PCI Modem Card

User's Manual

Feb 2002, Rev01

Contents

Chapter 1 Introduction

Congratulations on the purchase of your new 56K modem! This handbook will help you through the installation procedure. You also can use the commands in this book to customize the performance of your modem, although this is not required for normal operation.

1.1 Features

- Integrated PCI solution with 5 V tolerant buffers
  - Two chip modem solution without voice support
- Data mode capabilities:
  - ITU-T V.92 : 56000 bits/s—48000 bits/s
  - ITU-T V.90 : 56000 bits/s—28000 bits/s
  - ITU-T V.34: 33600 bits/s—2400 bits/s
  - V.32bis, and fallbacks
  - V.42 and *MNP* error correction (LAPM)
  - V.44, V.42bis and *MNP* Class 5 data compression
- FAX mode capabilities:
  - ITU-T V.17, V.29, V.27ter, and V.21 Ch 2
  - ITU-T T.31 Class 1 FAX
- Compatible with transformer-based and silicon DAA circuits:
  - Line-powered silicon DAA
- Enhanced voice features incorporating:
  - Telephone answering machine (TAM)
  - Caller identification (caller-ID)
- Bit I/Os to support domestic and international DAAs
- Low power consumption
- Flexible power management modes

1.2 System Requirements

- Pentium® III or above
- Windows 95®/ 98®/ Me®/ NT4.0®/ 2000® / XP® operating system
- One available PCI slot
- 32 MB RAM or more
- CD-ROM drive

1.3 Package Contents

Your PCI modem package must include the following items:

- PCI Modem Card
- Software Utility/Driver CD
- Quick Installation

Chapter 2 Hardware Installation

2.1 Installing the Card

Step1 With the power to your computer disconnected, remove PC casing.

Note: Some PCI compliant motherboards supply power to the slots even when the PC is turned off. To prevent damage to your PC or PCI modem card, always unplug the power cord when installing or removing PCI modem cards**.**

Step 2 Press the PCI card into the empty PCI slot firmly, and secure it with screws to your computer.

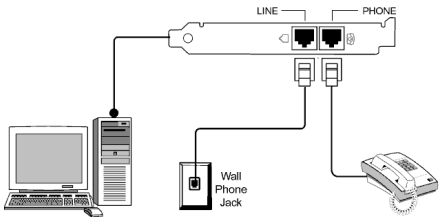
Step 3 Reinstall the casing on your computer.

2.2 Connection

Step 1 Plug one end of the phone cord into LINE jack and the other end to the wall phone jack.

Step 2 When you are not using the modem, you can use a telephone on the modem's phone line. Plug your telephone's cord into the modem's PHONE jack.

The figure below illustrates the typical connection of internal modem card.



After hardware installation, turn on your computer and the system should detect the modem upon startup. Proceed to next section to install the drivers.

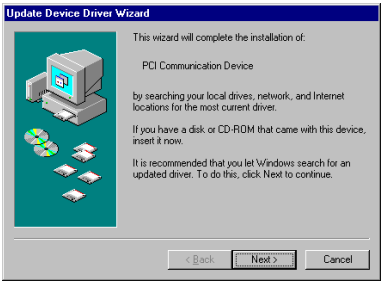
Chapter 3 Software Installation

Note: The document was written for both voice and non-voice model, so some strings in the figures appearing during installation might be a little different (but similar) from yours.

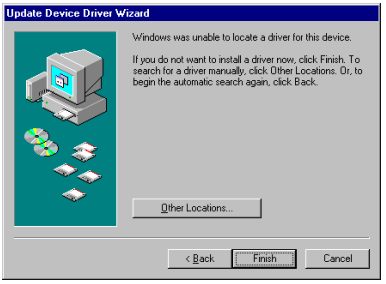
3.1 For Windows 95

Start Windows 95 and insert the provided CD into your CD-ROM drive to start driver installation.

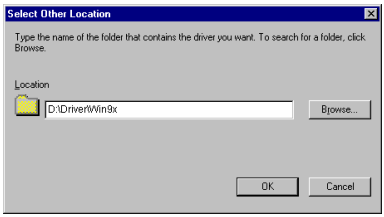
Step 1 The **Update Device Driver Wizard** screen will appear detecting a new device and request for the driver. Click **Next**.



Step 2 Windows will be unable to locate the driver; click **Other Locations**.



Step 3 Click **Browse** to specify the path to **X:\Driver\Win9x** where X is the CD-ROM drive letter and click **OK**.



Step 4 Windows will find the location of the driver; click **Finish**.

Step 5 When prompted to insert disk, click **OK**.

Step 6 In **Copying Files** window, click **Browse** to specify the path to **X:\Driver\Win9x** where X is the CD-ROM drive letter and click **OK**.

Step 7 Windows will continue to detect the voice device. Click **Next** and then repeat steps 2-4 to complete the installation.

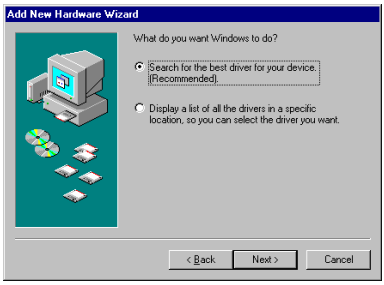
When you are done with driver installation, you will need to specify the country where you locate upon different telecommunication regulations/laws. Please proceed to “Chapter 4 Configuring Countries” on page 15 for instructions.

3.2 For Windows 98

Start Windows 98 and insert the provided CD into your CD-ROM drive to start driver installation.

Step 1 The **Add New Hardware Wizard** screen will appear detecting a new device and request for the driver. Click **Next**.

Step 2 Select **Search for the best driver for you device** and click **Next**.



Step 3 Check **Specify a location**, click **Browse** to specify the path to **X:\Driver\Win9x** where X is your CD-ROM drive letter and click **OK**. Then click **Next**.

Step 4 Windows will find the location of the driver; click **Next**.

Step 5 Click **Finish**.

Step 6 Windows will continue to detect the voice device. Click **Next** and then repeat steps 2-5 to complete the installation.

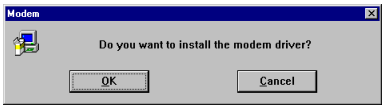
When you are done with driver installation, you will need to specify the country where you locate upon different telecommunication regulations/ laws. Please proceed to “Chapter 4 Configuring Countries” on page 15 for instructions.

3.3 For Windows Me

Start Windows Me and the system will auto-process the installation. However, you need to update the driver by following the steps below.

Step 1 Click **Start** menu and then click **Run**. Click **Browse** to open the file **Setup.exe** from **X:\Driver\WinME** where X is your CD-ROM drive letter and click **OK**.

Step 2 When confirm message appears, click **OK**.

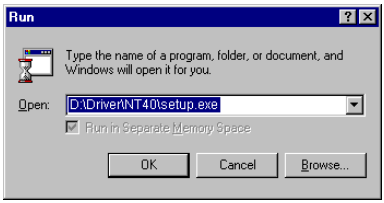


Step 3 Wait for the system to complete updating the hardware information.

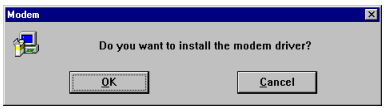
When you are done with driver installation, you will need to specify the country where you locate upon different telecommunication regulations/ laws. Please proceed to “Chapter 4 Configuring Countries” on page 15 for instructions.

3.4 For Windows NT4.0

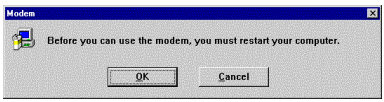
Step 1 Click **Start** menu and then click **Run**. Click **Browse** to open the file **Setup.exe** from **X:\Driver\NT40** where X is your CD-ROM drive letter and click **OK**.



Step 2 When confirm message appears, click **OK**.



Step 3 When prompted to restart your computer, click **OK**.



When you are done with driver installation, you will need to specify the country where you locate upon different telecommunication regulations/ laws. Please proceed to “Chapter 4 Configuring Countries” on page 15 for instructions.

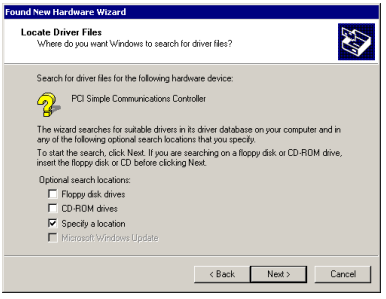
3.5 For Windows 2000

Start Windows 2000 and insert the provided CD into your CD-ROM drive to start driver installation.

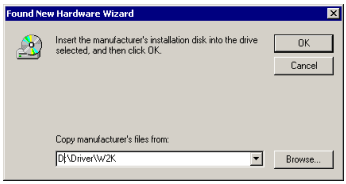
Step 1 The **Found New Hardware Wizard** screen will appear detecting a new device and request for the driver. Click **Next**.

Step 2 Select **Search for a suitable driver for my device** and click **Next**.

Step 3 Check only **Specify a location**, and click **Next**.

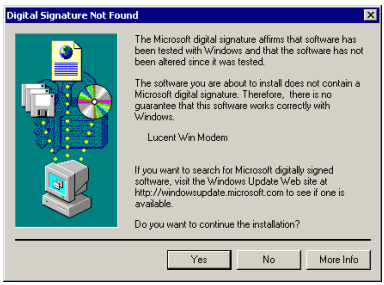


Step 4 Click **Browse** to locate the driver **X:\Driver\W2K** from your CD-ROM drive where X is your CD-ROM drive letter and click **OK**.



Step 5 Windows will find the location of the driver; click **Next**.

Step 6 If **Digital Signature Not Found** window appears, click **Yes** to continue.



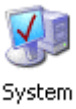
Step 7 Click **Finish** and wait for Windows to complete the installation.

When you are done with driver installation, you will need to specify the country where you locate upon different telecommunication regulations/ laws. Please proceed to “Chapter 4 Configuring Countries” on page 15 for instructions.

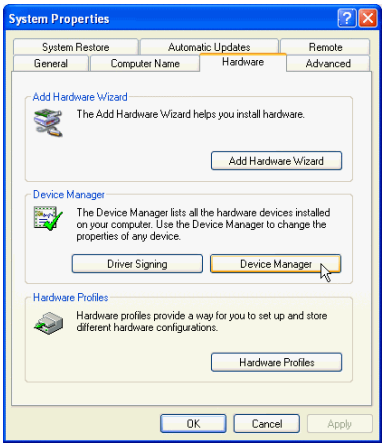
3.6 For Windows XP

The system will auto-process the driver installation for your modem card. After that, follow the steps below to update its driver.

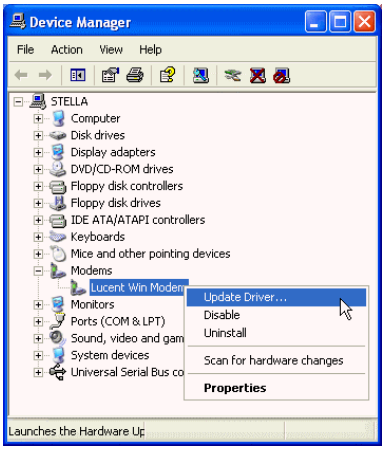
Step 1 Click **Start** menu, point to **Settings** and then click on **Control Panel**. On the Control Panel, double-click the **System** icon.



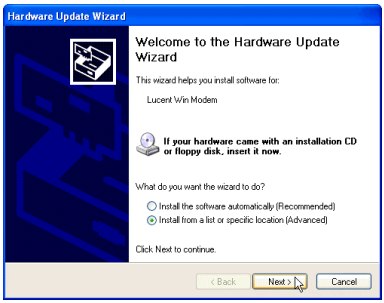
Step 2 Click **Hardware** tab and then click **Device Manager**.



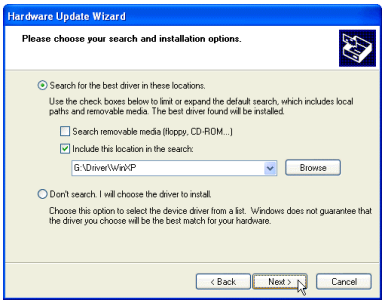
Step 3 Double-click **Modems** and right-click **Lucent Win Modem**. Select **Update Driver…** from the context menu.



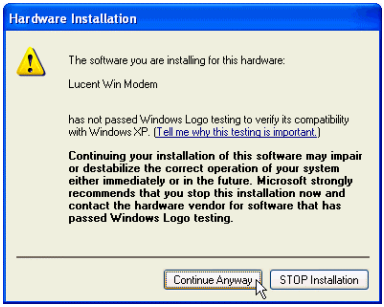
Step 4 When **Hardware Update Wizard** screen appears, select **Install from a list or specific location (Advanced)** and click **Next**.



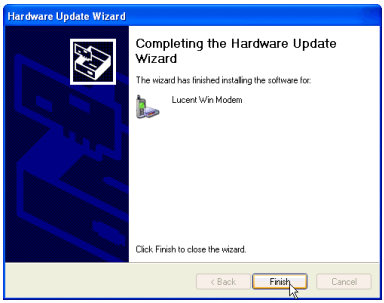
Step 5 With **Search for the best driver…** selected, check ONLY **Include this location in the search**. Click **Browse** to locate the driver path from **X:\Driver\WinXP** in your CD-ROM drive where X is your CD-ROM drive letter and click **Next**.



Step 6 If compatibility prompt message appears, click **Continue Anyway**.



Step 7 Click **Finish** to complete updating driver.



When you are done with driver installation, you will need to specify the country where you locate upon different telecommunication regulations/ laws. Please proceed to “Chapter 4 Configuring Countries” on page 15 for instructions.

Chapter 4 Configuring Countries

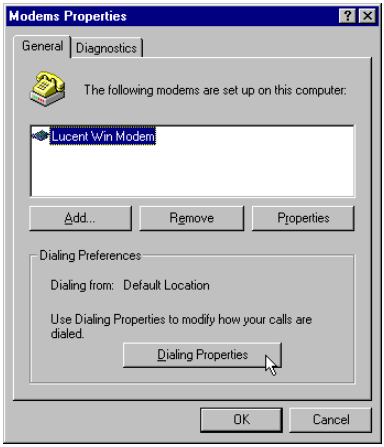
Before using the modem, you may need to specify the country where you locate upon different telecommunication regulations/ laws. If you have configured your country during the installation process, just ignore this section.

4.1 For Windows 95/98/Me

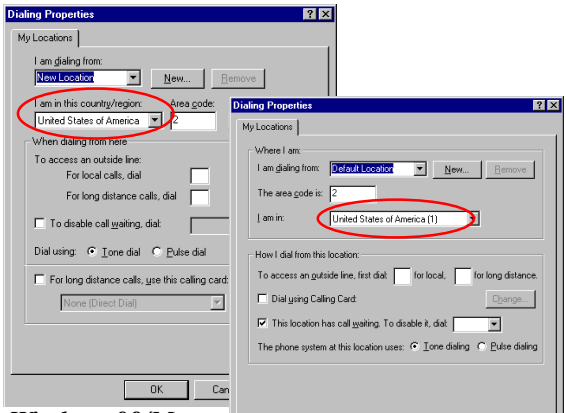
Note: If you are prompted with **Location Information** screen during configuration, enter your area code and then click **Close** or **OK**.

Step 1 Click **Start** menu, point to **Settings** and click **Control Panel**. On the Control Panel, double-click the **Modems** icon.

Step 2 In **Modems Properties** window, highlight **Lucent Win Modem** and click **Dialing Properties**.



Step 3 From the drop-down list of **I am in** (for Windows 95) or **I am in this country/region** (for Windows 98/Me), select a country where your modem is to be used and click **Apply** (for Windows 98/Me only) and then **OK**.



Windows 98/Me

Windows 95

Step 4 You will return to the **Modems Properties** window. Click **OK** to return to **Control Panel**.

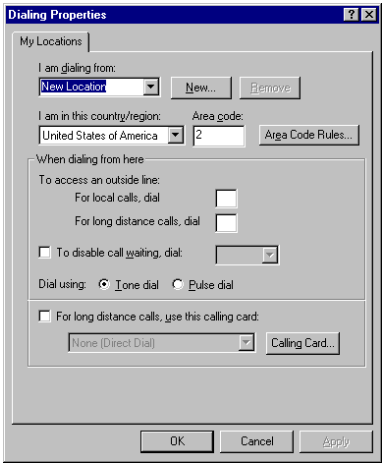
4.2 For Windows NT4.0

Step 1 Click **Start** menu, point to **Settings** and click **Control Panel**. On the Control Panel, double-click the **Modems** icon.

Note: If you are prompted with **Location Information** screen, enter your area code and then click **Close**.

Step 2 In **Modems Properties** window, highlight **Lucent Win Modem** and click **Dialing Properties**.

Step 3 From the drop-down list of **I am in this country/region**, select a country where your modem is to be used and click **Apply** and then **OK**.



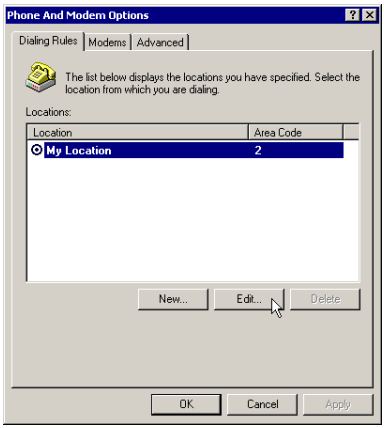
4.3 For Windows 2000/XP

Note: The configuration steps are the same in Windows 2000 and Windows XP. The graphics here assume a Windows 2000 environment.

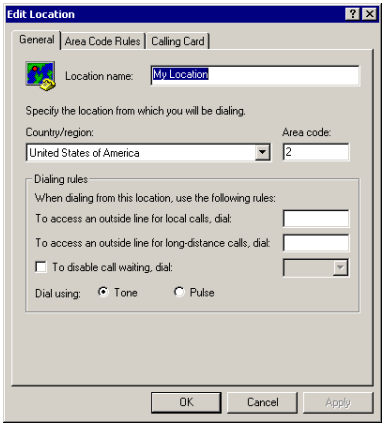
Step 1 Click **Start** menu, point to **Settings** and click on **Control Panel**. On the Control Panel, double-click the **Phone and Modem Options** icon.

Note: If you are prompted with **Location Information** screen, enter your area code and then click **OK**.

Step 2 On the **Dialing Rules** tab, select the location from which you are dialing and then click **Edit**.



Step 3: On the **General** tab, from the drop-down list of **Country/region** select the country where your modem is to be used. Click **Apply** and then click **OK**.



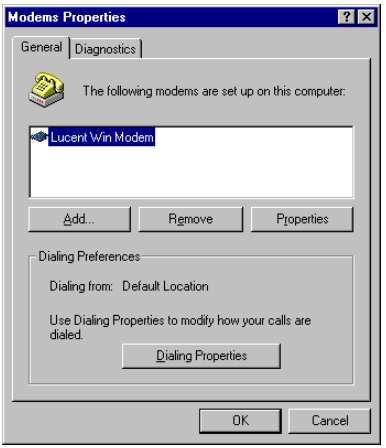
Chapter 5 Verify Modem Installation

If you are going to install data/fax communications software, you may start with a quick test to check that the Windows can communicate with your modem.

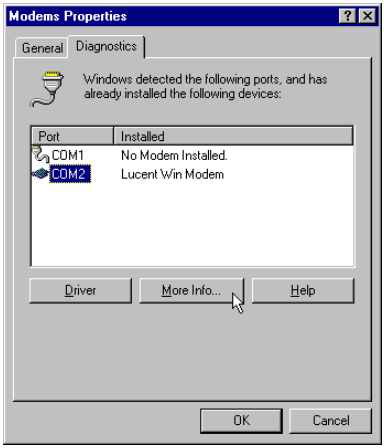
5.1 For Windows 95/98/Me

Step 1 Click **Start** menu, point to **Settings** and then click **Control Panel**. Double-click the **Modems** icon.

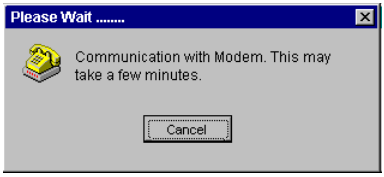
Step 2 Click the **Diagnostics** tab.



Step 3 Highlight the COM port used by your modem and then click **More Info…**.

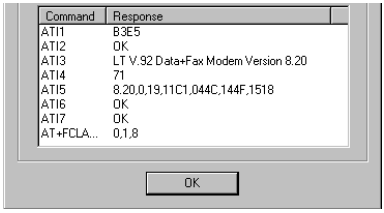


Step 4 Wait for communication with your modem.



Step 5 If your modem is properly installed, the command response (something like AT…) should appear on the screen.

Congratulations! You have successfully installed the modem hardware and its driver.



* According to your model, the command responses may differ from shown above.

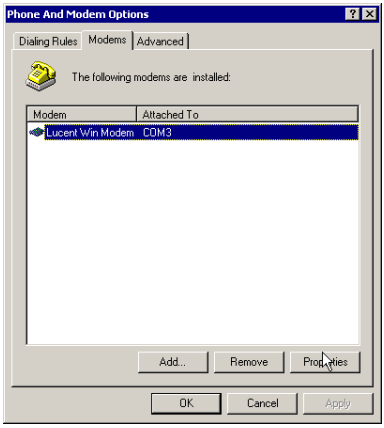
Note: If your modem fails to respond, you will see an error message. Make sure your modem is properly connected. Switch your modem off and on, and try again. If your modem still fails to respond, you may need to remove the driver and reinstall again.

5.2 For Windows 2000/XP

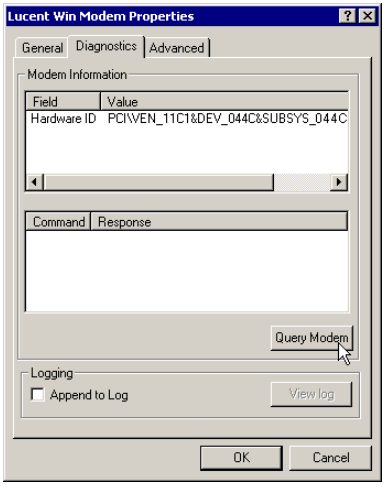
Note: The verification steps are the same in Windows 2000 and Windows XP. The graphics here assume a Windows 2000 environment.

Step 1 Click **Start** menu, point to **Settings** and then click **Control Panel**. Double-click the **Phone and Modem Options** icon.

Step 2 In the **Phone And Modem Options** window, click the **Modems** tab. Highlight **Lucent Win Modem** and then click **Properties**.



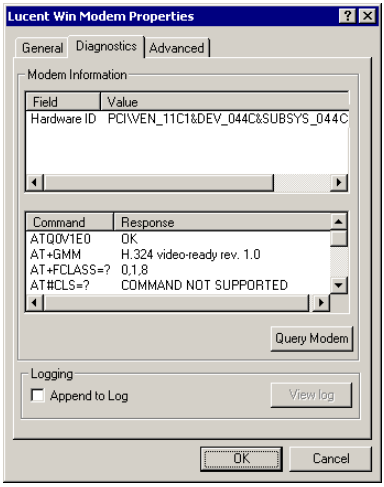
Step 3 Click the **Diagnostics** tab and then click **Query Modem**.



Step 4 Wait for communication with your modem.

Step 5 If your modem is properly installed, the command response (something like AT…) should appear on the screen.

Congratulations! You have successfully installed the modem hardware and its driver.



Note: If your modem fails to respond, you will see an error message. Make sure your modem is properly connected. Switch your modem off and on, and try again. If your modem still fails to respond, you may need to remove the driver and reinstall again.

Chapter 6 Uninstalling the Drivers

This chapter describes how to uninstall the modem software from your system. If you are going to uninstall the modem device permanently, follow these steps:

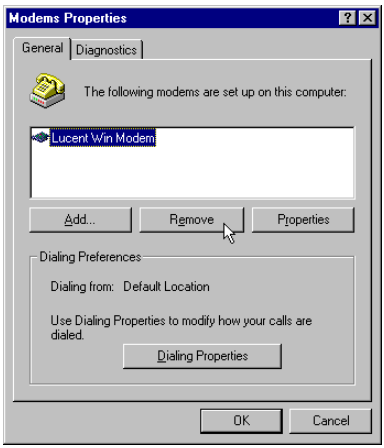
1. Uninstall the software first as described in this chapter.
2. Shut down your PC. Power off the PC and unplug all the peripherals. Remove the cover and pull the modem card out of its PCI slot.
3. Then reinstall the cover and the peripherals.

It is also possible that you want to reinstall or upgrade the driver. If this is the case, uninstall the modem software as described in this chapter and restart your PC. Then refer to the installation instructions to install required driver.

6.1 For Windows 95

Step 1 Click **Start** menu, point to **Settings** and then click **Control Panel**. Double-click the **Modems** icon.

Step 2 On the **General** tab, highlight **Lucent Win Modem** and then click **Remove**.



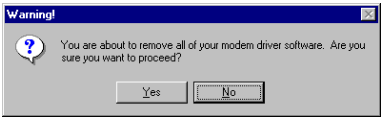
Step 3 You will find the modem has been removed from the modem list. Click **Close** to return to the **Control Panel**.

6.2 For Windows 98/Me/NT4.0/2000/XP

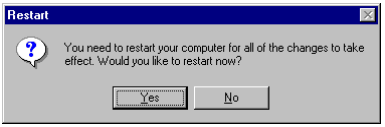
Note: For Windows 98/Me/NT4.0/2000/XP users, please have the provided CD handy before you perform remove procedures.

Step 1 Insert the provided CD into your CD-ROM drive. Run **Ltremove.exe** from the subdirectory **\Driver\Win9x** (or relevant directory according to your operation system) of the provided CD.

Step 2 When warning message appears, click **Yes**.



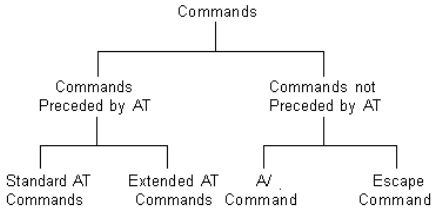
Step 3 When prompted, click **Yes** or **No** as required.



Appendix A AT Commands

This chapter provides an alphabetized reference with examples for all commands for the modem. The system of commands is depicted in figure below.

To use these commands for dialing or configuring the modem, make sure the communications software package you will be using lets you operate the modem through its interna1 commands. If your software permits use of the modem's internal commands, read this chapter. If not, read your software user's manual and ignore the rest of this manual.



A.1 General Command Information

Except for the **A/** command and the + + + escape command described in this manual, all commands must be prefixed with the attention code **AT**. For instance, the **A** command (below) would be entered as: "**AT A <CR>**". Without the **AT** prefix, the command line cannot be executed. Once entered, AT cannot be deleted with the **Backspace** or **Delete** keys.

More than one command can be placed on a single line and, if desired, separated with spaces for readability. Once the carriage return (**Enter**) key is pressed, the command line is executed. A line with no carriage return is ignored.

The modem accepts either upper or lower case characters in the command line and ignores any spaces within or between commands. Typing errors can be corrected with the **Backspace** key. Exceptions are noted in the description of specific commands.

Variables (r and x) are listed in italics. Punctuation symbols (**, ; ! @**) use as dial modifiers are listed alphabetically according to their English names. Where two commands are separated by a slash, either command will have the same effect. For example, if the command is listed as **B0/B**, issuing either **B0** or **B** will have the same effect.

A.2 AT Commands

A Go On-line in Answer Mode

This command instructs the modem to go off-hook immediately and then make a handshake with the remote modem. Handshaking is not available during leased line operation.

A is usually used to manually answer an incoming call or to switch from voice conversation to data communication.

Bn Communication Standard Setting

This command determines ITU-T vs. Bell standard.

B0 Selects ITU-T V.22 mode when the modem is at 1200 bits/s.

B1 Selects Bell 212A when the modem is at 1200 bits/s. (default)

B2 Unselects V.23 reverse channel (same as B3).

B3 Unselects V.23 reverse channel (same as B2).

B15 Selects V.21 when the modem is at 300 bits/s.

B16 Selects Bell 103J when the modem is at 300 bits/s. (default)

Cn Carrier Control Option(dummy command)

This command is used by some modems to control the transmit carrier. This chip set does not support C0 and will respond in error if this command is given. This chip set will accept C1 without error in order to ensure backward compatibility with communications software that issues this command.

C0 Transmit carrier always off (returns ERROR).

C1 Normal transmit carrier switching. (default)

Dn Dial

This command instructs the modem to begin the dialing sequence. The dial string (n, including modifiers and the telephone number) is entered after the **ATD** command.

A dial string can be up to 40 characters long. Any digit or symbol (0-9, *, A, B, C, D) may be dialed as touch tone digits. Characters such as spaces, hyphens, and parentheses do not count-they are ignored by the modem and may be included in the dial string to enhance readability.

The following may be used as dial string modifiers:

L Redials last number. Should be the first character following ATD, ignored otherwise.

P Pulse dialing.

T Touch-tone dialing. (default)

, Pause during dialing. Pause for time specified in Register S8 before processing the next character in the dial string.

W Wait for dial tone. Modem waits for a second dial tone before processing the dial string.

V The modem switches to speakerphone mode and dials the number. An ATH command may be used to disconnect the voice call.

@ Wait for quiet answer. Wait for five seconds of silence after dialing the number. If silence is not detected, the modem sends a NO ANSWER result code back to the user.

! Hook flash. Causes the modem to go on-hook for 0.5 seconds and then return to off-hook.

; Return to command mode. Causes the modem to return to command mode after dialing the number, without disconnecting the call.

^ Disable data calling tone transmission.

S=n Dial a telephone number previously stored. The range of n is 0-3.

$ Bong tone detection.

En AT Command Echo Options

This command determines whether characters are echoed to the DTE from the modem when it is in command state.

E0 Echo disabled.

E1 Echo enabled. (default)

Fn On-Line Data Character Echo Command

This command determines if the modem will echo data from the DTE. This modem does not support the F0 version of the command. However, the modem will accept F1, which may be issued by older communication software, to assure backward compatibility.

F0 On-line data character echo enabled (NOT SUPPORTED, ERROR).

F1 On-line data character echo disabled.

Hn Hook Control

This command instructs the modem to go on-hook to disconnect a call, or off-hook to make the phone line busy.

H0 Modem goes on-hook. (default)

H1 Modem goes off-hook.

In Request ID Information

This command displays specific product information about the modem.

I0 Returns default speed and controller resource version. (same as I3)

I1 Calculates ROM checksum and displays it on the DTE.

I2 Performs a ROM check and calculates and verifies the checksum displaying OK or ERROR.

I3 Returns the default speed and the controller resource version. (same as I0)

I4 Returns resource version for data pump.

I9 Returns country code.

Ln Speaker Volume

This command determines the volume level of the speaker, when supported by the modem.

L0 Lowest speaker volume.

L1 Low speaker volume.

L2 Medium speaker volume. (default)

L3 High speaker volume.

Mn Speaker Control

This command determines whether the speaker function of the modem is on or off.

M0 Speaker always off.

M1 Speaker on until carrier present. (default)

M2 Speaker always on.

M3 Speaker off during dialing and on until carrier.

Nn Modulation Handshake

This command controls whether or not the local modem performs a negotiated handshake at connection time with the remote modem when the communication speed of the two modems is different.

N0 When originating or answering, this is for handshake only at the communication standard by S37 and the ATB command.

N1 When originating or answering, begin the handshake only at the communication standard specified by S37 and the ATB command. During handshake, fallback to a lower speed may occur. (default)

On Return On-Line to Data Mode

O0 Instructs the modem to exit on-line command mode and return to data mode (see AT Escape Sequence, +++).

O1 This command issues a retrain before returning to on-line data mode.

O3 This command issues a rate renegotiation before returning to on-line data mode.

P Enable Pulse Dialing

This command instructs the modem to use pulse dialing. Dialed digits will be pulsed dialed until a T command or dial modifier is received. Tone dial is the default setting.

Qn Results Code Display Option

This command controls whether the result codes are displayed to the DTE.

Q0 Result codes enabled. (default)

Q1 Result codes disabled.

Sn Selects an S Register

This command selects a specific S register. n = 0 - 99

Sn=m Writes to an S Register

This command writes a value to a specified register.

n = 0 - 99

m = 0 - 255

Sn? Reads an S Register

This command display the value of a specified register in decimal form.

n=0 - 99

T Enable Tone Dialing

This command instructs the modem to send DTMF tones while dialing. Dialed digits will be tone dialed until a P command or dial modifier is received. This is the default setting.

Vn Result Code Form

This command controls whether result codes (including call progress and negotiation progress message) are displayed as words or their numeric equivalents.

V0 Displays result codes as digits.

V1 Displays result codes as text. (default)

Wn Select Extended Result Codes

This command determines which result codes will be used to describe the type of connection and protocol that resulted from handshaking and negotiation.

W0 CONNECT result code reports DTE speed. (default)

W1 CONNECT result code reports DTE speed; enable the CARRIER, COMPRESSION and PROTOCOL extended result code.

W2 CONNECT result code reports DCE speed.

Xn Result Codes Selection and Call Progress Monitoring

This command enables tone detection options used in the dialing process. As these functions are chosen, the modem chip set's result codes are also affected. Therefore, this command is frequently used to control the modem chip set's responses. The primary function of this control is to control the modem chip set's call response capabilities.

Command	Ext. Result Code	Dial Tone Detect	Busy Tone Detect
X0	Disable	Disable	Disable
X1	Enable	Disable	Disable
X2	Enable	Enable	Disable
X3	Enable	Disable	Enable
X4	Enable	Enable	Enable(default)
X5	Enable	Enable	Enable
X6	Enable	Enable	Enable
X7	Disable	Enable	Enable

Extended Result Codes

Disabled: Displays only the basic result codes OK, CONNECT, RING, NO CARRIER, and ERROR.

Enabled: Displays basic result codes, along with the connect message and the modem's data rate, and indicates the modem's error correction and data compression operation.

Dial Tone Detect

Disabled: The modem dials a call regardless of whether it detects a dial tone. The period of time the modem waits before dialing is specified in register S6.

Enabled: The modem dials only upon detection of a dial tone, and disconnects the call if the dial tone is not detected within 10 seconds.

Busy Tone Detect

Disabled: The modem ignores any busy tones it receives.

Enabled: The modem monitors for busy tones.

Result Codes:

OK n=0, 1, 2, 3, 4, 5, 6, 7

ERROR Otherwise.

Yn Long Space Disconnect

Long space disconnect is always disabled.

Y0 Disable long space disconnect. (default)

Y1 Enable long space disconnect. NOT SUPPORTED.

A.2.1 Commands Preceded by &

&Bn V.32 Auto Retrain

This command always auto retrains.

&B0 Disable V.32 auto retrains - NOT SUPPORTED.

&B1 Enable V.32 auto retrain. (default)

&Cn Data Carrier Detect (DCD) Control

Data Carrier Detect is a signal from the modem to your computer indicating that the carrier signal is being received from a remote modem. DCD normally turns off when the modem no longer detects the carrier signal.

&C0 The state of the carrier from the remote modem is ignored. DCD circuit is always on.

&C1 DCD turns on when the remote modem's carrier signal is detected, and off when the carrier signal is not detected. (default)

&Dn DTR Control

This command interprets how the modem responds to the state of the DTR signal and changes to the DTR signal.

&D0 Ignore. The modem ignores the true status of DTR and treats it as always on. This should only be used if your computer does not provide DTR to the modem.

&D1 If the DTR signal is not detected while in on-line data mode, the modem enters command mode, issues OK result code, and remains connected.

&D2 If the DTR signal is not detected while in on-line data mode, the modem disconnects. (default)

&D3 Reset on on-to-off DTR transition.

&F Load Factory Settings

This command loads the configuration stored and programmed at the factory. This operation replaces all of the command options and S register settings in the active configuration with factory values stored in the nonvolatile RAM.

&F Recall factory setting as active configuration.

&Gn Guard Tone Option

This command determines which guard tone, if any, to transmit while transmitting in the high band (answer mode). This command is only used in V.22 and V.22bis mode.

&G0 No guard tones. (default)

&G1 550 Hz guard tone.

&G2 1800 Hz guard tone.

&Jn Auxiliary Relay Option

&J0 The auxiliary relay is never closed.

&J1 NOT SUPPORT, responds ERROR.

&Kn Select Flow Control

This command selects the flow control method the modem chip set provides to the DTE to prevent the modem's buffer from overflowing with data. A data buffer holds the data until the modem is ready to transmit it. When the

data buffer is full, flow control instructs the DTE to stop sending to the modem while the modem continues to send characters.

&K0 Disable flow control.

&K1 Reserved.

&K2 Reserved.

&K3 Enable bi-directional hardware flow control (RTS/CTS). (default)

&K4 Enable bi-directional XON/XOFF flow control.

&Mn Asynchronous Communications Mode

&M0 Asynchronous mode. (default)

&M1 Reserved.

&M2 Reserved.

&M3 Reserved.

&M4 Reserved.

&Qn Asynchronous Communications Mode

&Q0 Asynchronous Mode, buffered. (**Same as \N0**)

&Q5 Error Control Mode, buffered. (default)**(Same as \N3)**

&Q6 Asynchronous Mode, buffered. (**Same as \N0**)

&Q8 MNP error control mode. If an MNP error control protocol is not established, the modem will fallback according to the current user setting in S36.

&Q9 V.42 or MNP error control mode. If neither error control protocol is established, the modem will fallback according to the current user setting in S36.

Result Codes:

OK n=0, 5, 6, 8, 9

&Sn Data Set Ready Option

This command controls the functions of DSR. DSR indicates when the modem is connected to a communications channel and is ready. Async mode only. If the modem is in Sync mode, DSR is on during handshake and on-line, off in test or idle mode.

&S0 DSR circuit always on. (default)

&S1 DSR circuit on during handshaking and on-line, off in test modes or in idle mode.

Result Codes:

OK n=0, 1

&Tn Self-Test Commands

These commands allows the user to perform diagnostic tests on the modem. Thses tests can help to isolate problems when experiencing periodic data loss or random errors.

&T0 Abort. Stops any test in progress.

&T1 Local analog loop. This test verifies modem operation, as well as the connection between the modem and computer. Any data entered at the local DTE is modulated, then demodulated, and returned to the local DTE. To work properly, the modem must be off-line.

&Vn View Active Configuration and Stored Profile

This command is used to display the active profiles.

&V0 View active file.

&Wn Store Current Configuration

This command stores certain command options and S-register values into the modem's nonvolatile memory. The ATZ command or a power-up reset of the modem restores this profile.

A.2.2 Commands Preceded by \

\Gn Modem Port Flow Control

\G0 Returns an "OK" for compatibility. (default)

Result Codes:

OK n=0

ERROR Otherwise.

\Jn Adjust Bits/s Rate Control

When this feature is enabled, the modem emulates the behavior of modems that force the DTE interface to the line speed.

\J0 Turn off feature. (default)

\J1 Turn off feature.

\Kn Set Break Control

This command determines how the modem processes a Break signal received from the local DTE during a connection(online).

\K0 Reserved, returns ERROR.

\K1 Reserved, returns ERROR.

\K2 Reserved, returns ERROR.

\K3 Reserved, returns ERROR.

\K4 Reserved, returns ERROR.

\K5 Modem sends the break to the remote modem in sequence with 0the transmitted data, non-destructive/non-expedited. (default)

\Nn Error Control Mode Selection

This command determines the type of error control used by the modem when sending or receiving data.

\N0 Buffer mode. No error control. (Same as &Q6)

\N1 Direct mode.

\N2 MNP or disconnect mode. The modem attempts to connect using MNP 2-4 error control procedures. If this fails, the modem disconnects. This is also known as MNP reliable mode.

\N3 V.42, MNP, or buffer. The modem attempts to connect in V.42 error control mode. If this fails, the modem attempts to connect in MNP mode. If this fails, the modem connects in buffer mode and continues operation. This is also known as V.42/MNP auto reliable mode. (Same as &Q5) (default)

\N4 V.42 or disconnect. The modem attempts to connect in V.42 error control mode. If this fails, the call will be disconnected.

\N5 V.42, MNP or buffer. (Same as \N3)

\N7 V.42, MNP or buffer. (Same as \N3)

\Qn Local Flow Control Selection

\Q0 Disables flow control. (Same as &K0)

\Q1 XON/XOFF software flow control. (Same as &K4)

\Q2 CTS-only flow control. This is not supported and the response is ERROR.

\Q3 RTS/CTS to DTE. (Same as &K3) (default)

\Tn Inactivity Timer

This command specifies the length of time (in minutes) that the modem will wait before disconnecting when no data is sent or received. A setting of zero disables the timer. Alternatively, this timer may be specified in register S30. This function is only applicable to buffer mode.

\Vn Protocol Result Code

\V0 Disable protocol result code appended to DCE speed.

\V1 Enable protocol result code appended to DCE speed. (default)

A.2.3 Commands Preceded by %

%Cn Data Compression

This command controls the MNP Class 5. The command can only perform data compression on an error corrected link.

%C0 No compression.

%C1 MNP Class 5 compression. (default)

Result Codes:

OK n=0, 1

A.2.4 Commands Preceded by -

-Cn Data Calling Tone

Data Calling Tone is a tone of certain frequency and cadence as specified in V.25 which allows remote Data/FAX/Voice discrimination. The frequency is 1300 Hz with a cadence of 0.5 s on and 2 s off.

-C0 Disabled. (default)

-C1 Enabled.

A.2.5 Commands Preceded by "

"Hn V.42bis Compression Control

This command controls V.42bis data compression over an error correction link.

"H0 Disable V.42bis.

"H1 Enable V.42bis only when transmitting data.

Result Codes:

OK n=0, 1

A.3 Commands Not Preceded By AT

Two commands, **A/** and +++, are neither preceded by the attention code **AT** nor followed by a carriage return.

A/ Repeat Command

A/ repeats the execution of the last command line stored in the command buffer. If the last command line is invalid, the ERROR result code will appear on the screen. Note that **A/** cannot be preceded by **AT**; if it is, ERROR will appear on the screen.

+++ Escape

+++ followed by **AT<CR>** returns to the on-line command state (command state without breaking the established connection) from the on-line state.

To escape, stop transmitting data, wait at least one escape guard time (the default time is one second), and then enter three consecutive escape characters (the default character is +) followed by **AT<CR>**. After one more escape guard time (one second), the modem returns to the command state and sends the **OK** result code to the screen. Note that the escape command is the only command that can be recognized by the modem in the on-line state; it cannot be recognized in the command state.

Appendix B S Register Reference

Your modem has status registers. These registers are memory locations inside your modem which control your modem's operation. You usually do not have to worry about setting any register because the default values work for most applications.

Registers denoted with an "*****" may be stored in one of the two user profiles by entering the **&Wn** command.

The factory default values are stored in ROM and are loaded into the active configuration at power-up. In addition, the designated default profile is subsequently loaded, and may change some of the factory default values. The designated default profile can be changed by entering the **&Yn** command, where 'n' is one of the two possible user profiles. The factory defaults can be loaded at any time by entering the **&F** command.

B.1 Register Summary

The following chart summarizes your modem's registers:

Reg.#	Range	Unit	Default Dec	Default Hex	Description
S0	0-255	ring	0	00h	Number of Ring Before Auto-answer.
S1	0-255	ring	0	00h	Ring Count.
S2	0-255	ASCII	43	2Bh	AT Escape Character.
S3	0-127	ASCII	13	0Dh	Command Line Termination Character.
S4	0-127	ASCII	10	0Ah	Response Formatting Character.
S5	0-32,127	ASCII	8	08h	Command Line Editing Character.
S6	2-65	seconds	2	02h	Wait Before Dialing.
S7	1-255	seconds	50	32h	Connection Completion Time-Out.
S8	0-65	seconds	2	02h	Comma Dial Modifier Time.
S10	1-254	1/10 sec.	20	14h	Automatic Disconnect Delay.
S11	50-150	1/1000 sec.	95	5Fh	DTMF Dialing Speed.
S12	0-255	1/50 sec.	50	32h	Escape Guard Time.
S28	0-255		1	01h	V.34 Modulation Enable/Disable.
S30	0-255	minutes.	0	00h	Inactivity Timer.
S32		dB	10	10h	Synthetic Ring Volume.
S33	0-5		0	00h	Synthetic Ring Frequency.
S35	0-1		0	00h	Data Calling Tone.
S36	0-7		7	07h	Negotiation Fallback.
S37	0-19		0	00h	Dial Line Rate.
S42	0-1		1	01h	Auto Rate.
S43	0-1		1	01h	Auto Mode.

S48	7, 128	7	07h	LAPM Error Control and Feature Negotiation.
S89	0, 5-255	10	0Ah	Timer to Control Sleep Mode.
S90	0-1	0	00h	Local Phone Status.
S91	6-15 1dB	10	0Ah	Line Transmit Level.

B.2 Glossary of the S Registers

S0 Number of Rings Before Auto Answer

S0 determines the number of rings that must be received before the modem automatically answers an incoming call. For example, when **S0=3**, the modem automatically answers after the third ring. When **S0=0**, the modem does not automatically answer an incoming call; it stays on-hook until the **A** command is issued manually to answer the incoming call.

Range: 0-255

Default: 0

S1 Ring Count

S1 automatically increments its value by one each time the modem receives a ring while in the command state. **S1** is reset to zero if no ring is detected within 8 seconds.

Range: 0-255

Default: 0

S2 AT Escape Character(user defined)

This register determines the ASCII valued used for an escape sequence. The default is the + character. The escape sequence allows the modem to exit data mode and enter command mode when on-line. Values greater than 127 disable the escape sequence.

Range: 0-255

Default: 43(+)

S3 Command Line Termination Character(user defined)

This register determines the ASCII values as the carriage retuen character. This character is used to end command lines and result codes.

Range: 0-127

Default: 13(carriage return)

S4 Response Formatting Character(user defined)

This register determines the ASCII value used as the line feed character. The modem uses a line feed character in command mode when it responds to the computer.

Range: 0-127

Default: 10(Line Feed)

S5 Command Line Editing Character (user defined)

This register sets the character recognized as a backspace and pertains to asynchronous only. The modem will not recognize the backspace character if it is set to a value that is greater than 32 ASCII. This character can be used to edit a command line. When the echo command is enabled, the modem echoes back to the local DTE the backspace character, an ASCII space character, and a second backspace character. This means a total of three characters are transmitted each time the modem processes the backspace character.

Range: 0-32, 127

Default: 8(backspace)

S6 Wait Before Dialing

This register sets the length of time, in seconds, that the modem must wait (pause) after going off-hook before dialing the first digit of the telephone number. The modem always pauses for a minimum of 2 seconds, even if the value of **S6** is less than two seconds. If wait for dial tone call progress feature (**W** dial modifier in the dial string) will override the value in register **S6**. This operation, however, may be affected by some **ATX** options according to country restrictions.

Range: 2-65

Default: 2

S7 Connection Completion Time-Out

This register sets the time, in seconds, that the modem must wait before hanging up because carrier is not detected. The timer is started when the modem finishes dialing (originate), or goes off-hook (answer). In originate mode, the timer is reset upon detection of an answer tone if allowed by country restriction. The timer also specifies the wait for silence time for the **@** dial modifier in seconds. **S7** is not associated with the **W** dial modifier.

Range: 1-255

Default: 50

S8 Comma Dial Modifier Time

This register sets the time, in seconds, that the modem must pause when it encounters a comma(,) in the dial command string.

Range: 0-65

Default: 2

S10 Automatic Disconnect Delay

This register sets the length of time, in tenths of a second, that the modem waits before hanging up after a loss of carrier. This allows for a temporary carrier loss without causing the local modem to disconnect.

The actual interval the modem waits before disconnecting is the value in register **S10**.

Range: 1-254

Default: 20

S11 DTMF Dialing Speed

This register determines the dialing speed which is prefixed for each country.

Range: 50-150

Default: 95

S12 Escape Guard Time

This register determines the escape guard time. The escape guard time is the minimum waiting time required before and after entering the escape code (three consecutive escape characters) in the on-line state. It is also the maximum waiting time allowed between any two consecutive escape characters. If the waiting time before or after the escape code is shorter than the guard time, or if the waiting time between consecutive escape characters is longer than the guard time, then the modem does not recognize the escape command and stays on-line.

If the escape guard time is set at 0 seconds, it is impossible to return the modem to command state.

Range: 0-255

Default: 50

S28 V.34 Modulation Enable/Disable

This register enables/disables V.34 modulation.

0 Disabled.

1-255 Enabled.

Range: 0-255

Default: 1

S30 Inactivity Timer

This register specifies the length of time, in minutes, that the modem will wait before disconnection when no data is sent or received. This function is only applicable to buffer mode.

Range: 0-255

Default: 0

S32 Synthetic Ring Volume

This register specifies a synthetic ring volume in dB with an implied minus sign.

Default: 10

S33 Synthetic Ring Frequency

This register specifies a synthetic ring frequency. Valid ranges are 0-5, with 0=disabled and 1-5 corresponding to 5 ring frequencies.

Range: 0-5

Default: 0

S35 Data Calling Tone

Data Calling Tone is a tone of certain frequency and cadence as specified in V.25 which allows remote Data/FAX/Voice discrimination. The frequency is 1300 Hz with a cadence of 0.5 s on and 2 s off.

0 Disabled.

1 Enabled.

Range: 0-1

Default: 0

S36 Negotiation Fallback

This register specifies the action to take in the event of negotiation failure when error control is selected.

0, 2 Hang up.

1, 3 Fall back to an asynchronous connection.

4, 6 Attempt MNP. If MNP fails, hang up.

5, 7 Attempt MNP. If MNP fails, fall back to asynchronous connection.

Default: 7

S37 Dial Line Rate

0 Maximum modem speed.

1 Reserved.

2 1200/75 bits/s.

3 300 bits/s.

4 Reserved.

5 1200 bits/s.

6 2400 bits/s.

7 4800 bits/s.

8 7200 bits/s.

9 9600 bits/s.

10 12000 bits/s.

11 14400 bits/s.

12 16800 bits/s.

13 19200 bits/s.

14 21600 bits/s.

15 24000 bits/s.

16 26400 bits/s.

17 28800 bits/s.

18 31200 bits/s.

19 33600 bits/s.

Default: 0

S42 Auto Rate

This command is used for testing and debugging only.

V.32bis and V.22bis auto rate is disabled. Retrain operation is disabled or enabled in data mode, and fallback is disabled in data mode.

0 Disabled.

1 Enabled.

Range: 0-1

Default: 1

S43 Auto Mode

This command is used for testing and debugging only.

V.32bis startup auto mode operation disabled.

0 Disabled.

1 Enabled.

Range: 0-1

Default: 1

S48 LAPM Error Control and Feature Negotiation

7 Negotiation enabled.

128 Negotiation disabled; forces immediate fallback options specified is S36.

Default: 7

The following chart lists the S36 and S48 configuration settings necessary to negotiate certain types of connections.

	S48=7	**S48=128**
S36=0, 2	LAPM or hangup	do not use
S36=1, 3	LAPM or async	async
S36=4, 6	LAPM, MNP or hangup	MNP or hangup
S36=5, 7	LAPM, MNP or async	MNP or async

S89 Timer to Control Sleep Mode

This command displays the number of seconds of inactivity (no characters sent from the DTE, no RING) in the off-line command state before the modem places itself into standby mode. A value of zero prevents standby mode.

Note: If a number between 1 and 4 is entered for this register, it will set the value to 5, and the inactivity before standby will be 5 seconds. This is done for compatibility with previous products which allowed time-outs down to 1 s.

Range: 0, 5-255

Default: 10

S90 Local Phone Status

This register tells the status of the Local Phone. It is read only.

0 Local phone on-hook.

1 Local phone off-hook.

Range: 0-1

Default: 0

S91 Line Transmit Level

This register is effective only for Japan. It specifies the line transmit level in dB with an implied minus sign.

Range: 6-15

Default: 10

Appendix C Technical Specifications

Compatibility

ITU-T V.92 V.90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000 bps.
ITU-T V.34Annex12	33600, 31200 bps.
ITU-T V.34	28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 bps
ITU-T V.32 bis	14400, 12000, 9600, 7200, 4800 bps
ITU-T V.32	9600, 4800 bps
ITU-T V.17	14400bps/12000bps
ITU-T V.29	9600bps/7200bps
ITU-T V.27 ter	4800bps/2400bps
ITU-T V.22 bis	2400bps
ITU-T V.23	1200bps/75bps
ITU-T V.22	1200bps
ITU-T V.21	300bps
BELL 212A	1200bps
BELL 103	300bps

Modulation

56000bps(ITU-T V.90)	PCM
33600bps(V.34Annex12)	TCM
31200bps(V.34Annex12)	TCM
28800bps(V.34/V.FC)	TCM
14400bps (V.32 bis)	TCM
12000bps (V.32 bis)	TCM
9600bps (V.32 bis)	TCM
7200bps (V.32 bis)	TCM
9600bps (V.32)	TCM,QAM
4800bps (V.32)	QAM
14400bps (V.17)	TCM

12000bps (V.17)	TCM
9600bps (V.29)	QAM
7200bps (V.29)	QAM
4800bps (V.27ter)	DPSK
2400bps (V.27ter)	DPSK
2400bps (V.22bis)	QAM
1200bps/75bps(V.23)	FSK
1200bps (V.22/Bell 212A)	DPSK
300bps (V.21/Bell 103)	FSK

Operation

- Full-duplex or half duplex in Data mode.
- Half-duplex in Fax mode.
- Asynchronous operation.
- Auto dial/answer.
- Manual originate/answer.
- Call waiting
- Quick Connector
- Quick Upload

TAM

Support telephone answer machine.

Plug and Play

Optional Plug and Play device.

Data mode

- Ultrahigh compression throughput due to parallel access directly to the host PC.
- ITU-T V.34 extended rates 33600bps to 2400bps.
- V.32terbo, V.32bis and fallbacks.
- TIA/EIA 602 standard for AT command set.
- V.42 error correction (LAMP and MNP).
- V.42bis and MNP Class 5 data compression.

Fax mode

Fax modem send and receive rates up to 14400bps

- V.17, V.29, V.27ter, and V.21 channel 2.
- TIA/EIA 578 Class1 FAX.

Asynchronous Data Format

Parity	Data Length	Stop Bits	Character Length
None	7	2	10
Odd	7	1	10
Even	7	1	10
None	8	1	10

Line Operating Speed

56000bps, 52000bps, 48000bps, 40000bps, 36000bps, 32000bps.(Receive Only)

33600bps, 31200bps, 28800bps, 26400bps, 24000bps, 21600bps, 19200bps, 16800bps, 14400bps, 12000bps, 9600bps, 7200bps, 4800bps, 2400bps, 1200bps, 300bps.

Dialing Type

Tone or Pulse dialing.

Call Progress Monitors

Dial tone, Busy tone.

Diagnostics

- Remote digital loop and remote digital loop self test.
- Analog loop and analog loop self test.
- Power-on self test

Flow Control

XON/XOFF or RTS/CTS

Telephone Line Interface

Single RJ-11 phone jack for PSTN line.

Receive Sensitivity

-33 ± 2 dBm

Transmit Sensitivity

-11± 2 dBm

DTMF SIGNAL LEVEL (dBm)

Hi. G = -8± 2 dBm

Lo. G = -10± 2 dBm

M/B RATIO

39± 3/61± 4 10 PPS

RETURN LOSS

300Hz ~ 3400Hz >10 dB

Carrier Frequency

- V.34 1800Hz 0.01%
- V.32bis 1800Hz 0.01%
- V.32 1800Hz 0.01%
- V.17 1800Hz 0.01%
- V.29 1700Hz 0.01%
- V.27ter 1800Hz 0.01%
- V.22bis, original mode 1200Hz 0.01%
- V.22bis, answer mode 2400Hz 0.01%
- V.22, original mode 1200Hz 0.01%
- V.22, answer mode 2400Hz 0.01%
- V.21 channel #1, mark 980Hz 0.01%
- V.21 channel #1, space 1180Hz 0.01%
- V.21 channel #2, mark 1650Hz 0.01%
- V.21 channel #2, space 1850Hz 0.01%
- Bell 212A, original mode 1200Hz 0.01%
- Bell 212A, answer mode 2400Hz 0.01%
- Bell 103, original mark 1270Hz 0.01%
- Bell 103, original space 1070Hz 0.01%
- Bell 103, answer mark 2225Hz 0.01%
- Bell 103, answer space 2025Hz 0.01%

DTMF Tone Frequency

Low Group Frequency (Hz)

		697	770	852	941
High Group Frequency (Hz)	1209	1	4	7	*
	1336	2	5	8	0
	1477	3	6	9	#
	1633	A	B	C	D

*Specification and features subjects to change without notice.

Appendix D Quick Reference

A	Go On-line in Answer Mode
Bn	Communication Standard Setting
Cn	Carrier Control Option (dummy command)
Dn	Dial
En	AT Command Echo Options
Fn	On-Line Data Character Echo Command
Hn	Hook Control
In	Request ID Information
Ln	Speaker Volume
Mn	Speaker Control
Nn	Modulation Handshake
On	Return On-Line to Data Mode
P	Enable Pulse Dialing
Qn	Results Code Display Option
Sn	Selects an S Register
T	Enable Tone Dialing
Vn	Result Code Form
Wn	Select Extended Result Codes
Xn	Result Code Selection and Call Progress Monitoring
Yn	Long Space Disconnect
&Bn	V.32 Auto Retrain
&Cn	Data Carrier Detect (DCD) Control
&Dn	DTR Control

&F Load Factory Settings

&Gn Guard Tone Option

&Jn Auxiliary Relay Option

&Kn Select Flow Control

&Mn Asynchronous Communications Mode

&Qn Asynchronous Communications Mode

&Sn Data Set Ready Option

&Tn Self-Test Commands

&Vn View Active Configuration and Stored Profile

&Wn Store Current Configuration

\Gn Modem Port Flow Control

\Jn Adjust Bits/s Rate Control

\Kn Set Break Control

\Nn Error Control Mode Selection

\Qn Local Flow Control Selection

\Tn Inactivity Timer

\Vn Protocol Result Code

%Cn Data Compression

-Cn Data Calling Tone

"Hn V.42bis Compression Control

A/ Repeat Command

+++ Escape

Appendix E Glossary

ASCII - An acronym for American Standard Code for Information Exchange. ASCII is a seven-bit code which defines 128 standard characters, including control characters, letters, numbers, and symbols. An extra 128 characters comprise the extended ASCII set.

Baud Rate - The transmission rate between two serial devices, e.g., modems, fax machines, etc. Measured in Bits Per Second.

Blind Dialing - In blind dialing, the modem continues to dial, regardless of the existence of a dialtone, ring, or busy signal.

BPS - Bits Per Second; the number of bits that can be transmitted in one second.

Carrier Signal - The analog data signal that a modem sends over telephone wires.

COMx - Where (x = 1, 2, 3, or 4), COMx is the name(address) of serial communications ports on personal computers. Each serial port in a personal computer has a different number.

CTS - Clear To Send.

Default - The assumed value that is used for a command parameter when no other value is explicitly provided.

DCD - Data Carrier Detect.

DCE - Data Communication Equipment.

DTE - Data Terminal Equipment.

DSVD - Digital Simultaneous Voice and Data.

DTMF - Dual Tone Multifrequency(for touchtone dialing).

DTR - Data Terminal Ready.

FSK - Frequency Shift Keying.

GSTN - General Switched Telephone Network.

Make/Break Ratio - The ratio of the off-hook (make) to on-hook (break) interval is the make/break ratio in pulse dialing.

Modem - A combination of the words MOdulator and DEModulator. Modems transform digital data into analog signals and back again.

Off-Hook - The condition when the modem has picked up the telephone line.

Off-Line Command State - A modem state in which the modem accepts, interprets and executes commands from an asynchronous computer or terminal.

On-Hook - The condition when the modem has not picked up the telephone line; the telephone is hung up.

On-Line - A carrier signal link with a remote modem has been established; communication is in progress.

On-Line State - A modem state in which the modem is connected with a remote modem. Data can be sent or received from the remote modem in this state. No commands will be accepted from the modem except the escape command which will bring the modem into the on-line command state.

On-Line Command State - A modem state in which the modem can accept or and execute commands from an asynchronous computer or terminal while remaining connected with the remote modem. The user can return the modem to the on-line state by issuing the **AT0n** command or put it into the off-line command state by issuing commands such as **ATZ** or **ATH**.

Parity - An error-checking method by which the modem verifies that the data just sent is correct.

pps - Pulse per second.

Profile - A list of default settings.

Protocol - A technical specification for serial communications; the protocols supported by the modem are listed in Appendix B.

PSK - Phase Shift Keying.

Pulse Dialing - A dialing form in which each digit is represented by a series of pulses. Rotary telephones all use pulse dialing.

QAM - Quadrature Amplitude Modulation.

Result Codes - The response the modem returns to the screen upon executing a command.

RAM - Random Access Memory.

ROM - Read-Only Memory. A chip inside the modem which stores the factory default settings. This memory cannot be changed.

RTS - Request To Send.

RX - Reception.

S Register - RAM locations in the modem which store the active configuration.

Serial Port - See COMx.

TCM - Trellis-Coded Modulation.

Touchtone Dialing - A dialing format in which each digit is represented by a musical frequency.

TX - Transmission.

Appendix F ASCII Code Table

Decimal	Hex	Value	Decimal	Hex	Value	Decimal	Hex	Value	Decimal	Hex	Value
000	00	NUL	032	20	(space)	064	40	@	096	60	'
001	01	SOH	033	21	!	065	41	A	097	61	a
002	02	STX	034	22	"	066	42	B	098	62	b
003	03	ETX	035	23	#	067	43	C	099	63	c
004	04	EOT	036	24	$	068	44	D	100	64	d
005	05	ENQ	037	25	%	069	45	E	101	65	e
006	06	ACK	038	26	&	070	46	F	102	66	f
007	07	BEL	039	27	'	071	47	G	103	67	g
008	08	BS	040	28	(	072	48	H	104	68	h
009	09	HT	041	29	)	073	49	I	105	69	i
010	0A	LF	042	2A	*	074	4A	J	106	6A	j
011	0B	VT	043	2B	+	075	4B	K	107	6B	k
012	0C	FF	044	2C	,	076	4C	L	108	6C	l
013	0D	CR	045	2D	-	077	4D	M	109	6D	m
014	0E	SO	046	2E	.	078	4E	N	110	6E	n
015	0F	SI	047	2F	/	079	4F	O	111	6F	o
016	10	DLE	048	30	0	080	50	P	112	70	p
017	11	DC1	049	31	1	081	51	Q	113	71	q
018	12	DC2	050	32	2	082	52	R	114	72	r
019	13	DC3	051	33	3	083	53	S	115	73	s
020	14	DC4	052	34	4	084	54	T	116	74	t
021	15	NAK	053	35	5	085	55	U	117	75	u
022	16	SYN	054	36	6	086	56	V	118	76	v
023	17	ETB	055	37	7	087	57	W	119	77	w
024	18	CAN	056	38	8	088	58	X	120	78	x
025	19	EM	057	39	9	089	59	Y	121	79	y
026	1A	SUB	058	3A	:	090	5A	Z	122	7A	z
027	1B	ESC	059	3B	;	091	5B	[	123	7B	{
028	1C	FS	060	3C	<	092	5C	\	124	7C	|
029	1D	GS	061	3D	=	093	5D	]	125	7D	}
030	1E	RS	062	3E	>	094	5E	^	126	7E	~
031	1F	US	063	3F	?	095	5F	_	127	7F	■