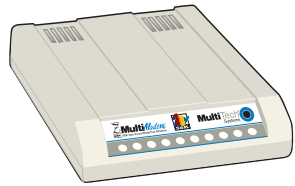
MultiModem™ ZDX



V.90/K56flex™ Data/Fax Modem

Model MT5600ZDX
Model MT5600ZDXV (Voice)

User Guide

MultiTech® Systems

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 when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, 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.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that of which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

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

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone fax machine unless such message clearly contains in a margin at the top or bottom of each page or the first page of the transmission, the date and time it is sent and an identification of the business or other entity, or other individual sending the message and the telephone number of the sending machine or such business, other entity, or individual. See the cover page of your fax software manual for setup details. This device complies with Part 15 of the FCC rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

User Guide
88312350 Revision A
Models MT5600ZDX & MT5600ZDXV

Revision	**Date**	**Description**
A	8/30/99	Joint manual for ZDX & ZDXV issued at Revision A.

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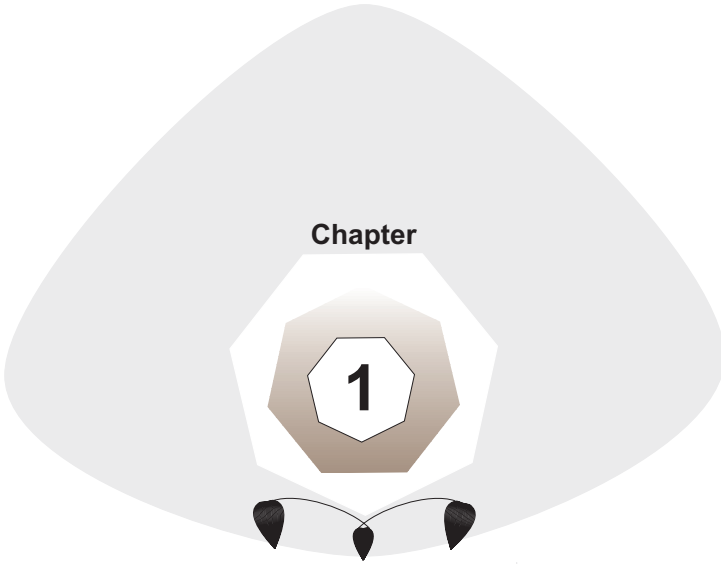

Introduction

Introduction

Welcome to the world of data communications. You have acquired one of the finest intelligent data/fax modems available today, the MultiModem ZDX or ZDXV, from Multi-Tech Systems. This Owner's Manual will help you install, configure, test and use your modem.

Product Description

Your modem incorporates new modem technologies called *V.90* and *K56flex™*, that enable Internet connections at data rates up to 56K bps over standard telephone lines. This 56K technology is able to propel data downstream from the Internet to your computer at speeds of up to 56K bps because data is digitally encoded instead of modulated. Upstream transmission, mostly keystroke and mouse commands from your computer to the central site, continue to flow at the conventional data rate of 33.6K bps.

Your modem offers interactive automatic dialing, as well as command mode option configuration. You may store four command line/telephone numbers, of up to 40 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. The modem can detect AT&T calling card tones. It is FCC-registered for connection to telephone networks without any Data Access Arrangements (DAA's).

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

This is a desktop fax/modem for compatible IBM Personal Computers; and provides dial-up asynchronous communication capability with other personal computers, terminals, on-line computer services or other types of computer systems.

Connection to the phone line and/or an attached telephone device is made by RJ11 modular type connectors; the PC connection is made via an RS232C/V.24 serial cable receptacle; and low voltage DC power is supplied to the modem through a modular power supply connection shipped with it. All these connections are located on the rear of the modem. Hardware installation procedures are described in Chapter 2.

General features include:

- Compliance with major ITU-T, TIA, and EIA international standards to ensure compatibility with other modems.
- Distinguishes data, and fax calls. The MT5600ZDXV also distinguishes voice calls using DTMF and tone detection with software packages that support these features.
- Caller ID to identify your caller's phone number (available on U.S. products).

Data

- Supports V.90 and K56flex™ for data transmission speeds up to 56Kbps, while maintaining compatibility with lower-speed modems.

  Note the V.90 and K56flex standards asymmetrically transfers data--client downloads at speeds up to 56K bps, client uploads at speeds up to 33.6K bps.
- Supports the enhanced ITU-T V.34 standard, with data transmission speeds to 33.6K bps, while also maintaining compatibility with lower-speed modems.
- Supports V.90 and K56flex speeds plus 33.6K, 31.2K, 28.8K, 26.4K, 24K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, 9.6K, 7.2K, 4.8K, 2.4K, 1.2K, and 0-300 bps.
- Automatic fallback to slower speeds in noisy line conditions, and fall-forward to faster speeds as conditions improve (line quality monitoring).
- ITU V.42 LAP-M and MNP Class 3 and 4 error correction.
- ITU V.42bis (4-to-1) and MNP 5 (2-to-1) data compression.
- MNP10 and MNP10EC™ Enhanced Cellular Performance (error correction).
- H.324 compliant (videophone ready).
- Automatic disabling of compression when transferring already-compressed files.
- Autodial, redial, pulse (rotary) and touch-tone dial.
- Dial tone and busy signal detection for reliable call-progress detection.
- Distinctive ring support to route voice, data, or fax calls on a single phone line.
- Plug and Play (*PnP*) serial support.
- FlashROM upgradable.
- Compatibility with the standard AT command set used by most communication programs.

Fax

- Supports V.17, Class 1 and Class 2 Group 3 fax communication 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, 9600 bps, 7200 bps, 4800 bps, 2400 bps, or 300 bps.

What Is in Your Modem Package?

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

- MultiModemZDX data/fax modem
- DC power supply
- One set of four plastic feet
- Two sets of velcro fasteners (ZDXV only)
- Telephonecord
- Quick Start Guide (printed) and User's Guide (on disk)
- Data Communications Software
- One Set-Up diskette
- Brochure with warranty registration card

If any of these items are missing, please contact Multi-Tech Systems or your dealer/distributor.

Voice {ZDXV only}

- Full-duplex speakerphone support with adjustable speaker volume control. Can record and play back answering machine messages using optional microphone and speaker.
- Remote/local telephone answering machine (TAM) capabilities include voice mail control, record/playback, and call screening.
- Supports AT#V voice commands.

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* For more information on the #V commands supported by the MT5600ZDXV,see the Voice #V Commands Developer's Kit . This document is available upon request, and at *www.multitech.com/support/manuals.asp*.

1.3 Software Considerations {for ZDXV}

You will need data communications (datacomm), fax communications software and an appropriate application software package to access the Personal Voice-Mail features of the MT5600ZDXV. You must have Microsoft Windows 3.1 or later to run these programs. With the appropriate application software you can use your MT5600ZDXV to:

- speed dial
- mute a phone call
- place a call on hold
- forward or transfer a call
- three-way or conference call
- fax from any Windows' application
- record telephone conversations

How to Use This Manual

This manual is divided into five chapters and three appendices. The information contained in each chapter and appendix is as follows:

Chapter 1 - Introduction

Chapter 1 begins with a short product introduction and description; followed by a guide (which you are now reading) to the use of this manual.

Chapter 2 - Installation

Details are given, supported by illustrations as a guide for installing your MT5600ZDX/ZDXV to the point of operation. There is also a Trouble-shooting section in the event your MT5600ZDX/ZDXV is not operating properly.

Chapter 3 - AT Commands, S-Registers & Result Codes

Chapter 3 documents default and option ATcommands, S-Registers and Result Codes supported by the MT5600ZDX/ZDXV.

Chapter 4 - Troubleshooting

Chapter 4 covers the modem's built-in test features. These are: Power-on Self Test, Local Analog Loopback, Digital Loopback and Remote Digital Loopback Tests. We have included a description of each test and how to use each test procedure.

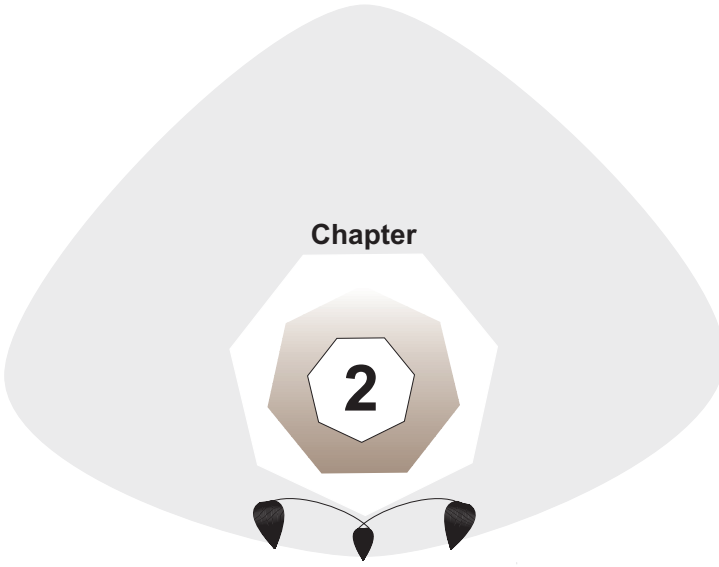
Chapter 5 - Warranty, Service, & Tech Support

Chapter 5 provides instructions for getting modems serviced at the factory, statements on your ten-year warranty, the procedure for downloading firmware upgrades via FlashROM, information about our user Bulletin Board Service (*BBS*) and receiving technical support via the CompuServe and Internet forums.

Appendices

Appendix A - Technical Specifications
Appendix B - Tone Dial Frequencies
Appendix C - Regulatory Information
Appendix D - V.90 Information

Chapter



Installation

Installation

In addition to the contents of the modem package, you will need the following equipment.

Computer

The modem can be connected to any computer with an RS-232 serial port. For MT5600ZDXV *modems,* the computer's processor speed should be at least 75 MHz in order to take full advantage ZDXV telephony features.

Serial Cable

You must provide a serial cable to connect the modem to your computer. Serial cables are available at computer stores and many office supply stores. The cable must have a DB-25P connector at the modem end. For IBM and compatible computers, the other end may have a DB-25P connector or a DB-9S connector, depending on your particular computer and whether you are using the COM1 or the COM2 serial port. The FCC requires cables to be shielded.

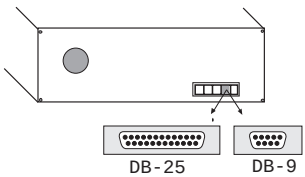


Figure 2-1. Serial connectors at PC end

Telephone Line

You must have a telephone line with a conveniently located connector (jack) to accept the cable that comes with the modem. If you do not have a telephone jack near your computer, you should install an extension before proceeding.

In North America, telephone extension kits and accessories are available at electronics stores and wherever telephones are sold. You may also hire an independent contractor or your local telephone company to do the work. If you want to add a line for this modem, you must contact your telephone company.

Safety Warning Telecom

1. Never install telephone wiring during a lightning storm.
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. This product is to be used with UL and cUL listed computers.
4. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
5. Use caution when installing or modifying telephone lines.
6. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.
7. Do not use the telephone to report a gas leak in the vicinity of the leak.
8. To reduce the risk of fire, use only No. 26 AWG or larger Telecommunication line Cord.

Communications Software

To operate the modem, you must have data and fax communications software. Data comm software simplifies control of the modem by guiding you through the process of selecting your serial port, your port speed, and other variables, and then storing your settings, including frequently called phone numbers, so they can be recalled with the stroke of a key or the click of a mouse. The software must be set up, or configured, before you can use it. You must have Microsoft Windows 3.1 or later to run most prevalent software packages. If you require software for DOS or for the Macintosh operating systems, please contact Multi-Tech Sales.

Assemble the Modem

The only assembly required is to mount the feet on the bottom of the modem. Simply peel the four self-adhesive plastic feet off the backing strip and press them into the recesses on the bottom of the modem.

The ZDX has no special placement restrictions, but we recommend that you place it where you can see the indicators on the front panel.

Installation Process

To install the modem mechanically, you must connect the serial datalilne, phone line, and the power cord to their proper connectors.

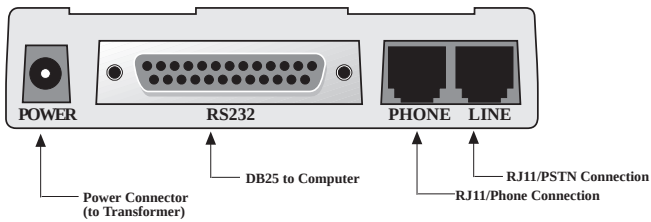


Figure 2-2. Modem Connections

To install your modem:

1. Attach modem to dial-up phone line using the RJ11 telephone cord provided with it. Plug one cable end into the telephone jack; plug the other cable end into the LINE jack on the modem.

   NOTE

   The LINE jack is not interchangeable with the PHONE jack (see rear of modem, Figure 2-2). Do not plug the telephone into the LINE jack or the line cable into the PHONE jack. BABT regulations require that the telecommunication cable be connected to the modem prior to being connected to the network.

2. Attach the modem to your PC or terminal with an RS232 (or V.24) cable (see Figure 2-1 and Figure 2-2). Be sure to tighten the mounting screws on the DB connectors.

3. Connect your telephone set to the phone jack using the RJ11 cable.

4. Attach the modem to the AC Power transformer and plug the AC connector into a live AC outlet.

   NOTE Use only the power supply shipped with the modem. Use of any other power supply will void the warranty and could damage the modem.

5. Turn on power by flipping the *"ON/OFF"* switch (on the side of the modem) to the *"ON"* position.

6. Make sure modem and computer/terminal serial port baud rates are adjusted. (Note that several programs can check this for you. If you have MS-DOS 5.0 or higher, a program called MSD.EXE [Microsoft Diagnostics] is in your DOS directory. Typing MSD at the DOS prompt brings up a screen that provides a variety of information about your computer. Select COM ports and it lists information about your com port, e.g., UART Type, Address, and IRQ, to name a few. Once you know your serial port's UART type, you can set your communications software appropriately.)

7. Proceed to Chapter 3 of this manual, or to your data communications software manual.

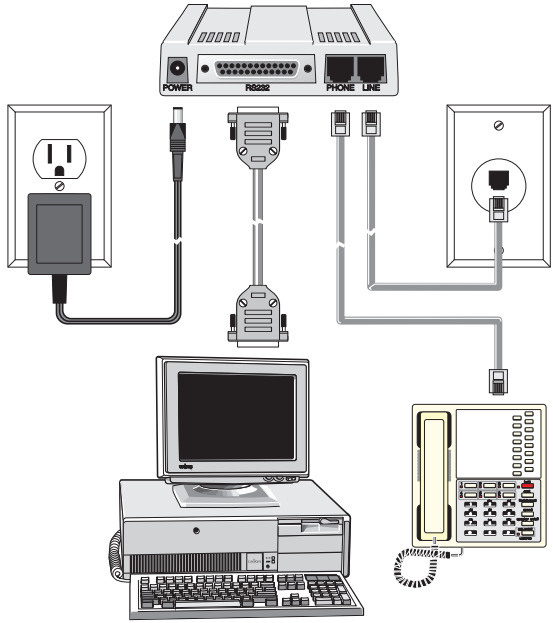


Figure 2-2a. Modem Connections

2.2.1 Sound Card Considerations {ZDXV only}

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

- two stereo PC microphones
- one stereo male-to-male patch cord
- one sound card and optional speakers

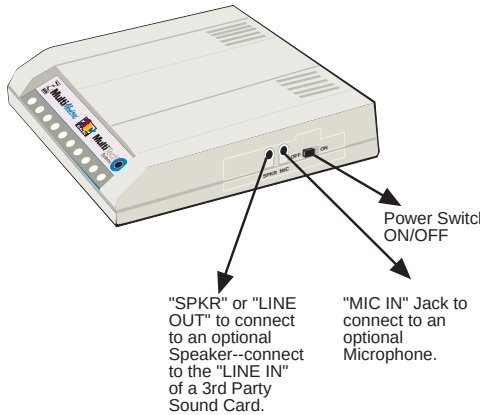


Figure 2-3. SoundCard Connections {ZDXV only}

To connect to a 3rd party sound card, perform the following steps:

1. Obtain a stereo male-to-male patch cord (which can be purchased at a local PC retail store).
2. Place one end of a stereo male-to-male patch cord into the "SPKR or LINE OUT" jack of the ZDXV and the other end into the "LINE IN " jack of the sound card. This lets you to hear the activity of the modem whether it is originating or answering a call or playing a recorded message using the bundled Trio software.
3. Place the two stereo microphones (do not use mono microphones) far enough apart from each other to eliminate feedback (e.g., one on each side of the monitor). Feedback will only occur if the microphones are too close to each other. Make sure speakers are amplified with power source being either a battery or AC outlet.
4. Place the microphone and speakers far enough apart from each other to eliminate feedback. Plug the connector of both microphones into the "MIC IN" jack of both the SoundCard and the ZDXV.

LED Indicators

The modem has ten LED indicators to report its status (such as verifying proper installation) and line activity (such as monitoring the status of a connection).

Figure 2-4. Modem Front Panel

Transmit Data. The TD LED flashes when data is being transmitted (on for a space, off for a mark). Signals on this circuit are generated by the terminal and transferred to the transmitter of the modem. The transmitting terminal should hold this line in the marking state when no data is being transmitted, including intervals between characters or words. The TRANSMIT (TD) LED indicates the status of this circuit.

Receive Data. The RD LED flashes when data is being received (on for a space, off for a mark). Data signals received from the remote modem are presented on this line. The RECEIVE (RD) LED indicates the status of this signal.

Carrier Detect. This LED lights when a valid carrier signal from another modem is detected.

V.90 or K56flex. This LED is lit when connected to an ISP-type K56flex server. The actual connection speed is contingent upon server capabilities and line conditions.

V.34. This LED is lit when the modem is connected in V.34 mode.

V.32*bis*. This LED is lit when the modem is connected in V.32*bis* mode. Note at speeds lower than a V.32*bis* connection, the modem speed LEDs remain unlit.

Off Hook. The condition of Off Hook indicates to the central office that the modem wants the phone line to do something (i.e., dial or answer a call). This LED is also lit when the modem has achieved on-line status.

Terminal Ready. When TR is lit, the modem can answer an incoming call. This signal (TR or DTR) provides a means for the terminal or computer to control the modem's connection to the communications channel. The modem needs a high DTR to communicate. The state of the TR LED matches that of the DTR circuit on pin 20 of the RS232/V.24 interface.

Error Correction. This LED is lit when the modem is set for V.42 error correction, and flashes on and off when data compression is activated.

Fax. This LED is lit when the modem is connected in Fax mode.

Is Your Modem Ready for Use?

As soon as you have connected power to the modem, if you're an experienced modem user, you may simply want to check your modem's settings for data compression, error correction, and so on. You may find that you can get moving quite quickly if you just issue the ***AT&V<cr>*** command. This command lists how your modem is currently configured, the stored (user) profiles, and the first four stored telephone numbers. If you come across a setting you're unsure of, see Chapter 3 of this manual for **AT** command and S-Register explanations and defaults.
If you're a novice, please continue to the next sections of this chapter.

Operating Your Modem

You control your modem by issuing **AT** commands and setting S-Registers. Right now your modem is set up for the most typical user application, that is, as a traditional modem set to make a dial-up call to a remote installation where the call is answered automatically; therefore, you shouldn't need to change the current default configuration. (If however, you know that your application does not follow this profile, see Chapter 3 for AT Commands and S-Registers.)

You will likely use your data communications software either to:

- enter "terminal" mode, where you can "speak most directly" to the modem by issuing AT commands, or to

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

AT is the prefix for nearly all commands issued in terminal mode. **AT** stands for attention, and alerts the modem that a command follows. You may enter these commands with either upper- or lower-case characters. Entering **AT**

automatically sets the modem's serial baud rate to match your computer's and also sets the modem's parity. It also clears the modem's command buffer. Once you're in terminal mode, enter **AT** followed by **<CR>** to check whether your modem is operational. If everything's fine, your modem will respond *OK*.

Simple Operations

You can dial by using the **ATD** command and the phone number of the modem with which you wish to connect, e.g., **ATD6127853500**. Your modem will dial the number. A "scrambling" noise is heard as the modem negotiates the kind of connection it can make. Once the modems have settled on a common connection, a connect message on your computer's video is displayed. To hang up a call, enter **ATH0<CR>**. Your modem will return on hook, just as if you had returned a phone's handset to its cradle. Your video now displays *OK*, signifying that your modem is ready for your next command.

Software Configuration

Communications software must be configured to work with the modem, your computer, and the remote system it is calling. Fortunately, most communications programs make the process easy by providing a default initialization string to your modem as well as defaults for most of the other required parameters.

Some software programs allow you to select your modem type from a menu. By this method, initialization strings that correspond to a particular modem type can be selected to operate optimally with the software being used.

✉: See your respective software manual for further information on your communications software.

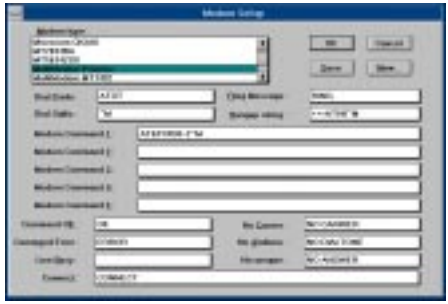


Figure 2-5. Modem Initialization Setup

Other software programs require you enter an initialization string in the software modem setup screen. If this is the requirement in your software application, enter the following command string to initialize your modem: ***AT&F<cr>***. This setting configures your modem to operate optimally with its software.

Hardware/Software Confirmation

To confirm that your modem (hardware) and communications package (software) are working properly:

1. Go into terminal mode in your communications package.
2. To determine if your computer and modem are communicating properly, Enter: **AT<CR>** At this point your video monitor should display *OK.* If the characters you typed do not appear or if double characters appear, see the troubleshooting section of this chapter.
3. To confirm how your modem is configured, enter ***AT&V<cr>***. The current modem configuration is displayed as show below.

Example:
AT&V
ACTIVE PROFILE:
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &J0 &K3 &Q5 &R1 &S0 &T4 &X0 &Y0
S00:002 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030 S08:002 S09:006
S10:014 S11:255 S12:050 S18:000 S25:005 S26:001 S36:007 S37:000 S38:020 S46:138
S48:007 S95:000

Troubleshooting

Your modem was thoroughly tested at the factory before it was shipped. If you cannot make a successful connection or if you lose data or notice garbled characters during your connection, the modem may be defective. However, it is more likely that the source of your problem lies elsewhere. Problems you may encounter include:

- None of the LEDs light when the modem is on;
- The modem does not respond to commands;
- The modem dials but is unable to make a connection;
- The modem disconnects while online;
- The modem cannot connect when answering;
- Slow file transfer;
- Losing data;or
- Garbage characters on the monitor

None of the LEDs Light When the Modem Is On

When you turn on the modem, the LED indicators on the front panel should flash briefly as the modem runs a self-test. If the LEDs remain off, the modem is probably not receiving power.

- Make sure the modem's power switch is on, especially if you normally turn on the modem by turning on a power strip.
- If the power supply is plugged into a power strip, make sure the power strip is plugged in, and its power switch is on.
- Make sure the power supply 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 modem power supply to another outlet on the power strip.
- Test the outlet is live by plugging a lamp into it.
- The modem or power supply may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem or power supply may be defective. Call Tech Support for assistance.

✉*:* Do not under any circumstances replace the power supply module with one designed for another product, as it may 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 LEDs Light When the Modem Is On.")
- Make sure you are issuing the modem commands from the data communications software, either manually in terminal mode or automatically once you have configured the software. (You cannot send commands to the modem from the DOS prompt.)
- Make sure you are in terminal mode in your data communications program, then type **AT** and press ENTER. If you get an *OK* response, your connections are good and the problem likely is in your phonebook entry or session settings. Be sure your modem is not in data mode when you type a command. Use the escape character sequence to switch to terminal mode. The default escape sequence must wait at least one second, enter +++, and pause another second or more before entering a command.
- The **E0** and **Q1** commands may be in effect, disabling echo and responses. Verify this with the **&V** command. To enable echo and responses, enter **ATE1Q0<cr>**.
- Try resetting your modem by turning it off and on. Make sure there is a reset command (**&F**) in your initialization string, or your modem may not initialize correctly.
- If you don't get an *OK*, the problem may still be in the communications software. Make sure you have done whatever is necessary in your software to make a port connection. Not all communications 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. Many communications software packages also allow multiple terminals to be open, but only one can access the modem at a time. If your package reports that it cannot make a connection, yet the modem's *TR* indicator is on, click on the Window menu to see if more than one terminal is open. The modem's *TR* indicator shows that the software has made a connection with the modem through the COM port.
- Your communications software settings may not match the physical port the modem is connected to. The serial cable may be plugged into the wrong connector—check your computer documentation to make sure. Or, you may have selected a COM port in your software other than the one the modem is physically connected to—compare the settings in your software to the physical connection.
- If the modem is on, the cable is plugged into the correct port, the communications software is configured correctly, and you still don't get an *OK*, the fault may 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 correct. Check the cable description on the packaging to make sure the cable is the right one for your computer.
- Peripheral expansion cards, such as bus mouse and sound cards, may 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 communications port. Be sure to disable any unused ports.

To look for address conflicts or IRQ conflicts when using Windows 3.1x, begin 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.

If you use Windows 95, 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 *Communications 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 will appear 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.

- The serial port may be defective. If you have another serial port, install the modem on it, change the COM port setting in your software, and try again.
- The modem may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem is possibly defective. Call Tech Support for assistance (see Chapter 5).

The Modem Dials But Cannot Make a Connection

The modem may fail to make a connection for one of several reasons:

- modem is not configured properly.
- modem is disconnected from 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. To enable

them, enter **ATV1X4** and press ENTER while in terminal mode, or include **V1X4** in the modem's initialization string. When you dial again, the modem will report the call's progress.

- Both local and remote modems may be misconfigured, thus encumbering the negotiation process between modems. The solution may be to modify modem parameters via AT command strings. There are other configurations you can modify as well. Note that you can return to the modem's default configuration by entering AT&F.

If your application requires modification, use the command strings shown below corresponding to your application:

To Force Different Communication Speeds/Protocols...	Enter these Commands
Negotiate Speed and Protocol (default setting)	AT&F
Negotiate Speed only, do not use protocol	AT\N0
Connect at 56000 bps (V.34)	AT +MS=56
Connect at 33600 bps (V.34)	AT +MS=11
Connect at 14400 bps (V.32bis)	AT +MS=10
Connect at 9600 bps (V.32)	AT +MS=9
Connect at 2400 bps (V.22bis)	AT +MS=2
Connect at 1200 bps (V.22)	AT +MS=1
Connect at 1200 bps, no protocol	AT\N0+MS=1
Force Protocol	AT\N3
Force No Protocol	AT\N0
MNP4/MNP5 operation	AT\N5
LAP-M only operation	AT\N4
MNP4 only operation	AT\N5%C0
MNP10 only operation	AT -K1 -SEC=1
No error correction/data compression, but speed buffering/auto-speed is operational.	AT\N0
Auto-Answer operation	AT S0=1

- If the modem reports *NO DIAL TONE*, 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 may 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 may be installed behind a company phone system (PBX) with an internal dial tone that sounds different from the normal dial tone. In that case, the modem may not recognize the dial tone and may 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.

- If the modem reports *BUSY*, the other number may be busy, in which case you should try again later, or it may 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., ATDT**9**,. 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 your communications package, select *Setup*, *Modem*; then select the modem type you are using, and type the new prefix in the Dial Prefix box. To change the dial prefix in Windows Terminal, select *Settings*, Modem Commands.

  To change it in Windows 95 HyperTerminal, select *Call*, Connect from the menu bar, 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 may 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 may interrupt your connection when someone tries to call you. If you have call waiting, disable it before each call. In most telephone areas, 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 your communications package, select *Setup*, *Modem*; then select the modem type you are using, and type

the new prefix in the Dial Prefix box. To change the dial prefix in Windows Terminal, select *Settings*, Modem Commands. To change it in Windows 95 HyperTerminal, select *Call*, Connect from the menu bar, 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 may have had a poor connection because of line conditions or the problem may have originated on the other end of the line. Try again.
- If you were online with a BBS, it may 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

- Auto-answer may be disabled. Turn on auto-answer in your datacomm program or send the command *ATS0=1* to your modem in terminal mode.

Slow File Transfer

- You may have an older UART. For best throughput, install a 16550AFN UART or a Multi-Tech ISI serial port card.
- 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 or Kermit, 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.
- Try entering the ***&V*** (View Parameters) command, making a screen print of the diagnostics listing, and checking for parameters that may be unacceptable.

Losing Data

- 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 may 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 running under Windows 3.1 and have a 16550AFN UART, you may need to turn on the 16550's data buffers and/or replace the Windows serial driver, COMM.DRV.
- Try entering the ***&V*** (View Parameters) command, making a screen print of the diagnostics listing, and checking for parameters that may be unacceptable.

Garbage Characters on the Monitor

- Your computer and the remote computer may be set to different word lengths, stop bits, or parities. If you have connected at 8-N-1, try changing to 7-E-1, or vice-versa, using your communications software.
- You may be experiencing line noise. Enable error correction, if it is disabled, or hang up and call again; you may get a better connection.
- 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 ***&V*** (View Parameters) command, making a screen print of the diagnostics listing, and checking for parameters that may be unacceptable.

Chapter

AT Commands, S-Registers, & Result Codes

AT Commands

AT commands are the means by which you, and your communications software, are able to communicate with and configure your modem. They enable you to establish, read, and modify parameters in addition to dialing. The following is a summary and of the AT commands recognized by the MT5600ZDX and MT 5600ZDXV.

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

Command: ENTER or Carriage Return <CR> Key
Values: n/a
Description: Press the ENTER or Carriage Return key to execute most commands.

Command: & **Detect AT&T's "call card" tone**
Values: n/a
Description: This symbol placed in dialing string enables the modem to detect AT&T's "call card" tones to access user's calling card when originating an on-line connection--

ATDT1028806127853500**$**123456789
(access/phone number) (Credit Card number)

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

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

Command: B*n* **Communication Standard Setting**
Values: *n* = 0 or 1
Default: 0 and 1
Description: B0 Select ITU-T V.22 mode when modem is at 1200 bps.

Command: D*s* **Dial** ***{ ZDXV only }***

Values: *s* = dial string (phone number and dial modifiers)

Default: none

Description: Dial telephone number *s*, where *s* may up to 40 characters. *Dial string modifiers:*

0-9 DTMF digits 0 to 9

***** The "star" digit (tone dialing only)

The "gate" digit or "pound sign" (tone dialing only)

A-D A, B, C, and D DTMF digits. Country specific; some countries may prohibit these digits.

L Redial last number. (Must be placed immediately after **ATD**.)

P Pulse-dial following numbers in command.

T Tone-dial following numbers in command

V Switch to speakerphone mode and dial the following number. Use **ATH** command to hang up.

W Wait for a new dial tone before continuing to dial. (**X0**, **X1**, **X3**, or **X4** must be selected.)

S Dial a telephone number previously stored using the &Zn=x command (see &Zn=x command for further information). The range of n is 0-3.

, Pause during dialing for time set in register S8.

; Return to command mode after dialing. (Place at end of dial string.)

! Hook flash. Causes the modem to go on-hook for one-half second, then off-hook again (time specified in S29).

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

$ Wait for credit card dialing tone before continuing with the dial string (wait contingent on S7 setting).

^ Toggles data calling tone enable/disable: applicable to current dial attempt.

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

Command: E*n* Echo Command Mode Characters
Values: *n* = 0 or 1
Default: 1
Description:
E0 Do not echo keyboard characters to the computer.
E1 Do echo keyboard characters to the computer.

Command: H*n* On-Hook/Off-Hook Control
Values: *n* = 0 or 1
Default: 0
Description:
H0 Go on-hook to hang up.
H1 Go off-hook to make the phone line busy.

Command: I*n* Information Request
Values: *n* = 0–7
Default: None
Description:
I0 Display product code. Example: 33600
I1 Calculate and display ROM checksum (e.g., "12AB").
I2 Calculates the ROM checksum and compares it to the prestored checksum, displaying *OK* or *ERROR*.
I3 Display the firmware version and application codes.
I4 Display OEM defined identifier string in either binary or ASCII format.
I5 Display country code (e.g., "NA Ver. 1").
I6 Display modem data pump model and internal code version.
I7 Display the DAA code resulting from MCU interrogation of the DAA for auto DAA recognition. Examples: 000 for US or Canada, 016 for Japan, 033 for Belgium, 034 for Finland, 035 for France, 037 for Italy, 038 for Netherlands, 039 for Sweden, 040 for Switzerland, and 041 for UK.

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

Command: N*n* **Modulation Handshake**
Values: *n* = 0 or 1
Default: 1
Description:
N0 Disables auto-mode (automatic modulation negotiation); uses connection speed specified in S37. (Equivalent to +MS <automode> subparameter to 0.)
N1 Enables auto-mode. (Equivalent to +MS <automode> subparameter to 1.)

Command: O*n* **Return Online to Data Mode**
Values: 0 or 1
Default: None
Description:
O0 Enters on-line data mode without a retrain. Handling is determined by the Call Establishment task. Typically, if a connection is established, this command connects the DTE back to the remote modem after an escape (+++).
O1 Issue a retrain and return to online data mode.

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

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

Command: S*n* **Read/Write Register Value**
Values: *n, v, or ?*
Default: None
Description: The modem selects an S-Register, performs an S-Register read or write function, or reports the value of an S-Register:
n Establishes S-Register *n* as the last accessed.
n=v Sets the S-Register value.
n? Reports the value of S-Register n.
For example:
ATS7 establishes S7 as the last accessed register.
AT=40 sets the contents of the last register accessed to 40.
ATS=20 sets the contents of the last register accessed to 20.

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

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

✉The Wn command controls the format of CONNECT messages. The parameter value, if valid, is written to S31 bits 2 and 3. The Wn command can be overridden by register S95.

Command: X*n* **Result Code Selection**
Values: *n* = 0–4
Default: 0
Description: 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.
X2 Sends X1 messages with *NO DIALTONE*.
X3 Sends X1 messages with *BUSY*.
X4 Sends all responses.

✉ If the modem is in facsimile mode (e.g., +FCLASS=1), the only message sent to indicate a connection is CONNECT without a speed indication.

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

Command: Z*n* **Modem Reset**
Values: *n* = 0 or 1
Default: None
Description: Z0 Reset modem to profile saved by the last ***&W*** command (profile 0).
Z1 Reset and restore stored profile 1.

Command: &C*n* **Data Carrier Detect (DCD) Control**
Values: *n* = 0 or 1
Default: 1
Description: &C0 Ignores the state of carrier on the remote modem and DCD circuit is always on.
&C1 DCD turns on when the remote modem's carrier signal is detected and DCD is off when the carrier signal is not detected.

Command: &D*n* **Data Terminal Ready (DTR) Control**
Values: *n* = 0, 1, 2, or 3
Default: 2
Description: &D0 Modem ignores the true status of the DTR signal and responds as if it is always on.
&D1 When DTR drops while in online data mode, the modem enters command mode, issues an OK, and remains connected.
&D2 When DTR drops while in online data mode, the modem hangs up (Auto-Answer is encumbered).
&D3 When DTR drops, the modem hangs up and resets as if an **ATZ** command were issued.

Command: &E*n* **Error Compression, Flow Control, and Compression** ***{ZDX only}***
Values: n = 0, 1, 2, 3, 4, 5, 14, 15
Defaults: 1, 4, and 15
Description: &E0 = Normal Mode (no error correction; won't establish-error-corrected calls)
&E1 = Auto-Reliable Mode (error correction preferred; permits both corrected and non-corrected calls)
&E2 = Reliable Mode (error correction required; won't establish non-error-corrected calls)

&E3 = no flow control
&E4 = hardware flow control (CTS on/off and RTS on/off)
&E5 = Xon/Xoff flow control

&E14 = data compression disabled
&E15 = data compression enabled

Command: &F*n* **Load Factory Default Settings**
Values: *n* = 0 or no value
Default: None
Description: &F0 (or simply &F) Restore factory configuration.

Command: &G*n* **V.22bis Guard Tone Control**
Values: *n* = 0, 1, or 2
Default: 0
Description: &G0 Disable guard tone.
&G1 Enable 550 Hz guard tone.
&G2 Enable 1800 Hz guard tone.

Command: &J*n* **Telephone Jack Control**
Values: *n* = 0 or 1
Default: None
Description: &J0 NA
&J1 NA
⌧This command is only included for compatibility and performs no function except to load the S-Register. The parameter value, if valid, is written S21 bit 1.

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

Command: &L*n* **Leased Line Operation**
Values: *n* = 0
Defaults: None
Description: &L0 NA
⌧This command requests leased line or dial-up operation. This command is provided for compatibility only; no mode change is performed, dial-up operation continues. The *OK* response is returned for a valid parameter, but no other action is performed. The parameter value, if valid, is written to S27 bit 2.

Command: &M*n* Communications Mode
Values: *n* = 0
Defaults: 0
Description: &M0 Asynchronous mode.
&M1 Reserved—responds ERROR.

⌧&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.

Command: &Q*n* Asynchronous Communications Mode
Values: *n* = 0, 5, or 6
Defaults: 5
Description: &Q0 Asynchronous with no data buffering/no error correction. Same as ***|N0***.
&Q5 Asynchronous with data buffering/error correction. Same as ***|N3***.
&Q6 Asynchronous with data buffering/no error correction. Same as ***|N0***.

Command: &S*n* Data Set Ready (DSR) Control
Values: *n* = 0 or 1
Default: 0
Description: &S0 Force DSR ON at all times.
&S1 DSR becomes active after answer tone is detected (CD), and inactive after carrier tone is lost.

Command: $SB*n* Serial Baud Rate
(Modem DTE Speed; bps) ***{ zdx only }***
Values : *n* = 300, 1200, 2400, 4800, 9600, 192000, 38400, 57600, 115200 (in bits per second)
Default: 56000
Description: Example: $SB115200. Sets serial baud rate within a host/server PC to 115,200 bps.

Command: &T*n* Test Commands
Values: *n* = 0, 1, 3, 4, 5, 6, 7 or 8
Default: None
Description: &T0 Abort. Stop any test in progress.
&T1 Starts Local Analog loop test.

&T2 Returns Error.
&T3 Starts Local Digital loopback test.
&T4 Responds to remote modem request for Digital Loopback.
&T5 Ignores remote modem request for Digital Loopback.
&T6 Requests remote Digital Loopback without self-test.
&T7 Requests remote Digital Loopback with self-test.
&T8 Starts Local Analog loop test with self-test.

Command: &V0 View Current Configuration
Values: n/a
Description: Displays the active modem settings.
⌧Reports the current (active) stored (user) profile. The stored active profile is not displayed if the NVRAM is not installed or is not operational as detected by the NVRAM test during reset processing.

Example:
AT&V
ACTIVE PROFILE:
B0 E1 L1 M1 N1 QO T V1 W0 X4 Y0 &C0 &D0 &G2 &J0 &K3 &Q5 &R1 &S0 &T4 &X0 &Y0
S00:002 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030 S08:002 S09:006
S10:014 S11:255 S12:050 S18:000 S25:005 S26:001 S36:007 S37:000 S38:020 S46:138
S48:007 S95:000

Command: &V1 Display Last Connection Statistics
Values: n/a
Description: Displays the last connection statistics in the following format (shown with typical results):

TERMINATION REASON..... LINK DISCONNECT or LOCAL REQUEST
Last TX Data Rate ..... 33600 BPS
Highest TX Data Rate ..... 33600 BPS
Last RX Data Rate ..... 28800 BPS
Highest RX Data Rate ..... 28800 BPS
Error Correction Protocol ... LAPM
Data Compression V42Bis
Line Quality 030
Highest SPX RX state 068
Highest SPX TX state 067

Command: &W*n* **Store Current Configuration**
Values: *n* = 0 or no value
Default: None
Description: &W or &W0. Store current modem settings in NVRAM as profile.

Command: &Z*n=x* **Store Telephone Number**
Values: *n* = 0, 1, 2, or 3 memory locations
x = Dialing string
Default: None
Description: Stores telephone dial string *x* in memory location *n*. Dial the stored number using the command ***ATDS=n***.

Command: %E*n* **Monitor Line Quality and Auto-Retrain or Fallback/Fallforward**
Values: *n* = 0, 1 or 2
Default: 2
Description: %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 which indicates the received signal level. The value returned is a direct indication (DAA dependent) of the receive level at the MDP, not at the telephone line connector (e.g., 009 = 9dBm, 043 = -043 dBm, etc.).

Command: %Q **Line Signal Quality**
Values: none
Default: none
Description: %Q Reports the line signal quality (DAA dependent). 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. For example:
AT%Q
015

Command: **%7** **Plug and Play Serial Number**
Values: none
Default: none
Description: %7 Sets and stores eight serial numbers in hex format for serial Plug and Play. For example:
AT%7 <8 hex numbers><same 8 hex numbers>

Command: %8 **Plug and Play Vendor ID and Product Number**
Values: none
Default: none
Description: %8 Sets and stores Vendor ID and product number for serial Plug and Play. For example:
AT%8 <3 ASCII characters><4 hex numbers><3 ASCII characters><same 4 hex numbers><cr>

Command: %C **Enable/Disable Data Compression**
Values: *n* = 0, 1, 2, or 3
Default: 3
Description: %C0 Disables Data Compression.
%C1 Enables MNP 5 Data Compression negotiation.
%C2 Enables V.42 bis Data Compression negotiation.
%C3 Enables both V.42 bis and MNP 5 Data Compression negotiation.

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

Command: \B*n* **Transmit Break to Remote**
Values: *n* =\B1-\B9
Default: \B3
Description: \B3 Break length in 100 ms units (non-error correction mode).
In non-error correction mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100 ms according to parameter specified. The command works in conjunction with the ***|K*** command. In error correction mode, the modem will signal a break through the active error correction protocol, giving no indication of the length.

✉: When the modem receives a break from the remote modem, break is passed to the DTE as follows: In non-error correction mode *direct*, the break length is passed; in non-error correction mode *normal* and in error correction mode, a 300 ms break is passed.

Command: \K*n* **Set Break Control**
Values: *n* = 0, 1, 2, 3, 4 or 5
Default: 5
Description: Controls the response of the modem to a break received from the DTE or the remote modem or the \B command according to the parameter specified. The response is different in three separate command states.

✉The first state is where the modem receives a break from the DTE when the modem is operating in data transfer mode:

\K0 Enter on-line command mode, no break sent to the remote modem.
\K1 Clear data buffers and send break to remote modem.
\K2 Same as \K0.
\K3 Send break to remote modem immediately.
\K4 Same as \K0.
\K5 Send break to remote modem in sequence with transmitted data.

⊠The second case is where the modem is in the on-line command state (waiting for AT commands) during data connection and the \B command is received in order to send a break to the remote modem:

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

⊠The third case is where a break is received from a remote modem during a non-error corrected connection:

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

Command: \N*n* **Error Correction Mode Selection**

Values: *n* = 0–5

Default: 3

Description:

\N0	Non-error correction mode with data buffering (same as ***&Q6***).
\N1	Direct mode.
\N2	V.42/MNP reliable mode.
\N3	Same as \N2.
\N4	V.42 reliable mode.
\N5	MNP reliable mode.

Command: \V*n* **Single Line Connect Message**

Values: *n* = 0 or 1

Default: 0

Description:

\V0	Disables Single Line Connect Message.
\V1	Enables Single Line Connect Message, where the format is: CONNECT, DTE speed>,Modulation></ Protocol></Compression></Line speed>.

⊠Connect messages are contingent on X, W, and S95 command settings.

Command: +MS Select Modulation

Values:

Default: n/a

Description: +MS= This extended-format command selects the modulation, optionally enables or disables automode, and optionally specifies the lowest and highest connection rates using one to four subparameters (client modem) or five subparameters (server modem).

The command format is:

+MS=<mod>[,[<automode>][,[<min_rate>][,[<max_rate>][,[<x_law>][,[<rb_signalling>]]]]]]<cr>

The modem can send a string of information to the DTE consisting of selected options when AT+MS?<cr> is entered. The following table is a display of subparameter definitions:

Subparameter Definitions

<mod>	Selects Modulation	Possible Rates (bps):
0	V.21	300
1	V.22	1200
2	V.22bis	2400, 1200
3	V.23	1200
9	V.32	9600, 4800
10	V.32bis	14.4k, 12k, 9.6k, 7.2k
11	V.34	33.6k, 31.2k, 28.8k, 26.4k 24k, 19.2k, 16.8k, 14.4k 12k, 9.6k, 7.2k, 4.8k, 2.4k
12	V.90	28.8k, 29.3k, 30.7k, 32k, 33.3k, 34.7k, 36k, 37.3k 38.7k, 40k, 41.3k, 42.7k, 45.3k, 46.7k, 48k, 49.3k, 50.7k, 52k, 53.3k, 54.7k, 56k
56	K56Flex	56k, 54k, 52k, 50k, 48k, 46k, 44k, 42k, 40k, 38k, 32k (downstream speeds)
64	Bell 103	300
69	Bell 212	1200

[,[<auto-mode>]	Enables/disables automatic modulation negotiation with remote modem.
0	Disables NO command equivalent.
1	Enables NO command equivalent
[,[<min-rate>]	See “Possible Rates (bps)” above. Default value is 300 bps.
[,[<max-rate>]	See “Possible Rates (bps)” above. Default value is 33600 bps.

✉: Use a comma (,) to separate optional parameters. For example: +MS=11,1,300,28800 (+MS command with the default settings). Subparameters that you do not enter remain at their current value. Type a comma only to skip a subparameter or carriage return to skip the last subparameter. For example, +MS=,0,<Enter> disables auto mode and keeps all other settings at their current value.

Command: -SDR=n Enable/Disable Distinctive Ring
Values: -SDR=n
Default: 0
Description: -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 Type 1 and 2.
-SDR=4 Enables Distinctive Ring Type 3.
-SDR=5 Enables Distinctive Ring Type 1 and 3.
-SDR=6 Enables Distinctive Ring Type 2 and 3.
-SDR=7 Enables Distinctive Ring Type 1, 2 and 3.
The ring types supported and the corresponding ring cadence detect definitions are as follows:

Distinctive Ring Type	Definitions of Ring Cadence
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, 4.0 sec OFF

Command:)M*n* Enable MNP 10 Cellular Power Level Adjustment
Values: *n* = 0, 1, or 2
Default: n/a
Description:)M0 n/a
)M1 n/a
)M2 n/a
✉This command is included only for compatibility and performs no function.

Command: *H*n MNP 10 Link Negotiation Speed
Values: *n* = 0, 1, or 2
Default: n/a
Description: *H0 n/a
*H1 n/a
*H2 n/a
✉This command is included only for compatibility and performs no function.

Command: -K*n* MNP 10 MNP Extended Services
Values: *n* = 0, 1, or 2
Default: 0
Description: -K0 Disables V.42 LAPM to MNP 10 conversion.
-K1 Enables V.42 LAPM to MNP 10 conversion.
-K2 LAPM answer mode detection phase.

Command: -Q*n* MNP 10 Enable Fallback to V.22 bis/V.22
Values: *n* = 0 or 1
Default: n/a
Description: -Q0 n/a
-Q1 n/a
✉This command is included only for compatibility and performs no function.

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

Command: @M*n* MNP 10 Initial Cellular Power Level Setting
Values: *n* = 0-30
Default: n/a
Description: @M0n/a ... @M30 n/a
✉This command is included only for compatibility and performs no function.

Command: :E*n* **MNP 10 Compromise Equalizer Enable** Command
Values: *n* = 0 or 1
Default: n/a
Description: :E0 n/a
:E1 n/a

⌧This command is included only for compatibility and performs no function.

Command: *B **View Numbers in Blacklist**
Values: n/a
Description: This command requests the modem to return a list of blacklisted numbers to the DTE. Permanently forbidden numbers as defined by country requirements will not appear on this list. If no numbers are blacklisted, only the OK result code is issued. The format of the response is shown by the example below:

No. -- Phone Number
1; 6127853500
2; 2154778767
3; 2128724549

Command: *D **View Delayed Numbers**
Values: n/a
Description: This command causes the modem to send a list of the delayed numbers together with the delay associated with each. The modem will return a list of delayed telephone numbers as defined in the *B command. If no numbers are delayed, only the OK result code is issued. The format of the response is shown by the example below (delay times are shown as:hours:minutes:seconds):

No. -- Phone Number--Delay
1; 6127853500 1:59:25
2; 2154778767 0:4:43
3; 2128724549 2:33:00

Command: #CID Caller ID
Values: *n* = 0, 1, or 3
Default: 0
Description: #CID=0 Disables Caller ID
#CID=1 Enables Caller ID with formatted presentation to the DTE. The modem will present the data items in a <TAG><Value> pair format. The expected pairs are data, time, caller code (phone number), and name (US models only).
#CID=2 Enables Caller ID with unformatted presentation. The modem will present the entire packet information, excluding the leading U's in ASCII printable hex numbers. ⊠#CID? Retrieves the current CID mode from the modem (US models only).

Command: P Pulse Dial
Values: n/a
Description: Pulse dial until T (Tone Dial) Command.

Command: T Tone Dial
Values: n/a
Description: Tone dial until P (Pulse Dial) Command.

Command: +++ Escape Sequence
Values: n/a
Description: Puts the modem in command mode (and optionally issues a command) while remaining online. Type **+++** and up to ten command characters, then press ENTER.

Command: &Pn Make/Break Dial Ratio
Values: 0-3
Description: &P0 Make/Break dial ratio of 39/61 10 pps
&P1 n/a
&P2 n/a
&P3 n/a

Command: ATn Download to Flash Memory**
Values: 0-2
Description: AT**0 Download speed is the last sensed speed
AT**1 Download speed is 38.4K bps
AT**1 Download speed is 57.6K bps
⊠See Chapter 5 for Download to Flash Memory procedure.

S-Registers

Certain Command Mode configurations are stored in memory registers called, S-Registers. The ***S*** command is used to assign a value to, and to read the current value of an S-Register. To assign a value to an S-Register, enter the letter ***S***, followed by the S-Register number and an equals sign (=). To read an S-Register value, enter the letter ***S*** followed by the S-Register number and a question mark (?), then hit RETURN. To verify that the S-Register value was entered correctly, enter for example, ***ATS8?*** and hit RETURN. You should receive a response of the assigned value given to that S-Register.

Register	***Unit***	***Range***	***Default***	***Description***
S0	rings	0, 1–255	1	Sets the number of rings before the modem answers. ***ATS0=0*** disables auto-answer completely.
S1	rings	0–255	0	Counts the number of rings that have occurred.
S2	decimal	0–255	43 (+)	Sets ASCII code for the escape character. Values greater than 127 disable the escape sequence.
S3	decimal	0–127	13 (^M)	Sets ASCII code for the carriage return character.
S4	decimal	0–127	10 (^J)	Sets ASCII code for the line feed character.
S5	decimal	0–255	8 (^H)	Sets ASCII code for the backspace character. Values greater than 32 disable the backspace character.

S6	seconds	2–255	2	Sets the time the modem waits after it goes off-hook before it begins to dial the telephone number.
S7	seconds	1–255	50	Sets the time the modem waits for a carrier signal before aborting a call. Also sets the wait for silence time for the @ dial modifier.

Register	***Unit***	***Range***	***Default***	***Description***
S8	seconds	0–255	2	Sets the length of a pause caused by a comma character in a dialing command.
S9	1/10 sec	0–255	6 (0.6)	Sets the time, in tenths of a second, that the carrier must be present before the modem considers it valid and turns on the RLSD.
S10	1/10 sec	1–255	14 (1.4)	Sets the time, in tenths of a second, that a carrier signal must be lost before the modem disconnects.
S11	1 ms	50–255	95	Sets spacing and duration of dialing tones.
S12	1/50 sec	50–255	50 (1sec)	Defines the maximum period, in fiftieths of second, allowed between receipt of the last character of the three escape character sequence from the DTE (escape code guard time).
S18	decimal	0–255	0	Sets the length of time, in seconds, that the modem conducts a test (commanded by &Tn) before returning to the command mode. If this register value is zero, the test will not automatically terminate; the test must be terminated from the command mode by issuing and &T0 or H command. When S18 is non-

zero, the modem returns the OK message upon test termination.

Register	Unit	Range	Default	Description

S23 General Bit Mapped Options Status (Indicates the status of command Options.) Default: 62 (3Dh)

Bit 0 Grant RDL

0 = RDL not allowed (&T5)--Default
1 = RDL allowed (&T4)

Bit 1-3 DTE Rate

0 = 0-300 bps
1 = 0600 bps
2 = 1200 bps
3 = 2400 bps
4 = 4800 bps
5 = 9600 bps
6 = 19200 bps
7 = 38400 bps or higher (Default)

Bit 4-5 Assumed DTE parity

0 = even
1 = not used
2 = odd
3 = none (Default)

Bit 6-7 Guard Tone (&Gn)

0 = none (&G0)--Default
1 = none (&G1)
2 = 1800 Hz (&G2)

S24	seconds	0–255	0	Sets the length of time, in seconds, that the modem operates in normal mode with no detected telephone or DTE line activity before entering low-power sleep mode. The timer is reset upon any DTE or Telephone line activity.

S25	seconds	0–255	5	Sets the length of time, in seconds, that the modem ignores DTR for taking the action specified by &Dn. Its units are one hundredths of a second.

Register	***Unit***	***Range***	***Default***	***Description***
28	Bit-Mapped Options Status Default: 0			

Bit 0-1 Reserved
Bit 2 Reserved (always 0)
Bit 3-4 Pulse Dialing (&Pn)

0 = 39%-61% make/break ratio at 10 pulses per second (&P0)-- Default.
0 = 33%-67% make/break ratio at 10 pulses per second (&P1).
0 = 39%-61% make/break ratio at 20 pulses per second (&P2).
0 = 33%-67% make/break ratio at 20 pulses per second (&P3).

S29	1 minute	0–255	70ms	Sets the length of time, in units of 10 ms, that the modem will go on-hook when it encounters a flash (!) dial modifier in the dial string. The time can be limited as it is a country dependent parameter.
S30	1 minute	0–255	0	S30 specifies the length of time (in tens of seconds) that the modem waits before disconnecting when no data is sent or received. This function is only applicable to buffer-mode.
S32	decimal	0–255	17	Sets the value of the XON character.
S33	decimal	0–255	19	Sets the value of the XOFF character.

S36 Bit-Mapped Options Status (Indicates the status of command Options.) **LAPM Failure Control** Default: 7

Bits 0-2 This option indicates what should happen upon a LAPM failure. These fallback options are initiated immediately upon connection if S48 = 128. If an invalid number is entered, the number is accepted into the register, but S36 will act as it the default value has been entered.

0 = Modem Disconnects.
1 = Modem stays on-line 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 (Default)

Bits 3-7 Reserved

S37 Bit-Mapped Options Status ***{ ZDX only }*** (Indicates the status of command Options.) Desired DTE Connection Speed Default: 0

When the Nn command is issued or the S37 register value is modified, the +MS command subparameters are updated to reflect the speed and the modulation specified bit the S37 value. For Example:

If N0 command is active, S37 = 10 updates the +MS command subparameters to reflect +MS = 10,1,300,12000.

IF N1 command is active, S37 = 10 updates the +MS command subparameters to reflect +MS = 10,0,12000,12000.

S37 is not updated by the +MS command.

Use of the +MS command is recommended instead of the Nn and S37 = x commands. Nn and S37 = x commands are supported for compatibility with existing communications software.

Bits 0-4 Desired line connection speed. If an invalid number is entered, the number is accepted into the register, but S37 will act as if the default value has been entered.

0 = Attempt automode connection. If N0 is active, connection is attempted at the most recently sensed DTE speed (+MS command settings are updated to the most appropriate values). If N1 is active, connection is attempted at the highest possible speed (+MS settings are updated to 11,1,300,2880 to reflect V.34, automode, 300 bps minimum speed, and 28800 bps maximum speed)--Default.

Register	***Unit***	***Range***	***Default***	***Description***
S38	decimal	0–255	20	This register specifies the delay between the modem's receipt of the H command to disconnect (or ON-to-OFF transition of DTR if the modem is programmed to follow the signal), and the disconnect operation. Applicable to error-correction connection only. If S38 is set to a value between 0 and 254, the waits for the remote modem to acknowledge all data in the modem buffer before disconnecting. If S38 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
S46	decimal	136 or 138	138	Controls selection of compression. S46 = 136 means execute error correction protocol with no compression. S46 = 138 means error correction protocol with compression (default).
S48	decimal	0, 7, 128	7	Determines the remote modem's V.42 negotiation capabilities. If the remote modem's capabilities are known, this process can be bypassed. S48 = 0 means to disable negotiation; bypass the detection/negotiation phases; and proceed to LAPM. S48 = 7 means to disable negotiation (default). S48 = 128 means to disable negotiation; bypass the detection/negotiation phases; and proceed at once with the fallback action specified in S36. The following table lists configuration settings necessary to negotiate certain types of connections.

	S48=7	S48=128
S36=0,2	LAPM or Hangup	Do not Use
S36=1,3	LAPM or Async	Async
S36=4,6	LAPM, MNP, or Hangup	MNP or Hangup
S36=5,7	LAPM, MNP, or Aysnc	MNP or Async

S82 - Break Handling Options

S82 is for compatibility purposes only, changing this register will not have any affect.

Register Unit Range Default Description

S86 decimal 0, 4, 5, 9, 12, 13, or 14 When the modem issues a NO CARRIER result code, a value is written to this S-Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The cause codes are:

S86=0 Normal disconnect, no error occurred.
S86=4 Loss of carrier.
S86=5 V.42 negotiation failed to detect an error-correction modem at the other end.
S86=9 The modems could not find a common protocol.
S86=12 Normal disconnect initiated by the remote modem.
S86=13 Remote modem does not respond after 10 re-transmissions of the same message.
S86=14 Protocol violation.

S91 dBm 0 to -15 dB 10 Sets the transmit attenuation level from 0 to 15 dBm for the **PSTN mode**, resulting in a transmit level from 0 to -15 dBm, In some countries, the transmit level may not be changed and there are checks to prevent transmit attenuation level change.

			-10 dBm is the transmit level default.
S92	dBm	0 to -15 dB	10 Sets the transmit attenuation level from 0 to 15 dBm for the **FAX mode**, resulting in a transmit level from 0 to -15 dBm. In some countries, the transmit level may not be changed and there are checks to prevent transmit attenuation level change. -10 dBm is the transmit level default.

S95 - Extended Result Codes

The bits in this register can be set to override some of the Wn command options. A bit set to a 1 in this register will enable the corresponding result code regardless of the Wn setting. Also, refer to Table 3-4.

Default: 0

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

Bit 1 Append/ARQ to CONNECT XXXX result code in error-correction mode (XXXX = rate; see Table 3-4).

Bit 2 Enable CARRIER XXXX result code (XXXX = rate; see Table 3-4.

Bit 3 Enable PROTOCOL XXXX result code (XXXX = protocol identifier; see Table 3-4).

Bit 4 Reserved.

Bit 5 Enable COMPRESSION result code (XXXX = compression type; see Table 3-4).

Bit 6 Reserved.

Bit 7 Reserved.

Result Codes

When the modem receives an AT command from the terminal or PC, it tries to execute the command, then sends a status message to the PC or terminal reporting the "results" of the command (hence the name "result codes"). In the Modem Command mode, several visual responses, or *"Result Codes"*, may appear on your PC's video monitor.

Note that Extended Result Codes are displayed when your modem is set up to do so with an X1, X2, X3, or X4 command; these Extended Result Codes are denoted with an asterisk (*) in the table below.

Table 3-4 Result Codes

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
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

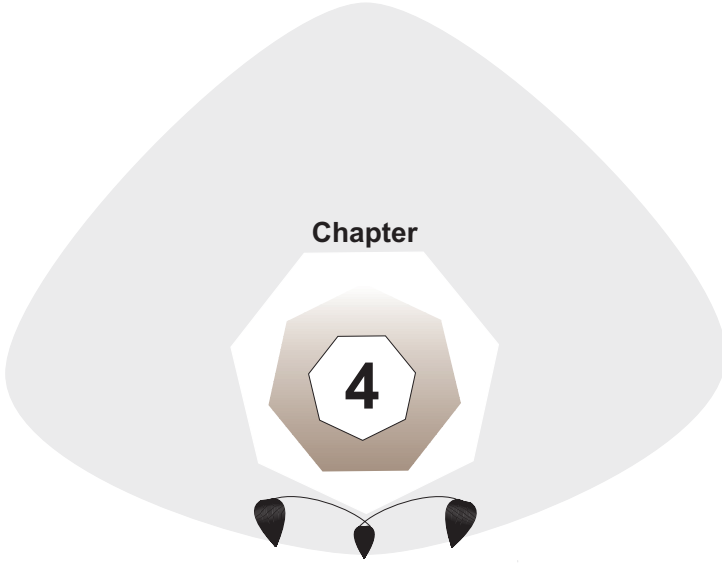
18	*	CONNECT 57600	Connected at 57600 bps
19	*	CONNECT 115200	Connected at115200 bps
22	*	CONNECT 75TX/1200RX	Connected at V.23 Originate
23	*	CONNECT 1200TX/75RX	Connected at V.23 Answer
24	*	DELAYED	Delay is in effect for the dialed number
32	*	BLACKLISTED	Dialed number is blacklisted
33		FAX	Connected FAX mode
35		DATA	Connected 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

Terse		***Verbose***	***Description***
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
62	*	CONNECT 24000	Connected at 24000 bps
63	*	CONNECT 26400	Connected at 26400 bps
64	*	CONNECT 28800	Connected at 28800 bps
66	*	COMPRESSION CLASS5	Connected MNP Class 5 and COMPRESSION
67	*	COMPRESSION V.42 bis	Connected V.42 bis and COMPRESSION
69	*	COMPRESSION NONE	Connected Without COMPRESSION
70	*	PROTOCOL NONE	Connected Without any form of PROTOCOL
77	*	PROTOCOL LAPM	Connected in V.42 LAPM mode
78	*	CARRIER 31200	31200 bps Data Carrier Detected
79	*	CARRIER 33600	33600 bps Data Carrier Detected
80	*	PROTOCOL ALT	Connected in MNP mode

81	*	*PROTOCOL ALT-CELLULAR*	Connected in MNP 10 mode
84	*	*CONNECT 33600*	Connected at 33600 bps
91	*	*CONNECT 31200*	Connected at 31200 bps
150	*	*CARRIER 32000*	32000 bps Data Carrier Detected
151	*	*CARRIER 34000*	34000 bps Data Carrier Detected
152	*	*CARRIER 36000*	36000 bps Data Carrier Detected
153	*	*CARRIER 38000*	38000 bps Data Carrier Detected
154	*	*CARRIER 40000*	40000 bps Data Carrier Detected
155	*	*CARRIER 42000*	42000 bps Data Carrier Detected
156	*	*CARRIER 44000*	44000 bps Data Carrier Detected
157	*	*CARRIER 46000*	46000 bps Data Carrier Detected
158	*	*CARRIER 48000*	48000 bps Data Carrier Detected
159	*	*CARRIER 50000*	50000 bps Data Carrier Detected.
160	*	*CARRIER 52000*	52000 bps Data Carrier Detected
161	*	*CARRIER 54000*	54000 bps Data Carrier Detected
162	*	*CARRIER 56000*	56000 bps Data Carrier Detected
165	*	*CONNECT 32000*	Connected at 32000 bps
166	*	*CONNECT 34000*	Connected at 34000 bps
167	*	*CONNECT 33600*	Connected at 33600 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
20	*	*CONNECT 230400*	Connected at 230400 bps
+F4	*	*+FCERROR*	V.21 signal received/High Speed Fax Expected (V.27, V.29, V.33 or V.17).

*These Extended Result Codes are displayed when your modem is set-up to do so with an X1, X2, X3, or X4 command.

Chapter



Troubleshooting

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 receiver, converted into digital form and then received back at your monitor for verification. No connection to the phone line is required. See Figure 4-1.

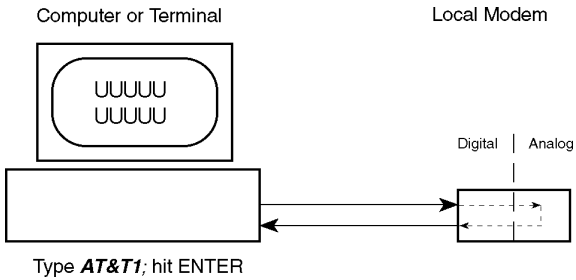


Figure 4-1. Local Analog Loopback Test

The test procedure is as follows:

1. Connect the modem to your computer. With your communication software, set the desired baud rate.
2. Type ***AT&T1*** and hit ENTER. This places your modem in Analog Loopback mode, in the Originate mode. The modem is now out of the Command mode and in a pseudo On-Line mode.
3. Once you receive a connect message (if responses are enabled), enter data from your keyboard. For this test, typing multiple upper case *"U"* characters is a good way to send an alternating test pattern of ones and zeros.
4. For a more complete test, you should also test the modem in Answer mode. To do this, you must "escape" from Originate mode by entering an Escape Sequence (***+++***) . Then type ***AT&T1*** and hit ENTER to place the modem in Analog Loopback mode, in the Answer mode. Then repeat step 3.
5. Your modem passes this test if the data entered from your keyboard are

the same as the data received on your monitor. If different data is appearing on your monitor, your modem is probably causing the problem, although 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.

Digital Loopback Test/V.54 Loop 2 (Local/Manual)

The Digital Loopback Test is an on-line test that loops data sent from one modem across the phone line to another modem, then back to the first modem. See Figure 4-2. There are two ways to put a modem into Digital Loopback mode:

1. Locally or Manually, described here in section 4.2.
2. Remotely or Automatically, see section 4.3.

Note: If you wish to abort any test in progress, enter ***AT&T0<CR>***.

All loopback tests will operate at all speeds except 300 bps. Disable error correction (***AT\|N0&W0<CR>***) before engaging in loopback tests. In this test the local modem is placed in Digital Loopback mode. Data is entered and transmitted from the remote modem (which is not in digital loopback mode), sent across the phone line to the local modem and looped back to the remote modem.

The test procedure is as follows:

1. Go into Terminal mode. Type ***AT*** and hit ENTER; you should get an *OK* message.
2. Dial the remote modem by entering the Dial command and the phone number, to establish On-line mode.
3. Type the Escape Sequence (***+++***) which brings your modem into Command mode, while still maintaining the pseudo On-line mode with the remote modem.
4. Type ***AT&T3*** from the local PC and hit ENTER. Once you receive an *OK* message from your modem (if responses are enabled), the local modem is placed in Digital Loopback mode.
5. Data is typed from the remote keyboard. For this test, typing multiple upper case *"U"* characters is a good way to send an alternating test pattern of ones and zeros. The data received by the local modem will enter its analog receiver, be converted to digital data, be reconverted into analog, and then looped through its transmitter back to the remote

modem. Your modem passes this test if the data entered from the remote keyboard is the same as the data received on the remote monitor.

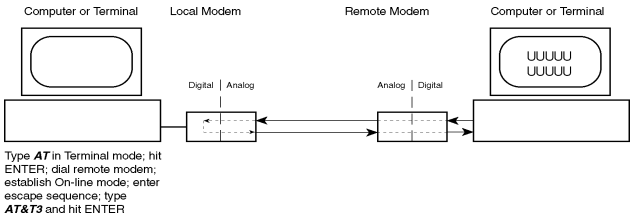


Figure 4-2. Digital Loopback Test (local/manual)

6. When testing is complete, you may end the test by typing an Escape Sequence (***+++***) to bring your modem into 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 ***ATO0*** and hit ENTER. If you wish to terminate the call, type ***ATH0*** and hit ENTER to hang up.

Digital Loopback Test/V.54 Loop 2 (Remote/ Automatic)

In this test, your modem must be On-line with another modem set up to respond to a request for Digital Loopback (note that some modems may not support Remote Loopback or may have this feature disabled). The test procedure is as follows:

1. Go into Terminal mode. Type ***AT*** and hit ENTER; you should get an *OK* message.
2. Dial the remote modem by entering the Dial command and the phone number, to establish On-line mode. **Note:** The ***&T6*** command must be set on the remote modem to run this test.
3. Type the Escape Sequence (***+++***) which brings your modem into Command mode, while still maintaining the connection with the remote modem.

4. Type ***AT&T6*** and hit 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 Command mode and enters pseudo On-line mode.
5. Type data from your keyboard. For this test, typing multiple upper case *"U"* characters is a good way to send an alternating test pattern of ones and zeros. The data received by the remote modem will enter its analog receiver, be converted to digital data, be reconverted into analog, and then looped through its transmitter back to the local modem. Your modem passes this test if the data entered from the local keyboard is the same as the data received on your monitor.

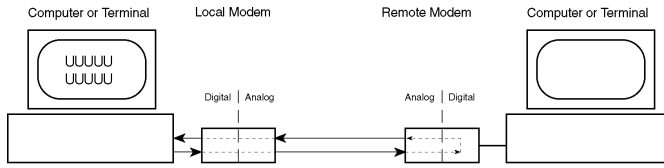


Figure 4-3. Digital Loopback Test (remote/automatic)

Chapter

Warranty, Service, & Tech Support

Introduction

This chapter starts out with statements about your modem's 10-year warranty (limited to customers in the U.S., Canada, Mexico and the United Kingdom). The next section, Tech Support, should be read carefully if you have questions or problems with your modem. It includes technical support telephone numbers, and an explanation of how to send in your modem if you require service. In the final section, we explain how to use our Bulletin Board Service (*BBS*).

Limited Warranty

Multi-Tech Systems, Inc. (*"MTS"*) warrants that its products will be free from defects in material or workmanship for a period of ten years from the date of purchase, or if proof of purchase is not provided, ten years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which 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 which 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 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 would like to register your MT5600ZDX modem electronically, you can do so at the following address:

http://www.multitech.com/register

Tech Support

Multi-Tech 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, call 1-800-972-2439. Please fill out the modem information (below), and have it available when you call. If your modem requires service, the tech support specialist will guide you on how to send in your modem (see *Service* section below).

Recording Modem Information

Please fill in the following information on your Multi-Tech modem. This will help tech support in answering your questions.

Modem Model No.:
Modem Serial No.:
Modem Firmware Version:
DataComm/FAX Software Version:
COM Port #:

The modem model and serial numbers are silkscreened on the bottom of your modem. The software versions are printed on the diskette labels. Type **ATI3** to display the modem firmware version. Please note the status of your modem before calling tech support.

Service

If your tech support specialist decides that service is required, modems may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems (within North America).

Include the following with your modem:

- a description of the problem.
- return billing and return shipping addresses.
- contact name and phone number.
- check or purchase order number for payment if the modem is out of warranty. (The standard repair charge for this modem is $95. This price is valid at the time of this publication but could change in the future. Check with your technical support specialist.)
- if possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent (see *Recording Modem Information* above). Send modems to this address:

MULTI-TECH SYSTEMS, INC.
2205 WOODALE DRIVE
MOUNDS VIEW, MINNESOTA 55112
ATTN: SERVICE OR REPAIRS.

About Ordering Accessories

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

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

SupplyNet Online Ordering Instructions

1. Browse to http://www.thesupplynet.com. In the **Browse by Manufacturer** drop-down list, select **Multi-Tech** and click GO!
2. To order, type in quantity, and click Add to Order
3. Click Review Order to change your order
4. After you have selected all of your items click Checkout to finalize the order. The SupplyNet site uses Verisign's Secure Socket Layer (SSL) technology to ensure your complete shopping security.

About the Multi-Tech BBS

Multi-Tech Systems maintains a Bulletin Board Service (*BBS*) for its customers. The information available via the BBS includes: new product information, product upgrade data, problem solving tips, and a message service for you to leave questions for which you would like additional information. The phone number for the Multi-Tech BBS is (612) 785-3702 or (800) 392-2432 (U.S.A. and Canada).

The BBS can be accessed by any asynchronous modem operating at speeds of 33,600-1200 bps (V.34 and downward compatible) with a setting of word length of 8 bits, 1 stop bit, and no parity.

Logging on to the Multi-Tech BBS

To log on to the Multi-Tech BBS, perform the following steps:

1. Set your communications program to **8-N-1**.
2. Dial to our BBS at (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).
3. At the prompt, type your first name, last name, and password; then press RETURN. If you are a first time caller, the BBS will ask if your name is spelled correctly. If you answer yes, a questionnaire will appear. You must complete the questionnaire to use the BBS on your first call.
4. Press RETURN until the Main Menu appears. From the Main Menu you have access to three main areas: the Files Menu, and Message Menu, and Bulletins. For help on menu commands, type **?**.

Downloading a File

If you know the file name:

1. From the Maim Menu, type **F** to access the Files Menu, then type **D**.
2. Enter the name of the file you wish to download from the BBS.
3. If a password is required, enter the password.
4. Answer **Y** or **N** to the automatic logoff question.
5. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
6. If you select Zmodem, the transfer will begin automatically. If you select another protocol, you may have to initiate the transfer yourself.

(In most data communications programs, the PAGE DOWN key initiates the download.)

If you don't know the file name:

1. From the Main Menu, type **F** to access the Files Menu. For a list of file areas, type **L** twice. (If you do not type the second *L*, you will list all of the files on the BBS.)
2. Mark the file areas you would like to examine by typing each file area's list number and a RETURN.
3. Enter **L** to list all the files in the selected file areas. Enter **C** to go forward in the file list and **P** to go back.
4. Mark one or more files for download by entering **M**, the list numbers of the files, and a RETURN
5. Enter **D**. You will see a list of the files you have marked. Enter **E** if you would like to edit the list; otherwise enter **D** again to start the download process.
6. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
7. If you select Zmodem, the file will transfer automatically. If you select another protocol, you may have to initiate the transfer yourself. (In MEWTERM and many other communications programs, the PAGE DOWN key initiates the download.)
8. When the download is complete, enter **S** to return to the File Menu.

Reading a Message

When you log on, the BBS will tell you if you have a personal message (mail). At the prompt *Would you like to read it now?,* type **R** to read the message. This is the only point at which you can read your mail, since you cannot read any messages from the Message Menu.

Leaving a Message

The Multi-Tech BBS has no public discussion areas. To leave a personal message, select the Message Menu by typing **M** at the Main Menu. Type **E**, then press RETURN to select the Sysop conference. Enter the name of the recipient (or "Sysop"), the subject, and the message text. Press

ESCAPE to finish, then type **S** to save the message and exit. To abort the message at any point, leave any of the fields blank and press RETURN.

Bulletins

When you log on, the BBS will ask if you would like to view the bulletin menu. The bulletins are menu-driven; to read a bulletin, enter its number. You can also access the bulletins by typing **B** at the Main Menu.

Using Flash to Upgrade Modem Firmware

The linear flash memory downloader in the modem firmware allows flash memory connected to the modem external memory bus to be upgraded with revised modem firmware. This process transfers (uploads) the upgraded modem firmware (data) from the host computer to the modem which transfers (downloads) the data to the flash memory device. Note that this downloader function must be provided in modem MCU firmware initially installed in external flash memory, i.e., the downloader does not support the programming of blank flash memory. Programming the flash memory device is a two-step process:

A. When the AT** command is issued, the modem firmware boot loader is invoked and you will first load a flash load module (FLM) into the modem's RAM. The FLM contains the programming algorithm for the flash memory device being programmed and any messages that may be sent during the load process.

B. Load the new modem firmware which the FLM will then program into the flash memory device.

Flash Procedure:

1. Put the FLM file and the new modem firmware file (e.g., V1400DS.S37) in an appropriate directory on the computer's hard disk.

2. Configure the communications application program for a DTE rate of between 9600 bps and 57600 bps and RTS/CTS flow control. A load at 57600 bps will take approximately 2 minutes; a load at 19200 bps will take approximately 6 minutes.

3. Check the modem for response by typing AT.

4. Initiate the download process using the AT**n command, where:

AT** or AT**0 Download speed is the last sensed speed (recommended command).
AT**1 Download speed is 38.4k bps.
AT**2 Download speed is 57.6k bps.

The "Download Initiated" message appears upon issuing the AT**n command.

5. Perform an ASCII upload of the FLM file (e.g., AMDE.S37) from the host computer to the modem RAM using an industry standard communications software or an equivalent process (ensure that all ASCII translation or pacing is turned off). To abort the load at this point, wait for the FLM download process to time-out, send a bad S37 record, or reset the modem. If the load process times-out, the modem must be reset (ATZ) before the FLM can be loaded again.

6. After the FLM has been loaded, perform an ASCII upload of the new modem firmware hex file (e.g., RC288ACi.S37) from the host computer to the modem RAM using an industry standard communications software or an equivalent process. There will be a 3-second pause after the first record of the RC288AXX.S37 file is sent, which is the FLASH erase cycle. **There is no turning back at this point.** If the flash download fails (because of a bad .S37 record for example) or the upload is aborted, as long as the modem is not turned off or reset, it will remain in the flash load cycle and the upload can be re-attempted at step 5.

   A "Wrong Device" message is displayed if an incorrect FLM is used. In this case, restart at step 5 and upload the correct FLM file.

   A "Wrong Hex file or flow control" message is displayed if an incompatible hex file format is used (non-Motorola S3 format) or if the DTE ignores flow control (the flash download uses both Xon/Xoff and RTS/CTS flow control). If the wrong format was used, reinitiate the upoad at step 5 using a correct firmware hex file.

7. The "Device successfully programmed" message is displayed by the FLM at the completion of a successful download and the modem will do a cold start. Contact our tech support department if you need more assistance.

About Internet Tech Support

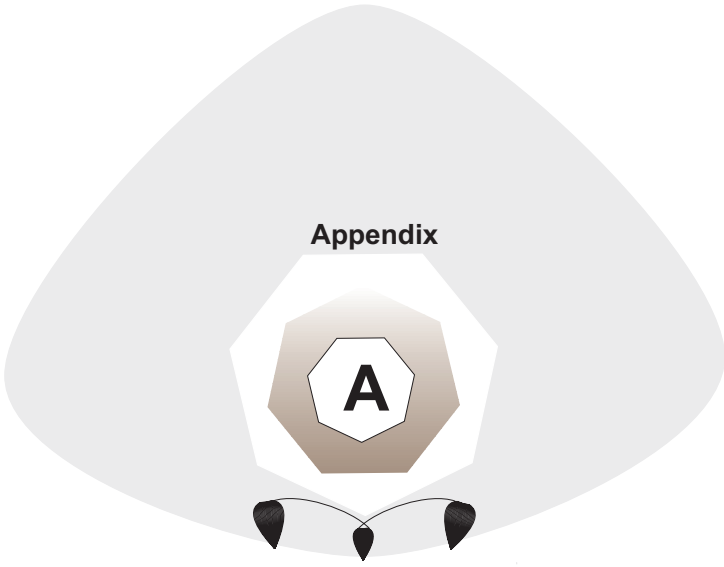
In addition to the BBS, Multi-Tech provides technical support via the Internet. Multi-Tech is a commercial provider on the Internet, and we retrieve e-mail messages from the following mailboxes on a periodic basis:

tsupport@multitech.com	Technical Support
mtsmktg@multitech.com	Marketing Dept.
mtssales@multitech.com	Sales Dept.
international@multitech.com	International Marketing & Sales

Multi-Tech's presence includes a Web site at: *http://www.multitech.com* and an ftp site at: *ftp://ftp.multitech.com*

The ftp server mirrors the Multi-Tech BBS.

Appendix



Technical Specifications

Data Compression V.42*bis*, (4:1 throughput), MNP 5 (2:1 throughput)

Speed Conversion Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600 and 115,200 bps

Flow Control Software Xon/Xoff, Hardware RTS/CTS

Mode of Operation Fax On-line modes, and Full duplex over dial-up lines

Intelligent Features Automatic or manual dialing, Automatic or manual answer, Microprocessor-controlled, EIA extended Automode, adaptive line probing, automatic symbol rate and carrier frequency during start-up, retrain and rate renegotiation, Autodial, Redial, Tone dial, Dial pauses, Call status display, Auto-parity and data rate selection, Keyboard-controlled modem options, Nonvolatile memory and on-screen displays for modem option parameters and four telephone numbers/ command lines of up to 40 digits each

Command Buffer 40 characters

Data Modulation Trellis Coded Modulation (*TCM*) at K56flex, 33,600, 31,200, 28,800, 26,400, 24,000, 21,600, 19,200, 16,800, 14,400, 12,000 and 9600 bps, Quadrature Amplitude Modulation (QAM) at 9600 (non-trellis), 4800 and 2400 bps, PSK at 1200 bps, FSK at 300 bps

Fax Modulation V.17 TCM at 14400, 12000, 9600, and 7200bps
V.29 QAM at 9600 and 7200 bps
V.27*ter* DPSK at 4800 and 2400 bps
V.21CH2 FSK at 300 bps (Half Duplex)

Carrier Frequencies (Data) 1800 Hz V.32/V.32*bis*/V32terbo/ Enhanced V.34/K56*flex*
K56flex speeds plus 33.6K, 31.2K, 28.8K, 26.4K, 24K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, 9.6K, 7.2K, 4.8K, 2.4K, 1.2K, and 0-300 bps.

Carrier Frequencies 2400 & 1200 bps Transmit Originate: 1200 Hz
Transmit Answer: 2400 Hz

(V.22bis/V.22 or Bell 212A Standard)	Receive Originate: 2400 Hz Receive Answer: 1200 Hz
Carrier Frequencies, 300 bps (Bell Standard)	1270 Hz Mark, 1070 Hz Space for Transmit Originate 2225 Hz Mark, 2025 Hz Space for Receive Originate 2225 Hz Mark, 2025 Hz Space for Transmit Answer 1270 Hz Mark, 1070 Hz Space for Receive Answer
Carrier Frequencies V.21	980 Hz Mark, 1180 Hz Space for Transmit Originate 1650 Hz Mark, 1850 Hz Space for Transmit Answer 1650 Hz Mark, 1850 Hz Space for Receive Originate 980 Hz Mark, 1180 Hz Space for Receive Answer
V.23	390 Hz Mark, 450 Hz Space for Transmit Originate 1300 Hz Mark, 2100 Hz Space for Transmit Answer 1300 Hz Mark, 2100 Hz Space for Receive Originate 390 Hz Mark, 450 Hz Space for Receive Answer

Carrier Frequencies Fax

V.21 CH2	Transmit Originate: 1650 Hz Mark, 1850 Hz Space
(Half Duplex)	Transmit Answer: 1650 Hz Mark, 1850 Hz Space
V.27ter	Originate/Answer: 1800 Hz
V.29 QAM	Originate/Answer: 1800 Hz
V.17 TCM	Originate/Answer: 1800 Hz

Transmit Level -10 dBm (dial-up)

Frequency Stability ±0.01%

Receiver Sensitivity-43 dBm under worst-case conditions

AGC Dynamic Range 43 dB

Interface EIA RS232C/CCITT V.24

Connectors DB25 (*RS232C*) connector; Two RJ11 modular phone jack: for line, for telephone set, and power jack.

Diagnostics Power-on Self Test, Local Analog Loop, Local Digital Loop, Remote Digital Loop.

Indicators LEDs for Send Data, Receive Data, Carrier Detect, various speed indicators, Off Hook, Terminal Ready, Error Correction, Fax.

Controls Power ON/OFF Switch

Speaker 2-inch cone with software- or command-controlled volume.

Operating Temperature 0° to 50° C (32° to 120° F)

Power Requirement 115 Volts AC, 60 Hz, .3 amp (2-prong outlet-mounted transformer); 240V/50Hz optional (international)

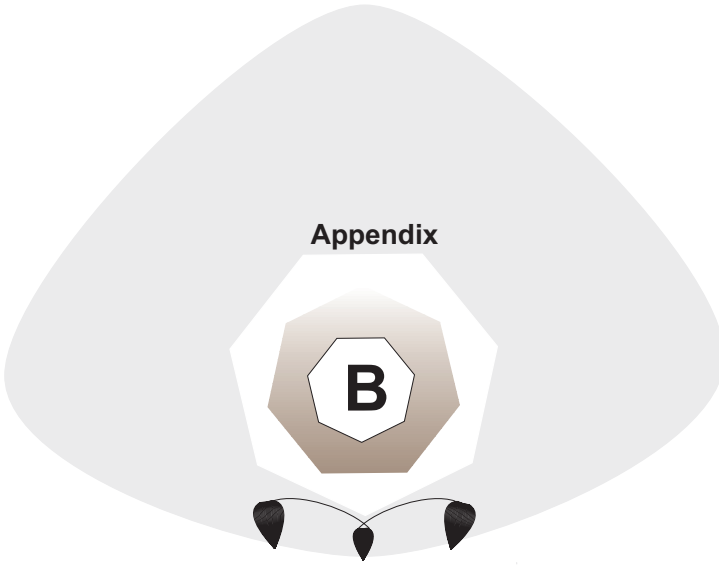
Power Consumption 5 Watts

Dimensions 14.8 x 10.8 x 2.9 cm (L x W x D)
(5.6 x 4.25 x 1.15 inches) (L x W x D)

Weight 8 oz.
224 grams

Limited Warranty 10 years in the U.S.A., U.K., Canada, and Mexico; 5 years elsewhere.

Appendix



Regulatory Information

Appendix B - Regulatory Information

FCC Regulations for Telephone Line Interconnection

1. This equipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company.

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

   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 which is Part 68 compliant. See installation instructions for details.

3. The ringer equivalence number (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total REN's, contact the telephone company to determine the maximum REN for the calling area.

4. 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 isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

5. 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.

6. 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 equipment is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

7. 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.

8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state

tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)

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

Manufacturer:	Multi-Tech Systems, Inc.
Model Number:	MT5600ZDX
FCC Registration #:	AU7USA-24713-M5-E
Ringer Equivalence:	0.3B
Modular Jack (USOC)	RJ11C or RJ11W (single line)
Service Center in USA:	Multi-Tech Systems Inc. 2205 Woodale Drive Mounds View, MN 55112 Voice (612) 785-3500/ FAX (612) 785-9874

FCC Fax Update

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone fax machine unless such message clearly contains in a margin at the top or bottom of each page or the first page of the transmission, the date and time it is sent and an identification of the business or other entity, or other individual sending the message and the telephone number of the sending machine or such business, other entity, or individual.

See the cover page of your fax software manual for setup details.

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 of a 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. The ringer equivalence number for this product is 0.3B.

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 does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

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

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

International Modem Restrictions

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

Compliance with BABT Requirements

Approved for connection to telecommunications system specified in the instructions for use subject to the conditions set out in them.

Warning: Interconnection directly, or by way of other apparatus, of ports marked "SAFETY WARNING see instructions for use" with ports marked or not so marked may produce hazardous conditions on the network. Advice should be obtained from a competent engineer before such a connection is made.

This apparatus has been approved for the use of the following facilities:

- Auto-calling
- Loop disconnect and MF dialing
- Phone number storage and retrieval by a predetermined code
- Operation in the absence of proceed indication
- Automatic storage of last number dialed
- Tone detection-busy
- Auto clear from the originating end
- DTR dialing
- Modem
- PBX timed break register recall

European Low Voltage Directive

When correctly installed and maintained, the modem will present no hazard to the user. When correctly installed the modem will be connected to the PSTN or a PW and to a Data Terminal Equipment (DTE), whose modem connections comply with ITU recommendation V28. The DTE connections are therefore taken to be safe voltages (less than ± 30 volts).

The main power source shall be installed near to the equipment and shall be easily accessible. The plug that connect to the apparatus to the main power supply must be fitted with a 5A fuse that complies with BSI1362.

Ports which are capable of connecting to other apparatus are defined as SELV. To ensure conformity with EN41003, ensure that these ports are only connected to ports of the same type on other apparatus.

Compliance with BS6305 Clause 6.2, BS6320 Clause 7.2, and BABT/SITS/82/005S/D

a. The modem is suitable for connection to the Public Switched Telephone Network (PSTN) provided by British Telecommunications plc or Kingston Communications (Hull) plc. Circuit supply by British Communications, Mercury Communication, or Hull City Council. Only direct exchange lines may be used, not shared service.

b. The modem is suitable for household, office, and similar general indoor use. It is not suitable for use as an extension to a payphone.

c. BT lines supplied must support either loop disconnect or multifrequency tone signalling.

d. REN (Ringer Equivalence Number).

The REN value of a unit is calculated from 3/n where n is the total number of units which can be connected in parallel which will still cause the standard bell (as defined in BS6305 Appendix D) to ring.

REN values of less than 0.3 cannot be assigned.

REN = 1

If a telephone or other device is connected in parallel with the modem, the combined REN must not exceed 4. A BT supplied telephone may be assumed to have REN of 1.0 unless otherwise noted.

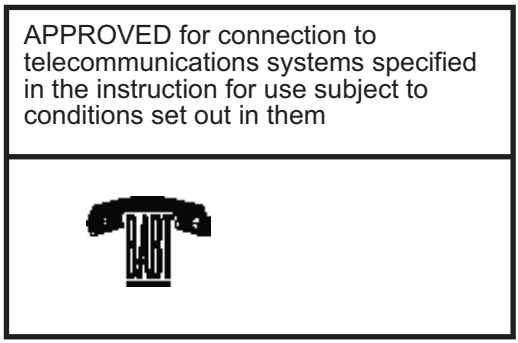
The approval of this modem for connection to the British Telecom public switched telephone network is INVALIDATED if the apparatus is subject to any modification in any material way not authorized by BABT or if it is used with or connected to:

i. internal software that has not been formally accepted BABT.

ii. external control software or external control apparatus which cause the operation of the modem associated call set-up equipment to contravene the requirements of the standard set out in BABT/SITS/82/005S/D.

All other apparatus connected to this modem and thereby connected directly or indirectly to the British Telecom public switched telephone network must be approved apparatus as defined in Section 22 of the British Telecommunications Act 1984.

The Approval Label is as follows:



The REN number for this apparatus = 1

Compliance with BS6789: Section 3.1 and Part 2

a. The modem is not capable of allowing Auto Call using '999' or other PABX emergency numbers.

b. Modes other than modes 1, 2, or 3 should not be used on the BT PSTN. This modem is a mode 1 device.

c. Users are advised to check the numbers entered during the Auto Call set up phase prior to dialing.

d. The user should not issue any sequence of commands to the modem which would cause the modem to exceed the maximum allowable pause of 8 seconds from the time the modem goes off hook until dialing begins.

e. For correct operation of the call progress monitor, the power has to be properly connected and switched on.

Compliance with BS6328 Part 1

a. The modem is not suitable for use on circuits with British Telecommunications signaling at a normal frequency of 2280 Hz.

b. The modem does not require signaling or otherwise employ the frequency range dc to 200 Hz.

c. The modem may be connected to a point to point two-wire or four-wire Private Circuit.

d. The modem does not require dc from the Private Circuit for correct operation. The modem may be damaged if connected, in a private circuit mode, to a circuit supplying dc current (the maximum permissible direct current is zero amps).

Modem CE Mark EMC and Safety Compliance

The CE mark is affixed to the enclosed Multi-Tech 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 98/13/EC of 12 March 1998 on the approximation of the laws of the Member States concerning telecommunications terminal and satellite earth station equipment.

Commission Decision "CTR21" & European Directive Notice

The equipment has been approved to [Commission Decision "CTR21"] for pan-European single terminal connection to the Public Switched Telephone Network (PTSN). However, due to differences between the individual PSTNs provided in different countries, the approval does not, of itself, give an unconditional assurance of successful operation on every PSTN network termination point.

In the event of problems, you should contact your equipment supplier in the first instance.

This equipment is designed to work with PSTN networks that accept analog signals. Multi-Tech does not currently know of any interoperating difficulties.

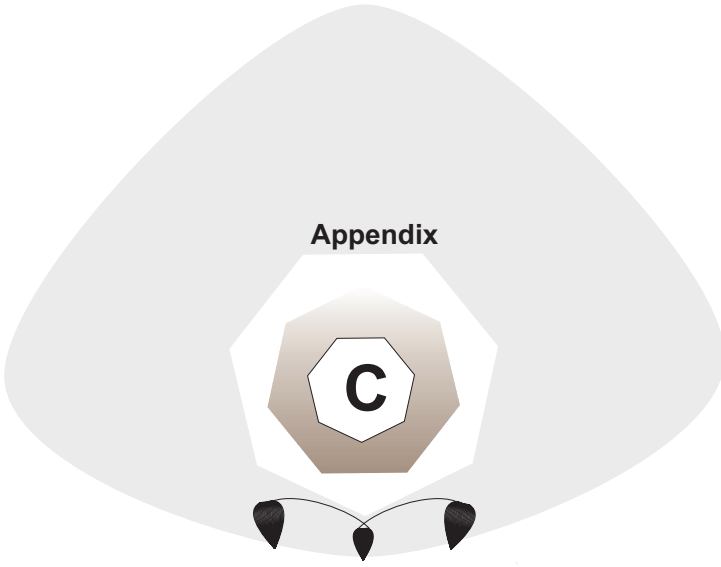
The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

New Zealand Telecom Warning Notice

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.

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

Appendix



V.90 Information

Appendix C - V.90 Information

This appendix provides information on ITU V.90 support for the Multi-Tech MT5600ZDX modem. It lists some of the differences in the ITU-T V.90 code compared to the K56flex only code.

V.90 Support

V.90 is the ITU designation for what had formerly been called V.pcm. The ITU recommendation V.90 was determined at a meeting in Geneva ending February 6, 1998. The current draft revision date is 2/4/98; it is expected to be ratified later in 1998.

V.90 will replace K56flex and other proprietary solutions for PCM connections. Dual-mode client modem code will be important until all central-site digital modems are upgraded to V.90 and all interoperability problems have been resolved. Until that time, the Dual-mode client code will provide reliable connections in K56flex mode to the central-site modems currently deployed.

Your V.90 dual-mode (V.90/K56flex) modem now includes:

·New AT commands (***+MS=12***, ***AT!***),
· New Result Codes in V.90 mode, and
· A-law/u-law selection (***+MS*** parameter 5), and various changes to the AT command documentation.

These new functions are explained in documents that are readily-available on the Multi-Tech web site in Portable Document Format (PDF) files at **http://www.multitech.com/support/manuals/IDCfiles/manuals.idc .** You can download the Acrobat Reader to view PDF files (you may want to bookmark **http://www.adobe.com/prodindex/acrobat/readstep.html** before following the "download" link). For files with a .ZIP extension, you can download PKUNZIP.EXE to extract the zipped files from the Multi-Tech FTP site at: **ftp://ftp.multitech.com/Utiltities/PKUNZIP.EXE**. Using your favorite Web browser, go to **http://www.multitech.com/support/V.90upgrades.htm** for additional information on ITU V.90 support and other Multi-Tech products.