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# MultiModemDID™

## MT5634ZBA-DID Data/Fax/DID Modem

### User Guide



## User Guide

Product Number S000234C Revision C  
MultiModemDID (MT5634ZBA-DID)

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### Record of Revisions

<i>Revision</i>	<i>Date</i>	<i>Description</i>
A	09/18/02	Supports V.92. Initial release of manual for publication on CD.
B	05/18/07	Revised tech support listing and warranty/repair descriptions.
C	01/02/08	Updated tech support contact listing.
	05/15/09	Added a link to the Multi-Tech Web site for warranty information

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### Warranty

For the Multi-Tech Warranty, see the Multi-Tech Web site at <http://www.multitech.com>

### Patents

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

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# Chapter 1 - Introduction and Description

Welcome to the world of data communications. You have acquired one of the finest intelligent data and fax modems available today from one of America's oldest and most respected modem manufacturers: Multi-Tech Systems, Inc. This User Guide will help you install, configure, test, and use your modem.

## Introduction

The MultiModemDID combines Direct Inward Dial (DID) with Super G3 V.34/33.6K bps fax and V.92 data modes of operation. Direct Inward Dial allows the user to use a block of telephone numbers larger than the number of physical telephone lines for direct dialing to extensions. When combining DID with inbound fax calls to a fax server, each user on the fax server can have faxes automatically routed to them at their client computer desktop.

DID fax routing assigns a unique fax number for every network user or network device (such as a printer). Senders simply dial a typical telephone number - no special procedures are required. The fax server automatically delivers the incoming fax to the user over the local area network.

Users get improved efficiency and security, since their faxes are delivered by the network fax server to the client desktop as soon as they are received. Time-wasting trips to the fax machine are eliminated and employees are more productive. In addition, DID offers a higher degree of security for both the sender and the recipient since faxes are not left unattended at a central fax machine.

The MT5634ZBA-DID utilizes Super G3 V.34 fax speeds of 33.6K bps. Now, computer-based fax servers can achieve the Super G3 speeds found in dedicated fax machines. The MT5634ZBA-DID also supports T.31 Annex B and T.32 Annex C, which allows the higher V.34 speeds to operate with Class 1.0 and Class 2.1 code sets. In addition, "on-the-fly" two-dimensional fax data compression plus support for error correction mode (ECM) increase the performance of the MT5634ZBA-DID to levels previously only found in expensive fax boards and dedicated fax machines.

To implement DID fax routing you must purchase fax server application software that supports Multi-Tech DID commands and DID routing, and obtain an analog DID trunk line which supports the inbound fax calls and a regular loop-start line for outbound fax transmission.

## Features

- One Direct Inward Dial (DID) port
- Super G3 V.34/33.6K bps fax communication
- T.31 Annex B Class 1.0 and T.32 Annex C Class 2.1 fax commands
- Error Correction Mode (ECM) provides fast and reliable fax transmissions
- Supports Wink-start, Immediate-start and Delay dial service types
- V.92/56K data mode
- V.44 compression improves data throughput rates
- V.42 error correction
- Flash memory for easy updates
- Plug and Play operation.
- Interactive automatic dialing and command mode configuration.
- In standard mode, you can store up to four command lines or telephone numbers of up to 40 characters each in the modems' nonvolatile memory.
- Pulse- or tone-dials and recognizes dial tones and busy signals for reliable call-progress detection.
- Detects AT&T calling card tones.
- Caller ID.
- Remote configuration.
- Incorporates self-resetting lightning protection.

## We Supply

- An MT5634ZBA-DID modem
- A set of four self-adhesive plastic feet
- A power supply
- A 9-pin to 9-pin serial cable
- Two RJ-11 telephone cables
- A printed Quick Start Guide
- A CD containing modem drivers, a User Guide, and Adobe Acrobat Reader.

## You Supply

- A computer with an available serial port
- A nearby AC power outlet
- A nearby phone line jack
- A nearby analog DID trunk line with a block of associated DID telephone numbers

## Safety

1. Use this product only with UL and cUL listed computers.
2. To reduce the risk of fire, use only 26 AWG (.41mm) or larger telephone wiring.
3. Never install telephone wiring during a lightning storm.
4. Never install a telephone jack in wet locations unless the jack is specifically designed for wet locations.
5. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
6. Use caution when installing or modifying telephone lines.
7. Avoid using a telephone during an electrical storm. There is a risk of electrical shock from lightning.
8. Do not use a telephone in the vicinity of a gas leak.

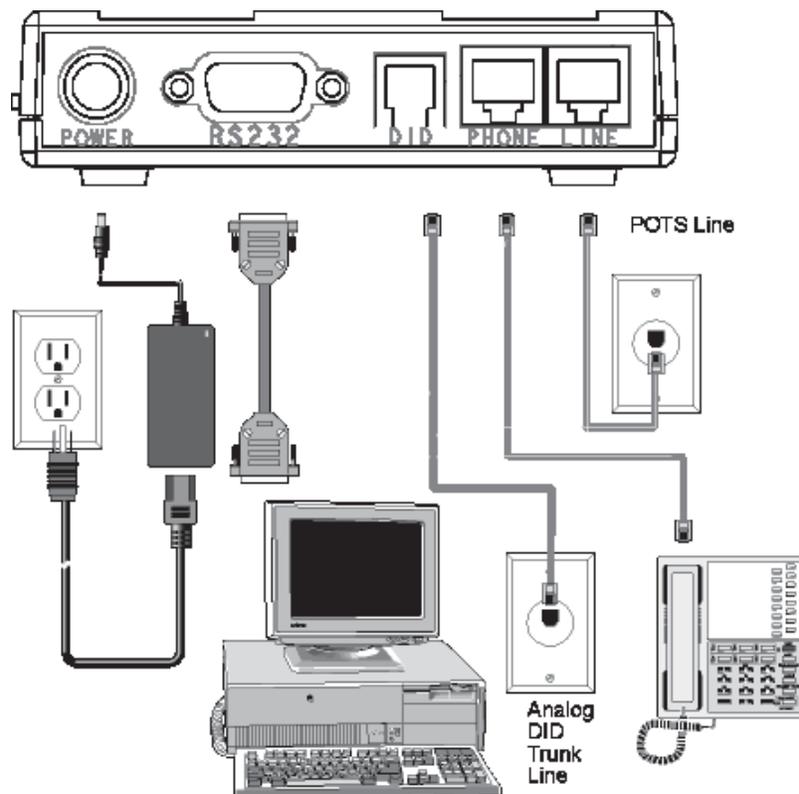
# Chapter 2 - Installation

## Step 1: 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.

## Step 2: Connect the Modem to Your System

Turn off your computer. Place the modem in a convenient location, and then connect it to your computer's serial port, the phone line, AC power, DID line, and your phone.



### Connect the Modem to Your PC

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

### Connect the Modem to the Telephone Line

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

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

### **(Optional) Connect the Modem to the Phone**

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

### **Connect the Modem to the AC Power Outlet**

Make sure the power is switch is OFF. Plug the DC power transformer into a power outlet or power strip. Plug the other end into the PWR jack on the modem. The DC power transformer is included with your modem.

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

### **Connect the Modem to the DID Line**

Plug one end of the phone cable into the modem's DID jack and the other end into an analog DID trunk line jack. The DID Line cable is included with your modem.

**CAUTION:** The DID Line cable has a 4-pos RJ11 on one side and a 6-pos on the other. Never plug the DID connector into a standard POTS Line. This may damage the modem or the central office equipment. Use only an analog DID Line.

### **Power-on Test**

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

## **Step 3: Install the Modem Driver**

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

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

2. Insert the MT5634ZBA-DID CD into your CD-ROM drive, and then click **OK**.
3. Windows installs the modem driver.
4. Click **Finish** to exit

## **Removing Your Old Modem from Windows**

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

***From Windows 2000, XP***

1. Click **Start | Settings | Control Panel**.
2. Double-click the Phone and Modems icon and click on the Modems tab.
3. In the list box, select the old modem.
4. Click **Remove**, then click **Close**.
5. The next time you dial a HyperTerminal connection, it will select your new modem and ask you to confirm the selection.

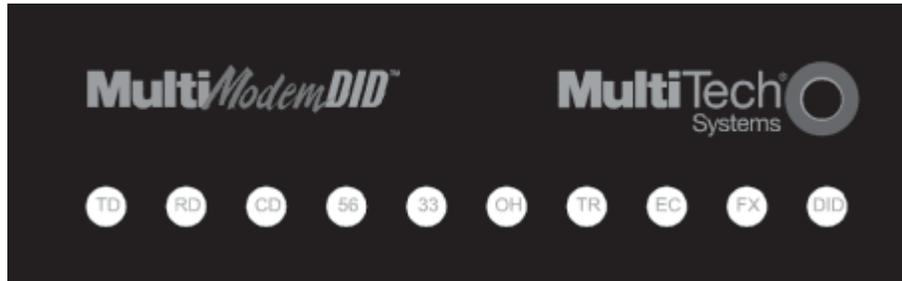
***From Windows 98, Me***

1. Click **Start | Settings | Control Panel**.
2. Double-click the Modems icon to open the **Modems Properties** sheet.
3. In the list box, select the old modem.
4. Click **Remove**, then click **Close**.
5. The next time you dial a HyperTerminal connection, it will select your new modem and ask you to confirm the selection.

# Chapter 3 – Operation

## Front Panel of the MultiModemDID Modem

The MT5634ZBA-DID modem has 10 LED indicators on the front panel that provide information about how your modem is operating: status, configuration and activity.



- TD** **Transmit Data** - The TD LED flashes when the modem is transmitting data to another modem.
- RD** **Receive Data** - The RD LED flashes when the modem is receiving data from another modem.
- CD** **Carrier Detect** - The CD LED lights when the modem detects a valid carrier signal from another modem. It is on when the modem is communicating with the other modem and off when the link is broken.
- 56** **56** - The 56 LED is a 56K mode indicator. It lights whenever the modem is set for or connects using the V.90 or V.92 protocols.
- 33** **33** - The 33 LED is a V.34 mode indicator. It lights whenever the modem connects using the V.34 protocol.
- OH** **Off-Hook** - The OH LED lights when the modem is off-hook, which occurs when the modem is dialing, online, or answering a call. The LED flashes when the modem pulse-dials.
- TR** **Terminal Ready** - The TR LED lights when a communications program is using the modem. It means the modem is ready for an outgoing or incoming call. It goes off when the communications program disconnects the serial port. When it goes off, a connected modem will also disconnect.
- EC** **Error Correction (V.42)** - The EC LED lights continuously when the modem is in V.42 error correction mode, and it flashes when compression is achieved.
- FX** **Fax** - The FX LED lights when the modem is in fax mode.
- DID** **DID** - The DID LED lights when there is an incoming call on the DID line.

## DID Operation

Direct Inward Dialing (DID) uses an analog trunk line to route several phone numbers to one line. The MT5634ZBA-DID modem has four ports, an RS232 serial port, two RJ11 ports for connection to a POTS line and an auxillary phone, and a 4 position RJ12 for connection to the DID analog trunk.

**Note:** The DID and POTS ports cannot operate simultaneously.

On a DID line the roles of the central office and the DID modem are somewhat reversed. The DID modem must provide a DC voltage, around 48V, to the line. When there is an incoming call, the central office will complete a loop and draw current from the DID modem.

On a standard POTS line, the central office provides the DC voltage and the user will close the loop by lifting the handset of a phone or making a call with a standard modem.

There are two critical points about the DC voltage:

1. The central office is sensitive to the DC polarity. TiP (positive) and riNg (Negative) must be connected to the line from the central office with the proper polarity. If not, callers will receive an immediate busy signal or may be allowed to make a short connection but become unexpectedly disconnected after a short time.
2. The DC voltage should be applied by the modem at all times, even when not in use. Occasionally, the central office will check the line; and, if a voltage is not sensed, the line will be put out of service. A call to the phone company will be required to get the line back in service.

The DID modem may use line reversals to signal the central office to send digit information or open the channel to the calling party depending on the start protocol of the DID line. The central office will forward several of the last digits of the incoming call to the DID modem through one of three formats, DTMF, MF, or pulse signaling.

## V.92 Operation

Because the V.92 protocol is new and still largely unsupported by central servers, some features are disabled by default in the initial release of the MT5634ZBA-DID modem. This section describes the status of the V.92 features in the initial release. Please note that the V.92 special features require connection to a V.92-capable server.

- **General.** The V.92 protocol is enabled by default. If the MultiModemZBA-DID detects another V.92 modem during the handshake phase, they will connect in V.92 mode; otherwise, they will connect in V.90 mode or the highest mutually acceptable mode. The AT command that controls this is **+MS=**.
- **Commands.** AT commands specific to the V.92 protocol and the new V.44 compression protocol begin with the plus character (+). These commands are in this manual. Also, the S109 register has been modified to support V.92.
- **PCM Upstream.** PCM Upstream is disabled by default. To upload files at speeds above 33.6 kbps, you must enable PCM Upstream using the command **+PIG=1**. Please note that this requires connection to a V.92-capable server. Also, please note that since upload speeds are affected by line conditions, meeting the previous requirements cannot guarantee speeds above 33.6 kbps.
- **Quick Connect.** Quick Connect, which shortens the handshake time with another V.92 modem, is disabled by default. To enable it, use the command **+PQC=0**. Quick Connect speeds connect times by skipping the line test during the handshake and using the configuration from the last data connection. Quick Connect works best when line conditions are consistent from call to call. If line conditions are variable, enabling Quick Connect can actually **increase** the connect time slightly.
- **Modem on Hold** (is not available at this time).

## Connecting to the Internet

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

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

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

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

## Dial-Up Networking

Before you can connect to the Internet, you must set up a remote-node client program on your computer. The Windows version is called Dial-Up Networking. Dial-Up Networking establishes your connection to the ISP's server, which is the shared computer that manages calls from clients (your computer) to the Internet. Most, if not all, Windows browsers start Dial-Up Networking automatically when you open them.

For instructions on how to set up Dial-Up Networking, consult your ISP or your operating system's online help or printed documentation. Many ISPs include, as part of their service, a program that will install and configure Dial-Up Networking automatically for you.

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

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

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

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

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

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

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

## AT Commands

Command:	<b>AT</b>	<b>Attention Code</b>
Values:		n/a
Description:		The attention code precedes all command lines except <b>A/</b> and the escape sequence.
Command:	<b>ENTER</b>	<b>Key</b>
Values:		n/a
Description:		Press the ENTER or RETURN key to execute most commands.
Command:	<b>A</b>	<b>Answer</b>
Values:		n/a
Description:		Answers an incoming call before the final ring.
Command:	<b>A/</b>	<b>Repeat Last Command</b>
Values:		n/a
Description:		Repeats the last command string. Do not precede this command with <b>AT</b> . Do not press ENTER to execute.
Command:	<b>Bn</b>	<b>Communication Standard Setting</b>
Values:		$n = 0-3, 15, 16$
Default:		1 and 16
Description:	B0	Select ITU-T V.22 mode when modem is at 1200 bps.
	B1	Select Bell 212A when modem is at 1200 bps.
	B2	Deselect V.23 reverse channel (same as <b>B3</b> ).
	B3	Deselect V.23 reverse channel (same as <b>B2</b> ).
	B15	Select V.21 when the modem is at 300 bps.
	B16	Select Bell 103J when the modem is at 300 bps.
Command:	<b>Ds</b>	<b>Dial</b>
Values:		$s =$ dial string (phone number and dial modifiers)
Default:		none
Description:		Dial telephone number $s$ , where $s$ may up to 40 characters long and include the 0-9, *, #, A, B, C, and D characters, and the L, P, T, W, S, comma (,), semicolon (;), !, @, ^ and \$ dial string modifiers.
		<i>Dial string modifiers:</i>
	<b>L</b>	Redial last number. (Must be placed immediately after <b>ATD</b> .)
	<b>P</b>	Select pulse-dialing until a <b>T</b> is encountered. Affects current and subsequent dialing.
	<b>T</b>	Select tone-dialing until a <b>P</b> is encountered. Affects current and subsequent dialing.
	<b>W</b>	Wait for a new dial tone before continuing to dial. ( <b>X2</b> , <b>X4</b> , <b>X5</b> , <b>X6</b> , or <b>X7</b> must be selected.)
	,	Pause during dialing for time set in register <b>S8</b> .
	;	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.

- @ Wait for quiet answer. Causes modem to wait for a ring back, then 5 seconds of silence, before processing next part of command. If silence is not detected, the modem returns a NO ANSWER code.
- ^ Disable data calling tone transmission.
- \$ Detect AT&T call card “bong” tone. The character should follow the phone number and precede the user’s call card number: **ATDT1028806127853500\$123456789**.

Command:	<b>DS=<i>n</i></b>	<b>Dial Stored Telephone Number</b>
Values:	<i>n</i> = 0, 1, 2	
Default:	none	
Description:	Dials a number previously stored in directory number <i>y</i> by the <b>&amp;Z<i>n</i>=<i>x</i></b> command. Example: <b>ATDS=3</b> .	
Command:	<b>En</b>	<b>Echo Command Mode Characters</b>
Values:	<i>n</i> = 0 or 1	
Default:	1	
Description:	E0	Does not echo keyboard input to the terminal.
	E1	Does echo keyboard input to the terminal.
Command:	<b>F<i>n</i></b>	<b>Echo Online Data Characters</b>
Values:	<i>n</i> = 0, 1	
Default:	1	
Description:	F0	Enables online data character echo. (Not supported.)
	F1	Disables online data character echo (included for backward compatibility with some software).
Command:	<b>H<i>n</i></b>	<b>Hook Control</b>
Values:	<i>n</i> = 0 or 1	
Default:	0	
Description:	H0	Goes on-hook (hangs up).
	H1	Goes off-hook (makes the phone line busy).
Command:	<b>I<i>n</i></b>	<b>Information Request</b>
Values:	<i>n</i> = 0–5, 9, 11	
Default:	None	
Description:	I0	Displays default speed and controller firmware version.
	I1	Calculates and displays ROM checksum (e.g., <i>B399</i> ).
	I2	Checks ROM and verifies the checksum, displaying <i>OK</i> or <i>ERROR</i> .
	I3	Displays default speed and controller firmware version.
	I4	Displays firmware version for data pump (e.g., <i>17</i> ).
	I5	Displays the board ID: software version, hardware version, and the country ID in hexadecimal format (e.g., <i>s0503a01V, 0, 34</i> ).
	I9	Displays the country code in decimal format (e.g., <i>52</i> ).
	I11	Displays diagnostic information for the last modem connection, such as DSP and firmware version, link type, line speed, serial speed, type of error correction/data compression, number of past retrains, etc.

Command:	<b>Mn</b>	<b>Monitor Speaker Mode</b>
Values:		$n = 0, 1, 2, \text{ or } 3$
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:	<b>Nn</b>	<b>Modulation Handshake</b>
Values:		$n = 0 \text{ or } 1$
Default:		1
Description:	N0	Modem performs handshake only at communication standard specified by <b>S37</b> and the <b>B</b> command.
	N1	Modem begins handshake at communication standard specified by <b>S37</b> and the <b>B</b> command. During handshake, fallback to a lower speed can occur.
Command:	<b>On</b>	<b>Return Online to Data Mode</b>
Values:		0, 1, 3
Default:		None
Description:	O0	Exits online command mode and returns to data mode (see <b>+++AT&lt;CR&gt;</b> escape sequence ).
	O1	Issues a retrain and returns to online data mode.
	O3	Issues a rate renegotiation and returns to data mode.
Command:	<b>P</b>	<b>Pulse Dialing</b>
Values:		P, T
Default:		T
Description:		Configures the modem for pulse (non-touch-tone) dialing. Dialed digits are pulsed until a <b>T</b> command or dial modifier is received.
Command:	<b>Qn</b>	<b>Result Codes Enable/Disable</b>
Values:		$n = 0, 1$
Default:		0
Description:	Q0	Enables result codes.
	Q1	Disables result codes.
Command:	<b>Sr=n</b>	<b>Set Register Value</b>
Values:		$r = \text{S-register number}; n \text{ varies}$
Default:		None
Description:		Sets the value of register $Sr$ to the value of $n$ , where $n$ is entered in decimal format. Example: <b>S0=1</b> .
Command:	<b>Sr?</b>	<b>Read Register Value</b>
Values:		$r = \text{S-register number}$
Default:		None
Description:		Reads the value of register $Sr$ and displays it in 3-digit decimal form. For example, <b>S2?</b> gives the response <i>043</i> .

Command:	<b>T</b>	<b>Tone Dialing</b>
Values:		P, T
Default:		T
Description:		Configures the modem for DTMF (touch-tone) dialing. Dialed digits are tone dialed until a <b>P</b> command or dial modifier is received.
Command:	<b>Vn</b>	<b>Result Code Format</b>
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:	<b>Wn</b>	<b>Result Code Options</b>
Values:		$n = 0, 1, 2$
Default:		2
Description:	W0	<i>CONNECT</i> result code reports serial port speed, disables protocol result codes.
	W1	<i>CONNECT</i> result code reports serial port speed, enables protocol result codes.
	W2	<i>CONNECT</i> result code reports line speed, enables protocol result codes.
Command:	<b>Xn</b>	<b>Result Code Selection</b>
Values:		$n = 0-7$
Default:		4
Description:	X0	Basic result codes (e.g., <i>CONNECT</i> ); does not look for dial tone or busy signal.
	X1	Extended result codes (e.g., <i>CONNECT 46000 V42bis</i> ); does not look for dial tone or busy signal.
	X2	Extended result codes with <i>NO DIALTONE</i> ; does not look for busy signal.
	X3	Extended result codes with <i>BUSY</i> ; does not look for dial tone.
	X4	Extended result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
	X5	Extended result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
	X6	Extended result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
	X7	Basic result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
Command:	<b>Zn</b>	<b>Modem Reset</b>
Values:		$n = 0$ or $1$
Default:		None
Description:	Z0	Resets modem to profile saved by the last <b>&amp;W</b> command.
	Z1	Same as <b>Z0</b> .
Command:	<b>&amp;Cn</b>	<b>Data Carrier Detect (DCD) Control</b>
Values:		$n = 0, 1, \text{ or } 2$
Default:		1
Description:	&C0	Forces the DCD circuit to be always high.
	&C1	DCD goes high when the remote modem's carrier signal is detected, and goes low when the carrier signal is not detected.
	&C2	DCD drops on disconnect for time set by <b>S18</b> , then goes high again (for some PBX phone systems).

Command: **&Dn Data Terminal Ready (DTR) Control**  
 Values:  $n = 0, 1, 2, \text{ or } 3$   
 Default: 2  
 Description: &D0 Modem ignores the true status of the DTR signal and responds as if it is always on.  
 &D1 If DTR drops while in online data mode, the modem enters command mode, issues an *OK*, and remains connected.  
 &D2 If DTR drops while in online data mode, the modem hangs up. If the signal is not present, the modem will not answer or dial.  
 &D3 If DTR drops, the modem hangs up and resets as if an **ATZ** command were issued.

Command: **&En XON/XOFF Pacing Control**  
 Values:  $n = 12 \text{ or } 13$   
 Default: 12  
 Description: &E12 Disables XON/XOFF pacing.  
 &E13 Enables XON/XOFF pacing. (**&K4** must also be set.)

**Note:** **&E13** has no effect if hardware control (**&K3**) is selected.

Command: **&Fn Load Factory Settings**  
 Values:  $n = 0$   
 Default: None  
 Description: &F0 Loads factory settings as active configuration.

**Note:** See also the **Z** command.

Command: **&Gn V.22bis Guard Tone Control**  
 Values:  $n = 0, 1, \text{ or } 2$   
 Default: 0  
 Description: &G0 Disables guard tone.  
 &G1 Sets guard tone to 550 Hz.  
 &G2 Sets guard tone to 1800 Hz.

**Note:** The **&G** command is not used in North America.

Command: **&Kn Flow Control Selection**  
 Values:  $n = 0, 3, \text{ or } 4$   
 Defaults: 3  
 Description: &K0 Disables flow control.  
 &K3 Enables CTS/RTS hardware flow control.  
 &K4 Enables XON/XOFF software flow control.

Command: **&Qn Asynchronous Communications Mode**  
 Values:  $n = 0, 5, 6, 8, \text{ or } 9$   
 Default: 5  
 Description: &Q0 Asynchronous with data buffering. Same as **IN0**.  
 &Q5 Error control with data buffering. Same as **IN3**.  
 &Q6 Asynchronous with data buffering. Same as **IN0**.  
 &Q8 MNP error control mode. If MNP error control is not established, the modem falls back according to the setting in **S36**.  
 &Q9 V.42 or MNP error control mode. If neither error control is established, the modem falls back according to the setting in **S36**.

Command: **&Sn Data Set Ready (DSR) Control**  
 Values:  $n = 0$  or  $1$   
 Default:  $0$   
 Description: &S0 DSR is always high (on).  
 &S1 DSR goes high only during a connection.

Command: **&Tn V.54 Test Commands**  
 Values:  $n = 0, 1, 3$  or  $6$   
 Default: None  
 Description: &T0 Abort. Stops any test in progress.  
 &T1 Initiates local analog loopback test.  
 &T3 Initiates local digital loopback test.  
 &T6 Initiates remote digital loopback test.

**Note:** To stop a test, you must use the escape sequence (**+++AT**) before typing **&T0**.

Command: **&V Display Current Settings**  
 Values: n/a  
 Description: Displays the active modem settings, including the callback security settings if callback security is enabled. If the setup password has been entered, it also displays the callback security passwords.

Command: **&Wn Store Current Configuration**  
 Values:  $n = 0, 1$   
 Default:  $1$   
 Description: &W0 Stores current modem settings in nonvolatile memory and causes them to be loaded in place of the factory defaults at power-on or following the **ATZ** command. See also the **&F** command.  
 &W1 Clears user default settings from nonvolatile memory and causes the factory defaults to be loaded at power-on or following the **ATZ** command.

Command: **&Zn=x Store Dialing Command**  
 Values:  $n = 0, 1, 2$  (callback security disabled)  
 $x =$  Dialing command string  
 Default: None  
 Description: Stores dialing command  $x$  in memory location  $y$ . Dial the stored number using the command **ATDS= $n$** . See also the **#CBSn** command.

Command: **\An Select Maximum MNP Block Size**  
 Values:  $n = 0, 1, 2,$  or  $3$   
 Default:  $3$   
 Description: \A0 64-character maximum.  
 \A1 128-character maximum.  
 \A2 192-character maximum.  
 \A3 256-character maximum.

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

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

**Data mode.** The modem receives the break from the computer:

\K0 Enters online command mode, no break sent to the remote modem.  
 \K1 Clears data buffers and send break to the remote modem.  
 \K2 Same as **\K0**.  
 \K3 Sends break immediately to the remote modem .  
 \K4 Same as **\K0**.  
 \K5 Sends break to the remote modem in sequence with the transmitted data.

**Data mode.** The modem receives the break from the remote modem:

\K0 Clears data buffers and sends break to the computer.  
 \K1 Same as **\K0**.  
 \K2 Sends break immediately to the computer.  
 \K3 Same as **\K2**.  
 \K4 Sends break to the computer in sequence with the received data.  
 \K5 Same as **\K4**.

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

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

Command:	<b>\Nn</b>	<b>Error Correction Mode Selection</b>
Values:		$n = 0-5$ , or 7
Default:		3
Description:	\N0	Non-error correction mode with data buffering (buffer mode; same as <b>&amp;Q6</b> ).
	\N1	Direct mode.
	\N2	MNP reliable mode. If the modem cannot make an MNP connection, it disconnects.
	\N3	V.42/MNP auto-reliable mode. The modem attempts first to connect in V.42 error correction mode, then in MNP mode, and finally in non-error-correction (buffer) mode with continued operation.
	\N4	V.42 reliable mode. If the modem cannot make a V.42 connection, it disconnects.
	\N5	V.42, MNP, or non-error correction (same as <b>\N3</b> ).
	\N7	V.42, MNP, or non-error correction (same as <b>\N3</b> ).
Command:	<b>\Qn</b>	<b>Flow Control Selection</b>
Values:		$n = 0, 1$ , or 3
Default:		3
Description:	\Q0	Disables flow control (same as <b>&amp;K0</b> ).
	\Q1	XON/XOFF software flow control (same as <b>&amp;K4</b> ).
	\Q2	CTS-only flow control. Not supported.
	\Q3	RTS/CTS hardware flow control (same as <b>&amp;K3</b> ).
Command:	<b>\Tn</b>	<b>Inactivity Timer</b>
Values:		$n = 0, 1-255$
Default:		0
Description:	\Tn	Sets the time (in minutes) that the modem waits after the last character is sent or received before it disconnects. A value of zero disables the timer. Applies only in buffer mode.
<b>Note:</b> You can also set the inactivity timer by changing the value of <b>S30</b> .		
Command:	<b>\Wn</b>	<b>Protocol Result Code</b>
Values:		$n = 0, 1$ , or 2
Default:		1
Description:	\W0	Disables the appending of the protocol result code to the DCE speed.
	\W1	Enables the appending of the protocol result code to the DCE speed.
	\W2	Same as <b>\W1</b> .
Command:	<b>\Xn</b>	<b>XON/XOFF Pass-Through</b>
Values:		$n = 0$ or 1
Defaults:		0
Description:	\X0	Modem responds to and discards XON/XOFF characters.
	\X1	Modem responds to and passes XON/XOFF characters.
Command:	<b>-Cn</b>	<b>Data Calling Tone</b>
Values:		$n = 0$ or 1
Defaults:		0
Description:	-C0	Disables V.25 data calling tone to deny remote data/fax/voice discrimination.
	-C1	Enables V.25 data calling tone to allow remote data/fax/voice discrimination.

Command: **%A Adaptive Answer Result Code Enable**  
 Values:  $n = 0$  or  $1$   
 Default:  $0$   
 Description: The **%A** command controls whether the *DATA* and *FAX* result codes will be sent by the modem. The modem must be in fax mode for this command to work. Also, the modem must be set to **+FAA=1**, which enables the modem to distinguish between a fax and a data call. When these commands are enabled, the modem sends *DATA* to the computer when it detects data tones, and *FAX* when it detects fax tones. These strings are used by some servers to select the appropriate communication program.

**%A0** Disables adaptive answer result codes.  
**%A1** Enables adaptive answer result codes.

**Note:** For descriptions of the **+FAA=** and other fax commands, see the *Multi-Tech Fax Class 2.1 Developer's Guide*.

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

Command: **%Cn Data Compression Control**  
 Values:  $n = 0$  or  $1$   
 Default:  $1$   
 Description: **%C0** Disable sV.42bis/MNP 5 data compression.  
**%C1** Enables V.42bis/MNP 5 data compression.

Command: **%DCn AT Command Control**  
 Values:  $n = 0$  or  $1$   
 Default:  $0$   
 Description: **%DC0** The modem responds to AT commands.  
**%DC1** The modem ignores AT commands.

**Note:** The modem will respond to **AT%DC** for 10 seconds after it is turned on.

Command: **%En Fallback and Fall Forward Control**  
 Values:  $n = 0, 1,$  or  $2$   
 Default:  $2$   
 Description: **%E0** Disables fallback and fall-forward.  
**%E1** Enables fallback, disables fall-forward.  
**%E2** Enables fallback and fall-forward.

Command: **%Hn Direct Connect Enable**  
 Values:  $n = 0, 1$   
 Default:  $0$   
 Description: **%H0** Sets callback security to normal operation.  
**%H1** All callback security calls will be direct connect regardless of whether the password or phone number has the - character.

- Command: **%Rn Cisco Configuration**  
 Values:  $n = 0, 1$   
 Default: 0  
 Description: %R0 Disables Cisco configuration.  
 %R1 Sets **E0, Q1, &D0, \N0, \$SB9600**, and **%S1** for operation with a Cisco router.
- Command: **%Sn Command Speed Response**  
 Values:  $n = 0, 1$   
 Default: 0  
 Description: %S0 Sets modem to respond to AT commands at all normal speeds.  
 %S1 AT commands accepted at 115200 bps only. AT commands at other speeds are ignored.
- Command: **\$Dn DTR Dialing**  
 Values:  $n = 0$  or 1  
 Default: 0  
 Description: \$D0 Disables DTR dialing.  
 \$D1 Dials the number in memory location 0 when DTR goes high.
- Command: **\$EBn Asynchronous Word Length**  
 Values:  $n = 0$  or 1  
 Default: 0  
 Description: \$EB0 Enables 10-bit mode.  
 \$EB1 Enables 11-bit mode.
- Command: **\$SBn Serial Port Baud Rate**  
 Values:  $n =$  speed in bits per second  
 Default: 57600  
 Description: \$SB300 Set serial port to 300 bps.  
 \$SB1200 Set serial port to 1200 bps.  
 \$SB2400 Set serial port to 2400 bps.  
 \$SB4800 Set serial port to 4800 bps.  
 \$SB9600 Set serial port to 9600 bps.  
 \$SB19200 Set serial port to 19200 bps.  
 \$SB38400 Set serial port to 38400 bps.  
 \$SB57600 Set serial port to 57600 bps.  
 \$SB115200 Set serial port to 115200 bps.
- Command: **+DCS=x,y Select V.44 Data Compression**  
 Values:  $x = 0$  or 1 (V.42bis)  
 $y = 0, 1,$  or 2 (V.44)  
 Default: 1, 2  
 Description: Selects V.42bis/V.44 data compression.  
 +DCS=0,0 V.42bis and V.44 data compression are both disabled.  
 +DCS=0,1 V.42bis is disabled; V.44 data compression is acceptable.  
 +DCS=0,2 V.42bis is disabled; V.44 only when connected to a V.92 server.  
 +DCS=1,0 V.42bis is acceptable; V.44 data compression is disabled.  
 +DCS=1,1 V.42bis is acceptable; V.44 data compression is acceptable.  
 +DCS=1,2 V.42bis is acceptable; V.44 only when connected to a V.92 server.  
 +DCS=? Displays the allowed values.  
 +DCS? Displays the current value.

Command: **+DR=*n* V.44 Data Compression Reporting**Values: *n* = 0 or 1

Default: 0

Description: Enables or disables the V.44 data compression report. If the compression report is enabled, the **+DR:<type>** intermediate result code reports the current DCE-DCE data compression type. It is issued after the Error Control Report (**+ER**) and before the final result code (e.g., *CONNECT*). The intermediate result code descriptions are shown after the command descriptions.

+DR=0 Disables the V.44 compression report.

+DR=1 Enables the V.44 compression report.

+DR=? Displays the allowed values.

+DR? Displays the current value.

+DR: NONE Data compression not in use.

+DR: V42B V.42bis is in use in both directions.

+DR: V44 V.44 is in use in both directions.

Command: **+DS44=*n* V.44 Data Compression**

Values: See description

Default: See description

Description: Controls the V.44 data compression function.

The command syntax is **+DS44=[*direction*][,*[0]*][,*[0]*][,*[max\_codewords\_tx]*][,*[max\_codewords\_rx]*][,*[max\_string\_tx]*][,*[max\_string\_rx]*][,*[max\_history\_tx]*][,*[max\_history\_rx]*]]]]]]]]<CR>**  
Subparameters that are not entered retain their current value. Commas separate optional subparameters, and must be inserted to skip a subparameter. Example: **+DS44=,,,2048,2048<CR>** changes the maximum number of code words in both directions, and keeps all other settings at their current values.

+DS44=? Reports supported options in the format (list of supported *direction* values), (0), (0), (list of supported *max\_codewords\_tx* values), (list of supported *max\_codewords\_rx* values), (list of supported *max\_string\_tx* values), (list of supported *max\_string\_rx* values), (list of supported *max\_history\_tx* values), (list of supported *max\_history\_rx* values). Example: **+DS44: (3, 0), (0), (0), (256-2048), (256-2048), (31-255), (31-255), (512-11008), (512-11008).**

+DS44? Reports current options in the following format:  
*direction*, 0, 0, *max\_codewords\_tx*, *max\_codewords\_rx*,  
*max\_string\_tx*, *max\_string\_rx*, *max\_history\_tx*, *max\_history\_rx*.  
Example: **+DS44: 3, 0, 0, 1024, 1024, 255, 255, 5120, 4096.**

**Subparameters**

<i>direction</i>	Specifies the DTE direction of the data compression.
0	No compression.
3	Compression in both directions (default).
<i>max_codewords_tx</i>	Specifies the maximum number of code words to be negotiated in the transmit direction.
1024	Default.
256–2048	Maximum number of code words in transmit direction.
<i>max_codewords_rx</i>	Specifies the maximum number of code words to be negotiated in the receive direction.
1024	Default.
256–2048	Maximum number of code words in receive direction.
<i>max_string_tx</i>	Specifies the maximum string length to be negotiated in the transmit direction.
255	Default.
31–255	Maximum string length in transmit direction.
<i>max_string_rx</i>	Specifies the maximum string length to be negotiated in the receive direction.
255	Default.
31–255	Maximum string length in receive direction.
<i>max_history_tx</i>	Specifies the maximum length of the history buffer to be negotiated in the transmit direction.
5120	Default.
512–11008	History buffer size in transmit direction.
<i>max_history_rx</i>	Specifies the maximum length of the history buffer to be negotiated in the receive direction.
4096	Default.
512–11008	History buffer size in receive direction.

Command: **+ES=*n*** **Enable Synchronous Buffered Mode**

Values: *n* = 6

Default: None

Description: Allows an H.324 video application direct access to the synchronous data channel. On underflow, the modem sends HDLC flag idle (0x7E) to the remote modem. This special error control mode is overridden by any of the following commands: **&F**, **&M**, **&Q**, or **\N**.

+ES=6 Enables direct access to the synchronous data channel.

+ES=? Displays the allowed values.

+ES? Displays the current value.

- Command: **+MS= Modulation Selection**
- Values: See description.
- Defaults: See description.
- Description: This extended-format command selects modulation, enables or disables automode, and specifies the highest downstream and upstream connection rates using one to four subparameters. The command syntax is **+MS=[mod],[automode],[0],[max\_rate],[0],[max\_rx\_rate]]<CR>**. Subparameters that are not entered retain their current value. Commas separate optional subparameters and must be inserted to skip a subparameter. Example: **+MS=,0<CR>** disables automode and keeps other settings at current values.
- +MS=?** Reports supported options in the format (list of supported *mod* values),(list of supported *automode* values),(0),(list of supported *max\_rate* values),(0),(list of supported *max\_rx\_rate* values). Example: **+MS: (BELL103, V21, BELL212A, V22, V22B, V23C, V32, V32B, V34, V90, V92), (0, 1), (0), (0-33600), (0), (0-56000)**
- +MS?** Reports current options in the format *mod, automode, 0, max\_rate, 0, max\_rx\_rate*. Example: **+MS: V92, 1, 0, 31200, 0, 56000.**

### Subparameters

*mod* Specifies the preferred modulation (automode enabled) or the modulation to use in originating or answering a connection (automode disabled). The default is V92.

mod	Modulation	Possible rates (bps) <sup>1</sup>
V92 <sup>2</sup>	V.92	56000, 54666, 53333, 52000, 50666, 49333, 48000, 46666, 45333, 44000, 42666, 41333, 40000, 38666, 37333, 36000, 34666, 33333, 32000, 30666, 29333, or 28000
V90 <sup>3</sup>	V.90	56000, 54666, 53333, 52000, 50666, 49333, 48000, 46666, 45333, 44000, 42666, 41333, 40000, 38666, 37333, 36000, 34666, 33333, 32000, 30666, 29333, or 28000
V34	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
V32B	V.32bis	14400, 12000, 9600, 7200, or 4800
V32	V.32	9600 or 4800
V22B	V.22bis	2400 or 1200
V22	V.22	1200
V23C	V.23	1200
V21	V.21	300
Bell212A	Bell 212A	1200
Bell103	Bell 103	300

#### Notes:

1. See optional <automode>, <max\_rate>, and <max\_RX\_rate> subparameters.
2. Selects V.92 modulation as first priority. If a V.92 connection cannot be established, the modem attempts V.90, V.34, V.32bis, etc.
3. Selects V.90 modulation as first priority. If a V.90 connection cannot be established, the modem attempts V.34, V.32bis, etc.

- automode* An optional numeric value that enables or disables automatic modulation negotiation using V.8 bis/V.8 or V.32 bis Annex A. Automode is disabled if values are specified for the *max\_rate* and *max\_rx\_rate* parameters. The options are:
- 0 Disable automode
  - 1 Enable automode (default)
- max\_rate* An optional number that specifies the highest rate at which the modem may establish an upstream (transmit) connection. The value is decimal coded in units of bps, for example, 33600 specifies the highest rate to be 33600 bps.
- 0 Maximum rate determined by the modulation selected in *mod* (default).
  - 300–33600 Maximum rate value limited by the modulation selected in *mod*. For valid *max\_rate* values for each *mod* value, see the following table.
- | <i>mod</i> value    | Valid max-rate values (bps)   |
|---------------------|---|
| V92, V90, V34       | 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400 |
| V32B                | 19200, 16800, 14400, 12000, 9600, 7200, 4800  |
| V32                 | 14400, 12000, 9600, 7200, 4800  |
| V22B                | 2400  |
| V22, V23C, Bell212A | 1200  |
| V21, Bell103        | 300   |
- max\_rx\_rate* An optional number that specifies the highest rate at which the modem may establish a downstream (receive) connection. The value is decimal coded in units of bps, e.g., 28800 specifies the highest rate to be 28800 bps.
- 0 Maximum rate determined by the modulation selected in *mod* (default).
  - 300–56000 Maximum rate value limited by the modulation selected in *mod*. See “Possible rates” in the *mod* table.

## V.92 Commands

**Command: +PCW=*n* Call Waiting Enable**Values: *n* = 0, 1, or 2

Default: 2

Description: Controls the action to be taken upon detection of a call waiting tone in V.92 mode. Values specified by this command are not modified when an **AT&F** command is issued.**+PCW=0** Toggles V.24 Circuit 125 and collects Caller ID if enabled by +VCID**+PCW=1** Hangs up**+PCW=2** Ignores V.92 call waiting**+PCW=?** Displays the allowed values**+PCW?** Displays the current value**Command: +PIG=*n* PCM Upstream Ignore**Values: *n* = 0 or 1

Default: 1

Description: Controls the use of PCM upstream during V.92 operation. PCM upstream allows faster upload speeds to a V.92 server.

**+PIG=0** Disables PCM upstream**+PIG=1** Enables PCM upstream**+PIG=?** Displays the allowed values**+PIG?** Displays the current value**Command: +PMH=*n* Modem on Hold Enable**Values: *n* = 0 or 1

Default: 1

Description: Controls if modem on hold procedures are enabled during V.92 operation. Normally controlled by a modem on hold program. Values specified by this command are not modified when an **AT&F** command is issued.**+PMH=0** Enables V.92 modem on hold**+PMH=1** Disables V.92 modem on hold**+PMH=?** Displays the allowed values**+PMH?** Displays the current value**Command: +PMHF V.92 Modem Hook Flash**

Values: n/a

Default: n/a

Description: Causes the DCE to go on-hook for a specified period of time, and then return off-hook for at least a specified period of time. The specified period of time is normally one-half second, but may be governed by national regulations. "ERROR" is returned if MOH is not enabled.

**Command: +PMHR=*n* Modem on Hold Initiate**Values: *n* = 0–13

Default: 0

Description: **+PMHR** is an action command that causes the modem to initiate MOH with the central site modem. It returns the following values to indicate what has been negotiated. Valid only if MOH is enabled and the modem is off-hook or in data mode. Otherwise, *ERROR* will be returned.

+PMHR=0	Deny MOH request
+PMHR=1	Grant MOH request with 10 second timeout
+PMHR=2	Grant MOH request with 20 second timeout
+PMHR=3	Grant MOH request with 30 second timeout
+PMHR=4	Grant MOH request with 40 second timeout
+PMHR=5	Grant MOH request with 1 minute timeout
+PMHR=6	Grant MOH request with 2 minute timeout
+PMHR=7	Grant MOH request with 3 minute timeout
+PMHR=8	Grant MOH request with 4 minute timeout
+PMHR=9	Grant MOH request with 6 minute timeout
+PMHR=10	Grant MOH request with 8 minute timeout
+PMHR=11	Grant MOH request with 12 minute timeout
+PMHR=12	Grant MOH request with 16 minute timeout
+PMHR=13	Grant MOH request with indefinite timeout
+PMHR=?	Displays the allowed values
+PMHR?	Displays the current value

**Command: +PMHT=*n* Modem on Hold Timer**Values: *n* = 0–13

Default: 0

Description: Determines if the modem will accept a V.92 Modem on Hold (MOH) request and will set the MoH timeout.

+PMHT=0	Deny MOH request
+PMHT=1	Grant MOH request with 10 second timeout
+PMHT=2	Grant MOH request with 20 second timeout
+PMHT=3	Grant MOH request with 30 second timeout
+PMHT=4	Grant MOH request with 40 second timeout
+PMHT=5	Grant MOH request with 1 minute timeout
+PMHT=6	Grant MOH request with 2 minute timeout
+PMHT=7	Grant MOH request with 3 minute timeout
+PMHT=8	Grant MOH request with 4 minute timeout
+PMHT=9	Grant MOH request with 6 minute timeout
+PMHT=10	Grant MOH request with 8 minute timeout
+PMHT=11	Grant MOH request with 12 minute timeout
+PMHT=12	Grant MOH request with 16 minute timeout
+PMHT=13	Grant MOH request with indefinite timeout
+PMHT=?	Displays the allowed values
+PMHT?	Displays the current value

Command: **+PQC=*n* Quick Connect Control**  
 Values: *n* = 0, 1, 2, or 3  
 Default: 3  
 Description: Controls the V.92 shortened Phase 1 and Phase 2 startup procedures (Quick Connect). When line conditions are stable, quick connect results in shortened connect times; however, significant fluctuation in line conditions from call to call can result in longer connect times, in which case it may be advisable to disable quick connect.

+PQC=0 Enables Short Phase 1 and Short Phase 2 (Quick Connect)  
 +PQC=1 Enables Short Phase 1  
 +PQC=2 Enables Short Phase 2  
 +PQC=3 Disables Short Phase 1 and Short Phase 2  
 +PQC=? Displays the allowed values  
 +PQC? Displays the current value

## Other Commands

Command: **+VCID=*n* Caller ID Selection**  
 Values: *n* = 0, 1, or 2  
 Default: 0  
 Description: Enables Caller ID detection and configures the reporting and presentation of the Caller ID data that is detected after the first ring. The reported data includes the date and time of the call, the caller's name and number, and a message. Set S0=2.

+VCID=0 Disables Caller ID  
 +VCID=1 Enables Caller ID with formatted data  
 +VCID=2 Enables Caller ID with unformatted data  
 +VCID=? Displays the allowed values  
 +VCID? Displays the current value

Command: **+VDR=*x*, *y* Distinctive Ring Report**  
 Values: *x* = 0, 1 *Distinctive Ring report control.*  
*y* = 0–255 *Minimum ring interval in 100 ms units.*  
 Default: 0, 0  
 Description: Enables reporting of ring cadence information to the DTE and specifies the minimum ring cadence that will be reported. The report format is one line per silence period and one line per ring period. The length of the silence period is in the form *DROF=number in units of 100 ms<CR><LF>*, and the length of the ring is in the form *DRON=number in units of 100 ms<CR><LF>*. The modem may produce a Ring event code after the DRON message if enabled by the *y* parameter. The *y* parameter must be set to a value equal to or smaller than the expected ring cadence in order to pass the report to the DTE.

+VDR=0, n/a Disables Distinctive Ring cadence reporting.  
 +VDR=1, 0 Enables Distinctive Ring cadence reporting. Other call progress result codes (including *RING*) are reported as normal.  
 +VDR=1, >0 Enables Distinctive Ring cadence reporting. The *RING* result code is reported after the falling edge of the ring pulse (i.e., after the DRON report).  
 +VDR=? Displays the allowed values.  
 +VDR? Displays the current value.

## Escape Commands

Command: **+++AT<CR> Escape Sequence**

Values: n/a

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

Command: **%%%AT<CR> Remote Configuration Escape Sequence**

Values: n/a

Description: Initiates remote configuration mode while online with remote modem. The remote configuration escape character (%) is defined in register **S13**.

## DID Commands

The MT5634ZBA-DID modem uses **\*D** commands to configure the modem's DID features. The modem must be configured for the proper protocol, digit format, digit time out, digit report format, and number of digits. This configuration is determined by the company from which the DID line is ordered and the setup used by the phone company. The DID configuration parameter settings of the modem can be viewed as part of the report of the **AT&V** command and can be stored with the **AT&W0** command.

### MT5634ZBA-DID Initialization Recommendations

Since the MT5634ZBA-DID can be processing a DID call before signaling the DTE, care must be taken to avoid unexpected call problems.

The first command of an initialization string should probably busy out the DID line. This will allow calls to rollover to other trunk lines in a trunk system or receive a busy signal in a single-line system. This will also avoid problems such as missing the incoming DID number information or causing a character abort of the incoming call after the DID information has been received.

Conversely, the last command to give the modem should be the **AT\*DS** configuration command putting the modem back in service and ready to receive incoming DID calls.

A check has been put in the **AT&F** command to determine if the modem has started a DID call. If the modem has started a DID call, it will respond to an **AT&F** command with an **ERROR** response and not process the **AT&F**.

The **AT\*DW** command can be used to keep a modem "Off Hook" or busied out at the completion of a DID call so the modem can be initialized without the concern of corrupting an incoming call.

### Commands:

Command:	<b>*DS</b>	<b>Start Protocol</b>
Values:		$n = 0, 1, 2$ or $3$
Default:		$0$
Description:		<p>Three DID start protocols: Wink, Immediate, and Delay Dial:</p> <p>In the <b>Wink Start protocol</b>, the central office closes the loop and draws current. The modem senses the current draw and will reverse the DC polarity for a short pulse to signal that it sees the incoming call and is ready to accept the DID digits.</p> <p><b>Delay Dial</b> is the same as Wink Start except that the length of the reverse pulse is not defined. When the DID modem senses the current draw, it reverses the DC voltage until it is ready to receive the DID digits.</p> <p>On an <b>Immediate Start</b> DID line, the central office closes the loop for a short time and then sends the DID digits without waiting for a response from the DID modem.</p> <p>After the central office sends the DID digits all three lines operate the same way. The modem will reverse the DC polarity to signal the beginning of the call and the central office will open the channel to the caller and begin billing. When the call is completed, the DID modem will return the DC voltage to normal polarity and the central office will open the circuit.</p> <p>While the modem is monitoring the DID line for current draw, it is also monitoring the POTS line for incoming rings.</p>
	<b>*DS0</b>	Disables DID detection of incoming DID calls (DC voltage still applies to DID line, but polarity is reversed to busy out line).
	<b>*DS1</b>	Wink Start
	<b>*DS2</b>	Immediate Start
	<b>*DS3</b>	Delay Dial

Command:	<b>*DT</b>	<b>Wait for Digit Time-Out Time</b>
Values:		$n = 0, 1, 2$ or 3
Default:		0
Description:		This command is used to configure the time between each digit the modem will wait. If the modem has not received the proper number of digits when the timer expires, it will report the digits it has received so far and move on to the answering sequence described in the <b>*DN</b> command.
Command:	<b>*DN</b>	<b>Number of DID Digits Expected</b>
Values:		0-7
Default:		0
Description:		This command is used to configure the modem for the expected number of digits from the central office (the central office will send the last few digits of the called number). When the proper number of digits are received, the modem will pass the digit information to the host computer. After passing the digits the modem will answer the incoming call if S0 is greater than 0. Otherwise the modem will wait for the host computer to issue an ATA command.
Command:	<b>*DW</b>	<b>Busy-Out Timer at End of Call</b>
Values:		0-255
Default:		0
Description:		This command defines the amount of time to busy out the modem upon disconnecting from a DID call. The delay is ended when the timer runs out or a <b>*DS</b> command is received. <b>*DW0</b> This command <i>disables</i> the delay. It ends the delay, but it also places the DID line a busy-out state. <b>*DW255</b> This command will extend the delay indefinitely.

### About the Busy-Out Features and Functions

A Direct Inward Dial (DID) line can be put in a "Busy Out" state by reversing the battery polarity the modem supplies to the line. This will cause a caller to receive either a busy signal in a single line system or roll over to the next line in a trunk system.

The line is busied out in the following cases.

- Modem is set to the factory default DID start format **\*DS0**
- Modem receives an incoming ring on the POTS line
- Modem is given the dial command **ATD**
- Modem is set with the **\*DW** command to busy-out delay after finishing a call

Command:	<b>*DD</b>	<b>Digit Format</b>
Values:		0, 1, 2
Default:		0
Description:		This command is used to configure the modem for the format the central office will send the incoming digits. At this time, only DTMF is supported. <b>*DD0</b> DTMF <b>*DD1</b> Pulse <b>*DD2</b> MF (MultiFrequency)

Command:	<b>*DF</b>	<b>Format for Reporting Incoming DID Number</b>
Values:	0, 1, 2	
Default:	0	
Description:	This command allows for three different reporting formats of the incoming number information. This information is output when either the proper number of digits have been received or the time out timer has expired and before the modem answers the call. When set to <b>*DFI</b> , the modem will output one line for every digit received. For the other formats, the modem will only output one line per call.	
	<b>*DF0</b>	"DID:xxx" - Default
	<b>*DF1</b>	"DTMFx" for each digit
	<b>*DF2</b>	"RINGxxx"

## Example Sessions

```
[15:31:29.100] AT+FCLASS=0
[15:31:29.100]
[15:31:29.100] OK
[15:31:29.160] AT*DS1*DD0*DF0*DN4*DT15
[15:31:29.160]
[15:31:29.160] OK
[15:31:29.160] ATSO=1
[15:31:29.160]
[15:31:29.160] OK
[15:31:40.800]
[15:31:40.800] DID:5980
[15:31:54.920] [DCD]
[15:31:54.920] CONNECT 28800 V42bis
[15:32:00.850] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:00.850] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:00.850] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:06.780] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:06.830] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:12.600] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:12.660] 1234567890ABCDEFGHIJKLMN0PQRSTUVWXYZabcdefghijklmnopqrstuvwxy
[15:32:12.710] +++ATH
[15:32:12.730] [dcd]
[15:32:12.730] NO CARRIER

[15:26:39.260] AT+FCLASS=0
[15:26:39.260]
[15:26:39.260] OK
[15:26:39.260] AT*DS1*DD0*DF1*DN4*DT15
[15:26:39.260]
[15:26:39.260] OK
[15:26:39.310] ATSO=1
[15:26:39.310]
[15:26:39.310] OK
[15:26:52.440]
[15:26:52.440] DTMF5
```

[15:26:52.500] DTMF9  
[15:26:52.500] DTMF8  
[15:26:52.500] DTMF0  
[15:27:06.610] [DCD]  
[15:27:06.610] CONNECT 31200 V42bis  
[15:27:07.990] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.040] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.040] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.040] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.100] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.260] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.420] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.420] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.480] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:08.480] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:27:24.680] +++ATH  
[15:27:24.850] [dcd]  
[15:27:25.400] NO CARRIER

[15:29:14.420] AT+FCLASS=0  
[15:29:14.420]  
[15:29:14.420] OK  
[15:29:14.480] AT\*DS1\*DD0\*DF2\*DN4\*DT15  
[15:29:14.480]  
[15:29:14.480] OK  
[15:29:14.480] ATSO=1  
[15:29:14.530]  
[15:29:14.530] OK  
[15:29:25.960]  
[15:29:25.960] RING5980  
[15:29:40.130] [DCD]  
[15:29:40.130] CONNECT 28800 V42bis  
[15:29:41.500] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.500] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.560] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.560] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.560] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.610] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.610] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.670] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.670] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.670] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:41.670] 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz  
[15:29:58.140] +++ATH  
[15:29:58.310] [dcd]  
[15:29:58.860] NO CARRIER

## S-Registers

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

Register	Unit	Range	Default	Description
<b>S0</b>	1 ring	0–255	1	Sets the number of rings until the modem answers. <b>ATS0=0</b> disables autoanswer completely. Range varies by country. Set S0=2 for Caller ID.
<b>S1</b>	1 ring	0–255	0	Counts the rings that have occurred.
<b>S2</b>	decimal	0–255	43 (+)	Sets ASCII code for the escape sequence character. Values greater than 127 disable escape.
<b>S3</b>	decimal	0–127	13 (^M)	Sets the ASCII code for the carriage return character.
<b>S4</b>	decimal	0–127	10 (^J)	Sets the ASCII code for line feed character.
<b>S5</b>	decimal	0–127	8 (^H)	Sets the ASCII code for the backspace character. Values over 32 disable it.
<b>S6</b>	seconds	2–65*	2*	Sets the time the modem waits after it goes off-hook before it begins to dial the telephone number.
<b>S7</b>	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.
<b>S8</b>	seconds	2–65	2	Sets the length of a pause caused by a comma character in a dialing command.
<b>S9</b>	decimal	0–127	37 (%)	Sets ASCII code for remote configuration escape character. <b>S9=0</b> disables remote configuration.
<b>S10</b>	100 ms	1–255	20	Sets how long a carrier signal must be lost before the modem disconnects.
<b>S11</b>	1 ms	50–150*	95*	Sets spacing and duration of dialing tones.
<b>S18</b>	50 ms	0–255	20	Sets the time the CD signal drops before going high again. Used for some PBX and CBX phone systems. See <b>&amp;C2</b> command.
<b>S28</b>	decimal	0, 1–255	1	0 disables, 1–255 enables V.34 modulation.
<b>S30</b>	1 minute	0, 1–255	0	Sets the time the modem waits before it disconnects when no data is sent or received. A value of zero disables the timer. See also the <b>\T</b> command
<b>S35</b>	decimal	0–1	0	0 disables, 1 enables the V.25 data calling tone, which allows remote data/fax/voice discrimination.

<b>S36</b>	decimal	0–7	7	Specifies the action to take in the event of a negotiation failure when error control is selected. (See <b>S48</b> .)
<b>S37</b>	decimal	0–19	0	Sets the maximum V.34 “upstream” speed at which the modem attempts to connect. <b>Value Speed</b> 0 maximum modem speed 1 reserved 2 1200/75 bps 3 300 bps 4 reserved 5 1200 bps 6 2400 bps 7 4800 bps 8 7200 bps 9 9600 bps 10 12000 bps 11 14400 bps 12 16800 bps 13 19200 bps 14 21600 bps 15 24000 bps 16 26400 bps 17 28800 bps 18 31200 bps 19 33600 bps
<b>S38</b>	decimal	0–23	1	Sets the maximum 56K “downstream” speed at which the modem attempts to connect. The default maximum speed is 56K bps. <b>Note:</b> When using V.34 or V.32 client-to-client connections in poor conditions, setting <b>S38=0</b> may result in better performance. <b>Value Rate</b> 0 56K disabled 1 56K autorate 2 28000 bps 3 29333 bps 4 30666 bps 5 32000 bps 6 33333 bps 7 34666 bps 8 36000 bps 9 37333 bps 10 38666 bps 11 40000 bps 12 41333 bps 13 42666 bps 14 44000 bps 15 45333 bps 16 46666 bps

17	48000 bps
18	49333 bps
19	50666 bps
20	52000 bps
21	53333 bps
22	54666 bps
23	56000 bps

**S42** decimal 0–1 1 Enables/disables the 56K auto rate. When 56K auto is disabled, fallback to V.34 is also disabled. 0 = disable; 1 = enable.

**S48** decimal 7 or 128 7 Enables (7) or disables (128) LAPM negotiation. The following table lists the **S36** and **S48** configuration settings for 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

**S89** seconds 0, 5–255 0 Sets the length of time in the off-line command mode before the modem goes into standby mode. A value of zero prevents standby mode; a value of 1–4 sets the value to 5.

**S108** decimal 0–3, 6, 7 6 Selects the 56K digital loss if using the modem thru a PBX line. The default value is -6 dB loss, the value used when calling from a typical POTS line long distance.

**Value Digital loss**

0	-0 dB digital loss, no robbed-bit signaling
1	-3 dB PBX digital loss
2	-2 dB digital loss
3	-3 dB digital loss
6	-6 dB digital loss
7	-0 dB digital loss with robbed-bit signaling

## Result Codes

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

Terse	Verbose	Description
0	OK	Command executed
1	CONNECT	Modem connected to line
2	RING	Ring signal detected
3	NO CARRIER	Carrier signal lost or not detected
4	ERROR	Invalid command
5	CONNECT 1200 *	Connected at 1200 bps
6	NO DIALTONE	No dial tone detected
7	BUSY	Busy signal detected
8	NO ANSWER	No answer at remote end
10	CONNECT 2400 *	Connected at 2400 bps
11	CONNECT 4800 *	Connected at 4800 bps
12	CONNECT 9600 *	Connected at 9600 bps
13	CONNECT 14400 *	Connected at 14400 bps
14	CONNECT 19200 *	Connected at 19200 bps
24	CONNECT 7200 *	Connected at 7200 bps
25	CONNECT 12000 *	Connected at 12000 bps
26	CONNECT 16800 *	Connected at 16800 bps
40	CONNECT 300 *	Connected at 300 bps
55	CONNECT 21600 *	Connected at 21600 bps
56	CONNECT 24000 *	Connected at 24000 bps
57	CONNECT 26400 *	Connected at 26400 bps
58	CONNECT 28800 *	Connected at 28800 bps
59	CONNECT 31200 *	Connected at 31200 bps
60	CONNECT 33600 *	Connected at 33600 bps
70	CONNECT 32000 *	Connected at 32000 bps, 56K rate
71	CONNECT 34000 *	Connected at 34000 bps, 56K rate
72	CONNECT 36000 *	Connected at 36000 bps, 56K rate
73	CONNECT 38000 *	Connected at 38000 bps, 56K rate
74	CONNECT 40000 *	Connected at 40000 bps, 56K rate
75	CONNECT 42000 *	Connected at 42000 bps, 56K rate
76	CONNECT 44000 *	Connected at 44000 bps, 56K rate
77	CONNECT 46000 *	Connected at 46000 bps, 56K rate
78	CONNECT 48000 *	Connected at 48000 bps, 56K rate
79	CONNECT 50000 *	Connected at 50000 bps, 56K rate
80	CONNECT 52000 *	Connected at 52000 bps, 56K rate
81	CONNECT 54000 *	Connected at 54000 bps, 56K rate
82	CONNECT 56000 *	Connected at 56000 bps, 56K rate
88	DELAYED	Delay is in effect for the dialed number
89	BLACKLISTED	Dialed number is blacklisted
90	BLACKLIST FULL	Blacklist is full

\* When the extended result code configuration option is enabled, one of the following codes is appended to the result code, depending on the type of error control connection:

V42bis – V.42 error control (LAP-M) and V.42bis data compression

V42 – V.42 error control (LAP-M) only

MNP5 – MNP 4 error control and MNP 5 data compression

MNP4 – MNP 4 error control only

NoEC – No error control protocol

100	CONNECT 28000 *	Connected at 28000 bps, 56K rate
101	CONNECT 29333 *	Connected at 29333 bps, 56K rate
102	CONNECT 30666 *	Connected at 30666 bps, 56K rate
103	CONNECT 33333 *	Connected at 33333 bps, 56K rate
104	CONNECT 34666 *	Connected at 34666 bps, 56K rate
105	CONNECT 37333 *	Connected at 37333 bps, 56K rate
106	CONNECT 38666 *	Connected at 38666 bps, 56K rate
107	CONNECT 41333 *	Connected at 41333 bps, 56K rate
108	CONNECT 42666 *	Connected at 42666 bps, 56K rate
109	CONNECT 45333 *	Connected at 45333 bps, 56K rate
110	CONNECT 46666 *	Connected at 46666 bps, 56K rate
111	CONNECT 49333 *	Connected at 49333 bps, 56K rate
112	CONNECT 50666 *	Connected at 50666 bps, 56K rate
113	CONNECT 53333 *	Connected at 53333 bps, 56K rate
114	CONNECT 54666 *	Connected at 54666 bps, 56K rate
115	CONNECT 25333 *	Connected at 25333 bps, 56K rate
116	CONNECT 26666 *	Connected at 26666 bps, 56K rate

\* When the extended result code configuration option is enabled, one of the following codes is appended to the result code, depending on the type of error control connection:

*V42bis* – V.42 error control (LAP-M) and V.42bis data compression

*V42* – V.42 error control (LAP-M) only

*MNP5* – MNP 4 error control and MNP 5 data compression

*MNP4* – MNP 4 error control only

*NoEC* – No error control protocol

## Chapter 5 - Remote Configuration

Remote configuration is a network management tool that allows you to configure modems anywhere in your network from one location. With password-protected remote configuration, you can issue AT commands to a remote MT5634ZBA-DID modem for maintenance or troubleshooting as if you were on site.

### Basic Procedure

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

1. Establish a data connection with a remote MT5634ZBA-DID modem.
2. Send three remote configuration escape characters followed by **AT** and the setup password, and press ENTER. Example: **%%%ATMTSMODEM**. You have four tries to enter the correct password before being disconnected. If the password is correct, the remote modem responds with **OK**.
3. You can now send AT commands to configure the remote modem.
4. When you have finished configuring the remote modem, save the new configuration by typing **AT&W0**, and pressing **Enter**.
5. Type **ATO** and press **Enter** to exit remote configuration. You can then break the connection in the normal way.

**CAUTION:** If you hang up while you are in remote configuration mode, it may lock up the remote modem.

### Setup

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

### Changing the Setup Password

1. Open a data communications program such as Phone Tools or HyperTerminal.
2. In the terminal window, type **AT#SMTSMODEM** (or **AT#Sxxxxxxx** if you have replaced the MTSMODEM password with xxxxxxxx) and press ENTER. The modem responds with **OK** if the setup password is correct, and **ERROR** if it is wrong.
3. To change the password, type **AT#S=xxxxxxx**, where xxxxxxxx stands for the password, and press ENTER. The password can include any keyboard character, and must be one to eight characters long. The modem responds with **OK**.
4. The new password is saved automatically. You can now either enter more AT commands or exit the data communications program. The next time you remotely configure the modem you must use the new setup password.

**Note:** You can only change the setup password locally; you cannot do it remotely. Also, passwords are case sensitive. The next time you enter the password, it must be in the same case as you set it up.

## Changing the Remote Escape Character

To increase security, you can change a remote modem's remote configuration escape character. The remote configuration escape character is stored in register **S9**. The factory default is 37, which is the ASCII code for the percent character (%). Setting **S9** to 0 (zero) disables remote configuration entirely—but if you do this remotely, you won't be able to change it back remotely!

1. Establish a remote configuration link with the remote modem as described in "Basic Procedure."
2. Type **ATS9=*n***, where *n* is the ASCII code for the new remote configuration escape character, then press ENTER.
3. Save the new value by typing **AT&W** and pressing ENTER.
4. Type **ATO<CR>** to exit remote configuration.

# Chapter 6 - Troubleshooting

Your modem was thoroughly tested at the factory before it was shipped. If you are unable to make a successful connection, or if you experience data loss or garbled characters during your connection, it is possible that the modem is defective. However, it is more likely that the source of your problem lies elsewhere. The following symptoms are typical of problems you might encounter:

- None of the LEDs light when the modem is on.
- The modem does not respond to commands.
- The modem dials but is unable to make a connection.
- The modem disconnects while online.
- The modem cannot connect when answering.
- The modem doesn't work with Caller ID.
- Fax and data software can't run at the same time.

If you experience problems, please check the following possibilities before calling Technical Support (see [Appendix E](#)).

## None of the Indicators Light

When you plug in the modem, the Power LED should come on. After the operating system detects and configures the modem, the TR LED should come on.

- If the Power LED does not come on, double check the cable connections.
- If the TR LED does not come on, check to see that the software from the installation disk has been installed (see [Chapter 2, Step 3](#)).

## The Modem Does Not Respond to Commands

- Make sure you are issuing the modem commands from the data communications software, either manually in terminal mode or automatically by configuring the software. (You cannot send commands to the modem from the DOS prompt.)
- Make sure you are in terminal mode in your data communications program, then type **AT** and press ENTER. If you get an *OK* response, your connections are good and the problem likely is in the connect setup in your communications software.
- Try resetting your modem by unplugging the DID cable from the modem, and then plugging it back in.
- Try rebooting the computer.
- The modem might 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 [Appendix E](#)).

## The Modem Dials But Cannot Connect

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

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

You can narrow the list of possibilities by using extended result codes. Extended result codes are enabled by default. If they have been disabled, 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.

- If the modem reports *NO DIALTONE*, check that the modem's telephone line cable is connected to both the modem's LINE jack (not the PHONE jack) and the telephone wall jack. If the cable looks secure, try replacing it. If that doesn't work, the problem might be in your building's telephone installation. To test the building installation, plug a telephone into your modem's telephone wall jack and listen for a dial tone. If you hear a dial tone, your modem might be installed behind a company phone system (PBX) with an internal dial tone that sounds different from the normal dial tone. In that case, the modem might not recognize the dial tone and might treat it as an error. Check your PBX manual to see if you can change the internal dial tone; if you can't, change your modem's initialization string to replace **X4** with **X3**, which will cause the modem to ignore dial tones (note, however, that **X3** is not allowed in some countries, such as France and Spain).
- If the modem reports *BUSY*, the other number might be busy, in which case you should try again later, or it might indicate that you have failed to add a **9**, prefix to the phone number if you must dial *9* for an outside line.

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

To change the dial prefix in Windows 98 HyperTerminal, select **Call** from the **Call** menu, click **Dialing Properties**, and type **9** in the local and long distance boxes in **How I dial from this location**.

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

## The Modem Disconnects While Online

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

You can automatically disable Call Waiting by including the disabling code in the modem's dial prefix (e.g., **ATDT\*70**,—note the comma, which inserts a pause before the number is dialed). To change the dial prefix in Windows 98 HyperTerminal, select **Call** from the **Call** menu, click **Dialing Properties**, check **This location has Call Waiting**, and select the correct code for your phone service.

- If you have extension phones on the same line as your modem, you or someone else can interrupt the connection by picking up another phone. If this is a frequent problem, disconnect the extension phones before using the modem, or install another phone line especially for the modem.
- Check for loose connections between the modem and the computer and the telephone jack.
- You might have had a poor connection because of line conditions or the problem might have originated on the other end of the line. Try again.
- If you were online with an online service, it might have hung up on you because of lack of activity on your part or because you exceeded your time limit for the day. Try again.

## The Modem Cannot Connect When Answering

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

## The Modem Doesn't Work with Caller ID

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

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

- Communications devices can be accessed by only one application at a time. In Windows 98, you can have data and fax communication applications open at the same time, but they cannot use the same modem at the same time.

## DID Troubleshooting

- Make sure that the MT5634ZBA-DID parameters match the DID line. Refer to the \*D command. Also, verify that your fax software is configured to match the analog DID trunk line and the MT5634ZBA-DID parameters.
- If callers are receiving an immediate busy signal or are allowed a short connection but become unexpectedly disconnected after a short time, try reversing the TIP and RING wires. The central office is sensitive to the DC polarity and this will reverse the polarity.
- If the MT5634ZBA-DID line is out of service, verify that the DC voltage is being applied by the MT5634ZBA-DID to the DID line. This voltage should be applied to the line at all times, even when the PC is not in use. The central office will check the line occasionally and if a voltage is not sensed, the line may be put out of service. If this has occurred, call the phone company to get the line back in service. Be sure to have you DID line information available.
- Note that the DID and POTS ports on the MT5634ZBA-DID **cannot** operate simultaneously. You can use only one port at a time since they share common circuitry within the modem.
- If the MT5634ZBA-DID is totally inoperational, verify that the power supply shipped with modem is connected properly to the modem and the wall outlet.

**Important:** Use the power source shipped with your modem. If you use any other power source, you could damage the MT5634ZBA-DID and void the warranty.

# Appendix A – Regulatory Compliance

## FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.
2. The suitable USOC jack (Universal Service Order Code connecting arrangement) for this equipment is shown below. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See installation instructions for details.
4. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company.
5. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
6. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
7. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
9. This equipment should not be used on party lines or coin lines.
10. If so required, this equipment is hearing-aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Trade Name:	MultiModem
Model Number:	MT5634ZBA-DID
FCC Registration No:	AU7USA-25665-MM-E
Ringer Equivalence No:	0.4B
Modular Jack (USOC):	RJ11C or RJ11W (single line)
Service Center:	Multi-Tech Systems, Inc. 2205 Wooddale Drive Mounds View, MN 55112 U.S.A (763) 785-3500 Phone (763) 785-9874 Fax

## FCC Part 15

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

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

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

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

## Fax Branding Statement

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

- Date and time the message is sent
- Identification of the business or other entity, or other individual sending the message
- Telephone number of the sending machine or such business, other entity, or individual

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

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

## Canadian Limitations Notice

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

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

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

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

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

## Industry Canada

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

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

## Appendix B – Technical Specifications

Your MultiModemZBA-DID fax modem meets the following specifications:

<b>Trade Name</b>	MultiModem™
<b>Model Number</b>	MT5634ZBA-DID
<b>Fax</b>	
Standards:	Super G3 V.34/33.6K bps; V.17/14.4Kbps, V.29, V.27ter, V.21, T.30, T.30 Annex A, T.30 Annex F, T.31, T.31 Annex B, T.32 Annex C, TR29.2 Class 2 Recommendation
Rates:	33.6K, 31.2K, 28.8K, 26.4K, 24K, 21.6K, 19.2K, 16.8K, 14.4K, 12K, 9600, 7200, 4800, 2400, 300 bps
Error Correction:	V.42, ECM
Compression:	MH (T.4), MR (T.4), & MMR (T.6)
Conversion:	Real time (on-the-fly) compression conversion
Commands:	Class 1, 2, 1.0, 2.0, 2.1
Service Types:	Wink-start; immediate-start; delay dial
Signaling Types:	DTMF (1-7 digits accepted)
<b>Data</b>	
Rates:	V.92/56K, V.90/56K, enhanced V.34/33.6K & others
Error Correction:	V.42 & MNP®
Data Compression:	V.44, V.42bis, MNP® Class 5
<b>Physical Description</b>	
	4.3" w × 1.0" h × 5.7" d; 8 oz (10.9 cm × 2.5 cm × 14.5 cm; 227g)
<b>Weight</b>	224 g (8 oz)
<b>Approvals</b>	
	EMC: FCC Part 15 Class B Safety: UL, cUL, UL60950 Telecom: FCC Part 68, CS03
<b>Modem Compatibility</b>	
	56K; ITU-T V.34 enhanced, V.34, V.32terbo, V.32bis, V.32, V.22bis, V.22; Bell 212A and 103/113; ITU-T V.29, V.42, V.42bis; ITU-T V.21 & V.23 in international versions
<b>Fax Compatibility</b>	
	ITU-T Group 3, Class 1 and 2, T.4, T.30, V.21, V.27ter, V.29, V.17, and TIA/EIA TR29.2
<b>Flow Control</b>	
	XON/XOFF (software), RTS/CTS (hardware)
<b>Command Buffer</b>	
	40 characters
<b>Frequency Stability</b>	
	±0.01%
<b>Receiver Sensitivity</b>	
	-43 dBm under worst-case conditions
<b>AGC Dynamic Range</b>	
	43 dB
<b>Cables</b>	
	Two RJ-11s (LINE jack and PHONE jack) One RJ-12 (DID line) One DB9 (serial port)
	<b>Note:</b> Any cables connected to the computer should be shielded to reduce interference.
<b>Environmental</b>	
	Temperature range 0°–50°C (32°–120°F); humidity range 20–90% (non-condensing)
<b>Limited Warranty</b>	
	2 years

# Appendix C - Upgrading the Modem's Firmware

## Upgrade Overview

1. Identify your modem's model number and firmware version.
2. Identify the current version of the firmware at the Multi-Tech Web site. If your modem already has current firmware, there is no need to install it.
3. Download the upgrade file and the appropriate Flash Wizard for your modem.
4. Install the Flash Wizard and extract the firmware .HEX file from you the file you downloaded.
4. If the firmware version number matches the firmware version number found in "Step 1: Identify the Modem Firmware," you have the current firmware version and do not need to be update.
5. Document and clear your stored parameters.
6. Upgrade the firmware using the .HEX file and the Flash Wizard.
7. Restore your parameters.

## Step 1: Identify Your Modem's Number and Firmware

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

1. Run your favorite terminal program. If you are using Windows 95 or above, you can use Windows Hyperterminal.
2. In the program's terminal window, type AT&F. Even if you cannot see the AT&F command on your screen, be sure to type it completely, and then press Enter. If the modem does not respond with OK, repeat the AT&F command.
3. Now type ATI, press Enter. The model number and firmware version should appear. Record these results.

## Step 2: Identify the Current Firmware Version

1. Using your favorite Web browser, go to <http://www.multitech.com/support/MultiModemZBA/firmware.asp>
2. Scroll down to your modem model number.
3. Look at the firmware version number for your modem.
4. If the firmware version number matches the firmware version number found in Step 1, you have the current firmware version and do not need to update.
5. If the firmware version is greater than the one found in Step 1, your modem has an older version of firmware. Continue with **Step 6**.

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

## Step 3: Download the Upgrade File

1. If you are not already at the MultiModemZBA Firmware page of the Multi-Tech Web site, follow the procedure in "Step 2: Identify the Current Firmware."
2. Download the upgrade file for your modem by clicking its name, and save the file in a temporary folder on your hard disk.
3. In the same section of the Web page, click the Flash Wizard utility for your operating system to download it, and save it in the same folder.

### Step 4: Extract the Upgrade Files

1. Install the Flash Wizard utility by double-clicking the file name in Windows Explorer.
2. Extract the upgrade files by double-clicking the file name. The extracted files include a .HEX file, which contains the upgrade data, and a Readme file.
3. Copy the upgrade .HEX file into the Flash Wizard folder, which, in a default installation, is at C:\Program Files\MultiTech Systems\Flash Wizard\.

### Step 5: Clear Your Stored Parameters

Before you flash your modem, you should record the parameters that are currently stored in it, so you can reprogram it after flashing. After you have recorded them, send the **AT&W1Z** command to the modem to clear the stored parameters.

1. Run your favorite terminal program. If you are using Windows 95 or above, you can use Windows HyperTerminal.
2. In the program's terminal window, type **AT&V** and press ENTER to list your modem's current parameters.
3. Record your parameters by saving the screens and sending them to your printer.
4. Type **AT&W1Z** and press ENTER to clear your stored parameters and reset your modem to factory default.
5. Close the terminal program.

### Step 6: Upgrade the Modem's Firmware

Before you begin the following procedure, read the README.TXT file extracted from the upgrade archive file. Note the file name for the new firmware (example: ARQG125A.HEX).

**Warning:** Never install an older version of firmware over a newer version. Doing this WILL DESTROY THE FLASH PROM! If the flash PROM is destroyed, the modem must be sent in for repair.

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

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

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

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

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

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

5. When the flash upgrade is complete, the message *Programming Complete* appears. Click **Next** to continue.
6. The **Results** dialog box appears next. Click **Finish** to exit Flash Wizard.

### Step 7: Restore Your Parameters

Your modem has been updated. You can now open your terminal program to reprogram your modem parameters or to confirm the update by typing **ATI** in the terminal window and pressing ENTER.

# Appendix D - Installing a Modem Under Linux

## Introduction

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

## Standard Linux Serial Port Definitions

PC port Linux port

Com1 ttyS0

Com2 ttyS1

Com3 ttyS2

Com4 ttyS3

## Installation

Connect the external modem to an available serial port.

## Setup

This section describes how to make sure Linux can talk to the modem and be able to dial up to the Internet. Linux can use different programs and desktops depending on who made the Linux operating system and what version it is. The following procedures use the most commonly installed components of Red Hat 6.2. More information can be found in your Linux OS owner's manual.

### *Using the Terminal Program Minicom to Verify Operation*

1. At the command prompt, type **minicom -s** and press **ENTER**.
2. Select **Serial port setup** and press **ENTER**.
3. From **Serial port setup**, use the **A** key to access **Serial Device**, and then press **ENTER**.
4. Press **Esc**.
5. You are now in the Minicom terminal. Type **AT** and press **ENTER**. The screen should display **OK** to verify the operation. Alternately, dial a phone number to verify line operation.
6. To leave Minicom, press **CTRL + A**, and then press **Z**.
7. On the help menu, press **X** to exit.

### *Using the Modem to Call the Internet*

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

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.
2. Select **Internet** from the menu.
3. Select **Dialup Configuration Tool**.
4. Select **Add**, and then click **Next**.
5. Enter the connection name and phone number, and then click **Next**.
6. Enter your user name and password, and then click **Next**.
7. Select **Normal ISP** if your ISP is not listed, and then click **Next**.
8. Click **Finish**.

## Calling the ISP

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.
2. Select **Internet** from the menu.
3. Select **RH PPP Dialer**.
4. Select the connection name you entered in step 5 of the previous section.
5. Click **OK**.

## Answering Calls

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

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