COMPAQ

MICROCOM 4000

Modem User's Guide

Part Number 380008-001

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Part Number 380008-001

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Chapter 1
Introduction

Compaq Microcom 4000 Chassis and Modem Cards

The Compaq Microcom 4000 chassis is a high-density, high-performance, central site modem communications system. The 4000 chassis supports 8-port digital, 4-port digital, and 4-port analog modem cards. The chassis supports up to 92 digital ports using PRI over T1, up to 112 digital ports using PRI over E1, up to 96 digital ports using channelized T1, up to 112 digital ports using channelized E1, or up to 64 analog ports. With the 4000 system, you can control and configure modems locally or remotely using Compaq 4000 Manager, a Windows-based GUI management program (run under Windows 95 or Windows NT 4.0).

8-port modem cards additionally support V.90 technology, while 4-port modem cards use V.34 modem technology, providing you with the most reliable, high-speed analog and digital data connections available. Both are fully compatible with Rockwell International's V.FC (V.Fast Class) modems; offer Enhanced Cellular operation and Fax Classes 1, 2, and 2.0 capabilities; support V.42bis data compression; and use the AT command set, with enhancements for maximum flexibility. They achieve error-free performance through the Microcom Networking Protocol (MNP) and V.42 error-correction protocol standards.

Intended Audience

This guide provides a central site network manager or system administrator with the information necessary to configure and manage modems in a central site application.

If you are not the network manager or system administrator, you will want to involve that person in planning the installation and configuration of the 4000 system.

This guide should be used with the *Compaq Microcom 4000 Installation Guide*, the *Compaq 4000 Manager User's Guide*, and the *Compaq Microcom 4000 PRI, Channelized T1, and Channelized E1 User's Guide*.

Features

- ITU-T standards: V.21, V.22, V.22bis, V.23, V.32, V.32bis, V.34 (including Annex 12 for 33,600 bps support) and V.90
- K56flex (32,000 through 56,000[1] bps) protocol standard
- Compatibility with V.FC (V.Fast Class) protocol
- Serial-port speeds up to 230,400 bps (8-port modems) or 115,200 bps (4-port modems)
- Bell 212A and Bell 103 protocol standards
- V.42 error correction, including LAPM and MNP Classes 2 through 4
- V.42bis compression as well as MNP 5 Data Compression
- MNP Class 10
- MNP Class 10EC Enhanced Cellular operation in cellular environments
- 14,400 bps Class 1, Class 2, and Class 2.0 fax send and receive operation
- Dial Access Security
- Password Connection Security (PCS)
- Remote access configuration and security (8-port modems only)
- Hewlett Packard ENQ/ACK in serial mode
- Multi-protocol auto-answering to answer incoming calls automatically using various modulation protocols
- Dial-out operation for PRI and channelized T1 calls

1. Designed only to allow faster downloads from V.90 or K56flex compliant sources. Maximum achievable download transmissions rates currently do not reach 56Kbps and will vary with line conditions.

- Trellis-coded modulation for forward error correction
- Distinctive Ring
- Near- and far-end echo cancellation
- 2-wire leased-line operation (4-port analog modems only)
- Auto-dial, auto-answer, manual dial, and manual answer capabilities
- Automatic power-up diagnostics
- Asynchronous 11-bit character support

Note: Some functions and features documented in this manual are not available in all countries where the modem is approved for use. Contact your local dealer for more information about country-specific features.

Using the Compaq Microcom 4000 System Documentation

The 4000 system documentation provides you with all of the information you need to install your chassis, connect it to the telephone network, and configure and operate PRI and modem cards using the Compaq 4000 Manager.

Table 1-1. Documentation Set

Document	***Contents***
Compaq Microcom 4000 Quick Setup	Describes the major steps necessary to quickly set up your chassis for either PRI, channelized T1, channelized E1, or analog operation.
Compaq Microcom 4000 Installation Guide	Describes the 4000 chassis and components; how to install and connect the chassis to the telephone network; and how to use the chassis controls and indicators.
Compaq Microcom 4000 PRI and Channelized T1 User's Guide	Describes, in detail, how to configure the PRI cards.
Compaq Microcom 4000 Modem User's Guide	Describes, in detail, all of the features and AT commands supported by the 4000 chassis' modem cards. This guide should be used with the *Compaq 4000 Manager User's Guide* to configure modems for proper operation in your network.
Compaq 4000 Manager User's Guide	Describes how to install the Compaq 4000 Manager in Windows 95 or Windows NT 4.0. It explains how to use the software to configure, monitor, and control a 4000 system.

Conventions and Symbols

Table 1-2. Documentation Set Conventions and Symbols

When you see...	***It means...***
■	The start of a main section.
➥	An Important, WARNING, or CAUTION note.
Enter	Press the Enter key.
X+k	Hold down a key *X* (such as Ctrl or Alt) while pressing key *k*.
raise DTR	The DTR signal is turned on. Most data communications software raises (turns on) DTR when it loads. Refer to your software manual.
bold	Information you will type or see on the screen in step-by-step procedures.

Note: References to V.34 in this manual refer also to Annex 12, the 33,600 bps speed enhancement to the V.34 standard.

Chapter 2

Getting Started

Configuring Compaq Microcom 4000 Modems

Now that your 4000 chassis is installed, you need to make sure that your Compaq Microcom 4000 modems match the serial-port speed, parity, and flow control that your data terminal equipment uses. The modem defaults are 115,200 bps; 8 data bits, no parity; and hardware flow control. If your DTE uses these defaults, then you do not need to do anything further.

To set different values, you need to issue four commands:

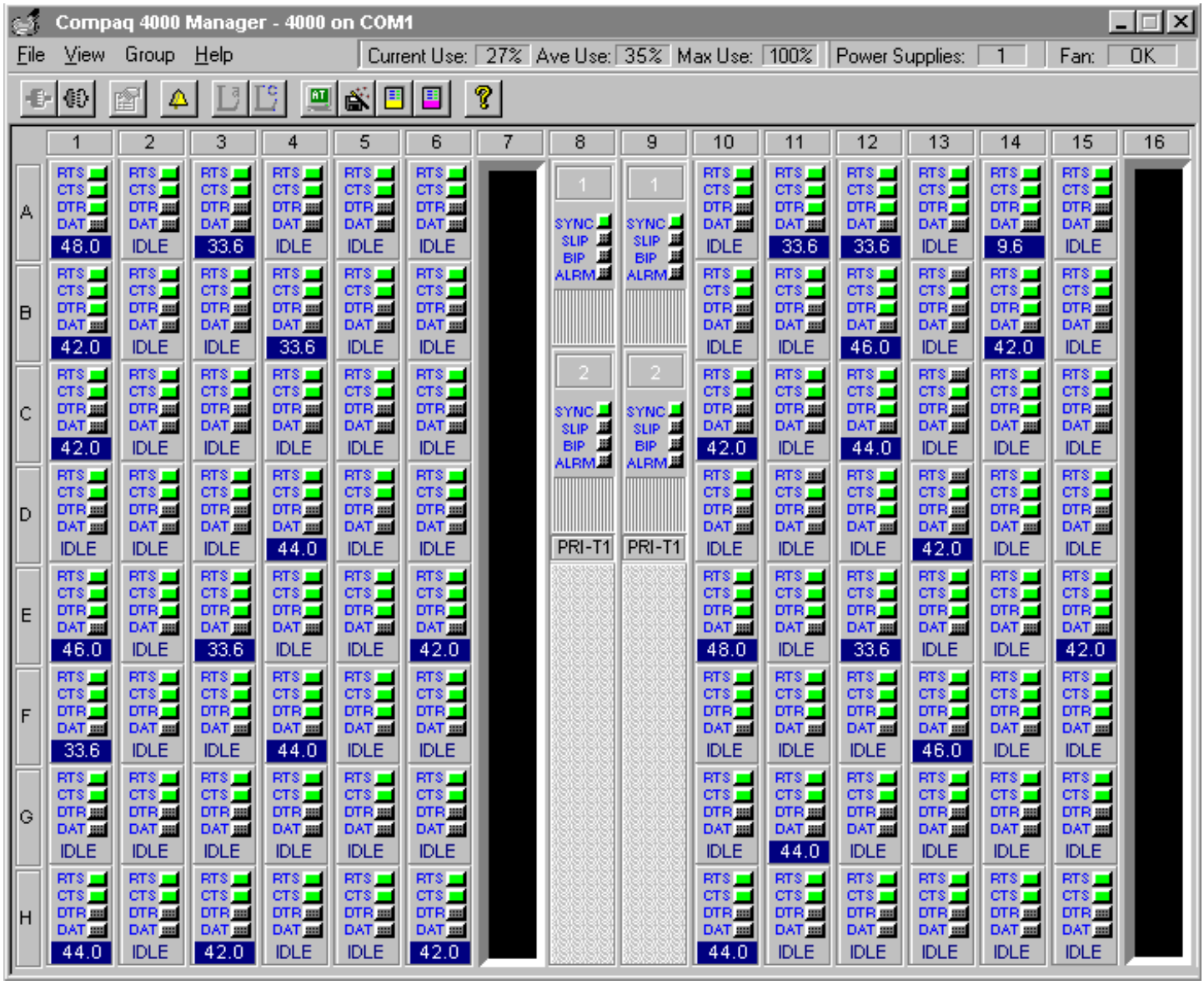
- $B*n* (serial-port speed)
- -O*n* (serial-port parity)
- \Q*n* (serial-port flow control)
- Q*n* (quiet)

Note: We recommend you use the Group AT Configuration feature in the Compaq 4000 Manager to issue commands, but you can also issue commands through the modem's serial port.

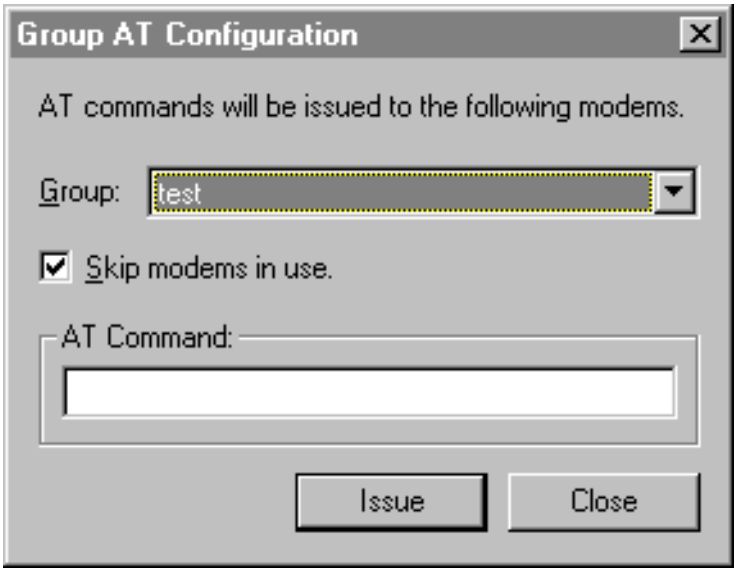
To issue the commands:

1. Start the Compaq 4000 Manager. The Compaq Microcom 4000 - Unconnected window appears.
2. Double-click a connection icon. The Chassis Snapshot window appears.

Note: If you have not created any connection icons, refer to Chapter 3 in the *Compaq 4000 Manager User's Guide*.



3. From the main menu, select **Group→AT Configuration**, or click the Group AT Configuration button on the toolbar. The Group AT Configuration dialog appears.



4. In the Group: field, from the drop-down menu select the modem group that you want to issue AT commands to. For example, **test** as in the dialog above.

5. In the AT Command: field, type **AT$B*n*-O*x*\Q*y*Q*z*** (defaults are shown in **bold**):
   where *n*=75, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, **115200**, or 230400 bps;
   where *x*=0 (7 data bits, odd parity)
   1 (7 data bits, even parity)
   2 (7 data bits, mark parity)
   3 (7 data bits, space parity)
   4 (8 data bits, no parity)
   5 (8 data bits, odd parity)
   6 (8 data bits, even parity)
   7 (8 data bits, mark parity);
   where *y*=0 (Disables flow control)
   1 (Enables bi-directional XON/XOFF flow control)
   2 (Enables unidirectional hardware flow control; the modem uses CTS to control the terminal)
   3 (Enables bi-directional hardware flow control)
   4 (Enables unidirectional XON/XOFF flow control)
   5 (Keeps CTS Off until connection for unidirectional hardware flow control)
   6 (Keeps CTS Off until connection for bi-directional hardware flow control; ignores RTS until connection); and
   where *z*=**0 (Enables output of result codes)**
   1 (Disables output of result codes)
   2 (Disables answer mode result codes only)

Note: You may need to disable command echo (E0). Check with the DTE's manufacturer to see if this is needed.

6. Click **Issue**.

Issuing AT Commands to Modems

You can issue AT commands to a Compaq Microcom 4000 modem using either the Compaq 4000 Manager or the modem's serial port. Use the Compaq 4000 Manager's Group AT Configuration feature to issue commands to multiple modems. Use either the Compaq 4000 Manager's DC Session feature or the serial port to issue commands to a single modem.

Each command line must begin with the characters **AT** (the **AT**tention code). Both characters of the attention code must be in either upper case or lower case, but you may type the commands in any combination.

The modem ignores spaces between characters. If you make a mistake, press the backspace keys (**Control+H**) and type the correct character.

Entering AT Commands at Any Speed

When you turn on your modem, you can enter an AT command at any supported serial-port speed up to 115,200 bps. Your modem automatically adjusts to the connection and command speeds (autobauds) up to 19,200 bps. After you enter an AT at any speed up to 19,200 bps, you can enter other commands at a new serial-port speed at any time. If you enter a command at 38,400, 57,600 or 115,200 bps, **the serial port locks** at that speed.

Note: Your modem cannot autobaud at speeds greater than 115,200 bps. To set the serial port to a higher speed, use the AT$B command. For example, to set a serial-port speed of 230,400 bps, type **AT$B230400** and press **Enter**.

To unlock the serial-port speed and change to another speed:

- Type **AT$B***n* (*n* is any supported serial-port speed) and change the speed set with your data communications software, ***OR***
- Type **AT%U** and press **Enter** to unlock the serial-port speed and enter an AT at the new speed, ***OR***
- With **&D3** set, lower and then raise DTR

Important: The serial-port speed defaults to 115,200 bps.

Key AT Command Factory Defaults

Table 2-1. Key AT Command Factory Defaults

AT Command	*Title*	*Default*
$B*n*	Serial-Port Bps Rate	115200
%B*n*	Modem-Port Bps Rate	33600 (4-port); 56000 (8-port)
%C*n*	Compression Control	3 (MNP 5 & V.42bis)
&C*n*	Serial-Port DCD Control	1 (On after connect message)
D	Dial	T (Tone dial)
&D*n*	DTR Control	2
E*n*	Command Echo	1 (echo to local DTE)
&F	Restore Factory Defaults	none
H	Hang Up	none
*H*n*	Link Negotiation Speed	0 (at highest speed)
\J*n*	Bps Rate Adjust	0 (disabled)
%L*n*	Speed Matching	1 (enabled)
)M*n*	Cellular Power Level Adjustment	0 (For central site modems)
@M*n*	Select Cellular Transmit Level	0 (-18 dBm)
\N*n*	Operating Mode	3 (auto-reliable)
O*n*	Enter Connect State and Retrain	none
P	Pulse Dial	none
Q*n*	Quiet	0 (result code output)
\Q*n*	Serial-Port Flow Control	3 (bi-directional hardware)
%R*n*	Read All Registers	none
S*n*?	Read Configuration Register	none
\S	Read On-line Status	none
T	Tone Dial	none
:T*n*?	Read Configuration Register	none
%U*n*	Clear Serial-Port Speed	0
V*n*	Result Code Form	1 (long form)
\V*n*	Error Correction Result Code Form	2 (long form; see Chapter 3)
%V	Display Modem Firmware Version	none
&W	Store Current Configuration	0
*W	Store Complete Configuration	0

Chapter 3

AT Commands and Registers

The Command Set

The Compaq Microcom 4000 modems respond to a superset of AT commands (additional commands use the prefixes **$**, **%**, **)**, *****, **-**, **:**, **@**, \, **#**, and ^). The modems also store configuration settings in a set of registers. These are similar to the standard AT registers, although some have enhanced modem features.

Note: ***Factory defaults for commands and registers work with many installations; you may never need to change the default settings.***

Command Descriptions

This section lists all the modem AT commands in alphabetical order.

Note: A command argument printed in **bold** is the default setting.

A/ Repeat Last Command

Re-executes the last command immediately. ***Note that the A/ command is not preceded by "AT" and not followed by*** *pressing* ***Enter.***

A Answer

Forces the modem to go off hook in answer mode, regardless of the value of register S0. If result codes are enabled, your computer displays RING (long form) or 2 (short form) when it receives a call.

$A*n* Auto-Answer Auto-Logon

$A0 Disables auto-answer auto-logon

$A*n* Enables auto-answer auto-logon for sequence *n*, where *n*=1-9

Performs a logon sequence (created using the $L*n* command) after accepting a call from a remote system. If the sequence is successful, a connection to the remote system is complete.

Sequences 1 to 4 are predefined and used as default logon sequences during Dial Access Security. Sequence 5 is predefined and used for Password Connection Security. See Chapter 5, *Auto Logon, Dial Access, and PCS Security*.

%A*n* Auto-Reliable Fallback Character

Range: *n* is an integer between 0 and 127 indicating an ASCII character

Default: **0** (auto-reliable fallback character disabled)

Sets the ASCII character recognized as the auto-reliable fallback character on the **answering** modem. In auto-reliable mode, when the modem encounters an incoming auto-reliable fallback character from the remote system, it automatically switches to normal mode and passes the character to the serial port. Auto-reliable fallback character recognition stops if the modem receives a SYN character (decimal 22).

↪ **CAUTION:** Do not set *n*=63 or *n*=126. These settings interfere with V.42 negotiations.

Note: With this command, \N3\C2 must also be set.

*A Request Remote Access (8-Port Modems Only)

Initiates a request for remote access. When you type **AT*A** and press **Enter**, the requesting modem waits 10 seconds for a response from the answering modem. If that modem denies remote access, the requesting modem displays REMOTE ACCESS FAILED (numeric 40) and returns to command state.

This command automatically sends the character set by *S. For the *A command to be successful, *S must be set the same on both modems.

Notes: Register S12 (guard time) should be set to the same value on both modems. If register S12 is set to a value greater than 127, the requesting modem waits up to 20 seconds for a response to a remote access request.

Remote access is available only during a normal connection or during an MNP reliable connection without data compression.

\A*n* Maximum MNP Block Size

\A0 Sets block size up to a maximum of 64 characters
\A1 Sets block size up to a maximum of 128 characters
\A2 Sets block size up to a maximum of 192 characters
\A3 Sets block size up to a maximum of 256 characters

Sets maximum block size for MNP stream link connections.

B*n* ITU-T/Bell Mode

B0 Uses ITU-T V.22 and V.21 standards at 1200 and 300 bps
B1 Uses Bell 212A and 103 standards at 1200 and 300 bps

Note: Refer to your country-specific addendum for differences.

$B*n* Serial-Port Bps Rate

8-port Range: *n* = 75, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, **115200**, 230400 bps
4-port Range: *n* = 75, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, **115200** bps

Sets the serial-port bps rate when issued.

%B*n* Modem-Port Bps Rate

8-port Range: *n* = 75, 300, 600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28000, 28800, 29333, 30667, 31200, 32000, 33333, 33600, 34000, 34667, 36000, 37333, 38000, 38667, 40000, 41333, 42000, 42667, 44000, 45333, 46000, 46667, 48000, 49333, 50000, 50667, 52000, 53333, 54000, 54667, 56000 bps
4-port Range: *n* = 75, 300, 600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, 33600 bps
Default: **56000** (8-port modems); **33600** (4-port modems)

➥ **Important: For 8-port modems only**, you must set the "%Mn Modulation Selection" command before you set a value for %B!

When you enter this locally, sets the modem-port bps rate. Downshifting can still take place.

When you enter this during a remote access session, the new modem-port bps rate does not take effect until the current connection ends.

Notes: %G0 is the default for 4-port modems; %G1 is the default for 8-port modems.

If %G0 is set, setting %M has no effect on %B.

If %G0 is set:
— Setting the host port speed to 19200 bps or lower limits the baud rate to that value;
— Setting the host port speed to 38400 bps sets the modem port speed to 33600 bps;
— Setting the host port speed to 57600 bps or higher sets the modem port speed to 56000 bps (8-port modems) or 33600 bps (4-port modems).

On 8-port modems when %G1 is set, setting %M causes the %B command to be set to the maximum value in that modulation.

\B*n* Transmit Break

Range: *n* is an integer between 1 and 9 indicating the time (in increments of 100 milliseconds) to send the Break
Default: **3** (300 milliseconds)

Note: During a reliable link the Break always equals 300 milliseconds.

Transmits a Break to the remote system from command state. To return to connect state, type **ATO** and press **Enter**. (See also \K.)

%C*n* Compression Control

%C0 Disables data compression
%C1 Enables MNP 5 Data Compression only
%C2 Enables V.42bis compression only
%C3 Enables both V.42bis and MNP 5 Data Compression. The modem matches the capability of the remote modem

Determines whether the modem attempts to use data compression during reliable connections. ***Compaq Microcom recommends leaving this command at its default (%C3).*** This allows the modem to establish a reliable connection using either MNP 5 Data Compression or V.42bis compression, depending on the capability of the remote modem.

Setting this command to 1 or 2 restricts the modem to using either MNP 5 Data Compression or V.42bis compression, respectively, or else a non-compression connection results.

If the remote modem does not support data compression or has it disabled, the modem can establish a connection without data compression, regardless of the modem's %C setting.

Notes: Microcom recommends disabling bps rate adjust (\J0) for the most throughput.

With AT\J1 set, when the modem establishes a reliable connection at speeds between 4800 and 16,800 bps, the serial port adjusts to 9600 bps. If the connection speed is 19,200 bps or above, the serial port adjusts to 19,200 bps.

Remote access is available during normal connections or during MNP reliable connections when data compression is disabled (%C0).

&C*n* Serial-Port DCD Control

&C0 DCD always On
&C1 DCD follows the state of the carrier from the remote system; DCD turns On after the connect message
&C2 DCD On except momentarily at disconnect

Controls the Data Carrier Detect (DCD) signal on the serial port. Use this command if your computer requires DCD to be Off at certain times. See also the \D command description.

Notes: The &C and \D settings are ignored while connected in V.23 half-duplex direct mode (%F3) or ITU-T V.13 (&R2) mode.

Hardware flow control overrides the &C and \D settings for CTS operation. (See also \Q).

-C*n* Calling Tone

-C0 Disables 1300 Hz calling tone
-C1 Enables 1300 Hz calling tone

If your country requires the modem to output a 1300 Hz tone when originating a call, set this command to -C1.

@C*n* CTS, DSR, and DCD Connect Message Control

@C0 CTS, DSR, and DCD On after the connect message is sent
@C1 CTS, DSR, and DCD On before the connect message is sent

Specifies whether CTS, DSR, and DCD go On before or after a connect message. Use this command with register :T14.

\C*n* Auto-Reliable Buffer

\C0 Does not buffer data during link negotiation. Switches to normal or direct mode if no SYN character detected within 3 seconds

\C1 Buffers all data on the **answering** modem until it receives either 200 non-SYN characters or a SYN character within 3 seconds (this delay is longer for modem speeds 300 or below). If it receives 200 non-SYN characters, the modem switches to normal mode and passes the data through to the serial port. If it detects a SYN character within 3 seconds, it attempts to establish a reliable connection. Otherwise, it switches to normal mode

\C2 Does not buffer data on the **answering** modem. Switches to normal mode upon receipt of a character defined by the AT%A command and passes that character to the serial port

Determines if an answering modem set to auto-reliable mode and auto-answer buffers data from the remote modem during the three seconds when it tries to establish a reliable connection. When the modem receives calls both from modems that support MNP and from modems that do not, set **\C2**. This allows the modem to switch to normal mode as soon as it detects a log-on character (defined by %A) from a non-MNP caller. This eliminates the three-second wait. (See the \N command description for more information about auto-reliable and normal modes.)

For example, use %A to set the auto-reliable fallback character to ASCII 13 (carriage return). Then set \C2\N3. Non-MNP callers who connect and press **Enter** to log on do not have to wait for the three-second auto-reliable window to expire before data can pass.

Notes: When either \C1 or \C2 is set, reliable and normal connections may result independent of bps rate adjust. However, when \C0 is set bps rate adjust affects the type of connection as follows:

- reliable and direct connections may result when bps rate adjust is On (\J1)
- reliable and normal connections may result when bps rate adjust is Off (\J0)

When falling back to V.23 full duplex connections and either \C1 or \C2 is set, reliable and normal connections may result independent of the \W command. However, when \C0 is set, the split serial-port speed affects the type of connection as follows:

- direct connections result with split speed enabled (\W1)
- normal connections result with split speed disabled (\W0)

When either \C0\N3 or \C1\N3 are set, the modem takes approximately 12 seconds to drop to a normal mode V.21 connection.

D *<dial string>* Dial

Where <*dial string*> is a string of up to 98 characters. Do not type < or >.Valid dial string characters are: 0-9, dial modifiers, and for tone dialing A, B, C, D, #, and *. The modem ignores invalid characters. Dial strings longer than 98 characters produce an error message

Dials a telephone number and attempts to establish a connection. The Dial command must be the last one on a command line.

To cancel the Dial command, press any key or use your data communications software to lower DTR (unless &D0 is set).

To dial the telephone number 011 22 555 1234, type **ATD 011225551234** and press **Enter**.

Note: After disconnect, there is a five second delay before the modem goes off hook in originate mode.

Dial Modifiers

Dial modifiers allow you to add conditions to the telephone number you dial. You can use several modifiers with the same telephone number. Dial modifiers include:

^A **(Link Negotiation)** Perform link negotiation at 4800 bps *for the current connection only.* (This dial modifier is equivalent to the *H2 command.)

J **(Link Negotiation)** Perform link negotiation at 1200 bps *for the current connection only.* (This dial modifier is equivalent to the *H1 command.)

K **(Cell-Side Cellular Connection)** Sets)M1 *for the current connection only.*

N*n* **(Dial an Alternate Stored Number)** Follows the last character in a dial string and, if the modem fails to make a connection, the N*n* modifier dials an alternate telephone number. *n* is a number between 1 and 9 that corresponds to a telephone number stored in the directory with the &Z*n* or \P*n* command. If you do not enter a value for *n*, it dials the first stored entry.

The N*n* modifier may also be stored at the end of the dial string. For example: **ATD 5551234N3** and press **Enter**.

If you do not specify any value for *n* at the end of a stored phone number and the modem fails to make a connection, it dials the number in the next position, even if you have not stored a number there. (This has the same effect as typing **ATD** — your modem goes off hook but does not dial. Stored number 1 follows stored number 9.)

O **(Cell-Side Cellular Call)** Sets the modem to operate with a cell-side (remote) cellular phone *for the current connection only.* This has the same effect as including the cellular string \N2)M1@M18*H1 in the dial command. These settings use the MNP reliable mode, force power adjustment for cell-side calls, select an initial transmit level of -18 dBm, and force link negotiation to occur at 1200 bps.

Note: This is unnecessary for land-side (central) sites. Your modem adjusts to incoming cellular calls automatically.

P **(Pulse Dial)** Placed anywhere in the dial string, causes the modem to pulse dial. For example, type **ATD P5551234** and press **Enter**.

Note: Tone dial is the default setting. The last P or T dial modifier used remains in effect until you either issue a dial command with a different P or T modifier or reset the modem. Also, you can combine P and T dial modifiers within a dial string. For example, to pulse dial a local telephone number and tone dial an access code and phone number, type **ATD P5551234 T33 5556789** and press **Enter**.

R **(Dial a Number in Answer Mode)** Must follow the last character in the dial string. Causes the modem to dial in answer mode when calling an originate-only modem. For example: **ATD 5551234R** and press **Enter**

S **(Dial the First Stored Telephone Number)** Follows the Dial command and causes the modem to dial the telephone number stored as entry 1 with the AT&Z1= or AT\P1 command. The telephone number displays as the modem dials it. For example, type **ATDS** and press **Enter**.

T **(Tone Dial)** Placed anywhere in the dial string, causes the modem to tone dial. For example, type **ATD T12345** and press **Enter**.

Note: Tone dial is the default setting. The last P or T dial modifier used remains in effect until you either enter a dial command with a different P or T modifier or reset the modem. You can combine P and T dial modifiers within a dial string. For example, to pulse dial a local telephone number and tone dial an access code and phone number, type **ATD P5551234 T33 56789** and press **Enter**.

W **(Wait for Dial Tone Before Dialing)** Inserted between digits in a dial string, causes the modem to wait for a second dial tone up to the register S7 time delay before dialing the remainder of the dial string. If the modem receives a dial tone before the register S7 delay expires, it continues dialing. If it does not receive a dial tone, it displays **NO DIALTONE** and hangs up. For example, type **ATD 5551234 W 5556789** and press **Enter**.

Note: See your country-specific addendum for differences.

, **(Pause During Dial)** Inserted in a dial string, causes the modem to pause for the register S8 delay before dialing the next digit. The default is 2 seconds. Use more than one comma for a longer pause. For example, when you need to dial “9” and wait for a dial tone before dialing an outside line, type **ATD 9,,5551234** and press **Enter**.

Note: See your country-specific addendum for differences.

@ **(Wait for Quiet Answer Before Dialing)** Inserted between characters in a dial string, causes the modem to wait for the register S7 time delay, for at least one ring followed by five seconds of silence, before acting on the next character in the dial string. If the modem does not detect this sequence within the S7 time delay, it displays **NO ANSWER** and hangs up. Use this modifier when the system you call does not provide a dial tone. For example, type **ATD 5551234 @ 43210** and press **Enter**.

Note: See your country-specific addendum for differences.

! **(Flash)** Inserted between characters in a dial string, causes the modem to go on hook for 1/2-second and then go back off hook, as though you depressed the switch-hook button on your telephone.

Note: See your country-specific addendum for differences.

; **(Return to Command State After Dialing)** Added to the end of a dial string, tells the modem to remain in command state after it dials the digits preceding the semicolon. This allows you to enter dial strings longer than 98 characters. After the final Dial command, the modem tries to establish a connection. To abort dialing before you attempt to make a connection, type **ATH** and press **Enter**. Each Dial command *except the last one* must end with a semicolon. For example:
ATD 9,5551234; (press **Enter**)
OK
ATD 5556789 @ 55512345678 W 344 (press **Enter**)

Note: See your country-specific addendum for differences.

+*n* **(Force Logon Sequence)** Dial, connect, and perform the logon sequence *n* (where *n*=1-9). For example, to perform sequence 1, type **ATD5551234+1** and press **Enter**.

$ **(Bong Detect)** Detects an AT&T BELLCORE service prompt to enter a calling card number and authorization. When the modem encounters a "$" modifier within a dial string, it waits to receive this "bong" signal. Once it detects it, the modem continues processing the dial string. If the time set by register S7 elapses first, the modem hangs up and displays **NO PROMPT TONE**.

Operating Mode Dial Modifiers

Use the following dial modifiers to override the \N*n* command setting. Placed anywhere in the dial string, these modifiers cause the modem to override the \N*n* setting *for that connection only.* For example, if your modem is set for **\N3** (auto-reliable) for answering and you are calling a modem that you know does not support error correction, use the Z dial modifier to force normal mode. Type **ATD 5551234Z** and press **Enter**.

M (Dial in LAPM Mode)

Q (Dial in LAPM Mode with Fallback to Normal)

U (Dial in Direct Mode)

V (Dial in LAPM Mode with Fallback to MNP)

X (Dial in Auto-Reliable Mode)

Y (Dial in MNP Reliable Mode)

Z (Dial in Normal Mode)

DL Redial the Last Telephone Number Dialed

Redials the last telephone number that the modem dialed.

D*/n* Dial a Stored Telephone Number

Where *n* is an integer between 1 and 9 that specifies a telephone number previously stored in the directory with the &Z*n*= or \P*n* command

Dials one of nine telephone numbers stored in the directory with the &Z*n*= or \P*n* command. The telephone number displays as the modem dials it.

$D Power-Up Diagnostics

Performs a modem reset and runs power-up diagnostics.

%D*n* Disconnect Buffer Delay

Range: *n* is an integer from 0 to 255 representing seconds
Default: **0**

Sets a delay during which the modem attempts to process data in its transmit or receive buffer before disconnecting. When your software lowers DTR or you type **ATH** and press **Enter**, the modem attempts for *n* seconds to empty its transmit buffer before disconnecting. When carrier drops, it attempts for *n* seconds to empty its receive buffer before disconnecting. If its buffers are empty or if *n*=0, it disconnects without delay.

If a physical disconnect occurs (for example, the connection drops from too many retransmissions in reliable mode), the modem can process only the receive buffer. If the delay expires before the modem empties its buffers or it is in command state at disconnect, it may lose data.

&D*n* DTR Control

&D0 Ignores DTR. DTR not needed for auto-answer
&D1 Enters command state on detecting On-to-Off transition of DTR. DTR not needed for auto-answer
&D2 Goes on hook on detecting On-to-Off transition of DTR. Serial port speed and parity remain locked at the speed and parity of the previous AT. DTR needed for auto-answer
&D3 Goes on hook and resets on detecting On-to-Off transition of DTR and prepares the serial port to accept an AT at any speed. DTR needed for auto-answer

The On-to-Off transition of DTR must last as long as the value specified in register S25 (default is 0.05 second). Positive transitions of DTR (Off-to-On) that occur within five seconds after disconnect are ignored.

-D Repeat Dial

-D <*dial string*> Where <*dial string*> is a string of up to 98 characters. Valid dial string characters are: 0-9, dial modifiers, and for tone dial, #, A, B, C, D and *. The modem ignores invalid characters
-D/*n* Where *n* is an integer between 1 and 9 that specifies a telephone number previously stored with \P*n*
-DL Redials the last number dialed
-DS Dials the first entry stored in the directory

Redials a number up to nine tries until connection. In reliable mode, it does not redial if a remote modem answers but fails to establish a reliable connection.

Note: See your country-specific addendum for differences.

:D*n* Manual Dial

:D0 Modem does not go off hook when DTR is raised
:D1 Modem goes off hook in originate mode when DTR is raised. &D*n* (where *n*=1, 2, or 3) must also be set
:D2 Modem goes off hook in originate mode and dials the first stored telephone number when DTR is raised. &D***n*** (where *n*=1, 2, or 3) must also be set

Determines whether the modem goes off hook in originate mode when DTR is raised.

Note: When :D1 or :D2 is set, register :T18 must be set to 0.

\D*n* Serial Port DSR/CTS Control

\D0 DSR and CTS always On
\D1 DSR and CTS follow DCD. If &C1 set, DSR follows off hook
\D2 DSR and CTS both follow DCD
\D3 DSR complies with ITU-T recommendations, CTS always On
\D4 DSR and CTS comply with ITU-T recommendations

Controls the serial-port Data Set Ready (DSR) and Clear To Send (CTS) signals. Use \D*n* when the central-site computer requires the DSR and CTS signals to be Off at specific times.

Notes: **Hardware flow control** overrides &C and \D settings for CTS. (See \Q.)

When \D4 is set, &D should be set to a value greater than 0.

ITU-T recommends that DSR come On when establishing a connection and drop when the connection ends.

ITU-T recommends CTS follow DTR while in command state; drop either when answer tone is detected when originating, when going off hook when answering, or when connection ends; and follow connection status during connection.

Use Table 3-1 when your computer requires DSR and CTS to be Off at certain times. It shows the &C and \D settings and the result of combining the two commands:

Table 3-1. Results of Combining &C and \D Settings

&C	*\D*	*Result*
0	0	DCD On, DSR On, CTS On
0	1	DCD On, DSR On, CTS On
0	2	DCD On, DSR On, CTS On
0	3	DCD On, DSR complies with the ITU-T recommendations, CTS On
0	4	DCD On, CTS/DSR comply with the ITU-T recommendations
1	0	DCD follows modem carrier, DSR On, CTS On
1	1	DCD follows modem carrier, DSR follows off hook, CTS follows DCD
1	2	DCD follows modem carrier, DSR and CTS both follow DCD setting
1	3	DCD follows modem carrier, DSR complies with the ITU-T recommendations, CTS On
1	4	DCD follows modem carrier, CTS/DSR comply with the ITU-T recommendations
2	0	DCD On (Off for a few seconds at disconnect only), DSR On, CTS On
2	1	DCD, DSR, and CTS On (Off for a few seconds at disconnect)
2	2	DCD, DSR, and CTS On (Off for a few seconds at disconnect)
2	3	DCD Off at disconnect then On, DSR complies with the ITU-T recommendations, CTS On
2	4	DCD On (Off for a few seconds at disconnect), CTS/DSR comply with the ITU-T recommendations

E*n* Command Echo

E0 Inhibits the echoing of commands to the local device
E1 Echoes commands to the local device

%E*n* Auto-Retrain

%E0 Disables the automatic retrain sequence
%E1 Enables the automatic retrain sequence (at 2400 bps or higher)

When %E1 is set and line quality is too poor to sustain communications, the modem tries up to three times to resynchronize the modems (for a total of up to six seconds) before hanging up. The modem can retrain during connections at 2400 bps or higher. Use ATO1 to force the retrain sequence when %E0 is set.

Note: The modem ignores %E0 during K56flex, V.90, V.34, V.FC, V.32bis, and V.32 connections.

*E*n* Enable Remote Access (8-Port Modems Only)

***E0** Disables remote access

*E1 Enables remote access

Determines how the modem responds to a request for remote access. Remote access is available only during a normal connection or during an MNP reliable connection without data compression.

Note: The modem does not support remote access during LAPM reliable connections.

-E*n* Modem-Port Data Length

-E0 Enables 10-bit data during normal mode connections

-E1 Enables 11-bit data during normal mode connections

Determines the number of data bits used on the modem port during normal mode connections (when \N0 is set) when the serial port is configured for asynchronous transmission of 11-bit characters. Both modems must be set to the same number of data bits.

Note: The modems will not be able to pass data when a reliable connection (\N3 or \N5 is set) falls back to a normal connection with 11-bit data characters enabled on both modems.

:E*n* Compromise Equalizer

:E0 Disables the compromise equalizer only when the modem is in V.32bis or V.32 mode; may be useful for direct line connections or PBX-to-PBX connections

:E1 Enables the compromise equalizer; may be useful for outside-line-to-outside-line or PBX-to-outside-line connections

Controls equalization operation in V.32bis or V.32 mode.

\E*n* Data Echo

\E0 Does not echo data sent by the local computer

\E1 Echoes data sent by the local computer

When operating in connect state, determines whether the modem echoes characters sent from the local computer. \E1 functions only during normal mode connections.

#E*n* Answer Mode Escape Code Sequence

#E0 Enables the escape code sequence in answer mode

#E1 Disables the escape code sequence in answer mode

Determines whether the escape code sequence is used when answering a call. When the escape code sequence is disabled, the modem does not enter command state upon receipt of the escape code sequence.

%F*n* V.23 Mode

%F0 Allows multi-protocol answering; disables V.23 mode on originate modem
%F1 75 bps transmit, 1200 bps receive (split speed) V.23 mode
%F2 1200 bps transmit, 75 bps receive (split speed) V.23 mode
%F3 1200 bps transmit, 1200 bps receive (half duplex) V.23 mode

Determines the V.23 mode used at 1200 bps.

Note: Entering AT%F*n* (n=1, 2, or 3) disables all protocols except V.23. Entering AT%B*n* forces the %F0 setting.

During normal split-speed connections, set \J0 to operate at the speed of the serial port prior to the connection. Set \J1 for a 1200 bps constant speed.

During direct split-speed connections, the computer must be able to support split transmit and receive speeds.

When %F0 is set and the modem is at 1200 bps or higher, it can answer as a V.23 1200/75 bps modem or a V.23 1200/1200 bps half-duplex modem.

When %F3 is set, the modem can only establish normal or direct 1200 bps half-duplex connections.

The \S command shows MODEM BPS V.23 AT when the modem establishes V.23 connection.

Note: Set %G1 first ***before*** setting %F*n*.

&F Restore Factory Defaults

Restores factory default settings. Stored telephone numbers are preserved.

Note: The AT\R command is not reset to the factory default setting. It will retain the value you set for it. The AT#T command is not reset to the factory default setting. It retains the value set in the PRI configuration file.

-F*n* Secondary Flow Control

-F0 Disables secondary flow control characters
-F1 Enables secondary flow control characters

Controls whether the modem sends or receives secondary flow control characters on the serial port. If -F1 is set and primary flow control is enabled on the serial port, the modem sends two flow control characters (one primary and one secondary) to the host for flow control processing.

If the modem receives either a primary or secondary XOFF flow control character, it stops sending data until it receives the corresponding primary or secondary XON character.

\F Read Stored Phone Numbers

Displays the telephone numbers stored in the telephone directory. To cancel a display, issue a Break with your data communications software.

$G*n* Dial Access Security

$G0 Disables Dial Access Security
$G1 Enables Dial Access Security

Controls whether the modem uses Dial Access Security during logon. If you also want the modem to auto-answer, set register S0 to a value greater than 0. Also see Chapter 5, *Auto Logon, Dial Access, and PCS Security*.

Note: With AT$G1 set, the modem controls V.24 signalling.

%G*n* Independent Serial-Port/Modem-Port Speed

%G0 Serial-port speed determines modem-port speed (default for 4-port modems)
%G1 %B command determines modem-port speed (default for 8-port modems)

Determines whether the modem-port speed updates to match the serial-port speed with each AT command. When %G1 is set, the modem-port speed does not update, and you must change it with a %B or %F*n* command.

&G*n* Guard Tone

&G0 Disables guard tone
&G1 Sets guard tone on the answering modem to 550 Hz
&G2 Sets guard tone on the answering modem to 1800 Hz

Note: See your country-specific addendum for differences.

\G*n* Modem-Port Flow Control

\G0 Disables modem-port flow control
\G1 Sets modem-port flow control to XON/XOFF
\G2 Sets modem-port flow control to unidirectional XON/XOFF

Sets the flow control method used to pace data between modems during a normal mode connection. When \G1 is set, the modem sends an XOFF character to stop receiving data, and sends an XON character to resume. When \G2 is set, the modem sends XON and XOFF characters to the remote device but ignores XON and XOFF characters from the remote device.

Notes: Reliable mode has its own method of flow control and ignores the \G setting, but \Q*n* settings remain active.

Both modems must have the same primary flow control characters set during normal connections. (See the register :T9 and :T10 descriptions.)

H*n* Hang Up

H0 Disconnects from the remote system and hangs up the telephone line
H1 Disconnects from the remote system and goes off hook in command mode

The modem ignores ring signals and positive transitions of DTR for five seconds after disconnect.

Note: If %D is set to a value other than 0, hang up may not occur immediately.

$H*n* Edit Dial Access Security Database

Range: *n*=1 through 9, indicating a position in the Dial Access Security database
Default: **none**

Allows the security administrator to enter valid users and passwords. Refer to Chapter 5, *Auto Logon, Dial Access, and PCS Security*.

*H*n* Link Negotiation Speed

***H0** Link negotiation occurs at the highest supported speed
*H1 Link negotiation occurs at 1200 bps
*H2 Link negotiation occurs at 4800 bps

Sets the connection speed for link negotiation for connections before upshift occurs between two MNP 10 modems. Use *H1 or *H2 to set speed to 1200 or 4800 bps, respectively, to facilitate link negotiation over poor phone lines.

-H*n* Dumb Mode

-H0 Disables dumb mode (sets smart mode)
-H1 Enables dumb mode

Used to configure the modem to ignore commands and not send result codes. The modem is in smart mode when it recognizes commands.

Note: If you set dumb mode, you can reset the modem to accept AT commands by turning it off and on.

\H*n* Hewlett Packard ENQ/ACK

\H0 HP ENQ/ACK protocol disabled
\H1 HP ENQ/ACK protocol enabled during MNP reliable link; modem emulates terminal
\H2 HP ENQ/ACK protocol enabled during MNP reliable link; modem emulates host

HP ENQ/ACK support allows the modem to emulate the ENQ/ACK protocol when an MNP reliable link is established. Flow control may be used in addition to the ENQ/ACK protocol if the host or terminal supports it. Data blocks should not exceed 250 characters. To use the HP ENQ/ACK protocol:

1. Set the modem at the host to \H1.
2. Set the modem at the terminal to \H2.
3. Enable XON/XOFF (\Q1) or hardware (\Q3) flow control on the serial port on both modems to prevent data loss.
4. Establish an MNP reliable link.

Note: The modem does not support HP ENQ/ACK protocol during V.42 LAPM reliable connections.

I*n* Identification

I0 Displays the 4-digit modem product code
I1 Performs a checksum on firmware and displays 3-digit result
I2 Performs a checksum on the firmware ROM and displays the checksum status, which should display OK
I3 Displays modem name and firmware version
I10 Displays DSP Data Pump version
I11 Display DSP Controller version

$I Display Dial Access Security Database

Allows the security administrator to display the Dial Access Security database. Refer to Chapter 5, *Auto Logon, Dial Access, and PCS Security*, for information.

%I*n* Edit Connection Security Password

Range: *n* = 0 to 49
Default: **none**

Allows the security administrator to set a new password or change the existing password. Passwords set by this command are verified during link negotiation by using the $M command.

You can password protect the Connection Security password with the $P command. If a password exists and has not been entered within the last two minutes, the modem prompts you for this password first. Then it asks you for the Connection Security password at the NEW PASSWORD: prompt.

Note: If the logon sequence has no password protection, any user can set a password or edit an existing one using %I.

Passwords must contain exactly five alphanumeric characters. The modem ignores upper case or lower case and parity. You must type the old password correctly to enter a new password. You must type the new password the same way both times for it to take effect. Periods echo as you type the password.

You can enter up to 50 passwords for both the originating and answering modems (see %I*n*, where *n* = 0 to 49). During link negotiation, the originating modem sends password 0 to the answering modem. The answering modem checks its list of passwords to see whether the password matches any of its passwords 0 through 49. If there is a match, the connection proceeds. If not, the connection fails.

Default sequence 5 is **D2A20 'Connection Password:' P2 '^M^J'Z**

Table 3-2. Logon Default Sequence 5

Where:	***Means:***
D2A20 'Connection Password:'P2	Send the string **Connection Password:** to the remote user and wait for a string containing the user's password. Echo periods to the remote user. If no string received within 20 seconds, abort and disconnect.
'^M^J'	Send a carriage return and a line feed.

Table 3-2. Logon Default Sequence 5 (Continued)

Where:	*Means:*
Z	Check the Connection Security password database for the password. If a match, the connection proceeds. If no match, retry the sequence up to two times more (for a total of three tries), then disconnect.

*I Modem Identifier

Sets the modem identifier that displays as part of the remote access session banner. You can also display the identifier with the \S command. When you enter the *I command, the ID: prompt appears.

The identifier can consist of up to 25 ASCII characters. It truncates after the twenty-fifth character. There is no default setting for the *I command.

$J*n* Clear Dial Access Security Database, Stored Telephone Numbers, and Connection Security Password Database

$J0 Clears the Dial Access Security database and restores the factory default auto-logon sequences $L1 - $L5

$J1 Clears the Dial Access Security database, restores the factory default auto-logon sequences $L1 - $L5, and clears the Connection Security password database. Also, clears stored telephone numbers from the modem's telephone directory and clears the last dialed number

Refer to Chapter 5, *Auto Logon, Dial Access, and PCS Security*, for more information about Dial Access Security.

➥ **CAUTION:** AT$J1 is a very powerful command. It clears all passwords from the modem's security database. This includes Connection Security passwords.

-J*n* Detect Phase

-J0 Disables the detect phase

-J1 Enables the detect phase

Indicates whether the originating modem sends the V.42 control sequence to the answering modem to determine the type of error correction it has enabled. The answering modem can have LAPM, MNP, or no error correction enabled. See the \N command description for the types of connections.

\J*n* Bps Rate Adjust

\J0 Disables the bps rate adjust feature

\J1 Enables the bps rate adjust feature

After establishing a connection with \J1 set, the modem automatically adjusts its serial port to match the connection speed until disconnection. If your PC does not automatically change to the adjusted bps rate, you must manually change the bps rate to the new setting. When \J0 is set, the serial-port rate is independent of the rate of the connection.

When the modem establishes a reliable connection at speeds between 4800 and 16,800 bps with bps rate adjust enabled, the serial-port speed adjusts to 9600 bps. If the connection speed is above 16,800 bps, the serial port adjusts to 19,200 bps. If you set the serial port to the modem's highest rate of 115,200 bps, turn off bps rate adjust to make sure that the serial port stays at 115,200 bps.

Notes: Refer to the %F command description for information about using the \J command during V.23 connections.

See the %U*n* command description for information about resetting the serial-port bps rate. When \J1\C0\N3 are set, the modem uses direct mode instead of normal mode if a reliable connection is not established.

Compaq Microcom recommends turning off bps rate adjust (\J0) when using data compression to retain the highest throughput.

-K*n* MNP Extended Services

-K0 Disables MNP Extended Services
-K1 Enables MNP Extended Services
-K2 Enables MNP Extended Services without MNP indication during the answer detect phase

MNP Extended Services allow two modems that support them to use MNP data services that are not available with LAPM. For example, negotiating MNP Class 10 with V.42bis compression in preference to LAPM.

:K*n* Kermit/UUCP Protocol (8-Port Modems Only)

:K0 Disables Kermit and UUCP spoofing asynchronous protocols
:K1 Enables Kermit spoofing asynchronous protocol
:K2 Enables UUCP spoofing asynchronous protocol

Note: This command is valid only in 8-port digital modems.

Enables the Kermit or UUCP spoofing asynchronous protocol (emulation). The same protocol (Kermit or UUCP) must be enabled on *both* the originating and answering modems. You can use the Kermit and UUCP protocols only during an MNP reliable connection, with or without data compression. The protocols are not available for direct or normal operation.

The Read Online Status command displays KERMIT when the modem establishes a Kermit connection and UUCP for a UUCP connection. (See also the :Q command.)

\K*n* Break Control

Range: *n* is a number between 0 and 5 indicating the type of Break the modem transmits
Default: **5**

Determines the type of Break the modem transmits when a Break enters the modem. The following table lists the different effects of the *n* value when the modem receives or transmits the Break. The modem can buffer up to four Breaks on both the modem port and the serial port.

Note: In reliable link connect state, the sender's Break control setting determines how the receiver handles the Break.

Table 3-3. \K Command Settings

	Local DTE sends Break during reliable or normal connection	***Local DTE sends \Bn; local modem in command mode, during reliable or normal connection***	***Local modem sends Break during direct connection***	***Remote modem sends Break during normal connection***
\K0	Enter command state; no Break to remote system*	Empty data buffers; send Break to remote system	Send Break to remote system; set modem to command state	Empty data buffers; send Break to serial port
\K1	Empty data buffers; send Break to remote system	Same as \K0	Send Break to remote system	Same as \K0
\K2	Same as \K0*	Immediately send Break to remote system	Same as \K0	Immediately send Break to serial port
\K3	Immediately send Break to remote system	Same as \K2	Same as \K1	Same as \K2
\K4	Same as \K0*	Send Break to remote system in sequence with any transmit data being buffered	Same as \K0	Send Break to serial port in sequence with receive data being buffered
\K5	Send Break to remote system in sequence with transmit data	Same as \K4	Same as \K1	Same as \K4

***** Forces the modem to command state. To transmit a Break and enter connect state, type **AT\BO** and press **Enter**. (See the \B and O command descriptions for details.)

$L*n* Logon Sequence

Edit logon sequence *n*, where *n* = 1 through 9

Allows you to edit logon sequences to be used during normal or reliable connections in either originate mode or auto-answer mode. If a Security Database password has been set, you *must* enter the correct password before you can edit a logon sequence. (See also the $P command.) If no password has been set, anyone can edit the logon sequence.

Refer to Chapter 5, *Auto Logon, Dial Access, and PCS Security*, for details.

%L*n* Speed Matching

%L0 Provides partial speed matching
%L1 Enables speed matching
%L2 Disables speed matching
%L3 Enables V.8 Automode with fallback to ITU-T Automode
%L4 Enables V.8 Automode only

Determines whether the modem uses speed matching to establish a connection.

Notes: Both modems must support the V.8 protocol when using %L4 or a connection will not be made.

%L2 is not supported when making either V.90 or K56flex connections.

The following charts indicate the connections that the modem can establish when %L1 or %L3 is set.

Table 3-4. Connections When %L1 or %L3 Is Set

	Mode Setting on Answer Modem								
Mode Setting on Originate Modem	***V.22[b]***	***V.22[a]***	***V.22bis***	***V.32***	***V.32bis***	***V.FC***	***V.34***	***V.90***	***K56flex***
K56flex (32,000-56,000)	—	V.22bis	V.22bis	V.32	V.32bis	V.FC	V.34	K56flex	K56flex
V.90 (28,000-56,000)	—	V.22bis	V.22bis	V.32	V.32bis	V.FC	V.34	V.90	K56flex
V.34 (2400-33,600)	—	V.22[a]	V.22bis	V.32	V.32bis	V.FC	V.34	V.34	V.34
V.FC (14,400-28,800)	—	V.22[a]	V.22bis	V.32	V.32bis	V.FC	V.FC	V.FC	V.FC
V.32bis (4800-14,400)	—	V.22[a]	V.22bis	V.32	V.32bis	V.32bis	V.32bis	V.32bis	V.32bis
V.32 (4800-9600)	—	V.22[a]	V.22bis	V.32	V.32	V.32	V.32	V.32	V.32
V.22bis (2400)	—	V.22[a]	V.22bis	V.22bis	V.22bis	V.22bis	V.22bis	V.22bis	V.22bis
V.22[a] (1200)	—	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22	V.22
V.22[b] (600)	V.22[b]	—	—	—	—	—	—	V.22	V.22
Bell212A (1200)	—	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]
Bell103 (300)	—	Bell103	Bell103	Bell103	Bell103	Bell103	Bell103	Bell103	Bell103

Note: When both the originate and answer modems are V.8 modems, setting 300 bps will make a V.21 connection.

Table 3-5. Bell Mode Connections When %L1 or %L3 Is Set

	Mode Setting on Answer Modem	
Mode Setting on Originate Modem	***Bell 212A***	***Bell 103***
K56flex (32,000-56,000)	Bell212A	—
V.90 (28,000-56,000)	Bell212A	—
V.34 (2400-33,600)	V.22[a]	—
V.FC (14,400-28,800)	V.22	—
V.32bis (4800-14,400)	V.22[a]	—
V.32 (4800-9600)	V.22[a]	—
V.22bis (2400)	V.22[a]	—
V.22[a] (1200)	V.22[a]	—
V.22[b] (600)	V.22[a]	—
Bell212A (1200)	Bell212A	Bell212A

Table 3-5. Bell Mode Connections When %L1 or %L3 Is Set (Continued)

Mode Setting on Originate Modem	*Mode Setting on Answer Modem*	
	Bell 212A	***Bell 103***
Bell103 (300)	Bell103	Bell103

The following chart indicates the connections that the modem can establish when %L4 is set. Both modems must support the V.8 protocol when using %L4 or a connection will not be made.

Table 3-6. Connections When %L4 Is Set

Mode Setting on Originate Modem	*Mode Setting on Answer Modem*								
	V.22[b]	***V.22[a]***	***V.22bis***	***V.32***	***V.32bis***	***V.FC***	***V.34***	***V.90***	***K56flex***
K56flex (32,000-56,000)	—	V.22bis	V.22bis	V.32	V.32bis	V.FC	V.34	K56flex	K56flex
V.90 (28,000-56,000)	—	V.22bis	V.22bis	V.32	V.32bis	V.FC	V.34	V.90	K56flex
V.34 (2400-33,600)	—	V.22[a]	V.22bis	V.32	V.32bis	V.32bis	V.34	V.34	V.34
V.FC (14,400-28,800)	—	V.22[a]	V.22bis	V.32	V.32bis	V.32bis	V.32bis	V.32bis	V.32bis
V.32bis (4800-14,400)	—	V.22[a]	V.22bis	V.32	V.32bis	V.32bis	V.32bis	V.32bis	V.32bis
V.32 (4800-9600)	—	V.22[a]	V.22bis	V.32	V.32	V.32	V.32	V.32	V.32
V.22bis (2400)	—	V.22[a]	V.22bis	V.22bis	V.22bis	V.22bis	V.22bis	V.22bis	V.22bis
V.22[a] (1200)	—	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]	V.22[a]
V.22[b] (600)	V.22[b]	—	—	—	—	—	—	V.22[b]	V.22[b]

To restrict the possible connections that can result, %L0 or %L2 can be set on originating or answering modem. If %L2 is set, modem and connection speeds are identical.

If %L0 is set:

Table 3-7. Connection Speeds When %L0 Is Set

Modem Speed	***Possible Connection Speed***
300	300
600	600
1200	1200
2400	1200, 2400
4800	2400, 4800
7200	2400, 4800, 7200
9600	2400, 4800, 7200, 9600
12000	2400, 4800, 7200, 9600, 12000
14400	2400, 4800, 7200, 9600, 12000, 14400
16800	2400, 4800, 7200, 9600, 12000, 14400, 16800
19200	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200
21600	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600
24000	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000
26400	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400
28800	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800
31200	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200
33600	2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, 33600
56000 (8-port only)	28000, 29333, 30667, 32000,33333, 34000, 34667, 36000, 37333, 38000, 38667, 40000, 41333, 42000, 42667, 44000, 45333, 46000, 46667, 48000, 49333, 50000, 50667, 52000, 53333, 54000, 54667, 56000

&L*n* Leased-Line Mode (4-Port Analog Modems Only)

&L0 Disables leased line (enables switched line)
&L1 Enables 2-wire leased line
&L2 Enables 2-wire leased line. Modem goes off hook automatically after 6 seconds in either originate or answer mode, depending on the setting of register S0

Controls leased-line connections when your modem and a remote modem are connected by a dedicated leased line. For leased-line connections, note the following:

- Both modems must be operating at the same speed: from 1200 to 33600. Speeds below 1200 bps are not supported.
- One modem must be in originate mode and the other in answer mode.
- Both your modem and the remote modem must use either direct, normal, or reliable mode.

When **&L2** is set and the modem receives any input before it connects, it goes back on hook. After 6 seconds, it goes off hook again in either originate or answer mode, depending on the setting of register S0, to try to connect.

Note: You cannot use **&L1** or **&L2** with modems set to auto-reliable mode.

To establish an asynchronous leased-line connection, ***enter command state and***:

Select an operating mode and at the command prompt type:

Normal mode:	**AT\N0**
Direct mode:	**AT\N1**
MNP Reliable mode:	**AT\N2**
LAPM Reliable mode:	**AT\N4**

%M*n* Modulation Selection

%M0 Disables V.34 modulation modes
%M1 Allows all modulation modes V.FC and below
%M2 Allows all modulation modes V.34 and below (default for 4-port modems)
%M3 Allows K56flex modulation modes and below
%M4 Allows V.90 modulation modes and below (default for 8-port modems)

Controls the modem's top modulation speed.

Notes: The following Notes are for 8-port modems only:

- When %M4 is set, V.90 mode allows you to set %B to any V.32, V.FC, V.34, K56flex, or V.90 speed. V.90 mode allows the client modems to connect at V.32, V.FC, V.34, K56flex, or V.90 speeds up to the %B limit.
- When %M3 is set, K56flex mode allows you to set %B to any V.32, V.FC, V.34, or K56flex speed. Setting %B to V.90 speeds results in ERROR and no changes are made. K56flex mode allows the client modems to connect at V.32, V.FC, V.34, or K56flex speeds up to the %B limit.
- When %M2 is set, V.34 mode allows you to set %B to any V.32, V.FC, or V.34 speed. Setting %B to V.90 or K56flex speeds result in ERROR and no changes are made. V.34 mode allows the client modems to connect at V.32, V.FC, or V.34 speeds up to the %B limit.
- When %M1 is set, V.FC mode allows you to set %B to any V.32 or V.FC speed. Setting %B to V.34, K56flex, or V.90 speeds result in ERROR and no changes are made. V.FC mode allows the client modems to connect at V.32 and V.FC speeds up to the %B limit.
- When %M0 is set, V.32 mode allows you to set %B to any V.32 speed. Setting %B to V.FC, V.34, K56flex, or V.90 speeds results in ERROR and no changes are made. V.32 mode allows the client modems to connect at V.32 speeds up to the %B limit.

$M*n* Connection Security Password Control

$M0 The originating modem does not send the Connection Security password; the answering modem does not verify the Connection Security password

$M1 The originating modem sends the Connection Security password; the answering modem verifies the Connection Security password for all connections. If the originator's password does not match one of the answerer's passwords, the connection fails

$M2 The originating modem sends the Connection Security password; the answering modem verifies the Connection Security password for all connections. If no password is sent, the answerer prompts the remote user (up to three times). If the password is not correct, the connection fails

)M*n* Power Level Adjustment for Cellular Telephone Connections

)M0 **For central site modems:** Auto-adjustment [adjusts power level if remote modem is set to)M1]. Use for MNP Class 10 modems that will connect to both MNP 10 non-cellular telephone site modems and to cellular modems that use only basic MNP 10 cellular operation instead of Enhanced Cellular operation

)M1 **For cell-side cellular modems:** Forces power-level adjustment

Adjusts the power levels during link negotiation for reliable connections to accommodate signaling requirements of cellular telephone equipment. This setting must be used for Method 2 MNP 10 Enhanced Cellular operation.

*M Modify Remote Access Level (8-Port Modems Only)

Initiates a request to move up from a Level 0 remote access session to a Level 1 remote access session. With security enabled and a Level 1 password set, the modem prompts for a valid password up to three times before granting Level 1 access. With security disabled or enabled but a Level 1 password not set, the modem grants Level 1 access on request without further prompting.

-M*n* MNP Class Connect Messages

-M0 Disables MNP Class connect messages

-M1 Enables MNP Class connect messages

Determines whether MNP Class connect messages are displayed. The **-M1** setting overrides the **\V** command setting for long form connection result codes and the **W** command for serial-port connect messages.

When -M1 is set and an MNP connection established, the connect message is **CONNECT MNP*n*/*x*,** where *n* equals the MNP Class (from 1 to 10) and *x* equals the type of data compression used (V.42bis or MNP Class 5). If)M1 is set, the message is **CONNECT MNP*n*/y/*x*,** where *y* equals **CELLULAR**. If the modems do not negotiate compression, the message is **CONNECT MNP*n*.**

During LAPM V.42bis connections when -M1 is set, the connect message is **CONNECT LAPM/V42BIS**. During LAPM connections with no compression active, the message is **CONNECT LAPM**.

When -M1 is set, the message during normal and direct connections is **CONNECT**.

The modem ignores this command with short-form result codes enabled by V0.

Setting X0 will also override the -M setting by displaying only **CONNECT**.

See also Appendix C, *Result Codes*, for a complete list of connect messages and result codes.

@M*n* Select Transmit Level (Only for Cellular Connections)

@M0 Use an initial transmit level of -18 dBm

@M1 Use an initial transmit level of -30 dBm

@M2 Use an initial transmit level of -10 dBm

@M*n* Where *n* =10 to 35, use an initial transmit level of -10 dBm through -35 dBm

Selects the initial transmit level for your connection. You can set levels from -10 dBm through -35 dBm. From @M10 through @M35, the level set is the variable expressed as -dBm. For example, @M12 sets -12 dBm.

Microcom recommends you set @M18 when making cell-side cellular calls. You may need to adjust this level, depending on your cellular equipment.

\N*n* Operating Mode

\N0 Sets normal mode
\N1 Sets direct mode
\N2 Sets reliable mode
\N3 Sets auto-reliable mode
\N4 Sets LAPM reliable mode
\N5 Sets LAPM reliable mode with fallback to normal mode
\N6 Sets LAPM reliable mode with fallback to MNP reliable mode

Note: You can use dial modifiers to set the operating mode for a single call. See the D command description for details.

Normal mode (\N0) can communicate with nearly any modem. Error correction does not take place in normal mode.

Direct mode (\N1) does not buffer data and ignores flow control. Also, in connect state, the serial port always adjusts to the speed of the connection, regardless of the setting of \J*n*. Error correction does not occur.

Note: Setting \J0 disables the escape code sequence in direct mode.

Reliable mode (\N2) uses the MNP reliable link to provide error detection and automatic retransmission of data if an error occurs. This provides for error-free communications between your system and another that supports the MNP reliable link. When \N2 is in effect, the modem disconnects if it fails to establish an MNP reliable link immediately after making a connection.

During an MNP reliable link, both modems should use flow control on the serial port. When one detects a transmission error, it holds data in a buffer while they retransmit.

Note: You may not want to use certain other protocols, such as HP Block Mode, with MNP. Such protocols have particular timing requirements that can interfere with MNP's effectiveness.

Auto-reliable mode (\N3) allows the modem to communicate with remote systems which support the MNP or LAPM reliable link and with systems that do not support the reliable link. In auto-reliable mode, the answering modem looks for incoming MNP or LAPM protocol characters from the remote modem. If it detects them within approximately three seconds, it tries to establish a reliable link connection.

When the modem is set to auto-answer in auto-reliable mode, you can shorten this three-second period by using the %A command with \C2.

Note: If both modems are set to auto-reliable mode, a normal connection or no connection could result due to noise on the telephone line.

LAPM reliable mode (\N4) uses the LAPM reliable link to provide error detection and automatic retransmission of data if an error occurs. This ensures that communications between your system and the remote system are error-free. The remote system must also be equipped to handle a LAPM reliable link. The modem attempts to establish a LAPM reliable link immediately after making a connection. If the attempt fails, the modem disconnects.

LAPM reliable mode with fallback to normal mode (\N5) attempts to establish a LAPM reliable connection. If the LAPM connection attempt fails, the modem falls back to a normal connection.

LAPM reliable mode with fallback to MNP reliable mode (\N6) attempts to establish a LAPM reliable connection. If the LAPM connection attempt fails, the modem then tries to establish an MNP reliable connection.

The following chart indicates the type of connections, depending on the operating mode. **NC** indicates No Connection. Where more than one operating mode is in a column, the first mode is for the originating modem and the second mode is for the answering modem.

Note for MNP Extended Services: In the chart, you can use MNP Extended Services for V.42 connections where LAPM appears if both modems are set with -K1 or -K2.

Answering	***Originating Modem***						
Modem	***\N0***	***\N1***	***\N2***	***\N3***	***\N4***	***\N5***	***\N6***
\N0	normal	direct/normal	NC	normal	NC	normal	NC
\N1	normal/direct	direct	NC	normal/direct	NC	normal/direct	NC
\N2	NC	NC	MNP	MNP	NC	NC	MNP
\N3	normal	direct/normal	MNP	LAPM	LAPM	LAPM	LAPM
\N4	NC	NC	NC	LAPM	LAPM	LAPM	LAPM
\N5	direct	direct/normal	NC	LAPM	LAPM	LAPM	LAPM
\N6	NC	NC	MNP	LAPM	LAPM	LAPM	LAPM

Note: The modem does not support LAPM error correction for Bell 103, V.21, and V.23 connections.

$N List Connection Security Passwords

Displays Connection Security password database. (See %I and $P for details.)

O*n* Enter Connect State

O0 Enters connect state

O1 Begins an equalizer retrain sequence when operating at 2400 bps or higher and then returns to connect state

Type **ATO1** and press **Enter** to reduce errors due to loss of equalization when excessive bit error rates are present.

Note: Entering ATO1 during remote access returns ERROR.

%O*n* V.23 Equalizer Control

%O0 Disables equalizers in V.23 half-duplex mode

%O1 Enables equalizers in V.23 half-duplex mode

Determines if equalizers are set in V.23 half-duplex mode. To avoid transmission errors during V.23 half-duplex connections, equalizer settings must be the same on both modems.

-O*n* Serial-Port Parity

-O0 7 data bits, odd parity

-O1 7 data bits, even parity

-O2 7 data bits, mark parity

-O3 7 data bits, space parity

-O4 8 data bits, no parity

-O5 8 data bits, odd parity

-O6 8 data bits, even parity

-O7 8 data bits, mark parity

Allows you to change the serial-port parity setting that is automatically set by the **AT** sequence.

You can also use the -O command to change the serial-port parity while connected to a remote device. Use this command when the local device supports XON/XOFF flow control and detects parity. This command ensures that all XON and XOFF characters generated by the modem have the correct parity.

You cannot change modem-port parity during a connection. When parity is required for a connection and is different than the parity set by the **AT** sequence, the parity must be set at the same time the dial command is issued and issued on the same command line. For example, type **AT-O4D12345** and press **Enter**.

Notes: The **AT** sequence cannot be used to match 8 bit data with mark parity. Eight data bits plus mark parity can only be set by the AT-O command. If -O7 is not set, the modem defaults to 8 data bits, no parity.

The **AT** sequence cannot be used to match space parity; no parity is set instead. You must enter AT-O3 to set space parity.

P Pulse Dial

Changes the current dialing mode to pulse. Tone is the default.

$P Security Database Password

Allows you to change the password needed to edit the auto-logon sequences, Dial Access and auto-logon commands, and Connection Security passwords. The default is no password set.

The following prompts appear after the $P command:

Prompt	*Response*
OLD PASSWORD:	Type the existing password and press **Enter**; If no password has been set, just press **Enter**
NEW PASSWORD:	Type a new password and press **Enter**
NEW PASSWORD:	Type the new password and press **Enter** again for verification

Notes: The password becomes valid 2 minutes *after* the last logon or Connection Security password was entered.

&P*n* Dial Pulse Ratio

&P0 Make = 40%, Break = 60%; 10 pps (pulses per second)
&P1 Make = 33%, Break = 67%; 10 pps
&P2 Make = 40%, Break = 60%; 20 pps
&P3 Make = 33%, Break = 67%; 20 pps

Controls the ratio of the off-hook (make) to on-hook (break) interval as well as the speed that the modem uses for pulse dialing.

Note: This parameter may be locked due to specific country requirements. See your country-specific addendum for further information.

*P*n* Remote Access Passwords (8-Port Modems Only)

*P0 Sets Level 0 remote access password
*P1 Sets Level 1 remote access password

Allows setting passwords used to establish remote access sessions.

Important: Set all passwords before you enable remote access security.

The *P command must be the last command on the line. Both Level 0 and Level 1 passwords are set to null at the factory.

The following prompts appear when you issue this command

Prompt	*Response*
OLD PASSWORD:	Type the existing password and press **Enter**; If no password has been set, just press **Enter**
NEW PASSWORD:	Type a new password and press **Enter**
NEW PASSWORD:	Type the new password and press **Enter** again for verification

Passwords must contain exactly five alphanumeric characters. Upper case or lower case and parity are ignored. You must type the old password correctly in order to enter a new password. You must type the new password the same way both times for it to take effect. Periods echo as the password is entered.

-P*n* Check Parity

-P0 Ignores parity of special characters
-P1 Processes special characters *only* if their parity matches that of the serial port
-P2 Processes special characters *only* if their parity matches that of the serial port; recognizes modem-port flow-control characters, however, *regardless* of their parity

Controls checking of parity for XON and XOFF characters, the escape code sequence, and HP ACK characters. In command state, the modem sends all command echoes and command responses to the PC with parity that matches the serial port's.

With -P0 or -P1 set, all received data pass through to the computer at 8 data bits, no parity.

With -P2 set, all received data pass through to the computer with parity corrected to match the serial-port parity.

Note: The -P command is used only for 10-bit data; the modem ignores -P*n* when it is set for 11-bit data.

\P*n <dial string>* Write a Stored Telephone Number

Where *n* is the telephone directory position from 1 to 9 and <*dial string*> is a string of up to 39 characters. Valid dial string characters are: 0-9, dial modifiers, and for tone dialing A, B, C, D, #, and *. Dial strings longer than 39 characters return an error message. The modem ignores invalid characters

Stores a number in the modem's telephone directory.

Q*n* Quiet

Q0 Enables output of result codes
Q1 Disables output of result codes
Q2 Disables answer mode result codes only

Determines whether the modem sends result codes and status codes (OK, BUSY, RING, etc.) to your computer.

*Q Recover Remote Access Configuration (8-Port Modems Only)

Discards configuration changes you made during a Level 1 remote access session but did not save with an *U. The *Q or *U commands do not affect commands that configure remote access operation and telephone numbers that you added or changed.

Note: When you modify stored phone numbers during a remote access session, changes take effect immediately.

-Q*n* Fallback Modulation Speeds

-Q0 Disables fallback from a V.32bis or V.32 MNP reliable connection to an MNP reliable 2400 or 1200 bps connection
-Q1 Enables fallback from a V.32bis or V.32 MNP reliable connection to an MNP reliable 2400 bps connection
-Q2 Enables fallback from a V.32bis or V.32 MNP reliable connection to an MNP reliable 2400 or 1200 bps connection

Controls whether the modem can fall back from a V.32bis or V.32 MNP reliable connection to a V.22bis MNP reliable connection at 2400 bps or a V.22 MNP reliable connection at 1200 bps. Fallback may occur when poor telephone lines cause excessive MNP retransmissions.

Fallback from a V.32bis or V.32 MNP reliable connection to a 4800 bps V.32bis or V.32 MNP reliable connection is always enabled, regardless of the -Q setting. The modem always uses the V.22 standard when it falls back from a V.32bis or V.32 MNP reliable connection to a 1200 bps MNP reliable connection, regardless of the B setting.

:Q*n* Kermit Mark Character (8-Port Modems Only)

Range: *n* is an integer from 0 to 31 indicating an ASCII character
Default: **1**

Defines the Kermit mark character the modem uses with the Kermit spoofing asynchronous protocol enabled. This character must match the computer's Kermit mark character. Most computers use the default Kermit mark character (1). Both the originating and answering modems must use the same Kermit mark character. See also the :K description.

\Q*n* Serial-Port Flow Control

\Q0 Disables flow control
\Q1 Enables bi-directional XON/XOFF flow control
\Q2 Enables unidirectional hardware flow control; the modem uses CTS to control the terminal
\Q3 Enables bi-directional hardware flow control
\Q4 Enables unidirectional XON/XOFF flow control
\Q5 Keeps CTS Off until connection for unidirectional hardware flow control
\Q6 Keeps CTS Off until connection for bi-directional hardware flow control; ignores RTS until connection

Sets the type of flow control used on the serial port. If the serial-port speed is faster than the modem-port speed, data from your computer enter the modem faster than they leave.

The modem holds characters in a buffer and sends them out at the slower modem-port bps rate. When the buffer is full, flow control instructs your computer to stop transmitting data to the modem; the modem continues to send out the characters and empty the buffer. When there is room in the buffer, flow control instructs your computer to resume transmitting data to the modem.

For reliable connections, retransmissions can reduce the effective modem-port speed. If this occurs, flow control prevents buffer overflow.

During direct mode connections, the modem does not use flow control and ignores the \Q setting.

Note: Hardware flow control overrides the &C and \D settings for CTS operation.

\Q1 enables bi-directional XON/XOFF flow control. Sending an XOFF character stops data transmission; sending an XON character restarts it. The modem generates XON and XOFF characters at the same parity as on the serial port. The serial port responds to XON and XOFF characters from the local computer in the same way.

\Q2 enables unidirectional hardware flow control. The modem turns CTS Off to signal the local computer to stop transmitting data, and turns CTS On to signal the local computer to resume transmitting data.

\Q3 sets bi-directional hardware flow control using the CTS and RTS signals. The modem uses the CTS signal to start and stop data transmission from the local computer. When RTS is Off, the modem stops transmitting data to the local computer. When RTS is On the modem resumes sending data.

\Q4 enables unidirectional XON/XOFF flow control. The modem serial port generates, but does not respond to, XON/XOFF flow control characters. This setting allows for computers to transmit data that has XON and XOFF data characters. The computer can still be set to respond to XON/XOFF flow control characters sent to it from the modem during serial-port flow control.

\Q5 enables unidirectional hardware flow control the same as \Q2, but also keeps CTS Off until a connection is established.

\Q6 enables bi-directional hardware flow control the same as \Q3, but also keeps CTS Off until a connection is established and ignores RTS while not connected.

%R*n* Read All Registers

%R0 Displays the contents of all S-registers in decimal and hexadecimal integers in tabular format
%R1 Displays the contents of all :T-registers in decimal and hexadecimal integers in tabular format

*R*n* Enable Remote Access Security (8-Port Modems Only)

***R0** Disables remote access security
*R1 Enables remote access security

Controls remote access security. With remote access security on and passwords set, password entry determines whether the modem grants Level 0 or Level 1 access at the start of a remote access session. With remote access security off, it does not require passwords and grants Level 0 access.

Note: Remote access is available only during a normal connection or during an MNP reliable connection without data compression.

Important: Set all passwords *before* you enable remote access security. An error message appears if you try to disable remote access security afterwards.

\R*n* Serial Port Ring Indicator

\R0 Keeps the Ring Indicator signal On for the duration of the telephone call
\R1 Turns Off the Ring Indicator signal after the telephone call is answered
\R2 Used as the DSR signal instead of the Ring Indicator signal

Controls the Ring Indicator (RI) signal. With either \R0 or \R1 set, when the modem receives an incoming call, the RI signal tracks the ring signal on the telephone line.

When \R2 is set, the RI signal is used as a DSR (Data Set Ready) signal instead, based on the &C and \D settings. This option is for systems that require DSR to be present when establishing a connection. The RI signal is seen on pin 1 of the RJ45 serial adapter. Use the \R2 setting to have the DSR signal seen on pin 1 instead.

Note: This command is automatically saved when issued. You do not need to issue &W or *W to save it.

S*n*? Read Configuration Registers

n is an integer from 0 to 27, indicating an S-register

Displays the contents in decimal form of the selected S-register.

*S*n* Remote Access Attention Character (8-Port Modems Only)

Range: *n* is an integer between 0 and 126 indicating an ASCII character
Default: **42** [***** (asterisk)]

Defines the attention character to request a remote access session. To request a remote access session using this character, establish a connection and type the attention character four times in succession (do not press **Enter**). The *A command sends this sequence automatically.

In normal mode, register S12 sets the guard time that precedes and follows the attention character sequence. Set S12 to the same value on both the originating and answering modems. Reliable mode uses its own timing and the modem ignores register S12. During reliable connections, allow a short pause between typing each attention character, or type **AT*A** and press **Enter** instead.

Note: Remote access is available only during a normal connection or during an MNP reliable connection without data compression.

\S*n* Read Online Status

T Tone Dial

Changes the current dialing mode to tone. Tone is the default.

&T*n* Test and Diagnostics Commands

&T0 End test in progress
&T1 Local analog loopback
&T3 Local digital loopback
&T4 Respond to remote digital loopback
&T5 Do not respond to remote digital loopback
&T6 Remote digital loopback
&T7 Remote digital loopback with self-test
&T8 Local analog loopback with self-test

Note: The modem does not support &T*n* commands for Bell 103, V.13, V.21, and V.23 modes. Refer to Appendix D, *Diagnostics*, for further information.

&T0 ends a test in progress without terminating a connection, and returns the local and remote modems to normal operation. If self-test is in progress, &T0 reports any errors. &T0 must be the last command on a command line.

&T1 makes the modem display the characters on your screen exactly as you type them. The modem must be in normal or direct mode and set to 1200 bps or higher.

&T3 allows a remote modem that does not support the ITU-T V.54 standard to perform a Remote Digital Loopback test with your modem. The modem must connect in normal or direct mode and be set to 1200 bps or higher.

&T4 allows the modem to respond to a remote caller's request to enter Remote Digital Loopback mode.

&T5 (default) prevents the modem from responding to a Remote Digital Loopback request.

&T6 instructs the remote modem to initiate a Remote Digital Loopback. It is available only when the modem is connected in normal or direct mode and set to 1200 bps or higher.

&T7 instructs the remote modem to enter a Remote Digital Loopback with Self-Test. Upon completion of the test, the modem reports errors to the local device. This command is available only when the modem connects in normal or direct mode and is set to 1200 bps or higher.

&T8 makes the modem send itself the ITU-T V.54 test pattern and verify these characters. Upon completion of the test, the modem reports errors to the local device. This command is available only when the modem is in normal or direct mode and set to 1200 bps or higher.

\T*n* Inactivity Timer

Range: *n* is an integer from 0 and 90 in minutes
Default: **0**

Specifies the number of minutes the modem waits for data before automatically hanging up. **T0** (default) disables the inactivity timer. The inactivity timer is only available during normal and reliable link connections; the modem ignores it in direct mode.

#T*n* T1 Mode Control

#T0 Analog signaling (default for modems with analog adapter cards)
#T1 Loop start signaling
#T2 DTMF E&M start signaling
#T3 DTMF E&M Wink start signaling
#T4 MF E&M start signaling
#T5 MF E&M Wink start signaling
#T6 PRI mode

You cannot issue this command to change the signaling value. This command is set automatically to the value of the Modem Signaling parameter found in the PRI card's configuration file. Refer to either the Compaq 4000 Manager's on-line help or the *PRI, Channelized T1, and Channelized E1 User's Guide* for instructions on editing a configuration file.

%U*n* Clear Serial-Port Speed

%U0 Allows the current serial-port speed change from any speed
%U1 Locks the serial-port at the speed you enter. To change serial-port speed, you *must* enter %U1 *each time* you change it
%U2 Allows the current serial-port speed change from any speed

Notes: You do not need to issue %U when bps rate adjust causes the serial-port speed to change during a connection.

You must enter AT%U0 when changing from 11-bit characters to 10-bit characters, and from 10-bit to 11-bit.

When the serial-port speed is set to 38400 bps or above, you cannot change it until you enter an AT%U*n* or reset it.

*U Update Remote Access Configuration (8-Port Modems Only)

Saves configuration changes made during a Level 1 remote access session. At disconnect, the modem loses configuration changes you made during a Level 1 session if you do not enter *U, and it restores the original configuration. This command does not affect remote access configuration commands. Stored telephone number changes take effect immediately during a remote access session.

Note: To save the configuration even after the modem is reset, also issue either &W or *W.

@U*n* Minimum Connection Speed

8-port Range: *n* = 300, 600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, 32000, 33600, 34000, 36000, 38000, 40000, 42000, 44000, 46000, 48000, 50000, 52000, 54000, 56000 bps

4-port Range: *n* = 300, 600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 21600, 24000, 26400, 28800, 31200, 33600 bps

Default: **none**

Sets the minimum modem port speed for connections. For example, if you want your modem to make connections only greater than or equal to 4800 bps, set **AT@U4800**. The modem will make connections only at 4800 bps or higher.

V*n* Result Code Form

V0 Sends short-form result codes

V1 Sends long-form result codes

Selects whether the modem sends long-form (verbose) or short-form (numeric) result codes to your computer. The format of the connection result codes is dependent upon the \V, W, and -M commands.

See also Appendix C, *Result Codes*, for a complete list of connect messages and result codes.

$V*n* Logon View Mode

$V0 Disables pass through of data during the logon sequence

$V1 Enables pass through of data during the logon sequence

Determines whether data passes through from the remote system to the local computer during the logon sequence. With view mode disabled ($V0), the modem does not pass through any data and delays the connect message until the logon sequence is complete. With view mode enabled ($V1), the connect message displays and then data passes through during the logon sequence.

%V Display Modem Firmware Version

%V0 Displays the modem firmware main code version in 2-position format (e.g., 2.0)

%V1 Displays the modem firmware main code version in 3-position format (e.g., 2.0.9)

-V*n* Split Serial-Port Speed with Multi-Protocol Auto-Answer

-V0 Enables V.23 split serial-port speed connections within the multi-protocol auto-answer feature

-V1 Disables V.23 split serial-port speed connections within the multi-protocol auto-answer feature

Determines whether the serial port uses split transmit and receive speed operation when using the multi-protocol auto-answer feature. %F0 must be set also.

\V*n* Error Correction Result Code Form

\V0 Uses standard long-form result codes: CONNECT <*speed*>

\V1 Adds /REL to long-form error correction result codes: CONNECT <*speed*>/REL

\V2 Displays long-form error correction protocol result codes: CONNECT <*speed*>/REL-MNP or CONNECT <*speed*>/REL-LAPM or CONNECT <*speed*>/REL-CELLULAR

\V3 Adds /REL to long form error correction result codes: CONNECT <*speed*>/REL. Displays Hayes-compatible short-form (numeric) result codes.

\V4 Displays long-form error correction protocol result codes: CONNECT <*speed*>/REL-MNP or CONNECT <*speed*>/REL-LAPM or CONNECT <*speed*>/REL-CELLULAR or CONNECT <*speed*>/REL-CELLULAR EC or CONNECT <*speed*>/LAPM-CELLULAR EC

\V5 Displays \V4 plus modulation K56, V.90, V.34, V.FC, V.32, V.22, FSK, or BELL. Also, when a command default changes, an asterisk (*) appears next to it in the \S report.

Determines whether result codes indicate that a reliable link connection is in effect. The W setting determines the contents of the <*speed*> field. Setting -M1 changes the format of the long-form connect result codes.

Even for a reliable connection, use \V0 if the communications software does not expect to see a reliable link result code.

Use \V1, \V2, \V3, \V4, or \V5 when your software supports error correction result codes.

Use V0\V3 if your communications software requires Hayes-compatible connection result codes. Note that when V1 is set to select long-form result codes \V3 is equivalent to \V1.

Use \V3, \V4, or \V5 to see actual connect speed.

Note: When either \V1 or \V2 is set, the message CONNECT 9600/REL displays during 4,800, 7,200, and 12,000 bps reliable connections. When either \V3 or \V4 is set, the actual modem bps rate displays for 4,800, 7,200, and 12,000 bps reliable connections.

See also Appendix C, *Result Codes*, for a complete list.

^V Display Bootstrap Revision

Requests modem to display its current flash memory bootstrap revision.

W*n* Connection Speed Reporting

W0 Displays serial-port connect messages
W1 Displays serial-port connect messages
W2 Displays modem-port connect messages

When W0 or W1 is set, the speeds reported in connect messages indicate the serial-port speed.

When W2 is set, the speeds reported in connect messages indicate the modem-port speed.

When X0 is set, CONNECT displays, regardless of the W setting.

See also Appendix C, *Result Codes*, for a list of valid connect messages and result codes.

%W*n* Pulse Digit Command

%W0 *n* pulse digits dialed for each number
%W1 *n*+1 pulse digits dialed for each number
%W2 10-*n* pulse digits dialed for each number

For pulse dialing, determines whether the modem dials each number in a dial string *n* pulses, *n*+1 pulses, or 10-*n* pulses. For example, when %W0 is in effect, it dials 6 with 6 pulses. However, with %W1, it dials 6 with 7 pulses; with %W2, it dials 6 with 4 pulses.

Notes: With %W0 or %W2 set, the modem dials digit 0 with 10 pulses. When %W1 is set, digit 0 is dialed with 1 pulse.

Refer to your country-specific addendum for differences.

&W Store Current Configuration

Stores the active commands and certain S-registers. You store telephone numbers independently with the \P*n* and &Z*n* commands. AT&W stores the serial-port speed and parity and the modem-port speed that are in effect when you enter &W.

AT&W does not store the following restricted S-registers:

S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12

The modem stores the following commands as you enter them. You do not have to also enter &W or *W.

Remote access settings (8-port modems only):

*E Enable Remote Access
*I Modem Identifier
*P Remote Access Password
*R Enable Remote Access Security
*S Remote Access Attention Character

Auto-logon settings:

$H Edit Dial Access Security Database
$L Logon Sequence
$P Security Database Password

Other commands:

%I Edit Connection Security Password
\R Serial Port Ring Indicator
#T T1 Mode Control

See also the *W, &Y, and Z commands.

*W Store Complete Configuration

Stores all active commands and registers as well as the restricted S-registers not stored with &W. (See the &W command description.)

Save telephone numbers independently with the \P*n* and &Z*n*= commands. The *W command saves the serial-port speed and parity and the modem-port speed in effect when you enter *W. See also the &W, &Y, and Z commands.

Notes: The &W and *W commands share the same stored configuration area. Issue one of these commands to override the other stored settings.

The &W command setting stores default settings for the restricted S-registers. If &W is issued after issuing *W, the default settings for the restricted S-registers are stored. If you change the setting of one of the restricted S-registers and want to save it, use the *W command instead of the &W command.

-W*n* Reverse Answer

-W0 Disables reserve answer
-W1 Enables reverse answer

To answer a call from a modem that has dialed with the R dial modifier (Dial a Number in Answer mode), set -W1 and turn on auto-answer. By default, auto-answer is enabled by S0=1; any S0 value other than 0 enables auto-answer. Modems set to reverse answer will go off-hook in originate mode after receiving a RING signal.

\W*n* Split Serial-Port Speed

\W0 Disables split serial-port speed
\W1 Enables split serial-port speed

Determines whether the serial port uses split transmit and receive speeds when %F1 or %F2 is set. The host computer or terminal must also have split transmit and receive speeds enabled. With \W1 set, the serial-port speed automatically adjusts to match the modem-port speeds set by %F*n*. With %F1 set, the modem accepts data from the DTE at 75 bps on the transmit-data line and outputs them at 1200 bps on the receive data line. With %F2 set, it accepts data at 1200 bps and sends them at 75 bps. It accepts AT commands at any transmit-data speed, while receive speeds are unchanged.

Notes: With \W0\J1 set, serial-port speed is forced to 1200 bps.

The modem ignores \W*n* when on hook with the serial-port speed locked.

X*n* Extended Result Codes

X0 Modem ignores dial tone and busy signals. Displays CONNECT when it establishes a connection. Smartmodem 300 compatible
X1 Modem ignores dial tone and busy signals. Sends a connect result code including bps rate when it establishes a connection
X2 Modem ignores busy signals. Displays NO DIALTONE if it does not detect one within 5 seconds of dialing. Sends a connect result code reflecting bps rate when it establishes a connection
X3 Modem ignores dial tone. Displays BUSY if it detects a busy signal. Sends a connect result code reflecting bps rate when it establishes a connection

X4 Displays NO DIALTONE if it does not detect one within 5 seconds of dialing. Displays BUSY if it detects a busy signal. Sends a connect result code reflecting bps rate when it establishes a connection

Determines whether the modem responds to dial tone and busy signals, and what kind of CONNECT result codes are displayed. Result codes are further controlled by the V*n* command. Result codes indicate MNP reliable mode only when either \V1, \V2, \V3, \V4, \V5, or -M1 is set. When the modem ignores dial tone, it waits for the register S6 time delay to expire and then dials regardless of whether a dial tone is present.

Notes: The W dial modifier causes the modem to wait for dial tone regardless of the X setting.

See your country-specific addendum for differences.

*X Exit Remote Access (8-Port Modems Only)

Moves remote access down one level. When you enter an *X command during a Level 1 remote access session, access moves down to Level 0. When you enter it during a Level 0 session, the remote access session terminates and the originating modem returns to connect state.

\X*n* XON/XOFF Pass-Through

\X0 Processes XON/XOFF flow control characters

\X1 Processes XON/XOFF flow control characters and passes them to the local or remote system so that the local or remote device also processes them

Determines whether XON/XOFF flow control characters pass to the remote or local modem. With XON/XOFF flow control enabled on the serial port (\Q1) and pass through enabled (\X1), the modem also transmits to the remote device any XON and XOFF characters sent to the serial port from the local device.

CAUTION: With \X0 set and XON/XOFF flow control enabled, local devices such as computers or printers may send XON and XOFF characters to the modem serial port. If the modem is already controlling data flow to the remote system, local flow control characters will not interfere with the connection. However, if \X1 is set, local flow control characters also pass to the remote system. These characters intended for the local system may turn on the flow of data from the remote system before the modem is ready to receive more data, resulting in a loss of data.

Y*n* Long Space Disconnect

Y0 Disables long space disconnect on receipt of H or DTR drop if &D2 or &D3 is set

Y1 Enables long space disconnect on receipt of H or DTR drop if &D2 or &D3 is set

Sends a Break up to 4 seconds before disconnecting in response to an H command or if DTR drops and either &D2 or &D3 is set. If &D3 is set and DTR drops, the modem disconnects. If the answer modem sees the Break, it drops the connection.

Notes: Y*n* is available ***only*** during normal and direct connections**.**

Y1 must be set on both modems to take effect.

*Y*n* Busy Out Modem

*Y0 Cancels busy out and puts the modem on hook

*Y1 Busies out the modem and puts it off hook. The specific modem's LED flashes Yellow for 1 second on/1 second off repeatedly while busied out

***Y2** Enables DTR busy out

*Y3 Displays in the AT\S report when you push the Busy Out button on the front of the modem card. This indicates a Hardware busy out. It can only be cleared by pressing either the Reset or Busy Out button on the front of the modem card

-Y*n* Call Abort Disable

-Y0 Disables call abort disable

-Y1 Enables call abort disable

By default, pressing any key aborts a connection attempt.

With -Y1 set, the modem ignores host input after going off-hook, whether originating or answering a call. You can abort a call by sending a break to the modem or lowering DTR if &D1, &D2, or &D3 is also set.

Z Reset

Hangs up the phone line; clears the modem and serial-port buffers; and when you enter the next AT command sets parity and bps rate to match the local PC. Also, restores commands and registers that you last saved with either &W or *W, or the factory defaults if you have not entered an &W or *W.

To reset the modem, type **ATZ** and press **Enter**. If OK does not appear, type **ATQ** and press **Enter** to enable result codes.

See also the &W, *W, and &Y commands.

&Z*n*=<*dial string*> Write Stored Telephone Number

Where *n* is a directory position from 1 to 9 and <*dial string*> is a string of up to 39 characters. Valid dial string characters are: 0-9, dial modifiers, and for tone dialing A, B, C, D, #, and *. Dial strings longer than 39 characters return an error message. The modem ignores invalid characters

Stores a telephone number in position *n* of the modem's telephone directory. When entering a stored number with the &Z*n*= command you can use any dial modifiers available with the Dial command. The &Z*n*= command must be the last command on a command line.

Registers

Some registers control a single function. Others control several functions and are bit mapped. We recommend bit mapped registers for reading modem status only; we suggest you ***use commands to change the modem's settings.***

Commands to Change or Read Registers

Change the Value of a Register

S*n*=*x*

:T*n*=*x* Changes the value of S- or :T-register "*n*" to a new value "*x*".

Change the Value of the Last Referenced S-Register

=*x* Changes the value of the last referenced S-register or the register pointed to with the ATS*n* command. For example, if the last register command used was ATS0=2, entering **AT=4** changes the value of register S0 from 2 to 4.

Display the Value of the Last Referenced S-Register

? Displays the value of the last S-register referenced in a read, write, or point to command.

Point to New Register

S*n* Where *n* is an integer from 0 to 27, indicating a register, instructs the modem to point to the register whose location is *n*. This becomes the last referenced register. For example, typing **ATS1** and pressing **Enter** places the pointer at register S1 and returns the command prompt.

%R*n* Read All Registers

%R0 Displays the contents of all S-registers in decimal and hexadecimal integers in tabular format.

%R1 Displays the contents of all :T-registers in decimal and hexadecimal integers in tabular format.

Read Configuration Register

S*n*? Where *n* is an integer from 0 to 27, indicating an S-register

:T*n*? Where *n* is an integer from 0 to 52, indicating a :T-register

Displays the contents in decimal form only of register "*n*".

Register Descriptions

S0=*n* Ring to Auto-Answer On

Range: 0 - 255 rings

Default: **1** ring (auto-answer enabled)

Sets the number of rings required before the modem answers. ATS0=0 disables auto-answer.

Notes: The modem ignores ring signals for five seconds after disconnect.

See your country-specific addendum for differences.

S1=*n* Ring Counter

Range: 0 - 255 rings

Default: **0** rings

Keeps a running total of the number of rings that occur before the modem answers a call. If no ring occurs within eight seconds after the last ring, the ring counter resets to 0.

Note: The modem ignores ring signals for five seconds after disconnect.

S2=*n* Escape Code Character

Range: 0 - 255, ASCII decimal

Default: **43** (+)

Sets the character used for the three-character escape code sequence. When the modem is in connect state and receives the escape code sequence, it enters command state. Setting register S2 to 0 disables the escape code character. See register S12 to set the guard time that brackets the escape code character.

Note: The modem does not store this register with &W; enter *W to save it.

S3=*n* Carriage Return Character

Range: 0 - 127, ASCII decimal

Default: **13** (carriage return)

Sets the character recognized as a carriage return. The carriage return terminates command lines and result codes.

Note: The modem does not store this register with &W; enter *W to save it.

S4=*n* Line Feed Character

Range: 0 - 127, ASCII decimal

Default: **10** (linefeed)

Sets the character recognized as a line feed. The line feed character follows the carriage return at the end of command lines and result codes.

Note: The modem does not store this register with &W; enter *W to save it.

S5=*n* Backspace Character

Range: 0 - 32, ASCII decimal

Default: **8** (backspace)

Sets the character recognized as a backspace.

Note: The modem does not store this register with &W; enter *W to save it.

S6=*n* Wait Before Dialing

Range: 2 - 255 seconds
Default: **2** seconds

Sets the length pause after off hook before the modem dials. The modem always pauses for a minimum of two seconds, even if S6 is set less than 2.

Notes: Register S6 is valid only when either X0, X1, or X3 is set.

The modem does not store this register with &W; enter *W to save it.

See your country-specific addendum for differences.

S7=*n* Wait for Carrier After Dial

Range: 0 - 255 seconds
Default: **60** seconds

Sets the length of time that the modem waits for:

- Carrier from remote modem before hanging up (originate or answer mode)
- Ring back (originate mode only, and only if either X3 or X4 is set)
- Dial tone when the "W" dial modifier is encountered in a dial string
- Quiet answer when the "@" dial modifier is encountered in a dial string

Note: The modem does not store this register with &W; enter *W to save it.

S8=*n* Pause Time for Dial Delay

Range: 0 - 255 seconds
Default: **2** seconds

Sets the length of time to pause when the modem encounters the comma (",") pause dial modifier.

Notes: The modem does not store this register with &W; enter *W to save it.

See your country-specific addendum for differences.

S9=*n* Carrier Detect Response Time

Range: 0 - 255 tenths of a second
Default: **6** (0.6 seconds)

Determines how long a signal must be present before the modem recognizes it as a carrier.

Notes: The modem does not store this register with &W; enter *W to save it.

Register S9 is used only in normal and direct modes.

S10=*n* Delay for Hang Up After Carrier Loss

Range: 0 - 255 tenths of a second
Default: **60** (6 seconds)

Sets the length of time the modem waits before hanging up after loss of carrier, allowing for a temporary loss. Both modems should have equal S10 values. Otherwise, disconnect occurs when the lower value is reached. When register S10 is set to 255, the modem functions as if carrier is always present.

After disconnecting, the modem waits for a minimum of five seconds before going off hook again in originate mode.

Notes: The modem does not store this register with &W; enter *W to save it.

Register S10 is ignored during V.34, V.FC, V.32bis, V.32, V.22bis, and V.22 reliable connections.

See your country-specific addendum for differences.

S11=*n* DTMF Tone Dialing Speed

Range: 50 - 100 milliseconds
Default: **75** milliseconds

Sets the length of time after the last tone and before the next tone is sent when the modem is dialing over a touch tone line.

Notes: The modem does not store this register with &W; enter *W to save it.

See your country-specific addendum for differences.

S12=*n* Escape Code Guard Time and Remote Access Attention Sequence Guard Time

Range: 0 - 255 (fiftieths of a second)
Default: **50** (1 second)

Sets the minimum "quiet" time that must be present before and after entering the escape code or the remote access attention sequence. The delay between each character in the escape code or remote access attention sequence must be less than this guard time. If register S12 is set to 0, the time it takes to enter the escape code or remote access attention sequence does not affect recognition.

Notes: The modem does not store this register with &W; enter *W to save it.

Register S12 sets the guard time that precedes and follows the attention character sequence. It should be set to the same value on both the originating and answering modems. For the remote access attention sequence guard time, **reliable** mode uses its own timing and register S12 is ignored.

S14=*n* Bit Mapped Register

The modem saves the following command settings when you enter them. You do not need to enter &W or *W also.

Bit Position	***Function***	***Decimal Value***	
0	Not used		
1	Command echo	0 1	No echo Echo
2	Result codes	0 1	Result codes No result codes
3	Result type	0 1	Short form Long form
4	Dumb mode	0 1	Smart mode Dumb mode
5	Dial method	0 1	Tone dial Pulse dial
6	Not used		
7	Originate/answer	0 1	Answer mode Originate mode

S16=*n* Bit Mapped Register, Test Options

Bit Position	*Function*	*Decimal Value*	
0	Local Analog Loopback	0 1	Disabled Enabled
1	Not used		
2	Local Digital Loopback	0 1	Disabled Enabled
3	Remote Digital Loopback status (initiated by the remote modem)	0 1	Loopback Off Loopback in progress
4	Initiate Remote Digital Loopback	0 1	Disabled Enabled
5	Initiate Remote Digital Loopback with Self-Test	0 1	Disabled Enabled
6	Initiate Local Analog Loopback with Self-Test	0 1	Disabled Enabled
7	Not used		

The modem does not support diagnostics in Bell 103, V.13, V.21, or V.23.

Note: Commands enable and disable loopback test options. Register S16 is a read-only register that displays loopback test option status, and is available only when the modem is in normal or direct mode. The modem supports all loopback tests at 1200 bps or higher. (See also Appendix D, *Diagnostics*.)

S18=*n* Test Timer

Range: 0 - 255 seconds
Default: **0** seconds (disables timer)

Sets how long the modem conducts a loopback diagnostic test. Register S18 is available only in normal or direct mode. When S18 is set to 0, type **AT&T0** and press **Enter** to end a test.

Note: Register S18 is not supported for V.54 loopback tests by circuit.

S21=*n* Bit Mapped Register

Bit Position	*Function*	*Decimal Value*	
0	Telco Jack	0 1	Default Not supported
1-2			Not supported
3-4	DTR	0 1 2 3	Ignores DTR (&D0) **On-to-Off DTR transition:** modem enters command state (&D1) **On-to-Off DTR transition:** modem goes on hook (&D2) **On-to-Off DTR transition:** modem resets (&D3)
5	DCD	0 1	DCD always On DCD On indicates data carrier is present or DCD On except momentarily at disconnect
6	Not used		
7	Long space disconnect	0 1	Off (Y0) On (Y1)

S22=*n* Bit Mapped Register

Bit Position	*Function*	*Decimal Value*	
0-3	Not used		
4-6	Result code options	0	Same as X0
		4	Same as X1
		5	Same as X2
		6	Same as X3
		7	Same as X4
7	Make/break ratio	0	40/60
		1	33/67

S23=*n* Bit Mapped Register

Bit Position	*Function*	*Decimal Value*	
0	Respond to remote digital loopback	0	Disabled
		1	Enabled
1-3	Serial-port bps	0	0 to 300 bps
		1	600 bps
		2	1200 bps
		3	2400 bps
		4	4800 bps
		5	9600 bps
		6	19200 bps
		7	38400, 57600, 115200, and, on the 8-port modem only, 230400 bps
4-5	Parity option	0	Even
		1	Space/none
		2	Odd
		3	Mark
6-7	Guard tones	0	Disabled
		1	550 Hz
		2	1800 Hz
		3	Not used

The modem ignores the Respond to Remote Digital Loopback option during reliable connections.

Note: If you use register S23 to change the parity set automatically or set by -O*n*, the same number of data and stop bits used before the change is retained. For example, if 8 data bits and even parity is set (-O6) and you change register S23 to odd parity, the 8 data bits and 1 parity bit are retained. However, the parity becomes odd instead of even, changing the Serial-Port Parity command setting to -O5.

S25=*n* Delay to DTR

Range: 0 - 255 hundredths of a second
Default: **5** hundredths of a second (0.05 seconds)

The modem ignores an On-to-Off transition of DTR that is less than the register S25 time delay.

S27=*n* Bit Mapped Register

Bit Position	*Function*	*Decimal Value*
0-1	Transmission mode	0 Asynchronous mode 1 Asynchronous mode 2 Not supported 3 Not supported
2-3	Leased-line operation	0 Leased line off (&L0) 1 2-wire leased line on (&L1 or &L2) 2 Not supported
4-5		Not supported
6	Answer tone when at 1200 bps	0 ITU-T V.22bis/V.22 1 Bell 212A when supported
7	Not used	

:T0=*n* Timer for V.22bis, V.22 and V.32 Modes During Multi-Protocol Answer

Range: *n* is an integer from 0 to 255, in tenths of a second
Default: **40** (4 seconds)

This command requires 1200 bps or higher operation with %F0%L1 set.

Determines how long the modem attempts to establish a V.32, V.22bis, or V.22 connection before attempting to establish a V.23 split speed or V.21 connection. During this period, the modem sends V.22bis or V.22 carrier.

:T1=*n* Timer for V.23 Split-Speed Mode During Multi-Protocol Answer

Range: *n* is an integer from 0 to 255, in tenths of a second
Default: **30** (3 seconds)

This command requires 1200 bps or higher operation with %F0%L1 set.

When the modem is unable to establish a V.32, V.22bis, or V.22 connection, :T1 determines how long the modem attempts to establish a V.23 split-speed connection before attempting a V.21 or V.23 half-duplex connection. During this period, the modem sends a V.23 forward channel carrier.

Note: If :T1 is set to 0, the modem does not send a V.23 forward channel carrier during the multi-protocol answer sequence.

:T2=*n* Timer for V.21 Mode During Multi-Protocol Answer

Range: *n* is an integer from 0 to 255 representing tenths of a second
Default: **0** (V.23 half duplex disabled)

This command requires 1200 bps or higher operation with %F0%L1\N3 set.

When the modem is unable to establish a V.32, V.22bis, V.22, or V.23 split-speed connection, :T2 determines how long the modem attempts to establish a V.21 connection before attempting a V.23 half-duplex connection. During this period, the modem sends V.21 carrier.

Set :T2=20 (2 seconds) when including V.23 half duplex in the multi-protocol answer modem.

Note: If :T2 is set to 0, V.23 half-duplex connections are not attempted. The modem attempts to establish a connection for the length of time specified by register S7 before hanging up.

:T3=*n* Timer for V.21 and V.23 Answer Tone Duration

Range: *n* is an integer from 0 to 33 (tenths of a second)
Default: **33** (3.3 seconds)

This command requires either V.21 operation (%F0 is set and the modem speed is 300 bps) or V.23 operation (**%F*n***, where *n*=1, 2, or 3).

When the **answering modem** is set for V.21 or V.23 operation, :T3 determines the duration of the V.25 answer tone that is sent to the originating modem. When :T3 is set to 0, no answer tone is sent. All V.21 and V.23 answers begin with two seconds of silence unless :T3 is set to 0.

When the **originating modem** is set for V.21 or V.23 operation, :T3 determines how long the modem waits after detecting answer tone before proceeding with the connection. When :T3 is set to 0, the originating modem does not wait for answer tone.

:T4=*n* Timer for Line Turnaround Delay - Carrier On

Range: *n* is an integer from 0 to 255 (in increments of 12.5 milliseconds)
Default: **20** (250 milliseconds)

This command takes effect only during normal mode V.23 half-duplex connections.

After the modem turns carrier off, determines the minimum time the modem waits for the remote modem to respond before turning carrier back on again to resume sending data.

:T5=*n* Timer for V.23 Half-Duplex Intercharacter Delay

Range: *n* is an integer from 0 to 255 (in increments of 12.5 milliseconds)
Default: **7** (87.5 milliseconds)

This command takes effect only during normal mode V.23 half-duplex connections.

Sets the length of time the modem waits after transmitting the last data character in the transmit buffer before turning carrier off. :T5 may need to be adjusted if the local computer intercharacter time causes excessive line turnarounds.

:T6=*n* Timer for DCD Turn On Delay

Range: *n* is an integer from 0 to 255, representing milliseconds
Default: **200** milliseconds (2 tenths of a second)

This command takes effect only during normal mode V.23 half-duplex connections.

Sets how long the modem waits after carrier goes on before it starts looking for data. This command may be set to exclude the turn-on noise that occurs when DCD turns On during V.23 half-duplex connections.

If :T6 is set to 0, the modem waits 256 milliseconds before looking for data.

:T7=*n* Timer for False Answer Abort

Range: *n* is an integer from 0 to 255, representing seconds
Default: **60** seconds

Note: Setting :T7=0 disables this timer

This command takes effect only when the modem falls back to a normal mode V.23 half-duplex connection.

Sets the amount of time the modem waits before hanging up when it receives no data from the local computer. If this command is set to a value greater than zero, the timer starts when the modem connects. If the modem does not receive data from the local PC in the specified time, it hangs up.

:T9=*n* Primary XON Flow Control Character

Range: *n* is a decimal from 0 to 255, representing an 8-bit character
Default: **11** hexadecimal (or 17 decimal) <DC1>

Defines the character used for primary XON flow control on the modem and serial ports. Enable primary flow control with \Q1, \Q4, \G1, or \G2.

Note: With modem-port flow control, both modems must have the same primary flow control characters set during normal connections.

:T10=*n* Primary XOFF Flow Control Character

Range: *n* is a decimal from 0 to 255, representing an 8-bit character
Default: **13** hexadecimal (or 19 decimal) <DC3>

Defines the character used for primary XOFF flow control on the modem and serial ports. Enable primary flow control with \Q1, \Q4, \G1, or \G2.

Note: With modem-port flow control, both modems must have the same primary flow control characters set during normal connections.

:T11=*n* Secondary XON Flow Control Character

Range: *n* is a decimal from 0 to 255, representing an 8-bit character
Default: **F9** hexadecimal (or 249 decimal)

Defines the character used for secondary XON flow control on the modem's serial port. For secondary flow control to take effect, you must set either -F1\Q1 or -F1\Q4.

:T12=*n* Secondary XOFF Flow Control Character

Range: *n* is a decimal from 0 to 255, representing an 8-bit character
Default: **FB** hexadecimal (or 251 decimal)

Defines the character used for secondary XOFF flow control on the modem serial port. For secondary flow control to take effect, you must set either -F1\Q1 or -F1\Q4.

:T14=*n* Connect Message Delay Timer

Range: *n* is an integer from 0 to 255, in 100 millisecond intervals
Default: **0**

Specifies how long to wait before or after a connect message before CTS, DSR, DCD go high. Use this command with @C*n* (where *n*=0 or 1).

:T15=*n* V.24 Control Register

Range: *n* is an integer from 0 to 255 (see below for the valid values for *n*)
Default: **149**

This command is bit-mapped and used as follows:

Bit Position	***Decimal Value***	
0	0	CTS is not affected by direct mode retrains
	1	CTS is lowered during direct mode retrains
1-5		Not used
6	0	CD follows link negotiation connection status
	1	CD always follows modem carrier when &C1 is set
7	0	V.32 answer tone without phase reversals
	1	V.32 answer tone with phase reversals

:T16=*n* CTS Turn On Delay Timer

Range: *n* is an integer from 0 to 255 (in increments of 12.5 milliseconds)
Default: **0**

After DCD and/or DSR have been turned On while connecting, determines how long the modem waits before turning On CTS.

:T17=*n* V.32/V.32bis Connection Training Timer

Range: *n* is an integer from 0, 1, 5 to 32
Default: **0** (use dynamic training sequences — equivalent to a setting of 28)

Controls the length of the training sequences exchanged when trying to establish V.32 and V.32bis connections.

Reduce the time required to establish a connection by setting **:**T17 to a value less than 28; this increases the modem's sensitivity to noise on the line.

Reduce the modem's sensitivity to noise by setting :T17 to a value greater than 28; this lengthens the time required to make a connection.

:T18=*n* Busy Out When DTR is Low Timer

Range: *n* is an integer from 0 to 255 seconds
Default: **0** (disabled)

When DTR is low, the modem goes off hook and busies out the line after the time set by :T18 expires. When DTR is raised, the modem re-enters command state. &D*n* (where *n*=1, 2, or 3) must also be set.

Note: Manual Dial (:D*n*) cannot be used when :T18 is in effect. :D0 must be set when :T18 is set to a non-zero value.

:T19=*n* Bit Mapped Register

Range: *n* is an integer from 0 to 255 (see below for the valid values for *n*)
Default: **1**

This command controls MNP link control as follows:

Bit Position	***Decimal Value***	
0	0	Modem keeps a non-MNP10 1200 bps connection if no MNP link activity is received from the remote modem
	1	Modem disconnects a non-MNP10 1200 bps connection if no MNP link activity is received from the remote modem for two minutes

:T20=*n* MNP 10 Link Request Parameter

Setting :T20=4 removes the MNP 10 parameter from the originating modem's link request. Setting :T20=32 restores the default parameters.

:T22=*n* DSR Timer

Range: *n* is an integer from 0 to 255 (in increments of 12.5 milliseconds)
Default: **34** (425 milliseconds)

After DCD and/or CTS drop, :T22 identifies how long the modem waits before DSR is dropped when disconnecting. For example, if \D2 and &C1 are set, when DCD and CTS drop, the modem then waits the amount of time specified by :T22 before dropping DSR.

:T23=*n* Bit Mapped Register

Bit Position	*Function*	*Decimal Value*	
0-3	Not used		
4-5	Rate negotiation at start-up	1	At the start of a V.32 connection, makes modem examine line quality and set speed accordingly.
		2	Disabled
6-7	Not used		

:T26=*n* Bit Mapped Register

Default: **0** (for modems with analog adapter cards);
9 (for modems with digital adapter cards)

Bit Position	*Decimal Value*	
0	0	Enables 2-second billing delay
	1	Disables 2-second billing delay. This bit decreases connection time, but may affect attaining connections
1	0	Normal answer tone length in V.32 mode
	1	Shortens answer tone length in V.32 mode
2		not supported
3	0	Disables quick ring detection
	1	Enables quick ring detection

:T42=*n* V.34/V.FC Connection Speed Selection

0 Default V.34/V.FC connection speed selection
1 Highest V.34/V.FC connection speed selection (about 2 speeds above default)
2 Higher V.34/V.FC connection speed selection (about 1 speed above default)
3 Default V.34/V.FC connection speed
4 Lower V.34/V.FC connection speed (about 1 speed below default)
5 Lowest V.34/V.FC connection speed (about 2 speeds below default)

Allows you to change the V.34/V.FC connection speed according to line quality. We recommend leaving this register at its default setting.

If you notice that your modem is falling back during V.34/V.FC connections, or that you are seldom able to make 33,600 bps connections, you can try the lower settings of this register.

:T49=*n* Bit Mapped Register

Range: Where *n* is an integer from 0 through 255
Default: **15** (all types of auto-answer using Distinctive Ring)

Controls which of four Distinctive Ring types (Type 1, Type 2, Type 3, or Type 4) the modem automatically answers when a RING signal is received. See also register :T50.

Bit Position	*Decimal Value*	
0	0	Type 1 disabled
	1	Type 1 enabled
1	0	Type 2 disabled
	1	Type 2 enabled
2	0	Type 3 disabled
	1	Type 3 enabled
3	0	Type 4 disabled
	1	Type 4 enabled
4-7		Not used

:T50=*n* Bit Mapped Register

Range: *n* is an integer from 0 through 255
Default: **15** (all types send RING message)

Controls which Distinctive Ring types (1, 2, 3, or 4) send a RING message to the host. Lets you optionally send a unique message (RING1, RING2, RING3, RING4) to identify which line is receiving the RING signal. See also register :T49.

Bit Position	*Decimal Value*	
0	0	Type 1 disabled
	1	Type 1 enabled
1	0	Type 2 disabled
	1	Type 2 enabled
2	0	Type 3 disabled
	1	Type 3 enabled
3	0	Type 4 disabled
	1	Type 4 enabled
4-6		Not used
7	0	Unique RING message disabled
	1	Unique RING message enabled

:T51=*n* Set Switched-Line Transmit Level

Range: *n* = 0 to 15, indicating a transmit level
Default: The U.S. default is either **-10** dBm (analog modems) or **-13** dBm (digital modems). See your country-specific addendum for other differences

This register allows you to set a transmit level for switched-line connections. For example, 0 = 0 dBm, 1 = -1 dBm, and so on to 15 = -15 dBm. However, if your country has set specific minimum and maximum transmit level values, then the modem allows values only within that range. For example, if the maximum is -10 dBm and the minimum is -15 dBm, then setting this register to any value between 0 and 10 results in a -10 dBm value.

:T52=*n* Set Leased-Line Transmit Level

Range: *n* = 0 to 15, indicating a transmit level
Default: The U.S. default is -10 dBm. See your country-specific addendum for other differences

Note: This command is valid only for 4-port analog modems.

This register allows you to set a transmit level for leased-line connections. For example, 0 = 0 dBm, 1 = -1 dBm, and so on to 15 = -15 dBm. However, if your country has set specific minimum and maximum transmit level values, then the modem allows values only within that range. For example, if the maximum is -10 dBm and the minimum is -15 dBm, then setting this register to any value between 0 and 10 results in a -10 dBm value.

:T73=*n* Bit Mapped Register

Default: 32

To enable split-speed CONNECT result codes, set this register to 160.

Chapter 4

Remote Access and Configuration

What is Remote Access?

Note: Remote access is available only on 8-port digital modems.

Remote access lets a local modem view or change the configuration status of a remote modem. This can be useful in a variety of configuration and troubleshooting situations. You can protect remote access to your modem by password security, so that callers must enter the correct password to change the modem's configuration.

After it establishes a connection, the local modem requests and conducts a remote access session with a remote modem.

Note: Remote access is available only during a normal connection or an MNP reliable connection without data compression.

Enabling Remote Access By Commands

The modem leaves the factory with remote access disabled. To set up the modem for remote access:

1. Set the modem to auto-answer. Type **ATS0=1** and press **Enter**.
2. Set the modem to either normal or reliable mode. Type one of the following and press **Enter**:
   Normal mode: AT\N0
   Reliable mode: AT\N2
3. Enable remote access. Type **AT*E1** and press **Enter**.
4. Disable data compression. Type **AT%C0** and press **Enter**.

Your modem can now accept a request for remote access. When the modem hosts a remote access session, **>OK** replaces **OK**.

Conducting a Remote Access Session With Security Disabled

To conduct a remote access session:

1. First call the modem that you want to access remotely and establish a reliable or normal connection.
2. Then enter command state and type **AT*A** and press **Enter**.

If the answering modem does not respond to a remote access request within 10 seconds, the remote session attempt fails. **REMOTE ACCESS FAILED** (numeric **40**) displays. If the originating modem does not support the *A command, the operator can type the default remote access attention sequence ******** [four asterisks] to request remote access.

When the modems establish a remote access session, a banner similar to the following appears:

```
REMOTE ACCESS - STATUS
AT MODE - ATE1Q0V1

MNP Class 10 Modem
*OK
```

The remote access banner displays the security access level, command echo, result code form, and the identifier of the answering modem. *OK indicates a remote access session is in progress and the answering modem will process commands from the originating modem. The ***** character also appears before result codes and messages.

Changing the Modem's Configuration

1. To change the modem's configuration, type **AT*M** and press **Enter**.

   A Level 1 **MODIFY** access banner appears, indicating that the modem will accept configuration changes.

2. To discard configuration changes that you have not yet saved with either an *U, &W, or *W, type **AT*Q** and press **Enter**.
3. When you finish entering configuration commands, type **AT*U&W** and press **Enter** or **AT*U*W** and press **Enter** to store your changes.

Note: Stored telephone numbers change immediately, regardless of whether you enter an *U command.

Ending the Remote Access Session

To end the session and remain connected, type **ATO** and press **Enter**. Also, you can end a Level 0 session by entering an *X; the remote access session terminates and the modem returns to connect state.

To end the session and hang up, type **ATH** and press **Enter** to either modem.

Remote Access Security

Remote access security lets you control the degree of access available to someone calling your modem from a remote site. The modem provides two levels of remote access security. **Level 0** access allows the caller to view the modem configuration only, and prohibits the caller from changing the configuration. **Level 1** access allows the caller to view and change the modem configuration. Separate passwords control access to Level 0 or Level 1 operation.

Temporarily Stopping Remote Access

To temporarily stop remote access and enter commands to the local modem, type the escape code sequence (+++) to enter command state. **OK** indicates that the local modem will process the commands. Type **ATO** and press **Enter** to resume the remote access session.

Level 0 Access: View Configuration Only

Most status display commands are available from Level 0 access. However, diagnostic loopback commands and the \F command are not. The \S command does not display the last telephone number dialed. Commands available during a Level 0 session include:

Table 4-1. Level 0 Session Commands

Command	*Title*
H	Hang Up
I	Identification
***M**	Modify Remote Access Level
O	Enter Connect State
%R	Read All Registers
S*n*?	Read Configuration Registers
\S	Read On-Line Status
%V	Display Modem Firmware Version
***X**	Exit Remote Access

Note: The O and *X commands terminate the remote access session and leave the modem in connect state.

Level 1 Access: View/Change Configuration

Most commands are available from Level 1 access. However, diagnostic loopback commands are not.

Configuration changes made during a Level 1 session may be temporary or permanent. When it first establishes a Level 1 session, the modem saves the current configuration settings. When the connection terminates, it restores these settings and discards any changes (except for certain remote access configuration commands indicated in the section, "Remote Access Commands.")

To save configuration changes made during a Level 1 session, type **AT*U&W** and press **Enter** or **AT*U*W** and press **Enter**.

To discard configuration changes that you have not saved yet with an *U, &W, or *W, type **AT*Q** and press **Enter**.

Switching Levels

The *M command changes access from Level 0 to Level 1, thus allowing remote callers to change the modem configuration. To upgrade to Level 1 type **AT*M** and press **Enter**.

The *X command moves down a level in access. To downgrade access type **AT*X** and press **Enter**.

If you enter *X from a Level 1 session, access changes to Level 0. If you enter *X from a Level 0 session, the remote access session terminates and the modem returns to connect state.

Enabling Remote Access Security

Important: Set all passwords *before* you enable remote access security. After you enable it, you cannot use normal procedures to set or change passwords, or to disable remote access security. Read Chapter 6, *Troubleshooting and Customer Support*, to learn how to disable security or set passwords after remote access security has been enabled.

To enable remote access security:

1. Set up the modem for remote access as described above.
2. Enter the Remote Access Passwords command to set passwords. Press **Enter** at the **OLD PASSWORD:** prompt, enter a 5-character password at the **NEW PASSWORD:** prompt and enter the same password again at the second **NEW PASSWORD:** prompt for verification.
   Level 0 password: **AT*P0** and press **Enter**
   Level 1 password: **AT*P1** and press **Enter**
   Periods echo on the terminal as you enter the passwords.
3. Enable remote access security. Type **AT*R1** and press **Enter**.
   Once you do this, you cannot use normal procedures to disable remote access security or set passwords.
4. Enable remote access. Type **AT*E1** and press **Enter**.
5. Disable data compression. Type **AT%C0** and press **Enter**.

Requesting Remote Access When Security is Enabled

With remote access security disabled (factory default setting), no password is necessary when a modem requests a remote access session, and the other modem grants Level 0 access. With remote access security enabled and a Level 0 password set on the answering modem, the following prompt appears on the monitor of the modem requesting remote access:

PASSWORD:

If you enter a matching Level 0 password, the answering modem grants Level 0 access. If you enter a matching Level 1 password, it grants Level 1 access. On the answering display, periods echo during password entry. When it receives a valid password, the answering modem displays a remote access banner similar to the following, indicating the level of access granted (modify or status):

REMOTE ACCESS - MODIFY
AT MODE - ATE1Q0V1

MNP Class 10 Modem
***OK**

If you enter an incorrect password, the answering modem gives you two more chances to enter a valid one. After the third incorrect entry, a message similar to the following appears and the original connection resumes:

REMOTE ACCESS FAILED
CONNECT 9600

To upgrade from a Level 0 session to a Level 1 session, type **AT*M** and press **Enter**. When the **PASSWORD:** prompt appears, enter the Level 1 password. If a password is not set for Level 1, the modem grants Level 1 access on demand. A new remote access banner appears, indicating **MODIFY** access is available.

Remote Access Commands

The following commands pertain to remote access. See Chapter 3, *AT Commands and Registers*, for further detail.

Table 4-2. Remote Access Commands

Command	*Command Name*
***A**	Request Remote Access
$B	Serial-Port Bps Rate
***E**	Enable Remote Access
***I**	Modem Identifier
***M**	Modify Remote Access Level
***P**	Remote Access Passwords
***Q**	Recover Remote Access Configuration
***R**	Enable Remote Access Security
***S**	Remote Access Attention Character
***U**	Update Remote Access Configuration
***X**	Exit Remote Access

Note: These command settings do not change when you reset the modem or when you enter &F, *Q, or *U.

Chapter 5

Auto Logon, Dial Access, and PCS Security

This chapter describes how to use three important features included with the Compaq Microcom 4000 modems:

- **Auto-logon** provides a quick and easy way to automate logging on to remote systems.
- **Dial Access Security** allows you to password-protect your system by selecting one of three types of access security for each user:
  - — Pass through security
  - — Fixed dial-back security
  - — Variable dial-back security

  The modem has default Dial Access Security scripts. By executing a few instructions and setting up the Dial Access Security database, you can be up and running quickly.
- **Password Connection Security** prevents an answering modem from establishing a connection with an originating modem that has a different password set or does not support this feature.

Note: Auto-logon and Dial Access Security operations are valid in normal and reliable modes only.

Auto-Logon and Dial Access Security Commands

Table 5-1. Auto-Logon and Dial Access Security Commands

Command	*Command Name*
$A	Auto-Answer Auto-Logon
$G	Dial Access Security
$H	Edit Dial Access Security Database
$I	Display Dial Access Security Database
$J	Clear Dial Access Security Database and Stored Telephone Numbers
$L	Logon Sequence
$P	Security Database Password
$V	Logon View Mode

The modem that originates a call can use auto-logon. You create (or modify) up to nine logon sequences with the $L*n* command. You call a remote system using a special dial modifier that instructs the modem to perform the logon sequence. If successful, this establishes a connection with the remote system.

During auto-logon, all data from the remote system pass through to the local computer. You can disable this pass-through with the $V*n* command.

Using Auto-Logon Scripts when Dialing

Dialing a UNIX System

The following is an example of setting an **auto-logon** sequence for sequence 7 to be used in a dial command to automatically logon to a UNIX system:

1. Type **AT$L7** and press **Enter**.
2. At the prompt, type on one line: **A5"login:"'<user_name>^M'R2"password:"'<your_password>^M'**

Where:	*Means:*
A5 "login:"	Wait 5 seconds for a match to the string **login:** or else abort the sequence and disconnect
'<user_name>^M'	Send the string **<user_name>^M**

Where:	***Means:***
R2 "password:"	Wait 2 seconds for a match to the string **password:** or else restart the entire logon sequence
'<your_password>^M'	Send the string **<your_password>^M**

Dial Access Security

The Dial Access Security feature provides automated site security. Once you set up the modem to use the Dial Access Security feature, on each incoming call, the modem answers; connects without any serial-port V.24 signal changes, CONNECT messages, or RING message; and begins execution of the Dial Access Security scripts. The modem is shipped with default dial-back security scripts (described below). You can use these default scripts or modify them to customize your security logon procedures.

Users who connect must enter valid user IDs and passwords. The modem searches its Dial Access Security database for a match. If it finds one, it either allows immediate access and passes the user through to the attached computer, or calls the user back — depending on the database permission value.

The modem supports three types of dial access security:

- **Pass through**. When the caller enters a valid user ID and password, immediately pass the connection through to the attached computer. Default auto-logon sequence 1 executes to perform pass-through security.
- **Fixed dial-back**. When the caller enters a valid user ID and password, the local modem automatically calls back the remote user using a predefined phone number stored in the modem's telephone directory. Default auto-logon sequence 2 executes to perform fixed dial-back security.
- **Variable dial-back**. When the caller enters a valid user ID and password, the local modem prompts the remote user for a callback phone number. Then it automatically calls back the user at that number. If the caller does not enter a number, the modem calls the default stored phone number for that user. Default auto-logon sequence 3 executes to perform variable dial-back security.

If the modem does not match the user ID and password, it allows the caller two more tries to enter valid ones. On the third failure, it disconnects.

Setting Up the Dial Access Security Database

To create an appropriate set of user IDs, passwords, and access security value entries in the Dial Access Security database, the security administrator must:

1. Type **AT$H*n*** and press **Enter** (where *n*=1-9 indicating a position in the Dial Access Security database). The modem displays the prompt **AS #*n*:**.
2. Enter the following information (make sure you enter the commas where indicated and do not type the < or >): ***<user ID>, <password>, <permission>*** and press **Enter**.

   The entry displays as it will be stored. The user ID and password fields truncate to 8 characters. If you are satisfied with the entry, press **Enter**. Otherwise, delete the entry and retype it.

   For example: **John,pswd,2**. Here the user name is "John", the password is "pswd" and the permission level is "2" for fixed dial-back.

   <user ID> and ***<password>*** are strings of up to 8 characters. Uppercase and lowercase are different characters (for example, **PSWD** and **pswd**). User IDs should be unique. For security, Microcom recommends that user IDs and passwords consist of a random combination of 8 characters each.

   <permission> is a number from 1 to 3 that determines what the modem does when a caller enters a valid user ID and password.

Where:	***Means:***
1	**Pass through**: Immediately pass the connection through to the attached computer.
2	**Fixed dial-back**: Automatically call back the remote modem using a stored phone number.
3	**Variable dial-back**: Automatically call back the user at the number entered. If the user does not enter a number, call the default stored phone number for that user.

3. Repeat steps 1 and 2 for each user you want to enter into the database.
4. Dial the UNIX system. For example, **ATD5551234+7**. The **+7** at the end of the dial string causes the modem to execute auto-logon sequence 7 when it connects.
5. To view a list of all entries in the database, type **AT$I** and press **Enter**.
6. Enter valid phone numbers into the telephone directory. Type **AT\P*n* <*dial string*>** and press **Enter** (where *n* = directory position 1 to 9 and <*dial string*> is up to 39 characters; do not type < or >). The telephone directory position *n* corresponds to the same number *n* in the Dial Access Security database.

   For example, the telephone number stored in position 4 of the telephone directory, with the command AT\P4 <*dial string*>, corresponds to the user whose dial access information is stored in position 4 of the Dial Access Security database with the command AT$H4.

   On your screen it would look like this:

   OK
   AT$H4
   AS #4: John,pswd,2
   AS #4: John,pswd,2
   OK
   AT\P04 5551234:John's home phone number
   OK

Initializing Dial Access Security

To initialize Dial Access Security, type **AT$G1$A4S0=1** and press **Enter**.

Where:	***Means:***
$G1	Enable the Dial Access Security feature.
$A4	The modem answers a call using logon sequence number 4 (the start up sequence for the default Dial Access Security scripts).
S0=1	The modem answers after the first ring. You can set register S0 to any non-zero value.

Dial Access Security Default Sequences

You can define up to nine Dial Access Security sequences, or you can use the four predefined default sequences. You can also modify these sequences with the $L command.

Note: The modem uses default sequence 5 for Password Connection Security.

The following explains each of the four default sequences. The modem executes sequence four when it answers.

Default Sequence 4

Default sequence 4 initiates the security negotiation and prompts the caller for a user ID and password. Once the caller enters a valid user ID and password, the Dial Access Security sequence continues, based on the caller's permission value – sequence 1 for pass through, 2 for fixed dial-back, or 3 for variable dial-back.

Default sequence 4 is:
D5A20 'User ID: 'N1 '^M^J Password: 'P2 '^M^J'B

Where:	***Means:***
D5	Delay 5 seconds.
A20 'User ID:'N1	Send the string **User ID:** and wait for a string containing user's ID. Echo the characters back to the remote user. If no string is received within 20 seconds, abort and disconnect.
'^M^J Password:'P2	Send a carriage return and line feed and the string **Password:** to remote user and wait for a string containing user's password. Echo periods to remote user. If no string is received within 20 seconds, abort and disconnect.
'^M^J'	Send a carriage return and a line feed.

Where:	*Means:*
B	Check the Dial Access Security database for the user's ID and password. If no match is found, retry the sequence up to 2 more times, and then disconnect. If a match is found, perform the valid security sequence based on the permission value found in the Dial Access Security database for the current user ID.

Default Sequence 1 (Pass Through)

Default sequence 1 performs pass through security (permission value 1), and is: **A20'^M^J'**

Note: The Abort function (**A20** as in the above example) starts **each time** the local modem sends data and expects a response from the remote modem.

Where:	*Means:*
A20'^M^J'	Send a carriage return and a line feed. If no string is received within 20 seconds, abort and disconnect.

Default Sequence 2 (Fixed Dial-Back)

Default sequence 2 performs fixed dial-back security. The modem checks its Dial Access Security for a match for the user's ID and password before allowing access. It checks the telephone directory for the phone number stored for the caller, and calls back the remote user.

Default sequence 2 is:
A20 'Please hang up and wait for callback. ^M^J' C

The modem is in connect state when the sequence ends.

Where:	*Means:*
A20 'Please hang up and wait for callback. ^M^J'	Send the string **Please hang up and wait for callback.** with a carriage return and a line feed. Wait 20 seconds for the remote modem to hang up. If it doesn't, disconnect.
C	Call back the remote user at the number stored in the correct position in the telephone directory.

Default Sequence 3 (Variable Dial-Back)

Default sequence 3 performs variable dial-back security. The modem checks its Dial Access Security database for a match for the user's ID and password before allowing access. It prompts the caller for a phone number, and if it receives none, calls the user back at the phone number stored in the telephone directory for that user.

Default sequence 3 is: **A20 'Phone #: ' V1 '^M^J'+2**

Where:	*Means:*
A20 'Phone #: '	Send the string **Phone #:** and wait for a phone number string or a carriage return from the remote modem. If no response within 20 seconds, abort and disconnect.
V1	Wait for a phone number from the remote modem. Echo characters to the remote modem.
^M^J	Send a carriage return and a line feed.
+2	Continue this logon sequence by using sequence $L2.

Connection Security Default Sequence 5

Default sequence 5 initiates a Connection Security password negotiation (see %I). The modem prompts the caller for a Connection Security password. When the user enters a valid password, the connection proceeds. When the user does not enter a valid password, the modem disconnects.

Default sequence 5 is: **D2A20'Connection Password:' P2 '^M^J'Z**

Where:	*Means:*
D2A20 'Connection Password: 'P2	Delay 2 seconds. Sends the string **Connection Password:** to the remote user and wait for a string containing the user's password to be received. Echo periods to the remote user. If no string is received within 20 seconds, abort the sequence and disconnect.
'^M^J'	Send a carriage return and a line feed.

Where:	***Means:***
Z	Check the Connection Security Password database for the password. If a match is found, the connection proceeds. If no match is found, retry the current sequence up to two times more (for a total of three tries), and then disconnect.

Dial Access Security Operation

Dial access security operation requires that the Dial Access Security database be created, and that both the Dial Access Security command and the Dial Access Security auto logon string be enabled.

Command	***Action***
AT$H*n* (*n*=1 to 9)	Creates the Dial Access Security database
AT\P*n* (*n*=1 to 9)	Stores a telephone number in the telephone directory
AT$G1	Enables Dial Access Security
AT$A4	Enables auto-logon sequence #4 (defined using $L4)

The database consists of a <*user ID*> and <*password*> (each up to 8 characters in length) and a permission value of 1, 2, or 3. (Value 2 requires a phone number to be stored in the phone directory.)

Example:

AT$H8 <CR>
AS #8: abcdefgh, 22aa22bb, 2
(**abcdefgh**=<user ID>;**22aa22bb**=<password>;**2**=<fixed callback>)
AT\P08 555 1212 <CR>
[the phone directory position number (08) must be the same as the database position number (8)].

The first four sequences $L1 through $L4 are predefined for use with Dial Access Security. If changed, they are restored by $J. This command also clears the Dial Access Security database.

Auto-logon sequence #4 receives the user ID and password from the remote user using the "N" and "P" operators, then the "B" operator searches the database to determine permission value.

Permission 1 (pass through)
Auto-logon sequence #1 is used to send a <CR> <LF>. A RING message is passed to the serial port and the modem simulates V.24 signals before entering connect state.

Permission 2 (fixed call-back)
Auto-logon sequence #2 is used to inform the remote user to "Please hang up and wait for callback." The "C" operator performs the callback using the number in the phone directory. If no number is stored, the modem disconnects. A RING message is passed to the serial port and the modem simulates V.24 signals before entering connect state.

Permission 3 (variable call-back)
Auto-logon sequence #3 is used to ask the remote caller for a phone number to be used for callback. The +2 continuation sequence operator chains to auto-logon sequence #2, which informs the user to "Please hang up and wait for callback." The "C" operator performs the callback using the number given by the remote caller. If no number was given, the stored number is called. If no number is stored, the modem disconnects. A RING message is passed to the serial port and the modem simulates V.24 signals before entering connect state.

The Remote User

The remote user who calls into a secure modem and enters a valid user ID and password encounters one of three responses:

Pass Through:	User's password is validated and user is connected.
Fixed Call Back:	User's password is validated and user is asked to hang up and wait for callback.
Variable Call Back:	User's password is validated and user is asked to hang up and wait for a callback at the specified number.

Using Auto-Logon to Call a Dial-Back Modem

The previous section explained how to set up the modem for Dial Access Security. This section describes how to configure the modem to automate calling in to a site that has been configured for fixed dial-back security.

The following auto-logon sequence automates calling in to a central site to request a callback. It also prepares the modem to auto-answer the next call using auto-logon sequence 7.

1. Type **AT$L6** and press **Enter**.
2. At the prompt, type on one line:
   A20 "User ID:" 'John^M' "Password:" 'pswd^M' "callback." &7

Where:	***Means:***
A20"User ID:"	Wait for the **User ID:** prompt to be received. Abort in 20 seconds if the string is not received.
'John^M'	Send the user ID **John** followed by a carriage return.
"Password:"	Wait for the **Password:** prompt to be received.
'pswd^M'	Send the password **pswd** followed by a carriage return.
"callback."	Wait for **callback.** (which is the end of the message "Please hang up and wait for callback.").
&7	Disconnect and set up to answer the next call with auto-logon sequence 7.

To dial the number immediately, type **ATD** <*dial string*>. Be sure to add **+6** (to reference sequence $L6 from step 1) at the end of the dial string.

For example, to store the phone number of a remote system that is calling back, type **AT\P4 555-3000+6** and press **Enter**. Then when you want to dial that number, type **ATD/4** and press **Enter**.

Editing Logon and Security Sequences

You use the $L*n* command to edit logon and security sequences to be used during normal or reliable connections in either originate mode or auto-answer mode. If a logon security password has been set, you **must** enter the correct password before you can edit a logon or security sequence. ***If no password is set, anyone can edit the logon or security sequence***.

Refer to the section, "Dial Access Security Default Sequences," for examples of predefined security sequences.

The following functions are available within a logon or security sequence:

1. **'<*string*>'** To ***send*** data characters to the remote system, enclose the characters in **‘ ‘** (single quotation marks). A 1-second delay occurs when a ’ is encountered.

   ^*x* Non-printable ASCII control codes can be entered within a string by preceding the key with a caret (^). For example, **^M** can be entered for a carriage return, control M.

2. **“<*string*>“** To indicate that the modem must ***wait*** for a string and match it, enclose the string in **“ ”** (double quotation marks).

   While **waiting** for a string, a time-out action can be specified with the following commands, which have a range from 1 to 255 seconds, in increments of 1 second:

   A*n* - **Abort** the call when the timer expires. For example, **A5“<*string*>“** means that if **<*string*>** is not received within 5 seconds, the call aborts.

   R*n* - **Restart** the entire logon sequence when the timer expires. For example, **R10 “<*string*>”** means that if **<*string*>** is not received within 10 seconds, the entire sequence is restarted.

   S*n* - **Skip** the current string when the timer expires. For example, **S8“<*string*>”** means that if **<*string*>** is not received within 8 seconds, skip the current string and continue with the logon sequence.

3. **D*n*** The logon sequence can be delayed by using **D*n***, where *n* is a range from 1 to 255 seconds, in increments of 1 second.

4. **+*n*** A sequence linking function (**+*n***, where *n*=1-9) allows a logon sequence to be continued from one sequence 1 to another sequence to provide for longer sequences. Enter the +*n* at the end of the first logon sequence. For example, if you want to continue from sequence 1 to sequence 2, enter **+2** at the end of sequence 1.

5. **&*n*** An auto-answer callback code (&*n*) enables **auto-answer auto-logon** *only for the next answered call* using sequence *n* (where *n*=1-9). This feature allows you to have extra security, for example, or to use one sequence for a first connection and the other sequence for a callback from a host system. For example, dial using **D5551234+5** (where sequence 5 has **&6** in it). The modem dials 5551234 and performs logon sequence number 5. If successful in matching, the caller disconnects and waits for a callback before performing logon sequence number 6.

Note: &*n* also works from a sequence performed when the modem **answers** if $A*n* is set (where *n*=1 to 9).

6. **N*n*** Waits for the remote caller to send a "user ID **Enter**" string to be used during Dial Access Security. The parameter *n* indicates the type of character echoed back to the remote user:

   n=0 do not echo characters (default)

   n=1 echo characters

   n=2 echo periods (.) instead of characters

7. **P*n*** Waits for the remote caller to send a "password **Enter**" string to be used during Dial Access Security. The parameter *n* indicates the type of character echoed back to the remote user:

   n=0 do not echo characters (default)

   n=1 echo characters

   n=2 echo periods (.) instead of characters

8. **B** Performs a search of the Dial Access Security database to match the "user ID" and "password" sent by the remote caller. If a match is found, the permission value stored for the user determines the next sequence to be executed. If no match is found, the modem restarts the sequence (up to a limit of three attempts). If no match is still found, the modem then disconnects.

9. **V*n*** Waits for the remote caller to send a "phone number" string to be used during Dial Access Security. The parameter *n* indicates the type of character echoed back to the remote user:

   n=0 do not echo characters (default)

   n=1 echo characters

   n=2 echo periods (.) instead of characters

10. **C** During Dial Access Security operation, waits up to 15 seconds for the remote modem to disconnect; otherwise the local modem disconnects, waits another 5 seconds, and then dials the "phone number" sent by the remote user. If no phone number was sent, then the phone number stored in the telephone directory is used.

11. **Z** Performs a search of the Connection Security database to match the caller's password. If it finds a match, the modem continues executing the auto-logon. If it does not find a match, the modem restarts the sequence (up to three tries), then disconnects if there is still no match.

If the modem finds a syntax error in the entered sequence, it displays the line you entered with a circumflex (^) under the error. You must correct any errors before the modem will use a sequence.

Password Connection Security Operation

Password Connection Security prevents an answering modem from establishing a connection with an originating modem that has a different password set or does not support this feature. Your modem performs this security check as part of the MNP link and synchronous negotiation processes. If the modem makes a LAPM or a normal connection, it can perform the check using auto-logon. (See $M2 for details).

To enable Password Connection Security operation for an MNP reliable connection:

1. Enter the Password Connection Security command: Type **AT%I*n*** and press **Enter** (where *n* is the 5 character password you want to use). The originating modem's password must match any of the answering modem's passwords to connect.
2. Set password sending and verification on both modems with **AT$M1** and press **Enter**.
3. Set the modems to reliable mode by typing **AT\N2** and press **Enter**.

You can set up to 50 passwords (see %I*n*). During link negotiation, the originating modem sends password 0 to the answering modem. The answering modem checks its list of passwords to see whether the password matches any of passwords 0 to 49. If it does, the connection proceeds. If the password doesn't match, the connection fails.

➥ **CAUTION:** You can completely erase the Connection Security Password database with AT$J1. This is a very powerful command. It clears all passwords from the modem's security database and all stored telephone numbers.

Notes: You can view the passwords you have entered with the $N command.

To ensure that password check occurs during link negotiation, configure the answering modem for reliable mode only (\N2).

You can set your modem to allow the remote user to enter a password with auto-logon. Set Verify Connection Security Password with AT$M2.

Connection Security Default Sequence

Use %I*n* to initiate a Connection Security password negotiation. The modem uses its stored sequence 5 as the default. You can edit this with the $L5 command. ***You must use $M2 with this sequence.*** See the section "Dial Access Security Default Sequences" for details.

The modem prompts a caller for a Connection Security password. When the user enters a valid password, the connection proceeds. Otherwise, the modem drops the connection.

The remote user sees periods when typing the password. If the local modem does not receive a password within 20 seconds, it disconnects.

The local modem checks the entered password against its database. If the password does not match, it will prompt the remote user two more times for a valid password before disconnecting after the third inaccurate entry.

■ Password Protecting Your Logon and Security Sequence

You can also control who can edit the logon and security sequence. Do this by password-protecting it with the $P command. (The default is no password set.)

Note: The password becomes valid 2 minutes **after** the last logon or Connection Security password was entered.

■ Using View Mode to Test Logon Sequences

The $V*n* command determines whether data pass through from the remote system to the local computer during the logon sequence.

With view mode disabled (**$V0**), the modem does not pass through any data and delays the connect message until the logon sequence is complete. With view mode enabled (**$V1**), the connect message displays and then data pass through during the logon sequence. With view mode enabled, you can monitor the progress of the auto-logon sequence. This mode is particularly helpful when testing new scripts.

➥ **CAUTION**: Characters from the remote system do not pass through during sequence execution unless there is a string matching active (for example, the local modem expects the user ID from the remote system). Otherwise, the modem stores all remote characters in its buffer, and passes them through to the serial port when the sequence terminates.

Chapter 6

Troubleshooting and Customer Support

You can solve most problems in installing and using your modem by carefully reading the appropriate chapter in this guide. If however, you cannot resolve your problem, this chapter contains general tips for troubleshooting the Compaq Microcom 4000 modems.

This chapter also describes how to download firmware files from Compaq Microcom's World Wide Web page, BBS*connection*, and ftp directory.

General Troubleshooting Tips

Modem does not connect at 33600 bps or 56000[1] bps

While your modems are highly advanced, you may not be able to use all of its features all of the time. Limiting factors include the type of modem you are connecting to and the quality of the phone lines.

- Try to find out what type of modem you are calling or answering. If you are connecting to a slower modem, be aware that the ***highest mutually supported speed*** is the maximum connect speed possible.
- With the V.34 protocol, you have the greatest chance at the highest speeds with ***two Compaq Microcom V.34 modems***.
- With the V.90 protocol, you have the greatest chance at the highest speeds with ***one Compaq Microcom V.90 server modem and one Compaq Microcom V.90 client modem.***

Note: When using two Compaq Microcom V.90 server or client modems, V.34 connections will occur.

- When phone line conditions are not optimal, most connections will be at speeds below 56,000 bps (8-port modems) or 33,600 bps (4-port modems).
- In order for the 8-port modem to make V.90 connections, you must connect the chassis to the PSTN via a PRI or T1/E1 line.
- 4-port modems do not support V.90 speeds.

The chassis is not receiving power

- Press the Power button on the front of the chassis to the On position.
- Check to make sure the A/C power connector is securely in place in the rear of the chassis.
- Check to make sure the A/C power supply is securely plugged into an AC outlet.
- Check the wall outlet for power with another device such as a lamp.

The power supply fan fail LED is solid yellow

- Check to see whether both fans are running. If so, contact your distributor or Compaq Microcom Technical Support and explain the symptoms. You may need to have the chassis repaired or replaced.
- If both fans are not running, this indicates a power supply fan failure. Immediately power down the chassis or risk severe damage to the modem cards. Return the power supply to your distributor or Compaq for a replacement.

The chassis fan fail LED is solid yellow

This indicates a chassis fan failure. Immediately power down the chassis or risk severe damage to the modem cards. Replace the chassis fan. Refer to Appendix D, *Fan Replacement Instructions*, in the *Compaq Microcom 4000 Installation Guide* for instructions on replacing the chassis fan.

1. Designed only to allow faster downloads from V.90 or K56flex compliant sources. Maximum achievable download transmissions rates currently do not reach 56Kbps and will vary with line conditions.

The modem's power LED is not lit

- Make sure there is a modem adapter card for the modem main card. If not, install one.
- Remove and replace the modem adapter card, making sure it connects to the mid-plane.
- Remove and replace the modem main card, making sure it connects to the mid-plane.

Modem LED (A, B, C, D, E, F, G, or H) is solid yellow

- Reset the modem card by pressing the Reset button on the front of the card.
- Use the Compaq 4000 Manager to issue a Reset command to a specific modem.

Modem LED (A, B, C, D, E, F, G, or H) is flashing yellow

- If a specific modem LED flashes yellow for 1 second on/1 second off continuously, it has been busied out. To clear the busy-out condition, either reset the modem or issue the AT*Y0 command to the modem.
- If a specific modem fails power-up diagnostics, its LED flashes yellow in the following sequence:

  SRAM failure: 1 flash (100 ms on/100 ms off/1 second of inactivity)
  DSP failure: 2 flashes (100 ms on/100 ms off/100 ms on/100 ms off/1 second of inactivity)
  Controller failure: 3 flashes (100 ms on/100 ms off/100 ms on/100 ms off/100 ms on/100 ms off/1 second of inactivity)

  Call Compaq Microcom's Response Center at (781) 255-2700 for help.
- This may indicate a hardware failure and that the card needs to be replaced. Call Compaq Microcom's Response Center at (781) 255-2700 for help.

How can I get the highest throughput from my modem?

- Make sure your communications software or DTE device and modem are configured for the maximum common serial port speed up to 230Kbps.
- In most cases, the maximum connection speed is related to the line conditions between the originating and answering modems. The modems probe the line to determine line conditions, then connect at the highest possible speed for those conditions. In some cases, your telco carrier can provide better quality lines that will allow for higher connection speeds.
- Check the compression setting (AT%C*n*) on the originating and answering modems. The default setting of %C3 can produce a 4-to-1 compression ratio on data before it is sent through the phone line.
- Experiments with different forms of error correction using the AT\N*n* command.

Modem does not respond to commands or communications software fails to initialize

- Check the cable for bent or missing pins.
- Check the Compaq 4000 Manager for modem status.
- Try setting the software or DTE up for a different COM port (try COM1, COM2, or COM3).
- Create a file in DOS edit called TEST with an ATDT in it, and save the file. At the DOS C: prompt type **COPY TEST COM1** and press **Enter** (or **COM2**). The modem should go off hook.

  If the modem passes this test, check the software initialization string.

Modem does not dial out

- For analog modems, make sure the telephone line is plugged into one of the four RJ11 phone connectors (marked A, B, C, or D) on the modem adapter card accessible from the rear of the chassis.
- For PRI cards, make sure each PRI, or T1/E1 line is plugged into the Line 1 and Line 2 jacks on the PRI adapter card.
- The PRI, T1, or E1 line may be provisioned to only accept calls, not dial out. Contact your telco service provider for information.

- Plug a telephone into the telephone line, pick up the receiver, and listen for dial tone. If no dial tone is heard there is a problem with the line.
- Does the software return no dial tone? If so, the modem may need to have the ATX3 command set so that it will dial without detecting dial tone.
- Do you need to insert a digit to get an outside line? If so, put a comma after the digit so there is a short delay before the dialing occurs.
- Use ATDT on a tone dial phone line, and ATDP on pulse dial lines.
- Make sure the signaling type (set in the configuration file) matches that of the line.
- Make sure that the PRI card's SY LED is On (meaning that the line is in sync) and that the SL and BP LEDs are Off.

Modem will not answer

- If auto answer has been shut off, the modem will not answer. Entering ATS0=1*W should enable auto answer.
- If DTR is not available, setting the modem for AT&D0*W can allow the modem to ignore DTR.
- The modem will not answer if it is configured for hardware flow control and the RTS signal is low. This can be resolved by setting XON/XOFF or no flow control (AT\Q1 or \Q0).
- Try setting Q1 or Q2. Certain equipment needs result codes disabled so that the answering process doesn't get aborted.
- The modem will not answer if it has been busied out. Check the modem LED on the front of the modem card and see if it is flashing yellow for 1 second on/1 second off, indicating that it is busied out.
- Make sure the signaling type (set in the configuration file) matches that of the line.
- Make sure that the PRI card's SY LED is On (meaning that the line is in sync) and that the SL and BP LEDs are Off.

Modem does not connect

- If the modem displays NO CARRIER after the dial, it has not connected.
- Call the remote modem with a telephone and a high pitched answer tone should be heard. If not, there is a problem with the remote modem.
- Call our BBS*connection* at (781) 551-4750. If it connects, the modem line and software are probably set correctly.
- Try using a direct line, one that does not require a 9 or 8 to access an outside line. Excessively noisy phone lines can cause connection problems.
- Attempt to connect at different speed. The remote modem may not be able to negotiate high-speed handshake.
- There may be an incompatibility with the remote modem. Using dial modifiers M, Y, or Z may allow the connection to occur.
- Shutting off additional features can simplify the connection. Try using either AT-J0, AT-K0, or AT%L3.

My modem won't accept the flash-memory upgrade

Download the file from Compaq Microcom's FTP directory again. Upgrade the modems using the Compaq 4000 Manager. If this still doesn't work, try upgrading the modems through the RJ45 serial port using a standard data communications program.

Modem will connect but nothing is received from the remote side

- Call into Compaq Microcom's BBS*connection* at (781) 551-4750. You should receive the Compaq Microcom banner.
- Try a different data communications software package or another PC.
- Check that the modem and software is set for similar flow control either XON/XOFF (AT\Q1) or RTS/CTS (AT\Q3). Try sending a few carriage returns or several **Control+Q** key combinations.

Modem connects but receives only garbage from the remote side

- If a call to Compaq Microcom's BBS*connection* revealed no obvious problems, try changing the speed and or parity in the software and again dial in.
- The type of terminal emulation should match what the remote side requires.
- Attempt a call with another modem if one is available.
- Make sure that the command AT\J1 is not set. This locks the serial port to the connection speed, which can result in a speed mismatch unless the DTE device can auto baud to this speed.
- If garbage is intermixed with good data, the line may be excessively noisy. Using error correcting modems on both sides will solve this problem.

Downloading Firmware Files

There are three ways you can download firmware files for your PRI and modem cards:

- From Compaq's ftp site
- From Compaq Microcom's BBS*connection*
- From Compaq Microcom's World Wide Web site

Downloading Firmware Files from the FTP directory

To download a firmware file from the FTP directory:

1. Use your ftp utility to access **ftp.compaq.com/pub/softpaq/IPG/microcom/4000_series** by anonymous ftp. Use your e-mail address as a password.
2. Using an ASCII format, download **00_index.txt** to view a list of all firmware files you can download. View the file, and write down the name of the file(s) you want.
3. Using a Binary format, download the firmware file(s).

Downloading Firmware Files from the BBS*connection*

To download a firmware file from the BBS*connection*:

1. Make sure your modem is set to 8 bits, no parity, and 1 stop bit.
2. Use your modem to dial **(781) 551-4750**.
3. Enter your user name and password. If you haven't called the BBS*connection* before, logon as a new user and register when prompted. You must register before you can access the BBS.
4. Access the Microcom 4000 area by typing **IS** and pressing **Enter**.
5. Type **F** and press **Enter** to access the files area.
6. Type **2** and press **Enter** to access the firmware area.
7. Using the spacebar, highlight the file you want to download and press **Enter**.
8. Type **D** and press **Enter** to download the file.
9. Type **P** and press **Enter** to choose a protocol that matches the protocol your computer uses.
10. Once the file has downloaded, type **G** (for goodbye) and press **Enter** to exit the BBS.

Downloading Firmware Files from the World Wide Web

To download a firmware file from the World Wide Web:

1. Use your browser to access Compaq's Home Page at http://www.compaq.com.
2. Select **Services**.
3. Select **FTP Site**.
4. Select the **softpaq** folder.

5. Select the **IPG** folder.
6. Select the **microcom** folder.
7. Select the **4000_series** folder.
8. Select the **firmware** folder.
9. Select the **Latest** folder.
10. Click on **FullRelease.exe** to download the latest release of firmware. In the Save As dialog, navigate to a directory where you want to put the file.

Updating Firmware

Your modem uses flash memory to let you quickly and easily upgrade with new sets of commands and functions from Compaq by sending a file to the modem. You can do this in two ways:

- Use the Compaq 4000 Manager. Refer to the *Compaq 4000 Manager User's Guide* for further details. ***This is the preferred option for updating a large number of modems.***
- Use a data communications software package to upgrade individual modems via the serial interface. See the instructions that follow.

Updating Firmware From a Data Comm Software Package

Your modem uses flash memory to let you quickly and easily upgrade with new sets of commands and functions from Compaq. New firmware is posted on Compaq Microcom's BBS*connection*, World Wide Web, and ftp sites. To do this:

1. Download the new firmware file. Refer to "Downloading Firmware Files" for instructions.
2. Make sure your modem's power is on and you have connected your modem and PC serial ports. ***You must use a serial connection to restore or update firmware.***
3. Start your data comm software. Be sure you know its ***ASCII upload*** command.
4. Set the DTE speed to 115200 bps.
5. Set flow control to hardware (RTS/CTS).
6. From Command (Terminal) mode, start the update process by typing **AT^H** and pressing **Enter**. The modem will wait up to four minutes for you to start sending the file.
7. Upload the file, just as you would send an ASCII file to a PC or bulletin board.

   Press **Enter** to begin the transfer.

Tip: If your software lets you set "pacing" or "delay" options for ASCII transfers, set all of those to 0 (zero) for the fastest file transfers.

8. The update process takes several minutes. When it is successful, the modem displays **MODEM UPGRADE COMPLETE**. The modem then resets.

   If the upgrade fails, repeat these steps. If it fails twice, contact the Compaq Microcom Response Center.

Note: If your modem is not compatible with the version of firmware, you will see **ERROR** on the screen immediately after the AT^H command. The program will stop.

Important: As soon as you install the new firmware, select your country, as described next. This ensures your modem works with your phone lines and complies with your country's regulations.

Selecting Your Country

To make sure your modem works properly with its new firmware, you can use AT commands to change your modem's country default settings.

Using AT Commands

To select your country, type the AT command to select your country, and end the line with the command to reset the modem. For example, to change to South African defaults, load your data communications software, type **AT-I16Z** and press **Enter**.

The number after -I is different for each country. The Z resets the modem so the modem loads the selection in memory. The commands are:

Table 6-1. AT-I Command Settings

Country	Command		Country	Command
Australia	AT-I20Z		Netherlands	AT-I5Z
Czech Republic	AT-I18Z		New Zealand	AT-I11Z
Denmark	AT-I10Z		Norway	AT-I8Z
Finland	AT-I9Z		Poland	AT-I19Z
France	AT-I25Z		South Africa	AT-I16Z
Germany	AT-I17Z		Sweden	AT-I7Z
Hungary	AT-I18Z		Switzerland	AT-I14Z
Italy	AT-I3Z		United Kingdom	AT-I2Z
Japan	AT-I13Z		United States	AT-I1Z

Once you have changed your country, the modem will maintain those defaults until you change the country again. ***The reset commands AT&F or ATZ will not override the country defaults***.

You can check the country setting by typing **AT\S** and pressing **Enter**. The modem will display its country setting at the end of the **MODEM HW:** line.

Customer Support Options

You have a variety of options in getting help with your 4000 chassis. Your dealer can often help you answer installation and operations questions.

This section describes:

- Compaq Microcom's FAX*connection*
- Compaq Microcom's BBS*connection*
- World Wide Web site
- Compaq's ftp site
- Compaq Microcom's Response Center

Compaq Microcom's FAX*connection*

You can get tips on fine tuning your system performance from Compaq Microcom's FAX*connection*. It offers a wide range of faxes with technical tips and troubleshooting suggestions. You can call this 24-hour service from any touch-tone phone. Leave a fax machine or faxmodem number to receive the fax. A voice system helps you select the fax you want and then sends it to you automatically.

You can request up to three documents per call. Call the FAX*connection* at:

(800) 285-2802 (inside USA)

or

(781) 551-2050 (outside USA)

You can also fax a question to us 24 hours a day. We return answers 8 a.m. to 7 p.m., Eastern time. Please allow 24 hours for a response. Be sure to describe your 4000 chassis, computer system, software and its setup in detail. Make your question as specific as you can. Include your name, company, telephone number, chassis serial number, and a return fax number. Fax questions to us at:

(781) 255-2699

Compaq Microcom's BBS*connection*

You can use Compaq Microcom's BBS*connection* to ask questions of customer support, read about solutions to common problems, and download tech tips and utility programs. The BBS*connection* operates 24 hours a day. To call, set a modem to 8 bits, no parity, 1 stop bit, and then use the modem to dial:

(781) 551-4750

The BBS*connection* leads you through on-line registration the first time.

If you leave a question for customer support, supply as much detail as possible about the problem and your system. Support staff members check the BBS*connection* for questions throughout the business day. They post responses as soon as possible, leaving a message for the customer.

World Wide Web

Our World Wide Web site offers up to date information about product features and availability, troubleshooting tips, and technical data about Compaq products.

Set your browser for the following Internet address:

http://www.compaq.com/products/networking/products.html

Compaq's ftp Site

Download the latest technical bulletins and program files from an ftp directory by simply pointing and clicking with a mouse. You can also e-mail messages to Compaq Microcom sales and support groups. Support staff checks for messages throughout the business day and responds to your questions as soon as possible.

For program files, check Compaq's ftp site at:

ftp.compaq.com/pub/softpaq/IPG/microcom/4000_series

Compaq Microcom's Response Center

For customers located outside North America, contact your dealer or distributor for help if you cannot resolve a problem after carefully reading the 4000 chassis documentation.

For customers located within North America, if you cannot resolve a problem with your system after carefully reading the 4000 chassis documentation, you can call our Response Center at:

(781) 255-2700

The Response Center operates Monday through Friday, 8 a.m. to 7 p.m., Eastern Time. Our support professionals devote as much time as necessary to each customer.

Note: The Response Center processes Returned Materials Authorization (RMA) requests Monday through Friday, 8 a.m. to 5:30 p.m., Eastern Time.

If you call:

- Know your model and serial number.
- Know the modem firmware version. Use the Compaq 4000 Manager to do one of the following:
  - — In the Chassis Snapshot window, double-click on the modem card to access the Modem Properties dialog. The main and boot code versions are shown at the bottom of the dialog.
  - — In the Chassis Snapshot window, choose **View→Modem→Boot Code** or **View→Modem→Main Code**. This requires version 4.0 of the Compaq 4000 Manager software.
  - — In the Chassis Snapshot window, point the mouse at a modem, click the right mouse button and choose **DC Session**. Then issue **AT%V1** to view the main code version or **AT^V** to view the boot code version.
- Know the PRI, channelized T1, or channelized E1 firmware version.
  - — In the Chassis Snapshot window, double-click on the PRI card to access either the PRI Properties dialog or the T1/E1 Properties dialog.
- Be ready to give your name, company, address, phone number, and fax number, if any.

- Have your 4000 system and computer available.
- If possible, have the 4000 system and computer connected to a different phone line for testing.

Then:

- Describe your problem to the customer support representative. You can use a 4000 system's modem to perform simple tests to determine the nature of the problem.
- If our representatives cannot solve the problem, they will issue you an RMA number and tell you how to package the system for return.

Note: Use the original packaging to return the system.

- Inside the package, be sure to include:
  — your return address and telephone number,
  — a brief description of the problem, and
  — your modem's serial number
- Mark the outside of the package clearly with the RMA number assigned to you by Customer Support. Compaq cannot process any returned product without an RMA number. Address the package to:

  Compaq Computer Corporation
  Attn: Repair Department, RMA # _____
  500 River Ridge Drive
  Norwood, MA 02062-5028 USA

Appendix A
Modulation Protocols

Using Multi-Protocol Auto-Answer

The multi-protocol auto-answer feature allows auto-answer of incoming calls from modems using any of the following protocols: K56flex, V.90, V.34, V.FC, V.32bis, V.32, V.22bis, V.22 (1200 bps only), V.21, V.23 split speed (1200 bps transmit/ 75 bps receive only), V.23 half-duplex, Bell 212A, and Bell 103.

Notes: To enable this feature for V.23 half-duplex connections, set **:T2** to a value greater than 0. We recommend setting **:T2=20** when falling back to a V.23 half-duplex connection.

References to V.34 in this appendix refer also to Annex 12, the new 33,600 bps speed enhancement to V.34.

K56flex and V.90 (56Kbps[1]) Technology

Compaq Microcom modems now incorporate Lucent Technology and Rockwell International Corporation's K56flex technology, as well as the new ITU-T V.90 standard. K56flex and V.90 enable your modem to download data at speeds up to 56Kbps, almost twice as fast as 33.6K modems.

A client K56flex or V.90 modem works over existing analog phone lines and is transparent to the phone company's equipment. You just need to install your client modem and attach it to the phone network. It already defaults to the 56K speeds.

K56flex and V.90 are in addition to the current V.34 standard. When the K56flex or V.90 client and server modems negotiate the initial connection, they connect at the highest possible speed — a 56K connection results only if line conditions permit it. Otherwise, a V.34 connection results.

The new K56flex or V.90 technologies are not an extension of V.34 28.8K/33.6K bps. Existing analog modems, using modulations such as V.34, see the PSTN as an *analog* transmission medium (even though the signals are digitized for communications throughout most of the network), while K56flex or V.90 modems view the PSTN as a *digital* transmission medium.

K56flex or V.90 technology is used primarily for faster World Wide Web browsing and Internet access, and for faster remote access to corporate LANs that digitally connect to the PSTN. If you are upgrading from V.34 to K56flex or V.90, the new K56flex or V.90 technology can almost double your download speed from the Internet, thereby reducing your wait for information by approximately 50 percent.

To achieve 56K speeds, both end users and Internet Service Providers (ISPs) or corporate LANs must use modems that incorporate this technology, and on phone lines with good line conditions (not noisy). In addition, there can be only one analog-to-digital conversion over the entire connection (normally the analog local loop from the central office to your house). This means your ISP or corporate LAN must be connected to the PSTN over a digital line such as PRI or T1. Otherwise, connections will be made at V.34 speeds.

Note: To achieve 56K speeds in E1 environments, the client modem must also be set to A-law or have the ability to automatically detect the environment during the negotiation sequence.

Right now the K56flex technology is one of several competing 56K solutions. In order to connect at 56K, both your modem and the central site modem must support the same 56K solution. Because Rockwell International's modem chipsets are used in more than 70 percent of modems worldwide, your modem can successfully communicate with most other modems. An international standard is expected to be reached in 1998.

K56flex or V.90 only works downstream from your ISP to your modem, not the other way. However, upstream transmissions from your modem to your ISP are mostly keystrokes and mouse commands that require less bandwidth, so they'll continue to flow quickly at the conventional rate of 33.6K. Also, if the modem cannot connect at 56K, it will downshift in 2K increments until it connects. If it reaches 32K, the modem switches over to using analog V.34 33.6K or lower speed connections.

1. Designed only to allow faster downloads from V.90 or K56flex compliant sources. Maximum achievable download transmissions rates currently do not reach 56Kbps and will vary with line conditions.

V.34 (including 33.6)

Your modem supports the V.34 and Annex 12 standards that provide for connection speeds of 31,200 and 33,600 bps. V.34 formalizes the V.Fast (V.FC) protocol; the new standard, called Annex 12 or simply 33.6, is actually an enhancement to V.34.

Your modem automatically attempts to connect at 33,600 bps, so you don't need to change any of your modem's commands or settings. Due to limitations imposed by poor phone line quality or the other modem's capability, you may not always connect at this speed. If the modem you are dialing does not support the 33.6 standard, you will always connect at the highest speed that is possible.

Because it is an enhancement to the V.34 standard, Annex 12 maintains the improvements introduced by V.34, such as the V.8 handshake between V.34 modems that minimizes the time it takes you to make a connection. If line conditions require fallback or permit fall-forward, your modem can perform either operation when you are connected to another V.34 modem. If the other modem does not have V.34 capability, your modem uses earlier negotiation protocols.

Not all V.34 modems support V.FC connections, but Compaq Microcom's do. That means you can expect continued high-speed connections to over 1 million V.FC modems from over 120 vendors. By default, your modem starts a negotiation at V.34 and then tries V.FC, V.32bis, and V.32 in that order — permitting the highest speed connections with other modems.

V.32 and V.32bis Protocols

The ITU-T V.32 protocol is for full-duplex data transfer over general switched telephone networks at 9600 and 4800 bps. V.32 employs echo cancellation and trellis coded modulation.

The ITU-T V.32bis specification enhances V.32 by adding 14,400, 12,000, and 7200 bps speeds and special rate sequences to shorten speed upshifting and downshifting.

V.23 Protocol

The modem supports two V.23 modes:

- One-way forward channel at 1200 bps with a 75 bps back channel
- Main channel half duplex at 1200 bps

Note: When you configure your modem for V.23 operation by setting the %F*n* command to a value other than 0, this disables other modulation protocols.

The features described in this manual apply to V.23 operation except that the modem does not support:

- Synchronous connections,
- V.54 digital and analog loopback,
- Leased-line operation, or
- MNP and LAPM connections.

V.23 1200/75 Bps Split-Speed Operation

This subset of the V.23 protocol uses two speeds for each connection: a 1200 bps channel and a 75 bps channel. You can configure either channel with the %F*n* command for transmitting or receiving data. The originating and answering modems must be set to opposite V.23 split-speed mode command settings: set %F1 on the modem transmitting at 75 bps and %F2 on the modem transmitting at 1200 bps.

For example, if you set it to transmit data at 1200 bps and receive data at 75 bps, it can establish a V.23 connection only with a remote modem that transmits data at 75 bps and receives data at 1200 bps.

During direct connections, the computer must also be able to accommodate split transmit and receive speeds. For other connections, you can use \W***n*** to control serial-port speed.

Note: When the modem establishes a V.23 split-speed connection, it displays **CONNECT V.23**.

V.23 1200 Bps Half-Duplex Operation

V.23 half-duplex operation is available only for direct and normal connections.

For V.23 half-duplex connections set %F3 on both modems.

Notes: When the modem establishes a V.23 half-duplex connection it displays **CONNECT V.23 HDX**.

When the originate modem is set to normal mode, you must send a few characters to the answer modem before the originate modem can fall back to a V.23 half-duplex connection.

V.22 and V.22bis Protocols

V.22 protocol is used for 1200 bps and 600 bps full-duplex connections. The version of V.22 your modem supports is Alternative B.

V.22bis protocol enhances V.22 by adding 2400 bps full-duplex connections.

Note: For V.22 at 600 bps, ***both modems*** must be set to 600 bps.

V.21 Protocol

V.21 protocol is used for 300 bps full-duplex connections. The features described in this manual apply to V.21 operation except that your modem does not support:

- Synchronous connections
- V.54 digital and analog loopback
- LAPM connections

Note: When your modem establishes a V.21 connection, it displays **CONNECT V.21/REL - MNP**. With a normal or direct V.21 connection, the message is **CONNECT**.

Bell 212A Protocol

Bell 212A protocol is for 1200 bps full-duplex connections.

Bell 103 Protocol

Bell 103 protocol is for 300 bps full-duplex connections. The features described in this guide apply to Bell 103 operation except that your modem does not support:

- Synchronous connections
- Digital (loop 1A) and analog (V.54 loop 3) loopback
- LAPM connections

Note: When your modem establishes a reliable Bell 103 connection, it displays **CONNECT 103/REL - MNP**. For a normal or direct Bell 103 connection, the message is **CONNECT**.

Protocol Configuration Command Settings

When you send an AT string to the modem, it adjusts modem-port speed automatically to match the AT speed. Use %G1 to disable this feature. With %G1 set, you can change the modem speed with %B*n* (where ***n*** is the new modem speed) and %F*n*.

This section lists settings to configure the modem for each mode and protocol. Modem connection speeds are in parentheses.

Table A-1. Protocol Configuration Command Settings

	When %F0 is set:	
Protocol	***Issue %G0:***	***Issue %G1:***
V.21 (75-300 bps)	B0 at 300 bps	B0%B300
Bell 103 (75-300 bps)	B1 at 300 bps	B1%B300

Table A-1. Protocol Configuration Command Settings (Continued)

	When %F0 is set:	
Protocol	***Issue %G0:***	***Issue %G1:***
V.22 (600 bps)	at 600 bps	%B600
V.22 (1200 bps)	B0 at 1200 bps	B0%B1200
Bell 212A (1200 bps)	B1 at 1200 bps	B1%B1200
V.34/V.22bis (2400 bps)	at 2400 bps	%B2400
V.34/V.32bis/V.32 (4800 bps)	at 4800 bps	%B4800
V.34/V.32bis (7200 bps)	at 7200 bps	%B7200
V.34/V.32bis/V.32 (9600 bps)	at 9600 bps	%B9600
V.34/V.32bis (12000 bps)	at 12000 bps	%B12000
V.34/V.FC/V.32bis (14400 bps)	at 14400 bps	%B14400
V.34/V.FC (16800 bps)	at 16800 bps	%B16800
V.34/V.FC (19200 bps)	at 19200 bps	%B19200
V.34/V.FC (21600 bps)	at 21600 bps	%B21600
V.34/V.FC (24000 bps)	at 24000 bps	%B24000
V.34/V.FC (26400 bps)	at 26400 bps	%B26400
V.34/V.FC (28800 bps)	at 28800 bps	%B28800
V.34 (31200 bps)	at 31200 bps	%B31200
V.34 (33600 bps)	at 33600 bps	%B33600
K56flex (32000)	at 32000 bps	%B32000
K56flex (34000)	at 34000 bps	%B34000
K56flex (36000)	at 36000 bps	%B36000
K56flex (38000)	at 38000 bps	%B38000
K56flex (40000)	at 40000 bps	%B40000
K56flex (42000)	at 42000 bps	%B42000
K56flex (44000)	at 44000 bps	%B44000
K56flex (46000)	at 46000 bps	%B46000
K56flex (48000)	at 48000 bps	%B48000
K56flex (50000)	at 50000 bps	%B50000
K56flex (52000)	at 52000 bps	%B52000
K56flex (54000)	at 54000 bps	%B54000
K56flex (56000)	at 56000 bps	%B56000

Note: For the highest possible throughput available, set the modem-port speed by typing **AT%G1%B*n*** (where *n* equals the desired speed).

Table A-2. V.23 Connections

When %F1, %F2, or %F3 is set for V.23 connections:	
Protocol	***Command***
V.23 (TX 75 bps/RX 1200 bps) Split Serial-Port Speed	%F1\W1
V.23 (TX 75 bps/RX 1200 bps) Constant Serial-Port Speed	**W0**%F1\J0
V.23 (TX 1200 bps/RX 75 bps) Split Serial-Port Speed	%F2\W1
V.23 (TX 1200 bps/RX 75 bps) Constant Serial-Port Speed	**W0**%F2\J0
V.23 (1200 bps half duplex)	%F3

Notes: If a direct connection results, the computer must be set to **split** speed to match the modem speeds.

All V.23 connections are available only for direct and normal connections.

■ Speed and Protocol Connection Matrices

The following tables show the possible speed and protocol combinations for modem connections. They also illustrate the action of an answer modem set to use multi-mode answering.

Table A-3. Speed and Protocol Connection Matrices - Part 1

Mode Setting on	***Mode Setting on Answer Modem***							
Originate Modem	***V.22[b]***	***V.22[a]***	***V.22bis***	***V.32***	***V.32bis***	***V.34/V.FC***	***V.90***	***K56flex***
K56flex (32,000-56,000)	—	V.22bis	V.22bis	V.32	V.32bis	V.34	K56flex	K56flex
V.90 (28,000-56,000)	—	V.22bis	V.22bis	V.32	V.32bis	V.34	V.90	K56flex
V.34/V.FC (2400-33,600)	—	V.22[a]	V.22bis	V.32	V.32bis	V.34/V.FC	V.34/V.FC	V.34/V.FC
V.32bis (4800-14,400)	—	V.22[a]	V.22bis	V.32	V.32bis	V.34/V.32	V.34/V.32	V.34/V.32
V.32 (4800-9600)	—	V.22[a]	V.22bis	V.32	V.32	V.34/V.22bis	V.34/V.22bis	V.34/V.22bis
V.22bis (2400)	—	V.22[a]	V.22bis	V.22bis	V.22bis	V.22[a]	V.22[a]	V.22[a]
V.22[a] (1200)	—	V.22[a]	V.22[a]	V.22[a]	V.22[a]	—	—	—
V.22[b] (600)	V.22[b]	—	—	—	—	V.22[b]	V.22[b]	V.22[b]
Bell212A (1200)	—	V.22[a]	V.22[a]	V.22[a]	V.22[a]	—	Bell212A	Bell212A
Bell103 (300)	—	Bell103	Bell103	Bell103	Bell103	V.23[c]	V.23[c]	V.23[c]

Table A-4. Speed and Protocol Connection Matrices - Part 2

Mode Setting on Originate Modem	***Mode Setting on Answer Modem***					
	Bell 212A	***Bell 103***	***V.21***	***V.23[c]***	***V.23[b]***	***V.23[a]***
K56flex (32,000-56,000)	Bell212A	—	—	—	—	—
V.90 (28,000-56,000)	Bell212A	—	—	—	—	—
V.34 (2400-33,600)	V.22[a]	—	—	—	—	—
V.FC (14,400-28,800)	V.22	—	—	—	—	—
V.32bis (4800-14,400)	V.22[a]	—	—	—	—	—
V.32 (4800-9600)	V.22[a]	—	—	—	—	—
V.22bis (2400)	V.22[a]	—	—	—	—	—
V.22[a] (1200)	V.22[a]	—	—	—	—	—
V.22[b] (600)	V.22[a]	—	—	—	—	—
V.23[a] (xmt 75)	—	—	—	—	V.23[b]	—

Table A-4. Speed and Protocol Connection Matrices - Part 2 (Continued)

Mode Setting on Originate Modem	***Mode Setting on Answer Modem***					
	Bell 212A	***Bell 103***	***V.21***	***V.23[c]***	***V.23[b]***	***V.23[a]***
V.23[b] (xmt 1200)	—	—	—	—	—	V.23[a]
V.23[c] (half-duplex)	—	—	—	V.23[c]	—	—
Bell212A (1200)	Bell212A	Bell212A	—	—	—	—
Bell103 (300)	Bell103	Bell103	—	—	—	—

Note: For operations at V.22 600 bps, both modems must be set to 600.

Appendix B

Microcom Networking Protocols

MNP Classes

The 4000 modem provides MNP Classes 10 and 10EC, and supports MNP Class 5 data compression. It is compatible with all Compaq Microcom MNP products. Its enhanced MNP service is completely transparent to the user.

Class 10 supports Adverse Channel Enhancements (ACE), which optimizes performance under poor line conditions. Class 10 continues to provide compatibility with non-MNP modems. It improves initial connection success rate by making multiple negotiation attempts when configured for auto-reliable mode. It uses Dynamic Transmit Level Adjustment to calculate optimal transmit levels automatically to compensate for cellular phone signal distortion. It lets the user configure the modem to negotiate the link at a low-speed modulation, then upshift to a higher speed after negotiation. It improves link performance during adverse channel conditions by aggressive Adaptive Packet Assembly. It maximizes throughput by continuously monitoring line quality and link performance, and dynamically upshifting or downshifting to the optimum modulation speed.

Class 10EC is an enhancement to MNP Class 10 that improves modem-to-modem connection rates and the throughput rate of data over cellular networks.

Class 5 provides data compression, which combined with MNP Class 4 allows throughput of almost twice the connection speed. Class 5 dynamically adjusts to the type of data being transmitted for maximum compression efficiency.

Other Classes of MNP

MNP Class 2 uses standard asynchronous framing techniques for data transmission and error correction. Because of this protocol overhead, the actual throughput is less than the bps rate of the modem.

MNP Class 3 uses synchronous framing techniques. Removing start and stop bits associated with each character prior to transmitting results in a 20% performance increase over Class 2. Thus, actual throughput is greater than the modem's bps rate.

MNP Class 4 uses synchronous framing techniques plus improvements developed by Compaq Microcom Adaptive Packet Assembly and Optimized Data Phase. These enhancements result in better performance for all types of connections.

Adaptive Packet Assembly automatically adjusts the size of the data packets based on the quality of the telephone line. When the line quality is good and there are few retransmissions, the modem increases the packet size. When the line quality is poor and retransmissions are frequent, the size of the packet decreases in order to maintain high throughput during error correction under poor conditions.

Optimized Data Phase is the redesign of the MNP protocol header that reduces the number of overhead bytes per data packet. For example, modems operating at Class 4 service transmit data at 2900 bps.

MNP Class 6 allows half-duplex, fast-train high-speed reliable connections with other MNP Class 6 modems at speeds of 4800 to 9600 bps.

Universal Link Negotiation allows the modem to automatically connect with other MNP modems at the highest common speed and protocol.

Statistical Duplexing adjusts the line bandwidth and data traffic flow during reliable connections to achieve maximum throughput, resulting in error-free transmission over 2-wire dial-up or leased lines at high throughputs.

MNP Class 7 provides Enhanced Data Compression, which combined with Class 4 allows throughput of more than twice the connection speed. MNP Class 7 Enhanced Data Compression not only dynamically adjusts to the type of data being transmitted, but allows for the probability of character frequency, for superior compression efficiency.

MNP Class 9 includes enhanced Universal Link Negotiation.

Appendix C
Result Codes

The 4000 modem can display these result codes when it attempts to establish a connection. See Chapter 3, *AT Commands and Registers*, for descriptions of the -M, V, \V, and W commands.

Connection Result Code Tables

The tables use the abbreviations: **rel** (reliable) and **non-rel** (non reliable).

Table C-1 shows the short and long form result codes, excluding connection result codes whose form depends on the \V, W, and -M commands.

Table C-1. Result Codes

Short Form	***Long Form***
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
6[1]	NO DIALTONE
7[1]	BUSY
8[1]	NO ANSWER
40	REMOTE ACCESS FAILED
51	NO PROMPT TONE

[1] Display of these call progress monitoring result codes depends on the setting of the X command.

Table C-2. Long Form Connect Result Codes (DTE Speed)

ATV1-M0W0 or ATV1 M0W1 Report DTE speed		
DTE Speed	***non-rel \V0 rel***	***\V1 rel, \V2 rel[1] \V3 rel, \V4 rel[1], \V5 rel[4]***
75	75	75/REL
300	300	300/REL
600	600	600/REL
1200	1200	1200/REL
2400	2400	2400/REL
4800	4800	4800/REL
9600	9600	9600/REL
19,200	19200	19200/REL
38,400	38400	38400/REL
57,600	57600	57600/REL
115,200	115200	115200/REL
230,400	230400	230400/REL

Table C-3. Long Form Connect Result Codes (Modulation Speed)

ATV1-M0W2 ***Report modulation speed***				
Modulation	***Speed***	***non-rel \V0 rel***	***\V1 rel \V2 rel[1]***	***\V3 rel \V4 rel[1] \V5 rel[4]***
V.21	300	__[2&3]	V.21/REL	V.21/REL
Bell 103	300	__[2]	103/REL	103/REL
V.23 half-duplex	1200	V.23 HDX[3]	—	—
V.23 split speed	75/1200	V.23[3]	—	—
V.22	600[3]	600	600/REL	600/REL
V.22 \Bell 212A	1200	1200	1200/REL	1200/REL
V.34/V.22bis	2400	2400	2400/REL	2400/REL
V.34/V.32	4800	4800	9600/REL	4800/REL
V.34/V.32bis	7200	7200	9600/REL	7200/REL
V.34/V.32	9600	9600	9600/REL	9600/REL
V.34/V.32bis	12000	12000	9600/REL	12000/REL
V.34/V.FC/V.32bis	14400	14400	14400/REL	14400/REL
V.34/V.FC	16800	16800	16800/REL	16800/REL
V.34/V.FC	19200	19200	19200/REL	19200/REL
V.34/V.FC	21600	21600	21600/REL	21600/REL
V.34/V.FC	24000	24000	24000/REL	24000/REL
V.34/V.FC	26400	26400	26400/REL	26400/REL
V.34/V.FC	28800	28800	28800/REL	28800/REL
V.34	31200	31200	31200/REL	31200/REL
V.34	33600	33600	33600/REL	33600/REL
V.90	28000	28000	28000/REL	28000/REL
V.90	29333	29333	29333/REL	29333/REL
V.90	30667	30667	30667/REL	30667/REL
V.90	32000	32000	32000/REL	32000/REL
V.90	33333	33333	33333/REL	33333/REL
V.90	34667	34667	34667/REL	34667/REL
V.90	36000	36000	36000/REL	36000/REL
V.90	37333	37333	37333/REL	37333/REL
V.90	38667	38667	38667/REL	38667/REL
V.90	40000	40000	40000/REL	40000/REL
V.90	41333	41333	41333/REL	41333/REL
V.90	42667	42667	42667/REL	42667/REL
V.90	44000	44000	44000/REL	44000/REL
V.90	45333	45333	45333/REL	45333/REL
V.90	46667	46667	46667/REL	46667/REL
V.90	48000	48000	48000/REL	48000/REL
V.90	49333	49333	49333/REL	49333/REL
V.90	50667	50667	50667/REL	50667/REL
V.90	52000	52000	52000/REL	52000/REL
V.90	53333	53333	53333/REL	53333/REL

Table C-3. Long Form Connect Result Codes (Modulation Speed) (Continued)

ATV1-M0W2 ***Report modulation speed***				
Modulation	***Speed***	***non-rel*** ***\V0 rel***	***\V1 rel*** ***\V2 rel***[1]	***\V3 rel*** ***\V4 rel***[1] ***\V5 rel***[4]
V.90	54667	54667	54667/REL	54667/REL
V.90	56000	56000	56000/REL	56000/REL
K56flex	32000	32000	32000/REL	32000/REL
K56flex	34000	34000	34000/REL	34000/REL
K56flex	36000	36000	36000/REL	36000/REL
K56flex	38000	38000	38000/REL	38000/REL
K56flex	40000	40000	40000/REL	40000/REL
K56flex	42000	42000	42000/REL	42000/REL
K56flex	44000	44000	44000/REL	44000/REL
K56flex	46000	46000	46000/REL	46000/REL
K56flex	48000	48000	48000/REL	48000/REL
K56flex	50000	50000	50000/REL	50000/REL
K56flex	52000	52000	52000/REL	52000/REL
K56flex	54000	54000	54000/REL	54000/REL
K56flex	56000	56000	56000/REL	56000/REL

1 If \V2 or \V4 is set and a reliable link is established, the message displays as one of the following formats:
CONNECT <*speed*>/REL - MNP or
CONNECT <*speed*>/REL - LAPM or
CONNECT <*speed*>/REL - CELLULAR or
CONNECT <*speed*>/REL - CELLULAR EC or
CONNECT <*speed*>/LAPM - CELLULAR EC.

2 In non-reliable V.21 or Bell 103 connections, the message displays as **CONNECT**.

3 Not supported in synchronous mode.

4 If \V5 is set, the message displays in one of the following formats:
CONNECT <*DCE speed*>/<*modulation*>/REL-CELLULAR
CONNECT <*DCE speed*>/<*modulation*>/REL-LAPM
CONNECT <*DCE speed*>/<*modulation*>/REL-MNP
CONNECT <*DCE speed*>/<*modulation*>/REL-CELLULAR EC
CONNECT <*DCE speed*>/<*modulation*>/LAPM - CELLULAR EC
with the modulation **/V.FC**, **/K56**, **/V.90**, **/V.34, /V.32, /V.22,** or **/FSK**

Table C-4. Short Form (Numeric) Connect Result Codes (DTE Speed)

ATV0W0 or ATV0W1 Report DTE speed			
DTE Speed	***\V0 \V1 non-rel \V2 non-rel \V4 non-rel \V5 non-rel***	***\V1 rel \V2 rel \V4 rel \V5 rel***	***\V3***
75	1	20	1
300	1	20	1
600	9	21	5
1200	5	22	5
2400	10	23	10
4800	30	31	11
9600	32	33	12
19200	36	37	14
38400	38	39	28
57600	42	43	29
115200	46	47	30
230400	48	49	51

Table C-5. Short Form (Numeric) Connect Result Codes

ATV0W2 Report Modulation Speed					
Modulation	***Speed***	***\V0 \V1 non-rel \V2 non-rel \V4 non-rel \V5 non-rel***	***\V1 rel \V2 rel \V4 rel \V5 rel***	***\V3***	***Non-compression***
V.21 or Bell 103	300	1	20	1	79
V.23 half-duplex	1200	5	—	5	24
V.23 split speed	75/1200	11	—	23	24
V.22	600	*9*	21	5	21
V.22 or Bell 212A	1200	5	22	5	80
V.34/V.22bis	2400	*10*	23	10	81
V.34/V.32	4800	30	31	11	82
V.34/V.32bis	7200	40[1]	33	24	83
V.34/V.32	9600	32	33	12	84
V.34/V.32bis	12000	44[1]	33	25	85
V.34/V.FC/V.32bis	14400	34[1]	35	13	87
V.34/V.FC	16800	60	61	13	88
V.34/V.FC	19200	36	37	14	89
V.34/V.FC	21600	62	63	13	90
V.34/V.FC	24000	64	65	13	91
V.34/V.FC	26400	66	67	13	92
V.34/V.FC	28800	68	69	13	93
V.34	31200	70	71	13	94
V.34	33600	72	73	13	95
V.90	28000	173	174	175	176

Table C-5. Short Form (Numeric) Connect Result Codes (Continued)

ATV0W2 Report Modulation Speed					
Modulation	***Speed***	***\V0 \V1 non-rel \V2 non-rel \V4 non-rel \V5 non-rel***	***\V1 rel \V2 rel \V4 rel \V5 rel***	***\V3***	***Non-compression***
V.90	29333	177	178	179	180
V.90	30667	181	182	183	184
V.90/K56flex	32000	130	131	15	160
V.90	33333	185	186	187	188
V.90	34667	189	190	191	192
V.90/K56flex	36000	134	135	15	162
V.90	37333	193	194	195	196
V.90	38667	197	198	199	200
V.90/K56flex	40000	138	139	15	164
V.90	41333	201	202	203	204
V.90	42667	205	206	207	208
V.90/K56flex	44000	142	143	15	166
V.90	45333	209	210	211	212
V.90	46667	213	214	215	216
V.90/K56flex	48000	146	147	15	168
V.90	49333	217	218	219	220
V.90	50667	221	222	223	224
V.90/K56flex	52000	150	151	15	170
V.90	53333	225	226	227	228
V.90	54667	229	230	231	232
V.90/K56flex	56000	154	155	15	172
K56flex	34000	132	133	15	161
K56flex	38000	136	137	15	163
K56flex	42000	140	141	15	165
K56flex	46000	144	145	15	167
K56flex	50000	148	149	15	169
K56flex	54000	152	153	15	171

[1] When \V0 is set, the following numeric codes display: 14400 bps=34; 12000 bps=44; 7200 bps=40.

Appendix D
Diagnostics

Your modem's diagnostic capabilities verify its performance and can isolate the source of a communications problem. If a problem exists, test ***all*** components of the communications path, including the data cable and all connectors.

Notes: The modem must be in normal or direct mode for loopback tests. It does not support these tests in Bell 103, V.13, V.21, or V.23 mode.

The modem supports all loopback tests 1200 bps or higher.

Power-Up Diagnostics

Power-up diagnostics test the program checksum, RAM memory, and components on the modem board each time you power up the modem or type **AT$D** and press **Enter**. With **AT$D,** the modem resets. Table D-1 shows the condition of the LEDs during a normal power up. If you have any problems, refer to Chapter 6, *Troubleshooting and Customer Support*, for help.

Table D-1. LEDs During a Normal Power Up

LEDs	***Condition During Normal Power-on***
Power Supply Fan Fail	Off
Chassis Fan Fail	Off
Modem Power	Solid Green
Modem Ports A, B, C, D, E, F, G, H	Flash Green/flash Yellow/flash Green/Off
PRI/T1/E1 Power	Solid Green
PRI/T1/E1 Synchronization	Solid Green
PRI/T1/E1 Framing Format	Off
PRI/T1/E1 Bipolar Violations	Off
PRI/T1/E1 Yellow Alarm	Off*

***** A Yellow Alarm LED may be On for a given span if you have not installed a line for that span.

Performing a Power-Up Diagnostic Test

To perform a power-up diagnostic test, do ***one*** of the following:

- Power down/up the modem, *OR*
- At the command prompt type **AT$D** and press **Enter**

If you have any problems, refer to Chapter 6, *Troubleshooting and Customer Support*, for help.

V.54 Loopback Tests by V.24 Circuit

The modem can perform V.54 loopback tests using the following circuits:

Table D-2. V.54 Loopback Tests Via Circuit

V.24 Circuit	***Test***
140	Remote digital loopback
141	Local analog loopback
142	Test Indicator goes high while test is performed

Initiates a remote digital loopback test by raising circuit 140, and terminates by lowering circuit 140.

Initiates a local analog loopback test by raising circuit 141, and terminates by lowering circuit 141.

Notes: To perform a remote digital loopback test, %H2 must be set. To perform a local analog loopback test, set either **%H1 with DTR high** or **%H2**.

The modem does not support V.54 loopback tests for Bell 103, V.13, V.21, and V.23 modes.

Local Analog Loopback with Self-Test

Local Analog Loopback with Self-Test tests the local serial port. The modem sends itself a test data sequence and then verifies the data to make sure that it receives them correctly.

To initiate a Local Analog Loopback with Self-Test, type **AT&T8** and press **Enter**. When the test finishes, the screen displays a three-digit number that represents the number of errors. For example:

AT&T8
(no display during test)
(test ends)
000
OK

The test continues until the time set with register S18 runs out, or until you terminate the test by typing **AT&T0** and pressing **Enter**. You can also type **ATH** and press **Enter** to end the test and hang up.

Local Analog Loopback

Local Analog Loopback tests the local serial port and the local computer. This test requires you to type a sequence of characters at your computer. The modem then sends these characters back to your computer.

Initiate a Local Analog Loopback test by:

- using the &T1 command
- using circuit 141

Using Commands to Perform a Local Analog Loopback

To initiate a Local Analog Loopback:

1. Type **AT&T1** and press **Enter** (must be the last command on the line).
2. Type a sequence of characters.

The characters on your display should match exactly the characters you type. This test mode continues for the time set with register S18, or until you manually terminate the test. To manually end the test, enter command state and type **AT&T0** and press **Enter**. To end the test and hang up, type **ATH** and press **Enter**.

Using Circuits to Perform a Local Analog Loopback

To initiate a Local Analog Loopback using circuits:

1. Set %H with DTR high or %H2.
2. Raise circuit 141.
3. Type a sequence of characters.

   The characters on your display should match your sequence exactly.
4. To end the test, lower circuit 141.

Remote Digital Loopback with Self-Test

Remote Digital Loopback with Self-Test tests the remote modem port, the telephone line, and the local serial and modem ports. When the modem is set to Remote Digital Loopback with Self-Test, it sends the remote modem a special test data sequence, and the remote modem echoes this data back to your modem.

To initiate a Remote Digital Loopback with Self-Test:

1. Dial the number of a remote system configured to accept a Remote Digital Loopback request.
2. When the modems connect, return to command state and type **AT&T7** and press **Enter**.

When the test is complete, the screen displays a three-digit number that represents the number of errors. For example:

AT&T7
(no display during test)
(test ends)
000
OK

The test continues for the time set with register S18 or until you terminate the test by typing **AT&T0** and pressing **Enter.** To end the test and hang up, type **ATH** and press **Enter**.

Remote Digital Loopback

Remote Digital Loopback tests the remote modem port, the telephone line, the local serial and modem ports, and the local computer. This test requires you to type a sequence of characters at your computer. The modem then sends these characters to the remote modem, which echoes them back to your modem.

Initiate a Remote Digital Loopback by:

- using the &T6 command
- using circuit 140

Using Commands to Perform a Remote Digital Loopback

To initiate a Remote Digital Loopback:

1. Dial the number of a remote system configured to accept a Remote Digital Loopback request.
2. When the modems connect, return to the command state and type **AT&T6** and press **Enter**.
3. Type a sequence of characters.

The characters echoed on your display should match exactly the characters you typed. The test continues for the time set with register S18, or until you manually terminate the test. To manually end the test, enter command state and type **AT&T0** and press **Enter**. To end the test and hang up, type **ATH** and press **Enter**.

Using Circuits to Perform a Remote Digital Loopback

To initiate a Remote Digital Loopback using circuits:

1. Set %H2.
2. Raise circuit 140.
3. Type a sequence of characters. The characters on your display should match your sequence exactly.
4. To end the test, lower circuit 140.

Local Digital Loopback

Local Digital Loopback allows the modem to loop back data to the remote modem. It tests the remote computer, the remote modem and serial ports, the telephone line, and the local modem port.

To initiate a Local Digital Loopback:

1. Dial the number of a remote system.
2. When the modems connect, return to command state and type **AT&T3** and press **Enter**.

The operator of the remote system now types a sequence of characters.

You do not see any characters on your display while your modem echoes the characters typed by the operator of the remote modem back to the remote computer. The test continues for the time set with register S18. If you do not use register S18, the operator of the remote modem must hang up or call you on another telephone line to tell you when the test is over. To manually end the test, enter command state and type **AT&T0** and press **Enter**. To end the test and hang up, type **ATH** and press **Enter**.

Respond to Remote Digital Loopback

The Respond to Remote Digital Loopback command configures your modem to accept a request from a remote modem to engage in a Remote Digital Loopback or a Remote Digital Loopback with Self-Test. To configure the modem to accept a remote digital loopback request, at the command prompt type **AT&T4** and press **Enter**.

To configure the modem to ignore a remote digital loopback request, type **AT&T5** and press **Enter**.

Automatically Terminating a Test: Register S18

To configure the modem to terminate a test automatically after a specified time, change the value of register S18. Register S18 determines the duration of a diagnostic test. The factory default setting is 0 seconds, which disables the timer and causes tests to continue indefinitely until you cancel them. You can set this register to terminate tests after 1 to 255 seconds.

Appendix E

Making Cellular Connections

This chapter explains how to configure your modem for improved cellular operation.

MNP Class 10EC

MNP Class 10EC is an enhancement to MNP Class 10 that improves modem-to-modem connection rates and the throughput rate of data over cellular networks.

Land-line modems are designed to operate over local loops that are fixed and relatively stable. Because the signal-to-noise ratio and distortion characteristics of individual loops are fairly constant, two land-line modems can establish the data rate and communications parameters for a session during the initial negotiation phase. The two modems can usually adjust to minor variations in media quality without dropping the call.

Cellular transmissions add new layers of interruptions, distortions, and level changes that land-line modems are not designed to handle. Some of the interruptions and distortions are caused by the nature of cellular transmission itself: a continuous negotiation takes place between the mobile phone unit and the transmission site to which it is currently assigned. The communications involve instructions for handoffs from one cell site to the next and adjustments to a signal level that is constantly changing. The interruptions, called blanking, are often too brief to be heard during a voice call.

In a data transmission, however, the constant blanking appears as a series of hits, and the modem designed solely for land-line use will generally overreact to them, resulting in failures to connect, multiple re-transmissions of data packets, and dropped calls.

Advantages of Using MNP Class 10EC Modems

The MNP Class 10EC solution to this new level of adversity involves enhancements at both the hardware and protocol levels:

- At the hardware level, the modem's data pump has been redesigned so that it now recognizes the frequent interruptions as normal and temporary characteristics of the transmission media. Additionally, it recognizes sudden bursts of RF noise and adapts to signal fading. It quickly recovers a lost signal.
- At the protocol level, MNP Class 10EC compensates for cellular's adverse environment by identifying and correcting errors. It optimizes throughput by making speed and packet size adjustments based on the actual frequency of blanking interruptions, as well as on the signal quality and overall error performance.

Because it is fully compatible with all MNP Class 10 modems, MNP Class 10EC can be implemented on just the remote side of a cellular link and it markedly improves performance. In major installations that frequently support cellular transmissions, MNP 10EC modems should be used on both the cell side and the land side to ensure optimum performance.

Setting Up MNP 10EC Modems

Compaq Microcom modems can be set up in different ways to operate over a cellular telephone network. The following setups are typical:

- Universal V.32bis setup
- V.32bis cellular quick connect setup

Method 1: Universal V.32bis Setup

With Method 1, MNP10 EC operation is available with other EC-capable modems and with non-EC modems that support MNP 10 Cellular. Enhanced Cellular V.32bis operation is active at speeds between 1200 to 14,400 bps.

AT&F Land-side modem.

Sets the modem to factory defaults; allows the land-side modem to make data connections with both land-based and cellular-based modems without reducing maximum connection speeds. MNP 10 cellular connections occur at the highest speed the modems determine they can support depending on the characteristics of the cellular connection. If the land-side modem will make cellular connections only, Compaq Microcom recommends setting **AT&F\N6)M1**. Cell-side MNP 10/EC or MNP 10 Cellular modems require ***H1** to make cellular connections.

AT&F\N2)M1*H1 Cell-side modem.

Allows the Compaq Microcom analog cell-side modem to make MNP 10EC connections with any other MNP 10EC or MNP 10 cellular modem. The modem makes the initial connection at 1200 bps, and then it attempts to upshift to the highest V.32bis speed that the modems can support given the characteristics of the cellular connection.

Method 2: V.32bis Cellular Quick Connect Setup

Method 2 allows cellular connections to V.32bis modems at the highest mutually supported V.32bis speed for that cellular connection, up to 14,400 bps.

AT&F\N2)M1 Land-side modem.

Forces MNP connections to all modems and allows MNP 10 Cellular or Enhanced Cellular connections to capable MNP 10 modems.

AT Commands and Registers

)M*n* Power Level Adjustment for Cellular Telephone Connections

)M0 For central site modems: Automatically adjusts power level of land-side modem if remote modem (a) originates the call and (b) is set to ***H1)M1**.
Use for MNP Class 10 modems that will connect to both MNP 10 non-cellular telephone site modems and to cellular modems that use only basic MNP 10 cellular operation instead of Enhanced Cellular operation.

)M1 For cell-side cellular modems: Forces adjustment of power level.
Adjusts the power levels during link negotiation for reliable connections to accommodate signaling requirements of cellular telephone equipment. This setting must be used for Method 2 MNP 10 Enhanced Cellular operation.

@M*n* Select Transmit Level (Only for Cellular Connections)

@M0 Use an initial transmit level of -18 dBm
@M1 Use an initial transmit level of -30 dBm
@M2 Use an initial transmit level of -10 dBm
@M*n* Whre *n*=10 to 35, use an initial transmit level of -10 dBm through -35 dBm

Selects the initial transmit level for your connection. You can set levels from -10 dBm through -35 dBm. The command is structured as follows: From @M10 through @M35, the level set is the variable expressed as -dBm. For example, @M12 sets -12 dBm.

Compaq Microcom recommends that you use the default, **@M0**, when making cell-side cellular calls. You may need to adjust this level, depending on your cellular equipment.

Result Codes for Cellular Connections

The tables in Appendix C, *Result Codes*, list the result codes the modem can display when it attempts to establish a connection.

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