protocol, and the serial port speed, respectively.
 W2 The *CONNECT* result code reports the line speed only.

Note: See also the *\V* command

Command: **Xn** **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.

BLIND? (X0)
 ←, →, Ent

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*.

SMART? (X4)
 ←, Ent

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: **Yn** **Long Space Disconnect**
 Values: $n = 0 \text{ or } 1$
 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: **Zn** **Modem Reset**
 Values: $n = 0 \text{ or } 1$
 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.

CD FORCED ON? (&C0)	←,→,Ent
CD NORMAL? (&C1)	←,→,Ent
CD NORMAL IN CB? (&C4)	←,→,Ent
CD LOW IN CB? (&C5)	←,Ent

Command: **&Cn Data Carrier Detect (DCD) Control**
 Values: $n = 0$ or $1, 2$ or $3, 4$ or 5
 Default: $1, 3, 4$
 Description: &C0 Forces the DCD circuit to always be high.
 &C1 DCD goes high when the remote modem's carrier signal is detected, and goes low when the carrier signal is not detected.
 &C2 DCD goes high 500 milliseconds after the CONNECT message is generated.
 &C3 DCD goes high when the CONNECT message is generated.
 &C4 Disables &C5 command.
 &C5 On UNIX systems, holds DCD low until the proper callback security password has been entered or until a disconnect occurs. This prevents the UNIX login prompt from being displayed before the callback security ENTER PASSWORD prompt appears.

IGNORE DTR? (&D0)	←,→,Ent
DTR NORMAL? (&D2)	←,→,Ent
RESET ON DTR ↓? (&D3)	←,Ent

Command: **&Dn 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.
 &D0 &Q0, &Q5, &Q6: DTR is ignored (assumed high). Allows operation with computers that do not provide DTR.
 &Q1: DTR drop causes the modem to hang up. Autoanswer is not affected.
 &Q2, &Q3: DTR drop causes the modem to hang up. Autoanswer is inhibited.
 &D1 &Q0, &Q1, &Q5, &Q6: DTR drop is interpreted by the modem as if the asynchronous escape sequence had been entered. The modem returns to asynchronous command state without disconnecting.
 &Q2, &Q3: DTR drop causes the modem to hang up. Autoanswer is inhibited.
 &D2 &Q0–&Q6: DTR drop causes the modem to hang up. Autoanswer is inhibited.
 &D3 &Q0, &Q1, &Q5, &Q6: DTR drop causes the modem to perform a soft reset as if the Z command were received. The &Y setting determines which profile is loaded.
 &Q2, &Q3: DTR drop causes the modem to hang up. Autoanswer is inhibited.
 &Q5 or &Q6 and +FCLASS=1 or +FCLASS=2: Same as for &Q0.

Note: If &D1, &D2, or &D3 is set, the modem will not dial without a DTR drop.

EC OFF? (&E0)	←,Ent
EC AUTO? (&E1)	←,→,Ent
EC ON? (&E2)	←,→,Ent

Command: **&En 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).

NO FLOW? (&E3)	←, Ent
HARDWARE FLOW? (&E4)	←, →, Ent
SOFTWARE FLOW? (&E5)	←, →, Ent

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

Note: See also the *L5* and *&K* commands.

Command: **&En V.42bis Data Compression**
 Values: $n = 14 \text{ or } 15$
 Default: 15
 Description: &E14 V.42bis data compression disabled.
 &E15 V.42bis data compression enabled.

Note: This command controls only V.42bis data compression, whereas the *%C* command controls both V.42bis and MNP-5 data compression. The command in effect is the one last entered. See also the *L5* command.

Command: **&Fn Load Factory Settings**
 Values: $n = 0 \text{ or } 1$
 Default: None
 Description: &F0 Load factory configuration 0.
 &F1 Load factory configuration 1.

Note: See also the *Z*, *L5*, and *&V* commands.

Command: **&Gn V.22bis Guard Tone Control**
 Values: $n = 0, 1, \text{ or } 2$
 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.

Command: **&Jn Telephone Jack Control**
 Values: $n = 0 \text{ or } 1$
 Default: None
 Description: &J0 NA
 &J1 NA

Note: This command is included only for compatibility. It performs no function except to load the S-register. The parameter value, if valid, is written to S21 bit 1.

Command:	&Kn Flow Control Selection
Values:	$n = 0, 3, 4, 5, \text{ or } 6$
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:	&Mn Communications Mode
Values:	$n = 0-3$
Default:	0
Description:	This command determines the DTR operating mode. The modem treats the &M command as a subset of the &Q command. &M0 Selects direct asynchronous operation. Note that the command sequence &M0\N0 selects normal buffered mode, but the command sequence \N0&M0 selects direct mode. This is because the \N0 command is analogous to the &Q6 command. &M1 Selects synchronous connect mode with asynchronous offline command mode. &M2 Selects synchronous connect mode with asynchronous offline command mode. Same as &M1 except that &M2 enables DTR dialing of directory slot 0. The modem disconnects if DTR is low for more than the period stored in S25 . &M3 Selects synchronous connect mode. This mode allows DTR to act as a talk/data switch. The call is manually initiated while DTR is inactive. When DTR becomes active, the handshake proceeds in originate or answer mode according to S14 bit 7.
Command:	&Qn Sync/Async Mode
Values:	$n = 0-3, 5, 6$
Default:	5
Description:	This command is an extension of the &M command, and 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 direct asynchronous operation. See &M0 . &Q1 Selects synchronous connect mode with asynchronous offline command mode. See &M1 . (Serial interface operation only.) &Q2 Selects synchronous connect mode with asynchronous offline command mode and enables DTR dialing of directory 0. See &M2 . (Serial interface operation only.) &Q3 Selects synchronous connect mode with asynchronous offline command mode and enables DTR to act as a talk/data switch. See &M3 . (Serial interface operation only.) &Q5 The modem will try to negotiate an error-corrected link. The modem can be configured using S36 to determine whether a failure will result in the modem disconnecting or falling back to a non-error-correction connection. See also \N3 . &Q6 Selects asynchronous operation with speed buffering and no error correction. Same as \N0 .

CTS NORM? (&R0)	←, →, Ent
CTS ON? (&R1)	←, Ent

Command: **&Rn Clear to Send (CTS) Control**
 Values: $n = 0$ or 1
 Default: 1
 Description: &R0 Let the CTS state follow the RTS state when online..
 &R1 Force CTS high (ON).

Note: This command applies only in synchronous mode.

INITIATE AL? (←, →, Ent)	
TERMINATE AL? (←, Ent)	
INITIATE DL? (←, →, Ent)	
TERMINATE DL? (←, Ent)	
INITIATE RDL? (←, →, Ent)	
TERMINATE RDL? (←, Ent)	

Command: **&Sn 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: **&Tn 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 in asynchronous operation 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 (+++) 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.

- &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: **&V0 Display Current Configuration**
 Values: 0
 Default: None
 Description: Displays the current (active) configuration.

Note: See also the *L5* command.

Command:	&V1 Display Last Connection Statistics
Values:	1
Default:	None
Description:	Displays statistics for the last connection. Not available in all versions.
Command:	&Wn 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:	&Xn Synchronous Clock Source
Values:	$n = 0, 1$, or 2
Default:	0
Description:	Selects the source of the transmit clock for synchronous mode. In asynchronous mode, the transmit and receive clocks are turned off. In synchronous mode, the clocks are turned on with a frequency of 1200 Hz or faster corresponding to the speed that is selected for modem operation. &X0 Selects internal timing. The modem generates the transmit clock signal and applies it to the TXCLK output at the serial interface. &X1 Selects external timing. The local DTE sources the transmit clock signal on the XTCLK input of the serial interface. The modem applies this clock to the TXCLK output at the serial interface. &X2 Selects slave receive timing. The modem derives the transmit clock signal from the incoming carrier and applies it to the TXCLK output at the serial interface.

Command:	&Yn 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.

ENTER PHONE #0? ←, →, Ent
ENTER PHONE #1? ←, →, Ent
ENTER PHONE #2? ←, →, Ent
ENTER PHONE #3? ←, Ent

Command:	&Zy=x Store Telephone Number
Values:	$y = 0-3$ $x =$ 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:	%Cn Data Compression Control
Values:	$n = 0, 1, 2, \text{ or } 3$
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.

Note: This command controls both V.42bis and MNP-5 data compression, whereas the **&E14** and **&E15** commands control only V.42bis data compression. The command in effect is the one last entered.

Command:	%En Line Quality Monitor
Values:	$n = 0, 1, \text{ or } 2$
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.

LINE QUALITY
← → ↓

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:	$n = 0 \text{ or } 1$
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:	\An	Maximum MNP Block Size
Values:	$n = 0, 1, 2, \text{ or } 3$	
Default:	1	
Description:	\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:	\Bn	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:	\Kn	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: **\Nn Error Correction Mode Selection**
 Values: $n = 0-5$
 Default: 3
 Description: \N0 Normal (non-error correction) mode with data buffering. (Forces &Q6.)
 \N1 Direct mode. Equivalent of &M0 and &Q0 modes. (Forces &Q0.)
 \N2 V.42/MNP reliable (error-correction) mode. The modem attempts first a V.42 connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=7.)
 \N3 V.42/MNP auto-reliable mode. The modem attempts first to connect in V.42 mode, then in MNP mode, and finally in non-error-correction mode with data buffering. (Forces &Q5, S36=7, and S48=7.)
 \N4 V.42 (LAPM) reliable mode. If the modem cannot make a V.42 connection, it disconnects. (Forces &Q5 and S48=0.) Note: The -K1 command can override the \N4 command.
 \N5 MNP reliable mode. If the modem cannot make an MNP connection, it disconnects. (Forces &Q5, S36=4, and S48=128.)

Command: **\Vn 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>. Overrides the X, W, and S95 commands. 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*.

MODEM SPEED
(AT+MS) ←, →

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).

<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.

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.

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: **-Kn 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 MNP 10 conversion.

-K1 Enables V.42 LAPM to MNP 10 conversion.

-K2 Enables V.42 LAPM to MNP 10 conversion; inhibits MNP Extended Services initiation during V.42 LAPM answer mode detection phase.

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:	**n	Flash Memory Download
Values:	$n = 0, 1, \text{ or } 2$	
Description:	**0	Initiate download to flash memory at the last sensed speed.
	**1	Initiate download to flash memory at 38.4K bps.
	**2	Initiate download to flash memory at 57.6K bps.
Command:	*B	View Numbers in Blacklist
Values:	n/a	
Description:	If blacklisting is in effect, AT*B displays a list of numbers for which the last call attempted in the previous two hours failed. Permanently forbidden numbers as defined by country requirements do not appear in this list. If no numbers are blacklisted, only the OK result code is displayed.	
Command:	*D	View Delayed Numbers
Values:	n/a	
Description:	AT*D 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.	

ENTER NUMBER
#1? ←,→,Ent

Command:	#CBNy=[-]x	Store Callback Number
Values:	$y = 01-30$ $x = \text{dialing string}$	
Default:	None	
Description:	Stores the callback dialing string x in memory location y . The dialing string can include the digits 0 through 9 and any of the following characters: #, *, comma (,), semicolon (;), W, A, B, C, and D. Up to 30 characters can be used. Example: AT#CBN01=9,16127853000 . If the optional - character precedes the dialing string, and the caller appends the same character to the password, the caller is immediately connected, and the hangup and callback are skipped.	

ENTER PASSWORD
#1? ←,→,Ent

Command:	#CBPy=x	Store Callback Password
Values:	$y = 01-30$ $x = \text{password (6-10 characters)}$	
Default:	None	
Description:	Stores callback security password x in memory location y . The password must have 6 to 10 characters. Example: AT#CBP01=gilgamesh .	

Note: A direct connect password may not end with a hyphen (-).

DISABLE CID? (#CID0) ←,Ent
ENABLE FCID? (#CID1) ←,↵,Ent
ENABLE UCID? (#CID2) ←,↵,Ent

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.

CALLBACK OFF? ←,Ent
CALLBACK ON? ←,↵,Ent

Command: **#DB*n* Callback Enable/Disable**

Values: *n* = 0 or 1

Default: 0

Description: Enables or disables callback security. When callback security is enabled, phone number memory locations 0–4, used for quick dialing and DTR dialing, become unavailable and are replaced by callback security memory locations 1–30. The phone number memory locations and their contents are restored when callback security is disabled.

#DB0 Disables callback security.

#DB1 Enables callback security.

SERIAL BAUD RATE (AT\$SB) ←,↵,↓

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.

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>.

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).

Register	Unit	Range	Default	Description
<i>S0</i>	1 ring	0, 1–255	1	Sets the number of rings before the modem answers. ATS0=0 disables autoanswer completely.
<i>S1</i>	1 ring	0–255	0	Counts the rings that have occurred.
<i>S2</i>	decimal	0–127 128–255	43 (+)	Sets ASCII code for the escape sequence character. Values greater than 127 disable escape.
<i>S3</i>	decimal	0–127	13 (^M)	Sets the ASCII code for the carriage return character.
<i>S4</i>	decimal	0–127	10 (^J)	Sets the ASCII code for the line feed character.
<i>S5</i>	decimal	0–32 33–127	8 (^H)	Sets the ASCII code for the backspace character. Values greater than 32 disable backspace.
<i>S6</i>	seconds	2–255	2	Sets the time the modem waits after it goes off-hook before it begins to dial the phone number.
<i>S7</i>	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 <i>W</i> in the dial string.
<i>S8</i>	seconds	0–255	2	Sets the length of the pause caused by a comma character in a dialing command.
<i>S9</i>	100 ms	1–255	6	Sets the time, in tenths of a second, that the carrier must be present before the modem considers it valid.
<i>S10</i>	100 ms	1–255	14	Sets how long a carrier signal must be lost before the modem disconnects.
<i>S11</i>	1 ms	50–255	95	Sets spacing and duration of dialing tones.
<i>S12</i>	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
	<i>S13</i>	decimal	0, 1–127	42 (*)	Sets the ASCII code for the remote configuration escape character. ATS13=0&W disables remote configuration.
TIME TO RESTORE (S15) ←, →, ↓	<i>S15</i>	minutes	0, 10–255	30	Sets the length of time the modem waits after making a dial-up connection before it checks the lease line for restoral. A zero value disables dial backup.
DIALBACKUP TIME (S17) ←, →	<i>S17</i>	minutes	0–255	1	Sets the length of time the modem waits after after a lease line fails before it attempts a dial-up connection.
	<i>S18</i>	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 <i>S18</i> is non-zero, the modem returns the OK message upon test termination.
	<i>S24</i>	seconds	0–255	0	Sets the number of seconds that the modem operates in normal mode with no detected telephone or serial port activity before it enters low-power sleep mode. The timer is reset upon any serial port or telephone line activity.
	<i>S25</i>	10 ms (async) 1 ms (sync)	0–255	5	Sets the length of time that the modem ignores DTR while taking the action specified by &D .
	<i>S26</i>	10 ms	0–255	1	When &R0 is commanded, sets the time after detecting an OFF-to-ON transition on RTS before the modem turns CTS ON. Applies to synchronous operation only.
	<i>S29</i>	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.
	<i>S30</i>	10 ms	0, 1–255	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.
	<i>S32</i>	decimal	0–255	17	Sets the ASCII code for the XON character.
	<i>S33</i>	decimal	0–255	19	Sets the ASCII code for the XOFF character.
	<i>S35</i>	decimal	0–1	0	0 disables, 1 enables the V.25 data calling tone, which allows remote data/fax/voice discrimination.

Register	Unit	Range	Default	Description
S36	decimal	0–7	7	LAPM Failure Control. Specifies the fallback action to take in the event of an LAPM negotiation failure. These fallback options are initiated immediately upon connection if <i>S48</i> is set to 128. If an invalid number is entered, <i>S36</i> acts as if the default value has been entered. (See <i>S48</i>.) 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 <i>N0</i> is active, connection is attempted at the most recently sensed serial port speed (<i>+MS=</i> command settings are updated to the appropriate values). If <i>N1</i> is active, connection is attempted at the highest possible speed. (<i>+MS=</i> 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 <i>+MS=</i> command instead.
S38	seconds	0–254, 255	20	Sets the delay between the modem's receipt of the <i>H</i> 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 <i>S38</i> 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 <i>S38</i> is set to 255, the 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.

Register	Unit	Range	Default	Description
<i>S46</i>	decimal	136, 138	138	Enables or disables data compression: 136 Error correction without compression. 138 Error correction with compression.
<i>S48</i>	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 <i>S36</i> . Can be used to force MNP.
<i>S86</i>	decimal	0, 3–23	n/a	When the modem issues a <i>NO CARRIER</i> result code, a value is written to this register to help determine the reason for the failed connection. <i>S86</i> records the first event that contributes to a <i>NO CARRIER</i> message. Use the <i>S86?</i> command to read the value. 0 Normal disconnect; no error occurred. 3 Call Waiting caused disconnect. 4 Physical loss of carrier. 5 No error correction at the other end. 6 No response to feature negotiation. 7 This modem is async-only, the other 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 modem. 12 Normal disconnect initiated by remote modem. 13 Remote modem does not respond after 10 retransmissions of the same message. 14 Protocol violation. 15 DTR lost. 15 Three retrains or excessive retransmissions when no DTR. 16 Received GSTN clear-down. 17 Inactivity timeout. 18 Speed not supported. 19 Long space disconnect. 20 Key abort disconnect. 21 Clears previous disconnect reason. 22 No connection established. 23 Disconnect after three retrains.

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

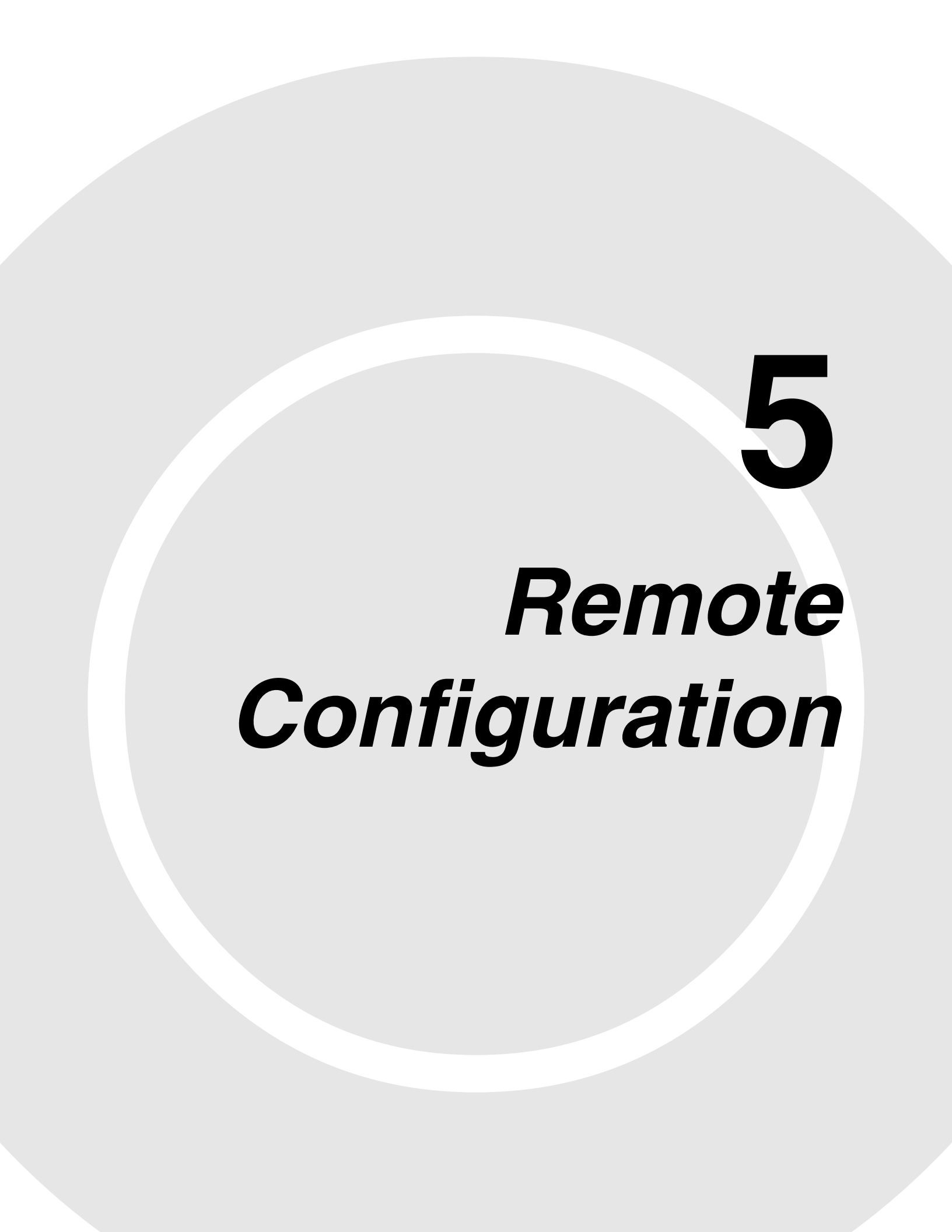
Result Codes

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
61	CONNECT 21600	Connected at 21600 bps

Terse	Verbose	Description
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
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)
184	CARRIER 34667	34667 bps data carrier detected (V.90 mode)
185	CONNECT 37333	Connected at 37333 bps (V.90 mode)

Terse	Verbose	Description
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).



5

***Remote
Configuration***

Introduction

Remote configuration is a network management tool that allows you to configure modems anywhere in your network from one location. With password-protected remote configuration, you can issue AT commands to a remote MultiModemII modem for maintenance or troubleshooting as if you were on-site.

Basic Procedure

The following steps are valid regardless of whether the connection is established by the local or the remote MultiModemII modem.

1. Establish a data connection with a remote MT5600BA or MT5600BL modem.
2. Send three asterisks to initiate remote configuration. The remote modem responds:

```
Online Remote Access
Remote password:
```
3. Type the remote configuration password, and then press ENTER. The default is "MULTITECH." It is not case-sensitive.
 - If the password is incorrect, the word `CONNECT` appears, and the local modem is returned to online mode.
 - If the password is correct, an `>AT_` command prompt appears.
4. Type AT commands to configure the remote modem. It is not necessary to precede the commands with "AT."
5. When you have finished configuring the remote modem, type `*E` and press ENTER to exit remote configuration mode and return to online data mode. You can now break the connection in the normal way.

Note: The dialing command is not allowed in remote configuration mode.

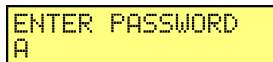
Setup

Multi-Tech modems are shipped with a default setup password (MULTITECH). Because anyone who has an owner's manual knows the default setup password, for security you should change the password and possibly also the remote configuration escape character.

Changing the Remote Configuration Password

The remote configuration password can be changed only from the front panel of the modem:

1. Turn on the modem.
2. Starting at the **STATUS** screen, press `↓ ↓ ↓ → → ↓ →` to access the **ENTER PASSWORD** screen.



```
ENTER PASSWORD
A
```

3. To change the password, press $\uparrow$ $\leftarrow$ or $\downarrow$ to select the first character of the password, and then press $\rightarrow$ to go to the next character. Repeat until you have entered the entire password.
4. To cancel the new password, press $\rightarrow$ until the password is erased. To save the new password, press the **Enter** button. The next time you remotely configure the modem you must use the new password.

Changing the Remote Escape Character

To improve security, you can change a remote modem's remote configuration escape character. The remote configuration escape character is stored in register **S13**. The factory default is 42, which is the ASCII code for the asterisk character (*). Setting **S13** to 0 (zero) disables remote configuration entirely—but if you do this remotely, you won't be able to change it back remotely!

1. Establish a remote configuration link with the remote modem as described in "Basic Procedure."
2. Type **ATS13=*n***, where *n* is the ASCII code for the new remote configuration escape character, and then press **ENTER**.
3. Save the new value by typing **AT&W** and pressing **ENTER**.
4. Type **ATO<CR>** to exit remote configuration.



6

***Callback
Security***

Introduction

This chapter describes how to use callback security with your modem.

Callback security protects your network from unauthorized access and helps control long distance costs. When callback security is enabled, all callers are requested to enter a password. If the password is invalid, the caller can try twice more before the modem hangs up. If the password is valid, the modem hangs up and returns the call by dialing the phone number associated with the password.

It is possible to implement password protection without callback by storing a hyphen (-) before the callback phone number. The caller must then append a hyphen to his password to establish the direct connection.

The modem can store up to 30 callback phone numbers and 30 callback passwords. Phone numbers can be up to 30 characters long and can contain the pause (,) and wait (W) characters in addition to the digits and characters normally found on a touch-tone keypad. Passwords can be up to 10 characters long.

Callback phone numbers are associated with callback passwords by being assigned to the same callback memory location. For example, if you assign the password "APRICOT" to memory location 16 and, in a separate operation, also assign phone number 6127853000 to memory location 16, the modem calls phone number 6127853000 when it receives the password "APRICOT."

Because there is no way to examine the passwords and phone numbers stored in the modem, it is important to write them down as you enter them. A form that you can print out for this purpose is provided on the last page of this chapter.

Setup Procedures

Turning Callback Security On and Off

Note: Autoanswer must be enabled (**S0=1** or **S0=2**) for callback security to work.

AT Command Method

1. Open a terminal program, such as HyperTerminal.
2. In the terminal window, type one of the following commands:
 - To turn on callback security, type **AT#DB1** and press ENTER. With remote callback security turned on, each caller is asked to enter a password, then is disconnected and called back by the modem. Also, dialing number locations 0–3, for use with the **DS=y** dialing command, are replaced by callback dialing number locations 1–30.
 - To turn off callback security, type **AT#DB0** and press ENTER. Callers no longer need a password to connect to the modem, the modem is unable to call them back, and stored dialing number locations 0–3 become available.

Front Panel Method

1. Turn on the modem.
2. Starting at the **STATUS** screen, press the following buttons on the front panel to turn callback security on and off:

CALLBACK ON?
←, →, Ent

- To turn on callback security, press ↓, ↓, →, ↓, ↓, →, → to display the **CALLBACK ON?** option, and then press the **Enter** button to select the option. When remote callback security is turned on, each caller is asked to enter a password, then is disconnected and called back by the modem. Also, dialing number locations 0–3, for use with the **DS=y** dialing command, are replaced by callback dialing number locations 1–30.

CALLBACK OFF?
←, Ent

- To turn off callback security, press ↓, ↓, →, ↓, ↓, →, →, → to display the **CALLBACK OFF?** option, and then press the **Enter** button to select the option. Callers no longer need a password to connect to the modem, the modem is unable to call them back, and stored dialing number locations 0–3 become available.

Assigning Callback Passwords**AT Command Method**

1. Open a terminal program, such as HyperTerminal.
2. To store a callback password for the first callback memory location, type **AT#CBP01=xxxxxxxx**, where **xxxxxxxx** is the first password, and press **ENTER**. The password must be six to ten characters in length.
3. To store a callback password for the second callback memory location, type **AT#CBP02=xxxxxxxx**, where **xxxxxxxx** is the second password, and press **ENTER**. Note that the memory location number in the command is incremented by one.
4. Repeat as many times as necessary, up to memory location 30, until all passwords have been entered.

Front Panel Method

1. Turn on the modem.
2. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, ↓, →, ↓, ↓, →, ↓, →. The **ENTER PASSWORD #1?** screen appears.
3. Press the **Enter** button on the front panel to select callback memory location 1. The **ENTER PASSWORD** screen appears.
4. Press the ↑← or ↓ button several times to select the first letter in the password.
5. Press the → button to go to the next letter in the password.

ENTER PASSWORD
#1? ←, →, Ent

ENTER PASSWORD
A

Note: To backspace or to cancel an entry, press → several times.

PASSWORD STORED

6. The password must be six to ten characters in length. Repeat steps 4 and 5 until the password is entered, and then press the **Enter** button to store it. The **PASS-WORD STORED** screen should appear.

PASSWORD SETUP
←, →, ↓

7. Press the **Enter** button again to go to the **PASSWORD SETUP** screen.
8. Press →, → to go to the **ENTER PASSWORD #2?** screen.
9. Repeat steps 3–7 to enter the next password.
10. Repeat as many times as necessary, up to memory location 30, until all passwords have been entered.

Warning: There is no way to review an entry to confirm that it has been entered correctly. If you attempt to look at a password entry by pressing the **Enter** button for an **ENTER PASSWORD #n?** screen, it is possible to accidentally erase the entry.

Assigning Callback Phone Numbers

At Command Method

1. Open a data communication program, such as HyperTerminal.
2. To store a callback phone number in the first memory location, type **AT#CBN01=xxxxxxxx**, where **xxxxxxxx** is the dialing string, and press **ENTER**. The dialing string can include the digits 0 through 9 and any of the following characters: #, *, comma (,), semicolon (;), W, A, B, C, and D. Up to 30 characters can be used. Example: **AT#CBN01=9,16127853000**. If a direct connection with password protection, but without hangup and callback, is desired, the first character in the dialing string should be a hyphen (-).
3. To store a callback phone number in the second memory location, type **AT#CBN02=xxxxxxxx**, where **xxxxxxxx** is the dialing string, and press **ENTER**. Note that the memory location number in the command is incremented by one.
4. Repeat as many times as necessary, through memory location 30, until all dialing strings have been entered.

Front Panel Method

ENTER NUMBER
#1? ←, →, Ent

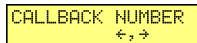
ENTER NUMBER
78x

1. Turn on the modem.
2. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, ↓, →, ↓, ↓, →, ↓, ↓, →. The **ENTER NUMBER #1?** screen appears.
3. Press the **Enter** button on the front panel to select memory location 1. The **ENTER NUMBER** screen appears.
4. Press the ↑↵ or ↓ button several times to select the first character. If a direct connection, without hangup and callback, is desired, the first character in the dialing string should be a hyphen (-).
5. Press the → button to go to the next character in the dialing string.

Note: To backspace or to cancel an entry, press → several times.

NUMBER STORED

6. The number can be up to 30 characters in length. Repeat steps 4 and 5 until the number is entered, and then press the **Enter** button to store it. The **NUMBER STORED** screen should appear.



7. Press the **Enter** button again to go to the **CALLBACK NUMBER** screen.
8. Press **→, →** to go to the **ENTER NUMBER #2?** screen.
9. Repeat steps 3–7 to enter the next number.
10. Repeat as many times as necessary, up to memory location 30, until all numbers have been entered.

Warning: There is no way to review an entry to confirm that it has been entered correctly. If you attempt to look at a number entry by pressing the **Enter** button for an **ENTER NUMBER #n?** screen, it is possible for you to accidentally erase the entry.

Calling Procedure

Use the following procedure to call a modem that has callback security enabled.

Note: Autoanswer must be enabled on the calling modem (**S0=1** or **S0=2**).

1. Using a data communication program such as HyperTerminal, dial the number of the callback modem.
2. When the connection is established, the callback modem responds with a request for a password.
3. Type the password for your modem, and then press **ENTER**. You have three attempts to enter a valid password or be disconnected.
4. If the password is valid, the callback modem disconnects. Then, after a short delay, it calls the number associated with the password and establishes a working connection.

Note: If you are calling a direct connect number, you must append a hyphen (-) to the password. If the corresponding phone number has - as its first character, you will be able to go directly online with the callback modem. If the corresponding phone number has no - character, you will be prompted for a different password.

Callback Security Commands

The following AT commands are used with callback security.

CALLBACK ON?
←, →, Ent.
CALLBACK OFF?
←, Ent.

Command: **#DB*n* Callback Enable/Disable**

Values: *n* = 0 or 1

Default: 0

Description: Enables or disables callback security. When callback security is enabled, phone number memory locations 0–4, used for quick dialing and DTR dialing, become unavailable and are replaced by callback security memory locations 1–30. The phone number memory locations and their contents are restored when callback security is disabled.

#DB0 Disables callback security.

#DB1 Enables callback security.

ENTER NUMBER
#1? ←, →, Ent.

Command: **#CBN*y*=[-]*x* Store Callback Number**

Values: *y* = 01–30
x = dialing string

Default: None

Description: Stores the callback dialing string *x* in memory location *y*. The dialing string can include the digits 0 through 9 and any of the following characters: #, *, comma (,), semicolon (;), W, A, B, C, and D. Up to 30 characters can be used. Example:
AT#CBN01=9,16127853000. If the optional - character precedes the dialing string, and the caller appends the same character to the password, the caller is connected immediately, and the hangup and callback are skipped.

ENTER PASSWORD
#1? ←, →, Ent.

Command: **#CBP*y*=*x* Store Callback Password**

Values: *y* = 01–30
x = password (6–10 characters)

Defaults: None

Description: Stores callback security password *x* in memory location *y*. The password must have 6 to 10 characters.

Note: A direct connect password may not end with a hyphen (-).

Callback Assignments Form

Location	Password	Phone number
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		



7

***Leased Line
Operation***

Introduction

This chapter describes how to use the MultiModemII modem on a leased line.

A leased line is a private, permanent, telephone connection between two points. Unlike normal dialup connections, a leased line is always active. The modems automatically connect when they are attached to the line and are turned on. Because a leased line is always active, one of the two modems on the line must be configured as the originate modem and the other as the answer modem; however, it does not matter which is which.

In the event of an interruption, leased line modems automatically reconnect when the data line or power is restored. The MT5600BL modem also supports dial backup, which enables the modem to automatically switch to a dial-up connection if the leased line goes down.

The MT5600BA modem supports two-wire leased-line operation, while the MT5600BL modem supports both two-wire and four-wire leased line operation.

Two-Wire Setup

1. For two-wire leased line operation on the MT5600BA modem, connect the provided modular telephone cable to the LINE jack. For two-wire leased line operation on the MT5600BL modem, connect the provided modular telephone cable to the LEASED jack. Connect the other end of the cable to the two-wire leased line jack or terminals supplied by the telephone company.
2. Turn on the modem.
3. Starting at the **STATUS** screen, press the following buttons on the front panel: $\downarrow$, $\rightarrow$, $\downarrow$, $\downarrow$, $\downarrow$, $\rightarrow$. The **CURRENT SETTING=** screen appears.
4. If the **CURRENT SETTING=** screen shows **ASync AT**, press $\uparrow\leftarrow$ and go to step 7. If it shows anything else, press $\rightarrow$ to go to the **ASync, NORM?** screen.
5. Press the **Enter** button to select normal asynchronous operation.
6. The **OPTION SET** screen appears. Press $\uparrow\leftarrow$ to exit to the **SYNC/ASync OPTIONS** screen.
7. Press $\uparrow\leftarrow$, $\uparrow\leftarrow$, $\uparrow\leftarrow$, $\rightarrow$, $\rightarrow$, $\rightarrow$, $\rightarrow$. The **2 WIRE LEASE? ORIG** screen appears.
8. Choose one of two actions:
 - To set up the modem as the originate modem, press the **Enter** button.
 - To set up the modem as the answer modem, press $\rightarrow$ to display the **2 WIRE LEASE? ANSWER** screen, and then press the **Enter** button.

```
CURRENT SETTING=
ASync AT  ←,→
```

```
ASync, NORM?
          ←,→,Ent
```

```
OPTION SET
          ←,→
```

```
2 WIRE LEASE?
ORIG.      ←,→,Ent
```

```
2 WIRE LEASE?
ANSWER    ←,→,Ent
```

```
OPTION SET
          ←,→
```

Note: One of the modems in a leased line pair must be configured as the originate modem, and the other as the answer modem, but it does not matter which is which.

9. The **OPTION SET** screen appears. Press $\uparrow\leftarrow$ to exit to the **ONLINE OPTIONS** screen, or $\rightarrow$ to exit to the **CURRENT SETTING=** screen to verify the selection.

10. This completes the setup for two-wire leased line operation. Upon completion, the modem attempts to connect to the modem at the other end of the leased line. If the remote modem has not yet been configured for leased line operation, you may turn off the local modem until the remote one is ready.

Four-Wire Setup

1. For four-wire leased line operation, connect one of the provided four-wire cables to the LEASED jack on the back of the MT5600BL modem. Connect the other end of the cable to a four-wire leased line jack or terminals supplied by the telephone company.

2. Turn on the modem.

```
SYNC, NORM?
←, →, Ent
```

3. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, →, ↓, ↓, ↓, →, →, →, →. The **SYNC, NORM?** screen appears.

4. Press the **Enter** button to select normal synchronous operation.

```
OPTION SET
←, →
```

5. The **OPTION SET** screen appears. Press ↑← to exit to the **SYNC/ASYNCH OPTIONS** screen.

```
4 WIRE LEASE?
ORIG. ←, →, Ent
```

6. Press ↑←, ↑←, ↑←, →, →, →, →, →, →. The **4 WIRE LEASE? ORIG** screen appears.

7. Choose one of two actions:

- To set up the modem as the originate modem, press the **Enter** button.
- To set up the modem as the answer modem, press → to display the **4 WIRE LEASE? ANSWER** screen, and then press the **Enter** button.

```
4 WIRE LEASE?
ANSWER ←, Ent
```

Note: One of the modems in a leased line pair must be configured as the originate modem, and the other as the answer modem, but it does not matter which is which.

```
OPTION SET
←, →
```

8. The **OPTION SET** screen appears. Press ↑← to exit to the **ONLINE OPTIONS** screen, or → to exit to the **CURRENT SETTING=** screen.

9. This completes the setup for four-wire leased line operation. Upon completion, the modem attempts to connect to the modem at the other end of the leased line. If the remote modem has not yet been configured for leased line operation, you may turn off the local modem until the remote one is ready.

Dial Backup and Leased Line Restoral

For four-wire leased line operation, the MT5600BL modem has a dial backup capability, in which the modem is connected to a standard dial-up line as well as to the leased line. If the leased line fails, the originate modem automatically dials and connects to the answer modem through the standard telephone network. While it is in dial backup mode, the MT5600BL periodically checks the leased line to see if it is operational. If the line is operational, the modem then attempts to restore the leased line. If the MT5600BL detects that it is not connected to the standard telephone network when the leased line fails, it immediately switches to leased line restoral.

The dial-back timer, register **S17**, determines how long the modem waits after a leased line failure before it attempts a dial backup connection. The **S17** default setting is one minute. During that minute, the originate modem tries to establish the leased line link. If the leased line is established during that time, the **S17** timer is cleared and everything is back to normal. If the timer expires, the modem attempts a dial backup connection. The purpose of the timer for the answer modem is to determine when it can accept a dial-up call. Dial-back starts only when both timers have expired and the leased line is still down.

The restore timer, register **S15**, determines how frequently restoral attempts occur when the modems are in dial backup mode. **S15** can be set from 10 to 255 minutes in one minute increments. A value of 0 disables dial backup. The default value is 30 minutes.

Note: Register **S15** must be set identically on the local and remote modems.

The dial backup number must be set from the front panel of the modem.

Dial Backup and Leased Line Restoral Setup

1. Connect a modular telephone cable to the LINE jack of an MT5600BL modem set up for four-wire leased line operation. Connect the other end of the cable to a standard dialup line jack.
2. Turn on the modem.
3. Starting at the **STATUS** screen, press the following buttons on the front panel: **↓, ↓, →, ↓, →, →, →**. The **ENTER NUMBER** screen appears.
4. Press the **↑** or **↓** button several times to select the first digit in the dial backup telephone number.
5. Press the **→** button to go to the next digit in the number.

ENTER NUMBER
78x

Note: To backspace or to cancel an entry, press **→** several times.

DIAL BACKUP #
STORED

6. The number can be up to 30 characters in length. Repeat steps 4 and 5 until the number is entered, and then press the **Enter** button to store it. The **DIAL BACKUP # STORED** screen appears.
7. Press the **Enter** button again to go to the **DIAL BACKUP NUMBER** screen.

DIAL BACKUP
NUMBER ←, →, ↓

Note: Steps 8 through 15 are optional.

TIME TO RESTORE
(S15) ←,→,↓
ENTER TIME IN
MINUTES 1

8. To change the default restore time, press ↓ to go to the **TIME TO RESTORE (S15)** screen, then press →, →. The **ENTER TIME IN MINUTES** screen appears.

9. Press the ↑← or ↓ button several times to select the first digit in the number.

10. Press the → button to go to the next digit in the number.

TIME STORED

11. Repeat steps 9 and 10 until you have entered a value between 10 and 255, or 0 to disable dial backup, and then press the **Enter** button to store it. The **TIME STORED** screen appears.

TIME TO RESTORE
(S15) ←,→,↓

12. Press the **Enter** button to return to the **TIME TO RESTORE (S15)** screen.

DIALBACKUP TIME
(S17) ←,→

13. To change the default dial backup time, press ↓ to go to the **DIAL BACKUP TIME (S17)** screen, then press →, →. The **ENTER TIME IN MINUTES** screen appears.

ENTER TIME IN
MINUTES 1

TIME STORED

14. Repeat steps 9 and 10 until you have entered a value between 0 and 255, and then press the **Enter** button to store it. The **TIME STORED** screen appears.

DIALBACKUP TIME
(S17) ←,→

15. Press the **Enter** button again to return to the **DIAL BACKUP TIME (S17)** screen.

16. Dial backup and leased line restoral setup is complete.

Note: Registers *S15* and *S17* can also be changed using the *Sr=n* AT command. See Chapter 4.

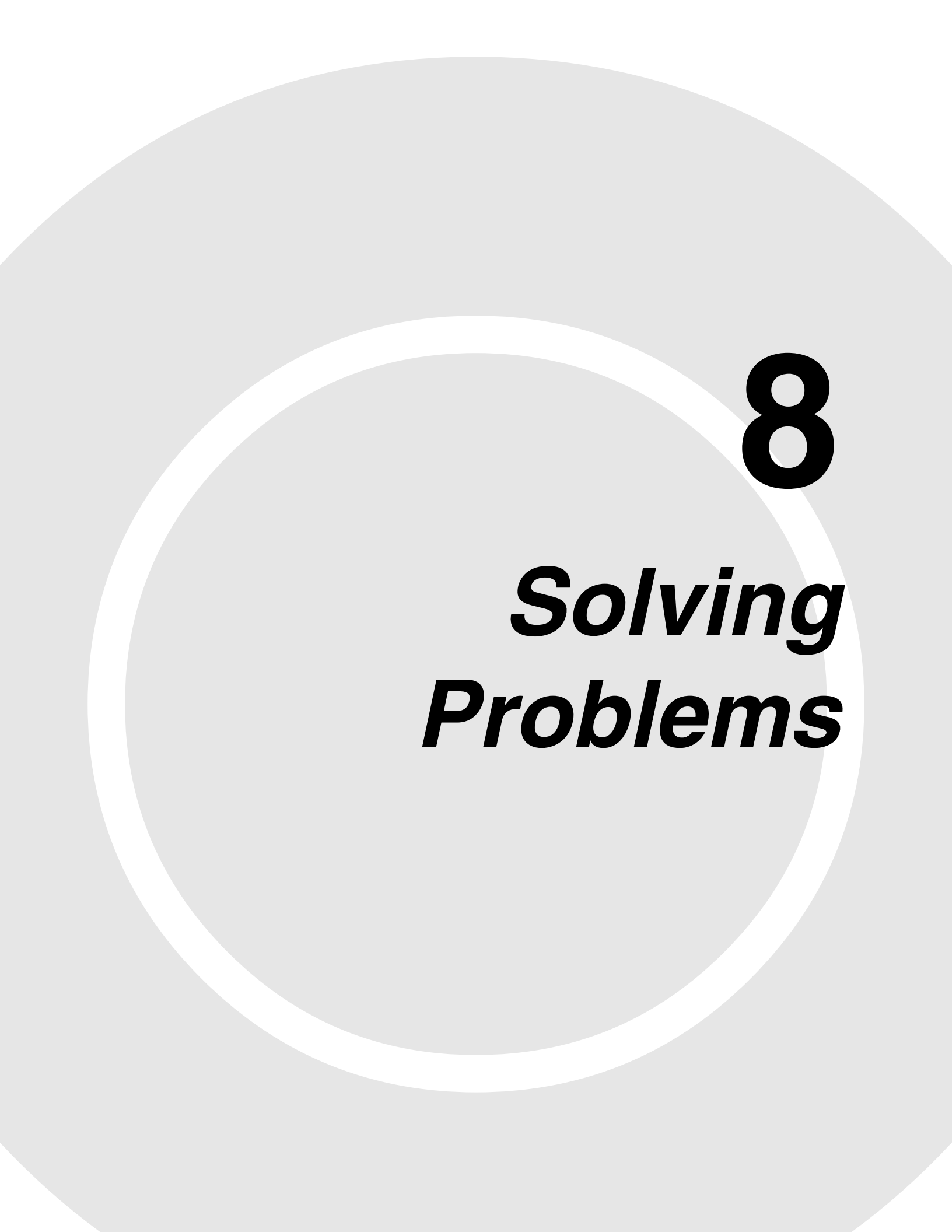
Note: The dial backup number can be displayed only 16 characters at a time. To see characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

Leased-Line Operating Distances

Wire gauge (AWG)					
Data rate (bps)	19	22	24	28	
2400	22.0	15.0	12.0	9.5	miles
4800	19.0	13.0	10.0	8.0	miles
9600	15.0	10.0	7.0	5.5	miles
19200	11.9	7.0	5.0	4.0	miles
56000	10.0	6.0	4.2	3.0	miles

Wire diameter (mm)					
Data rate (bps)	0.90	0.65	0.50	0.32	
2400	35.2	24.0	19.2	15.2	km
4800	30.4	20.8	16.0	12.8	km
9600	24.0	16.0	11.2	8.8	km
19200	19.0	11.2	8.0	6.4	km
56000	16.0	9.6	6.7	4.8	km

Distances depend upon data rate, wire gauge, impairments, cable type, manufacturer, msplices, bridge taps, etc. If you have any additional questions about distances, please contact your telephone company representative.



8

***Solving
Problems***

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, it is possible that the modem is defective. However, it is more likely that the source of your problem lies elsewhere. The following symptoms are typical of problems you might encounter:

- None of the LEDs light when the modem is on.
- The modem does not respond to commands.
- The modem cannot connect when dialing.
- 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 LED indicators on the front panel should flash briefly as the modem runs a self-test, and the liquid crystal display (LCD) should light. If the LEDs and LCD 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 transformer module may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem or transformer module 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 data communication software, 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 communication 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 communication software.
- ✓ Try resetting your modem by turning it off and on. If you are using DOS or Windows 3.1 communication software, 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 communication software. 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 communication software 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 communication software 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: 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 might have a problem beyond the scope of this user guide. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, call Technical Support for assistance (see Appendix D).

The Modem Cannot Connect When Dialing

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 telephone line cable is connected to both the modem's LINE jack (not the PHONE jack) and the telephone wall jack. If the cable looks secure, try replacing it. If that doesn't work, the problem might be in your building's telephone installation. To test the building installation, plug a telephone into your modem's telephone 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 telephone areas in North America, you can disable Call Waiting by preceding the telephone number with ***70** (check with your local telephone 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 telephone 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 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 "Step 3: Install and Configure Your Software" in Chapter 2.
- ✓ Autoanswer might be disabled. Turn on autoanswer in your datacomm 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 "Quick Start" 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

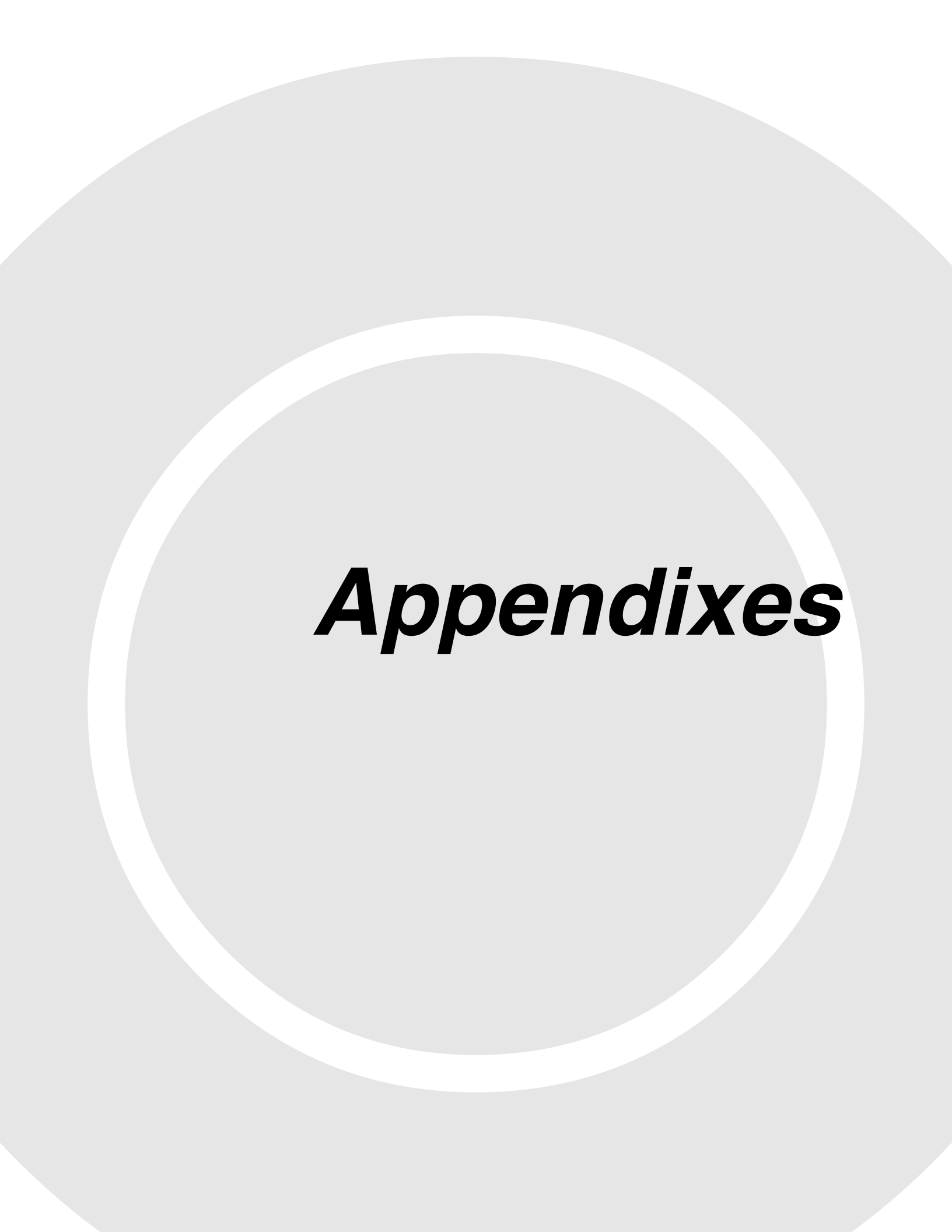
- ✓ Your computer and the remote computer might be set to different word lengths, stop bits, or parities. If you have connected at 8-N-1, try changing to 7-E-1, or vice-versa, using your communication software.
- ✓ You might be experiencing line noise. Enable error correction, if it is disabled, or hang 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 datacomm software, 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 applications open at the same time, but they cannot use the same modem at the same time.



Appendixes

Appendix A: Regulatory Compliance

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 number 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	MultiModemII
Model Number:	MT5600BA or MT5600BL
FCC Registration No:	AU7USA-33378-M5-E
Ringer Equivalence No:	0.1A
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.

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 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

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.

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 RNs 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

Your MultiModemII modem meets the following specifications:

<i>Trade Name</i>	MultiModemII™
<i>Model Number</i>	MT5600BA and MT5600BL
<i>Server-to-Client Data Rates</i>	K56flex or V.90 speeds when accessing a K56flex or V.90 server (actual speed depends on server capabilities and line conditions)*
<i>Client-to-Client Data Rates</i>	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400, 1200, 0-300 bps
<i>Fax Data Rates</i>	14400, 12000, 9600, 7200, 4800, 2400, 300 bps
<i>Data Format</i>	Serial, binary, synchronous and asynchronous
<i>Commands</i>	AT, V.25bis, TIA/EIA TR.29 Class 2
<i>Command Buffer</i>	40 characters
<i>Modem Compatibility</i>	ITU-T V.90; K56flex; ITU-T V.34 enhanced, V.34, V.32terbo, V.32bis, V.32, V.25bis, V.22bis, V.22; Bell 212A and 103/113; ITU-T V.42, V.42bis; ITU-T V.21 & V.23 in international versions
<i>Fax Compatibility</i>	ITU-T Group 3, Class 1 and 2, T.4, T.30, V.21, V.27ter, V.29, V.17, and TIA/EIA TR29.2
<i>Error Correction</i>	ITU-T V.42 (LAP-M or MNP 3 and 4)
<i>Data Compression</i>	ITU-T V.42bis (4:1 throughput), MNP 5 (2:1 throughput)
<i>Speed Conversion</i>	Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 230400 bps
<i>Mode of Operation</i>	Fax online modes; full duplex over dial-up and two-wire leased lines; data mode, command mode, online command mode, V.54 test mode
<i>Flow Control</i>	XON/XOFF (software), RTS/CTS (hardware)
<i>Intelligent Features</i>	Plug and Play; AT command compatible; autodial, redial, repeat dial; pulse or tone dial; dial pauses; auto answer; Caller ID; remote configuration; 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- and front panel-controlled modem options; monitor and LCD displays for modem options; non-volatile memory; storage of up to four command strings or telephone numbers of up to 40 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.

<i>Transmission Level</i>	-11 dBm (dial-up—varies depending on country setting), -10 dBm (leased-line)
<i>Frequency Stability</i>	±0.01%
<i>Receiver Sensitivity</i>	-43 dBm under worst-case conditions
<i>AGC Dynamic Range</i>	43 dB
<i>Interface</i>	TIA/EIA RS-232C/ITU-T V.24/V.28
<i>Connectors</i>	DB25F RS-232C connector; two RJ-11 phone jacks (BA model) or three RJ-11 phone jacks (BL model); power connector
<i>Cables</i>	One (MT5600BA) or three (MT5600BL) modular telephone cords (USA); country-specific cordage for International models; one 9-pin to 25-pin serial cable for International models; external power transformer
Note: Any cables connected to the computer should be shielded to reduce interference.	
<i>Diagnostics</i>	Power-on self test, local analog loop, local digital loop, remote digital loop
<i>Indicators</i>	32-character backlit LCD for status and configuration information; LEDs for Transmit Data, Receive Data, Carrier Detect, Off Hook, Terminal Ready, and Test Mode
<i>Speaker</i>	1-inch speaker for call progress monitoring
<i>Manual Controls</i>	Power switch, speaker volume control, four LCD control buttons
<i>Environmental</i>	Temperature range 0°–50°C (32°–120°F) ambient under closed conditions; humidity range 20–90% (non-condensing)
<i>Storage Temperature</i>	-10° to +85°C (14°–185°F)
<i>Power Requirement</i>	120 VAC, 60 Hz, 16 W; 230V/50 Hz optional (international)
<i>Power Consumption</i>	12 W @ 0.1 A typical
<i>Dimensions</i>	15.8 cm wide × 22.9 cm long × 3.6 cm high (6.2" × 9.0" × 1.4")
<i>Weight</i>	0.9 kg (2 lb.)
<i>Limited Warranty</i>	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 remote digital loopback test allows you to verify that the *local* computer or terminal, the serial ports, the local and remote modems, and the transmission line between them are functioning properly.

The local digital loopback test allows you to verify that the *remote* computer or terminal, the serial ports, the local and remote modems, and the transmission line between them 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.

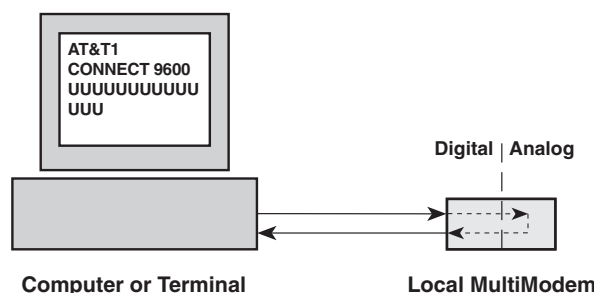


Figure C-1. Local analog loopback test.

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** and **TM** indicators are on. If they are not on, there is a defect in 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 are the same as the data entered from your keyboard. If different data appear 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.

Note: You can also start and stop an analog loopback test by using the front panel LCD and buttons. See "Diagnostic Options Trunk" in Chapter 3.

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.

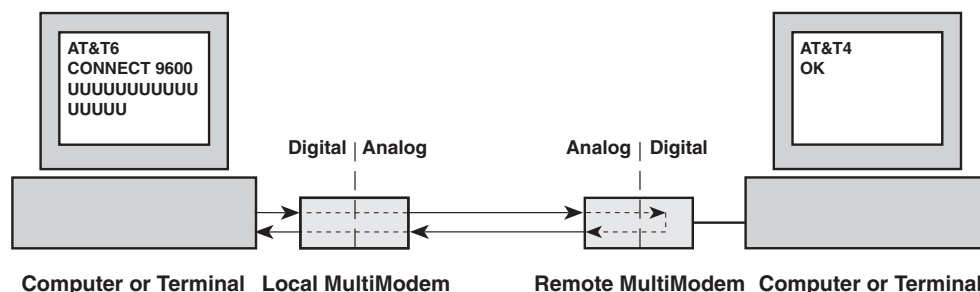


Figure C-2. Remote digital loopback test.

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.

Note: You can also start and stop a remote digital loopback test by using the front panel LCD and buttons. See “Diagnostic Options Trunk” in Chapter 3.

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.

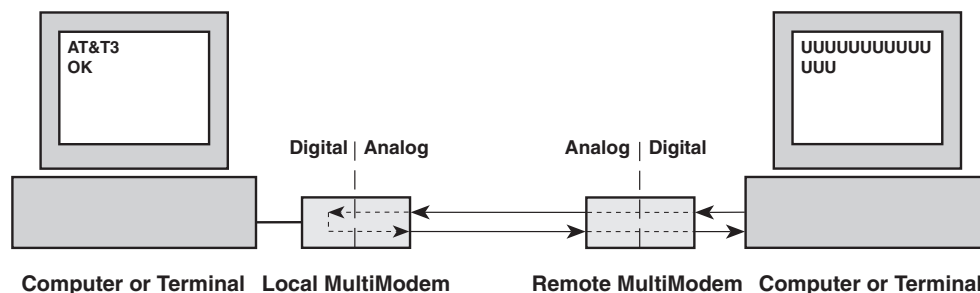


Figure C-3. Local digital loopback test.

Test procedure

1. Open your communication 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 modems.

Note: You can also start and stop a local digital loopback test by using the front panel LCD and buttons. See “Diagnostic Options Trunk” in Chapter 3.

Back-to-Back Test

This test verifies proper operation by connecting two MT5600BLs back to back using an RJ-11 cable. By using an MT5600BL that is known to be good, you can test a second MT5600BL that is suspect.

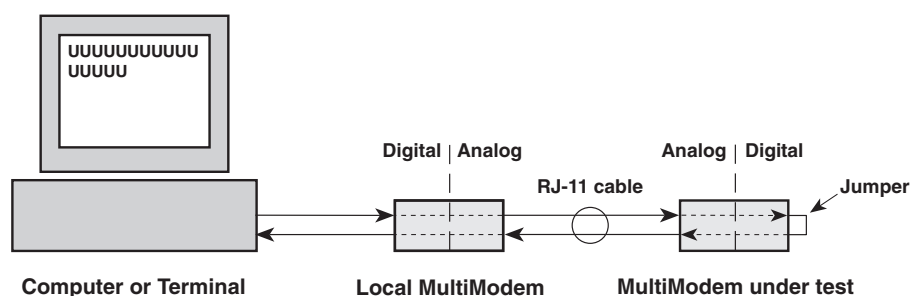


Figure C-4. Back-to-back test.

1. Connect two MT5600BLs by plugging an RJ-11 cable into their LEASED jacks.
2. Set the terminal and modems to the same serial port speed. For instance, if you are using a terminal that is limited to 9600 bps, set the modems to 9600 bps by sending the command **AT\$SB9600&W0** to each modem.

3. Following the instructions in Chapter 7, set both modems to two-wire leased-line mode. One should be set as the originate modem and the other as the answer modem, but it does not matter which is which.
4. Turn on both units and wait for carrier detect (CD).
5. On the modem under test, short pins 2 and 3 of the RS-232C connector with a paper clip or other metal device.
6. Enter data from your keyboard. 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, turn off the modems.

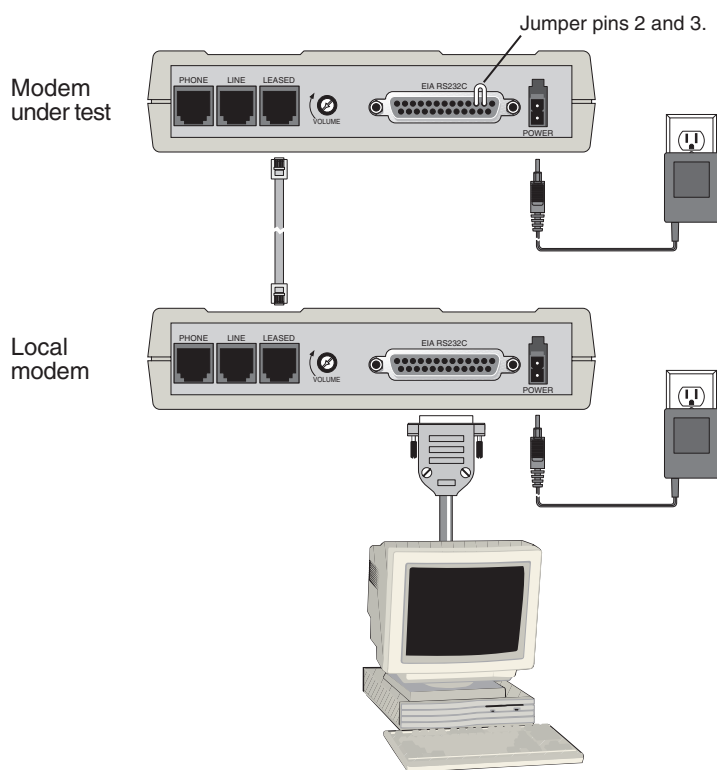


Figure C-5. Back-to-back test connections.

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 five years from the date of purchase or, if date of purchase is not provided, five years from the date of shipment, unless otherwise limited or prohibited by law.

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 DEFECTIVE 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
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.

Ordering Accessories

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.
614 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 & Europe: support@multitech.com

France: support@multitech.fr

India: support@multitechindia.com

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

Internet Sites

Multi-Tech is a commercial provider on the Internet. 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 or BBS. 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, Windows 98, Windows NT, or Windows 2000, you can use HyperTerminal.
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**, press ENTER, 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/MultiModemII/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 [MultiModemII 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, click the Flash Wizard utility for your operating system to download 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, Windows 98, Windows NT, or Windows 2000, 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 **ENTER** 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 this 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 modem is turned 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.

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

Appendix F: Installing a Modem Under Linux

Introduction

This appendix explains how to install a modem on a computer operating under the Red Hat Linux 6.2 operating system. Other versions of Red Hat 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

PC port	Linux port
Com1	ttyS0
Com2	ttyS1
Com3	ttyS2
Com4	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. Linux can use different programs and desktops depending on who made the Linux operating system and what version it is. The following procedures use the most commonly installed components of Red Hat 6.2. More information can be found in your Linux OS owner's manual.

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**.

Answering Calls

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

Appendix G: Pin Descriptions

RS-232 Pin Descriptions

Label	Pin	I/O type	Signal name/description
CGND	1	GND	CGND is tied common to GND on the modem's PCB.
TD	2		Transmitted Data The DTE uses the TD line to send data to the modem for transmission over the telephone line or to transmit commands to the modem.
RD	3		Received Data The modem uses the RD line to send data received from the telephone line to the DTE and to send modem responses to the DTE.
RTS	4		Request to Send The RTS signal is used for hardware flow control.
CTS	5		Clear To Send CTS is controlled by the modem to indicate whether or not the modem is ready to transmit data. CTS high indicates to the DTE that signals presented on TD will be transmitted to the telephone line. CTS low indicates to the DTE that it should not transfer data across the interface on TD.
DSR	6	Out	Data Set Ready DSR indicates modem status to the DTE. DSR low indicates that the DTE is to disregard all signals appearing on the interchange circuits except Ring Indicator (RI). It reflects the status of the local data set, and does not indicate an actual link with any remote data equipment.
GND	7	GND	Ground.
CFLO	8	CD	Carrier Detect The modem uses the CD line to signal to the DTE that a carrier has been detected.
+12V	9		A positive voltage output from the modem used for tests or for strapping signals high if needed.
	10		NC
	11		NC
	12		NC
	13		NC
	14		NC
TCLK	15	TC	Transmit Clock Output from modem, used in synchronous mode.
	16		NC
RCLK	17	RC	Receive Clock Output from modem, used in synchronous mode.
V54-2	18	AL	Analog Loop Input to modem to enable analog loop test.
	19		NC
DTR	20	DTR	Data Terminal Ready Input to modem from DTE to control answering and disconnection of modem.

Label	Pin	I/O type	Signal name/description
RDL	21	RDL	Remote Digital Loop Input to modem to enable RDL test.
RI	22		Ring Indicator RI output high indicates the presence of a ring signal on the telephone line.
	23		NC
XCLK	24	XCLK	External Clock Input to modem used in special synchronous applications.
TM	25	TM	Test Mode Output from modem to indicate modem is in one of the test modes.

RS-232 Cable Pinouts

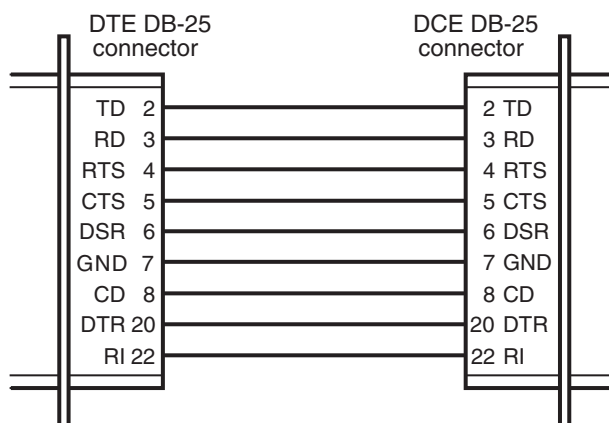


Fig. G-1. 25-pin to 25-pin RS-232 cable.

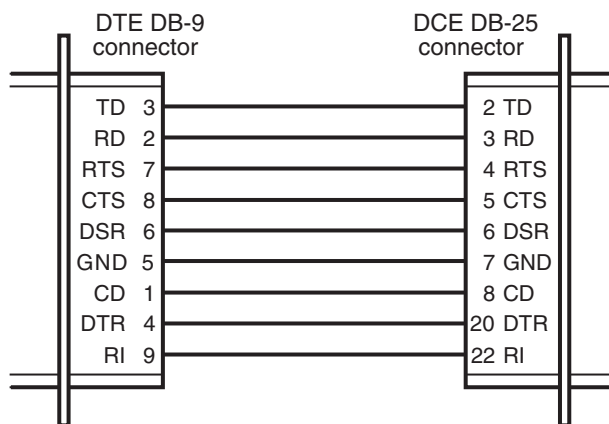


Fig. G-2. 9-pin to 25-pin RS-232 cable.

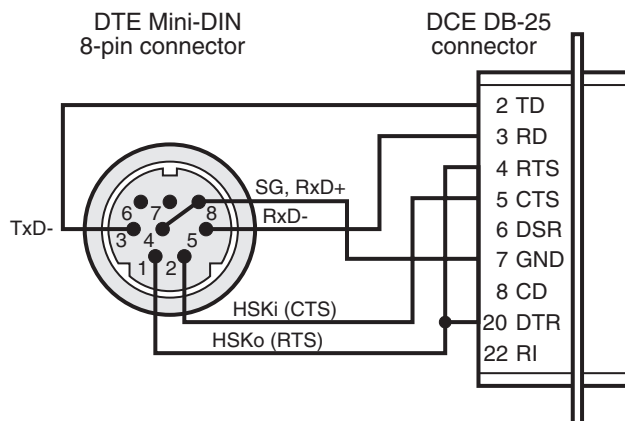


Fig. G-3. Macintosh cable.

Leased Line Pinouts

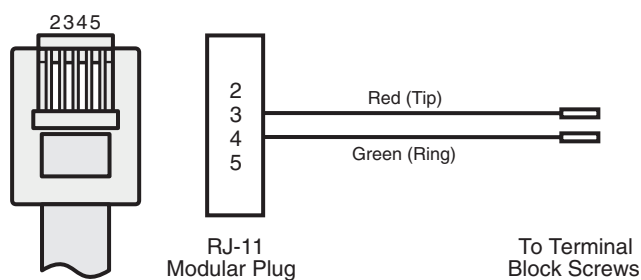


Fig. G-4. Two-wire leased line cable.

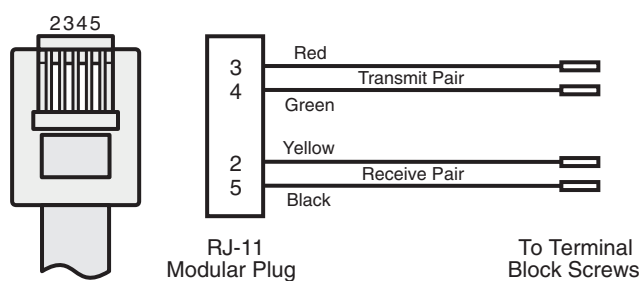


Fig. G-5. Four-wire leased line cable.

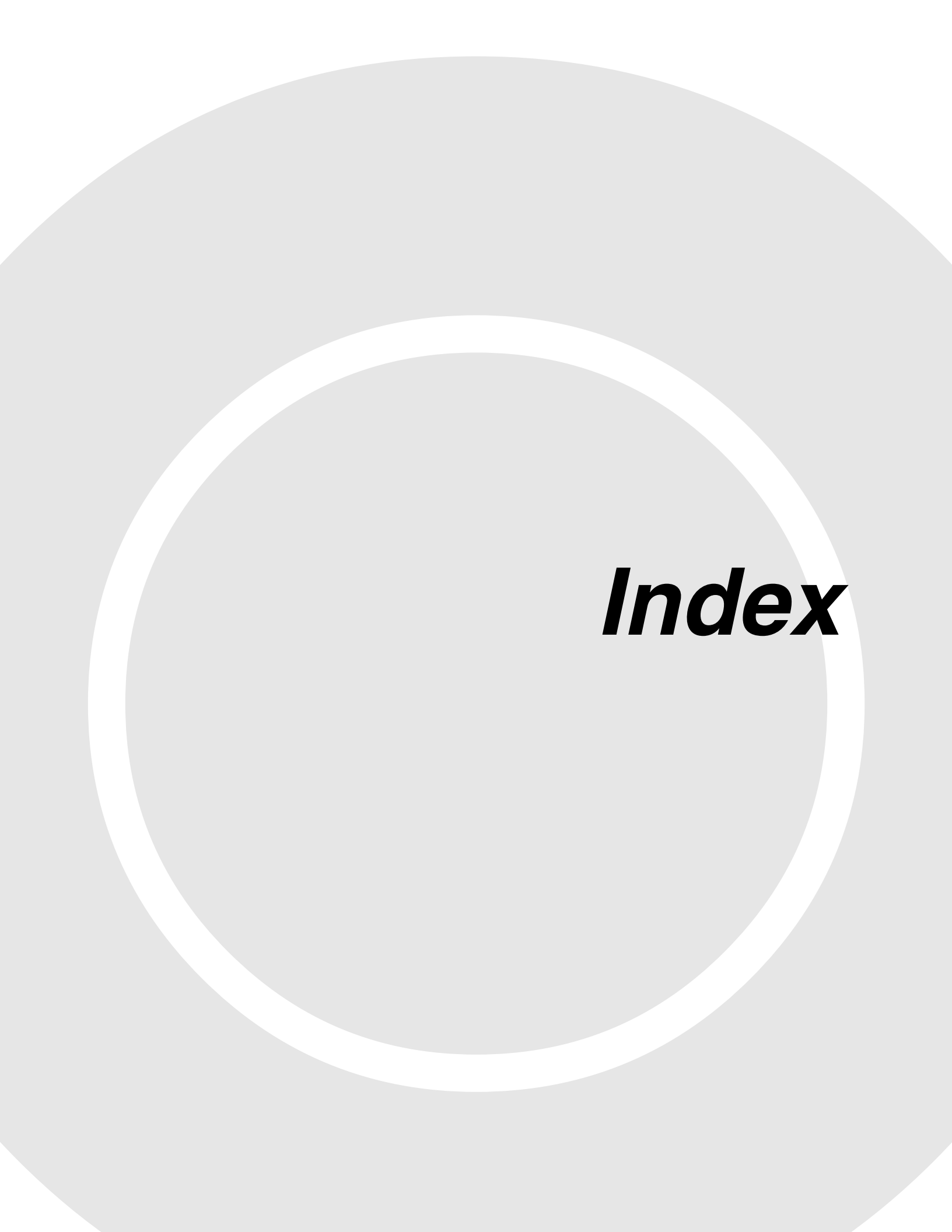
Appendix H: ASCII Character Map

Ctrl	Code	Hex	Dec	Code	Hex	Dec	Code	Hex	Dec	Code	Hex	Dec
@	NUL	00	0	SP	20	32	@	40	64	`	60	96
A	SOH	01	1	!	21	33	A	41	65	a	61	97
B	STX	02	2	"	22	34	B	42	66	b	62	98
C	ETX	03	3	#	23	35	C	43	67	c	63	99
D	EOT	04	4	\$	24	36	D	44	68	d	64	100
E	ENQ	05	5	%	25	37	E	45	69	e	65	101
F	ACK	06	6	&	26	38	F	46	70	f	66	102
G	BEL	07	7	'	27	39	G	47	71	g	67	103
H	BS	08	8	(	28	40	H	48	72	h	68	104
I	HT	09	9	)	29	41	I	49	73	i	69	105
J	LF	0A	10	*	2A	42	J	4A	74	j	6A	106
K	VT	0B	11	+	2B	43	K	4B	75	k	6B	107
L	FF	0C	12	,	2C	44	L	4C	76	l	6C	108
M	CR	0D	13	-	2D	45	M	4D	77	m	6D	109
N	SO	0E	14	.	2E	46	N	4E	78	n	6E	110
O	SI	0F	15	/	2F	47	O	4F	79	o	6F	111
P	DLE	10	16	0	30	48	P	50	80	p	70	112
Q	DC1	11	17	1	31	49	Q	51	81	q	71	113
R	DC2	12	18	2	32	50	R	52	82	r	72	114
S	DC3	13	19	3	33	51	S	53	83	s	73	115
T	DC4	14	20	4	34	52	T	54	84	t	74	116
U	NAK	15	21	5	35	53	U	55	85	u	75	117
V	SYN	16	22	6	36	54	V	56	86	v	76	118
W	ETB	17	23	7	37	55	W	57	87	w	77	119
X	CAN	18	24	8	38	56	X	58	88	x	78	120
Y	EM	19	25	9	39	57	Y	59	89	y	79	121
Z	SUB	1A	26	:	3A	58	Z	5A	90	z	7A	122
[	ESC	1B	27	;	3B	59	[	5B	91	{	7B	123
\	FS	1C	28	<	3C	60	\	5C	92		7C	124
]	GS	1D	29	=	3D	61	]	5D	93	}	7D	125
^	RS	1E	30	>	3E	62	^	5E	94	~	7E	126
_	US	1F	31	?	3F	63	_	5F	95	DEL	7F	127

NUL Null, or all zeros
 SOH Start of Header
 STX Start of Text
 ETX End of Text
 EOT End of Transmission
 ENQ Enquiry
 ACK Acknowledge
 BEL Bell or Alarm
 BS Backspace
 HT Horizontal Tab
 LF Line Feed

VT Vertical Tab
 FF Form Feed
 CR Carriage Return
 SO Shift Out
 SI Shift In
 DLE Data Link Escape
 DC1 Device Control 1
 DC2 Device Control 2
 DC3 Device Control 3
 DC4 Device Control 4
 NAK Negative Acknowledge

SYN Sync.
 ETB End Transmission Block
 CAN Cancel
 EM End of Medium
 SUB Substitute
 ESC Escape
 FS File Separator
 GS Group Separator
 RS Record Separator
 US Unit Separator
 DEL Delete



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