

Communicator

V.34 Data/Fax Modem

Plug n' Play PC Card

Reference Guide

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1. Using AT Commands

Communications programs control your modem by issuing modem instructions called AT commands. While it is usually easiest to let the communication software handle the task of issuing AT commands, there may be occasions when you will want to control a series of commands yourself. The information that follows is included to allow you to tailor your modem for specific needs.

If you want to send AT commands to your modem directly, you must be running a data communication program. (You cannot send AT commands from your operating system prompt.) Once the communication program is started, you must put it into terminal mode. Many programs do this automatically. Your modem must also be in command mode (see *Some Notes About AT Commands*) to accept AT command strings. To verify whether your modem is in the proper mode, type *AT <Enter>*. If the modem responds with an OK message, you are all set.

AT commands must:

1. Start with the command string AT
2. Contain one or more of the commands listed in this chapter
3. End with a carriage return (shown in this book as <Enter>).

The following notation conventions are used in this chapter:

- AT commands and messages are shown in italics, like so:
AT &FO <Enter>.
- Factory default settings for commands are shown in bold. These settings are in effect until you issue a command altering the setting. For instance, the default setting for *Bn* is **B1**. To return the modem to its factory default settings at any time, type *AT &FO <Enter>*.
- S-registers affected by, or related to, particular AT commands are listed in brackets at the end of the command descriptions. Similarly, the AT commands that affect, or are related to, the contents of an S-register are listed at the end of each S-register description.

Refer to *Table 1-1* for a summary of the basic AT commands. Refer to *AT Commands* for the complete list of AT commands.

Table 1-1. AT Command Summary

AT Command prefix used to begin almost all commands.

Commands preceded by AT and followed by <Enter>:

D Dial the following number using the default or previous method (tone or pulse).
DT Dial the following number using tones.
DP Dial the following number using pulses.
DS=*n* Dial stored number *n*.
W Wait for dial tone before dialing.
H Hang up the phone.
O Go on-line (switch from command mode to data mode). Used to resume interrupted communications when the remote modem is still on-line.
S*r*? Read S-register *r*.
S*r*=*n* Write value *n* to S-register *r*.
Z*n* Reset and recall saved profile *n*.
&F*n* Recall factory configuration *n*.
&V Display current configuration and stored profiles.
&W*n* Save current configuration as profile *n*.
&Z*n*=*x* Save *x* as stored telephone number *n*.

Command not preceded by AT and not followed by <Enter>:

A/ Repeat the previous command.

Some Notes About AT Commands

- Some AT commands override other AT commands. For example, issuing *AT*

&K3 &K4 <Enter> will not enable both hardware flow control (*&K3*) and software flow control (*&K4*), it will only enable software flow control. The latter command overrides the former.

- If you do not specify a number on commands that end in a number, the modem will take the number to be 0. So, for example, *AT B* and *AT B0* achieve the same effect: setting communications to the CCITT standard. This feature can be useful if you wish to save space when issuing commands.
- If your modem is on-line and you want to issue an AT command string to your modem without disrupting your connection, you can bring your modem into command mode by typing a special escape sequence. To issue the escape sequence you must first not transmit any data for a period equal to the guard time, which by default is one second. Then type *+++* quickly. Do NOT press *<Enter>*. Instead, wait for another second. The modem will respond to this step with an OK message. Now your modem is ready to accept AT command strings. When you want to resume your on-line connection, type *ATO <Enter>*.

Configuring the Modem

By default, your modem is set up to automatically detect the appropriate line speed, use hardware flow control, and connect using error correction and data compression protocols, if possible. These settings are stored in read-only memory (ROM) at the factory and can be recovered at any time by issuing the *&FO* command, described later in the chapter. If the factory settings do not meet your needs, (say for instance, your software does not support hardware flow control), you can define and store your own configurations into nonvolatile memory using the *&Wn* command. You can then recover these configurations at any time with the *Zn* command. Both *&Wn* and *Zn* are described more fully later in the chapter.

These stored configurations are called profiles. Not all AT command settings and S-registers can be stored as a part of a profile. The ones that can be stored are so noted. Several sample modem configurations are shown below. These are examples of profiles you might store in memory as your user-definable profiles. You can store two user-defined profiles.

Sample Configuration 1

One useful configuration is obtained by typing *AT &FO &C1 &D2 &W0 <Enter>*. These commands have the following effect:

- *&FO* restores the factory default configuration, turning on line speed detection, hardware flow control, error correction, and data compression. In other words, if the remote modem will allow it, your modem will use all of its most advanced features.
- *&C1* forces the carrier detect (CD) signal to follow the state of the carrier. This allows your communications software to properly determine whether the modem is on-line or off-line.
- *&D2* instructs your modem to hang up when the data terminal ready (DTR) signal drops. This will speed up the hang-up process for most communications software packages.
- *&W0* stores this configuration as profile 0. Now whenever you type *ATZ <Enter>*, you will restore this profile.

NOTE: *Since your modem will be using hardware flow control,*

your communications software must also be set for hardware flow control. In addition, to take advantage of the possible 4:1 data compression provided by V.42bis, you should set your communications package to lock the DTE rate to the highest speed possible: up to 115200 bps.

Sample Configuration 2

If you are using software that does not support hardware flow control, then you might use the following configuration: *AT &F0 &C1 &D2 &K4 <Enter>*

This configuration is identical to that of the previous example, except that *&K4* is used to enable software flow control rather than hardware flow control. Note that software flow control must be used with caution. Do NOT use software flow control when you are transferring files that might naturally contain XON and XOFF characters, such as binary files. Also, do not use software flow control when you are transferring files using protocols like XMODEM or ZMODEM.

NOTE: If your modem is configured to use software flow control, then you must also set your communications software to use software flow control.

Sample Configuration 3

If your software does not support hardware flow control, but you would like to transfer files with a protocol like XMODEM or ZMODEM, you should try configuring your modem as follows: *AT &F0 &C1 &D2 &K0 &Q0 \J1 <Enter>*.

The first three commands are the same as described in the first example. *&K0* turns off all flow control. *&Q0* specifies a direct connection, which is a connection without flow control, data compression, or error correction. *\J1* forces the data terminal equipment (DTE) rate to match the data communication equipment (DCE) rate, which is required when all flow control is disabled. In this case, you must set your terminal speed to match the line speed, e.g., 14.4 Kbps.

This configuration is not reliable for high-speed connections unless transferring files with newer XMODEM or ZMODEM protocols: XMODEM and ZMODEM protocols have error correction built into them. Also, to ensure that file transfer is reliable, make sure that the protocol does not use packet sizes that are too large.

AT Commands

This section lists the AT commands which the modem uses. This listing is organized by the nonalphabetic first character after "AT" (i.e., no letter, &, %, \,), @, *, :, and -), and then in alphanumeric order. The default settings are listed in bold.

A Answer Command. This command causes the modem to attempt to answer an incoming call. The modem will make its attempt regardless of whether the modem is in auto-answer mode or not. This command should be issued after the RING result code is seen (when another modem is attempting to connect).

A/ Re-executes the previous command line. This command is NOT preceded by *AT* or followed by <Enter>.

Bn CCITT/Bell Setting. This command selects either the CCITT standard or the Bell standard for 300 and 1200 bps communications. (See S27.)

B0 CCITT V.22 for 1200bps, CCITT V.21 for 300bps.

B1 BELL 212A FOR 1200BPS, BELL 103 FOR 300BPS.

Ci Carrier Control Command. This command is included for compatibility only and performs no function other than to return an OK message.

Dn Dial Command. This command directs the modem to go off-hook, wait for a dialtone, and dial the number indicated in the dial string, n. The dial string may contain the characters 0-9 for pulse-mode dialing or 0-9, A-D, *, and # for touch-tone dialing. Spaces, hyphens, and parentheses can be included in the command to improve readability. For example, *D (123) 456-7890* and *D1234567890* are equivalent.

In addition, the dial string may contain these dial command modifiers:

L Redial the last valid number entered.

P Pulse-mode dialing. (See S14.)

T **Touch-tone dialing.** (See S14.)

S=n Dial 1 of 4 stored telephone number, where n is 0, 1, 2, or 3. (See &Zn)

W Wait for a dialtone. (See S7.)

, Pause before dialing the digits that follow. (See S8.)

@ Wait for quiet answer. Wait for one or more rings followed by at least five seconds of silence before continuing with execution of the dial string. This is useful for transferring calls on some PBX systems.

; Return the modem to command state. When placed at the end of the dial string, this puts the modem into command mode. While in command mode, the modem will not attempt to connect with the remote modem.

! Put the modem briefly on-hook. This can be useful for transferring calls on some telephone systems. (See S29.)

^ Toggles calling tone for this call only.

J Perform MNP10 link negotiation at 1200 bps for this call only (see **H*).

K Enable power level adjustment during MNP 10 link negotiation for this call only (see "*Mn*").

& Wait for credit card bong before continuing with the dial string. If the bong is not detected within the time specified in *S7*, the dial string will be aborted, dialing terminated, and an error message generated.

R Accepted but causes no action.

En Local Echo Setting. This command determines whether the commands you type are echoed to the screen. (See S14.)

E0 Disable command echo.

E1 **ENABLE COMMAND ECHO.**

NOTE: If you see duplicate characters, then both your modem local echo and your application software local echo are enabled.

Fn Line Connection Speed Setting. This command is not supported in V.34 modems but reports OK for compatibility. *NO* or *+MS*, and *S37* may be used to force a particular connect mode.

Hn Hang-up Command.

H0 On-hook (hang up).

H1 Off-hook.

In Identification Command.

I0 Reports product code (e. g. 28800).

I1 Reports read-only memory (ROM) checksum. This number should always remain the same.

I2 Reports OK.

I3 Reports ROM revision level and model.

I4 Reports modem identifier string.

I5 Reports country code (e.g. 022 for U.S.).

I6 Reports data pump model and code revision.

I7 Reports DAA code for external DAA (if not installed, reports 255)

Ln Speaker Volume Setting. (See also register *S22*.) On PCMCIA modems, there may be no discernable difference between some volume levels.

L0 Off.

L1 Low.

L2 Medium.

L3 High.

Mn Speaker Control Setting. This command controls when the speaker will be on or off. (See also *S22*.)

M0 Always off.

***M1* On during call establishment, off after receiving carrier.**

M2 Always on, even during data transmission.

M3 On between dialing and carrier detection.

Nn Automatic Line Speed Detection Setting. (See also *S31* and *S37*.)

N0 Automatic line speed detection disabled. Handshaking will be conducted according to the contents of *S37*.

***N1* Automatic line speed detection enabled.**

On On-line Command. This command switches the modem from command mode to on-line mode. If there is no established connection, ERROR is returned.

OO Go back on-line without a retrain.

OI Go back on-line after initiating a retrain.

P Pulse-mode Dial Setting. This setting specifies pulse-mode dialing for all subsequent connections. (See *S14*, contrast with *T*.)

Qn Result Code On/Off Setting. This command determines whether or not the modem returns result codes such as OK, ERROR, or CONNECT. (See *S14*, *S95*, *Vn*, *Wn*, *Xn*.)

***QQ* Display result codes.**

QI Do not display result codes.

Sn? Read S-register. This command enables you to read the S-register specified by the number *n*. For example, typing *ATS0? <Enter>* will allow you to view the contents of the *S0* register.

Sn=x Write to an S-register. This command allows you to change the contents of an S-register. For example *ATS0=2 <Enter>* writes the value 2 to the *S0*

register. Note: the modem does not perform error checking on values written to S-registers. It will always return the OK message. (See *S-Registers* for details on the contents of each S-register.)

T Touch-tone Dial Setting. This setting specifies touch-tone dialing for all subsequent connections. (See *S14*, contrast with *P*.)

Vn Result Code Format Setting. (See *S14*, *S95*, *Qn*, *Wn*, *Xn*.)

V0 Numeric result codes.

***V1* Verbose result codes.**

Wn Connection Message Setting. If you change the value of *S95*, it may override the *Wn* setting. (See *S31*, *Vn*, *Qn*.)

***W0* Reports DTE rate only.** For example:

CONNECT 57600

W1 Reports DCE rate, error correction protocol, and DTE rate. For example:

CARRIER 28800

PROTOCOL: LAPM

CONNECT 57600

W2 Reports DCE rate only. For example:

CONNECT 28800

Xn Extended Result Code Setting. This command selects which call progress result codes are reported. (See *S22*, *S95*, *Qn*, *Vn*, *Wn*, and “*Result Codes and Messages*.”)

X0 Send basic call progress result codes: OK, CONNECT, RING, NO CARRIER, ERROR, NO ANSWER.

X1 Same as *X0* but also report rate-specific CONNECT messages.

X2 Same as *X1* but also report NO DIALTONE detection.

X3 Same as *X2* but also report BUSY signal detection.

***X4* Send all call progress messages.**

Yn Long Space Disconnect Setting. This command determines whether the modem hangs up when it receives a long space signal (greater than 1.6 seconds) from the remote modem. If enabled, the modem will send a 4 second space signal to the remote modem before hanging up. (See *S21*.)

***Y0* Disable long space disconnect.**

Y1 Enable long space disconnect.

Zn Modem Reset/Restore Profile Command.

Z0 Perform modem reset and restore configuration profile 0.

Z1 Perform modem reset and restore configuration profile 1.

AT& Commands

&Cn Carrier Detect (CD) Signal Setting. (See *S21*.)

&C0 CD always on.

***&C1* CD follows state of carrier.**

&Dn Data Terminal Ready (DTR) Signal Setting. This command affects the interpretation of the DTR signal. Note: when the modem is on-line, it ignores a DTR drop that lasts less than the value in *S25*, .05 seconds by default. (See *S21*.)

&D0 DTR is ignored.

- &D1** DTR drop causes the modem to go into command mode.
- &D2** Auto-answer is inhibited and a DTR drop causes the modem to hang up.
- &D3** DTR drop causes the modem to perform a soft reset.
- &Fn** Restore Factory Profile Command. This command will restore one of the two preset factory profiles. These profiles enable automatic line speed detection, hardware flow control, error correction, and data compression. You can also define and store your own specialized profiles. See the **&Wn**, **&Yn**, and **Zn** commands for details.
- &Gn** Guard Tone Setting. This command sets the guard tone for V.22 and V.22bis connections. (See **S23**.)
- &G0** No guard tone.
- &G1** No guard tone.
- &G2** 1800 Hz guard tone. Used in the U.K. and some other Commonwealth countries.
- &Jn** Telephone Jack Setting. The **&J0** and **&J1** commands are included for compatibility only and perform no function other than to return an OK message.
- &Kn** Flow Control Setting. If your communications software does not support hardware flow control, you will need to specify **&K0** or **&K4** (see below). (See **S39**.)
- &K0** Disable flow control.
- &K3** Enable hardware flow control only.
- &K4** Enable software flow control only.
- &K5** Enable transparent software flow control.
- &K6** Enable both hardware and software flow control.
- &L** Leased Line Setting. The **&L0** command is included for compatibility only and performs no function other than to return an OK message. This modem does not support leased line operation.
- &M** Selects a direct connection. This command is equivalent to **&Q0**.
- &Pn** Pulse Dial Make/Break Ratio Setting. Enabled on a per country basis (see **S28**). If enabled the dial make/break ratio is as follows:
- &P0** 39%-61% dial ratio at 10 pulses per second.
- &P1** 33%-67% dial ratio at 10 pulses per second.
- &P2** 39%-61% dial ratio at 20 pulses per second.
- &P3** 33%-67% dial ratio at 20 pulses per second.
- &Qn** Asynchronous Mode Setting. (See **S27** and **S36**.)
- &Q0** Selects a direct connection.
- &Q1** Reserved.
- &Q2** Reserved.
- &Q3** Reserved.
- &Q4** Reserved.
- &Q5** Selects a reliable connection. The value in **S36** will determine whether or not a failure to establish a particular error correction link will result in the modem hanging up or trying to make another type of

- connection.** (See also \N2, \N3, \N4, and \N5.)
- &Q6** Selects normal connection. (Equivalent to \N0.)
- &Rn** Hardware Flow Control Setting. This command selects how the modem controls its Clear to Send (CTS) signal if hardware flow control is selected. (See S21.)
- &R0** CTS always on.
- &R1** CTS will drop only if required by flow control.
- &Sn** Data Set Ready (DSR) Signal Setting. (See S21.)
- &S0** DSR always on.
- &S1** DSR is active after an answer tone has been detected and inactive after the carrier has been lost. Very few communications packages require this setting.
- &Tn** Diagnostic Test Commands. This set of commands provides diagnostic tests that comply with the CCITT V.54 recommendations. All connections established during testing must be normal or direct connections. (See \N0, +Q0, S16, S181.)
- &T0** Terminate test in progress. Generally during a test the modem is on-line. Therefore to issue this command you will need to type the escape sequence +++ and wait for the OK message. You can then type *AT&T0* <Enter> to terminate the test. Alternatively, if S18 is non-zero, a test will terminate automatically after the number of seconds specified in S18.
- &T1** Local analog loopback test. This test checks the operation of your modem's transmitter and receiver.
- For example:
1. Your modem should be on-hook and in command mode. Type *AT\N0* <Enter>. This specifies a normal connection.
 2. Type *AT S18=10* <Enter>. This specifies a test period of 10 seconds.
 3. Type *AT &T1* <Enter>. This initiates the local analog loopback test.
 4. Type a simple character pattern. If your modem is working properly, you will see this character pattern echoed to the screen.
 5. The test will end automatically after 10 seconds.
 6. Return your modem to its original state by typing *ATZ* <Enter>.
- &T2** Reserved.
- &T3** Local digital loopback test. This test verifies the operation of two connected modems and the phone channel.
- For example:
1. Your modem should be on-hook and in command mode. Type *AT\N0* <Enter>. This specifies a normal connection.
 2. Type *AT S18=10* <Enter>. This specifies a test period of 10 seconds.
 3. Establish a connection with the remote modem by typing *ATDnnn-nnnn* <Enter>. Wait for the CONNECT message.
 4. Issue the escape sequence to put the modem back into command mode (type +++ without pressing <Enter>). When you see the OK message, your modem is in command mode.
 5. Issue the command *AT &T3* <Enter>. This initiates the local digital loopback test.

6. Have someone at the remote modem type a simple character pattern. This character pattern then loops through your modem back to the remote modem. Everything is working properly if the original character pattern is echoed back to the remote user's screen.
7. The test will end automatically after 10 seconds.
8. When your testing is complete, hang up the line and return your modem to its original state by typing *ATHZ* <Enter>.

&T4 Allows local modem to accept a request from the remote modem for a remote digital loopback test. (See S23.)

&T5 **Prohibits local modem from accepting a request from the remote modem for a remote digital loopback test.**
(See S23.)

&T6 Remote digital loopback test. This test verifies the operation of two connected modems and the phone channel.

For example:

1. Your modem should be on-hook and in command mode. Type *AT\NO* <Enter>.
2. Type *AT S18=10* <Enter>. This specifies a test period of 10 seconds.
3. Establish a connection with the remote modem by typing *AT Dnnn-nnnn* <Enter>. Wait for the CONNECT message.
4. Issue the escape sequence to put the modem back into command mode (type +++ without pressing <Enter>). When you see the OK message, your modem is in command mode.
5. Issue the command *AT &T6* <Enter>. This initiates the remote digital loopback test. Note that the remote modem must support CCITT V.54 and must be prepared to accept the request for this test. (See &T4.)
6. Type a simple character pattern and verify that what you type is echoed correctly to your screen.
7. The test will end automatically after 10 seconds.
8. When your testing is complete, hang up the line and return your modem to its original state by typing *ATHZ* <Enter>.

&T7 Remote digital loopback with self-test. This test verifies the operation of two connected modems and the phone channel. It sends an internal test pattern through the loop and returns a numeric message that indicates the number of errors that were counted during the test period. (See &T6.)

For example:

1. Your modem should be on-hook and in command mode. Type *AT\NO* <Enter>.
2. Type *AT S18=10* <Enter>. This specifies a test period of 10 seconds.
3. Establish a connection with the remote modem by typing *AT Dnnn-nnnn* <Enter>. Wait for the CONNECT message.
4. Issue the escape sequence to put the modem back into command mode (type +++ without pressing <Enter>). When you see the OK message, your modem is in command mode.
5. Issue the command *AT &T7* <Enter>. This initiates the remote digital loopback with self-test. Note that the remote modem must support CCITT V.54 and must be prepared to accept the request for this test. (See &T4.)
6. The test will end automatically after 10 seconds. The number

of errors that were counted are displayed on your screen at the end of the test. 000 means that there were no errors. 255 means that there were 255 or more errors.

7. When your testing is complete, hang up the line and return your modem to its original state by typing *ATHZ* <Enter>.

&T8 Local analog loopback with self-test. This test checks the operation of your modem's transmitter and receiver. It sends an internal test pattern through the loop and returns a numeric message that indicates the number of errors that were counted during the test period. (See *&T1*.)

For example:

1. Your modem should be on-hook and in command mode. Type *ATVNO* <Enter>. This specifies a normal connection.
2. Type *ATS18=10* <Enter>. This specifies a test period of 10 seconds.
3. Type *AT &T8* <Enter>. This initiates the local analog loopback with self-test.
4. The test will end automatically after 10 seconds. When the test is ended, the modem will display the number of errors detected. 000 means that there were no errors. 255 means that there were 255 or more errors.
5. Return your modem to its original state by typing *ATZ* <Enter>.

&V View Profiles Command. This command displays the active modem profile, the user-defined profiles, and the stored telephone numbers. (See *&Wn* and *Zn*.)

&Wn Store Current Profile Command. This command stores the active modem configuration into nonvolatile memory (NVRAM) as user-defined profile 0 or 1. Storable parameters can be viewed with the *&V* command and recalled with the *Zn* command. To return to the factory defaults, type *AT&FO* <Enter>.

&W0 Store the current profile as profile 0.

&W1 Store the current profile as profile 1.

&Yn Default Reset Profile Setting. This command determines which user-defined profile will be used after a power-on reset.

&Y0 Select user-defined stored profile 0.

&Y1 Select user-defined stored profile 1.

&Zn=X Store Telephone Number Command. This command stores a phone number, X, to phone number entry n, where n is 0, 1, 2, or 3. Each phone number can be up to 34 digits long. Spaces, hyphens, and parentheses are not saved. The purpose of this command is to allow you to abbreviate dial commands. For example, you can store the dial string 9,(123)456-7890 by typing: *AT&Z3=9,(123)456-7890* <Enter>. Subsequent calls to this number can be issued with the command *ATDS=3* <Enter>. (See *Dn*, dial modifier S.)

AT% Commands

%Cn Compression Control Setting. (See *S41* and *S46*.)

%C0 Disable data compression.

%C1 Enable MNP 5 data compression only.

%C2 Enable V.42bis data compression only.
%C3 Enable both V.42bis and MNP 5 data compression.

%En Line Quality Monitor Setting. (See *S41*.)

%E0 Disable line quality monitoring and auto-retrain.

%E1 Enable line quality monitor and auto-retrain.

%E2 Enable line quality monitor and fallback/fall forward.

%L Line Signal Level Command. This command reports a value which indicates the received signal level. For example, 004 = -4dBm, 043 = -43dBm, etc.

%Q Line Signal Quality Command. This command reports the line signal quality. Typical values are in the range from 0 to 2 and increase as the signal quality degrades. Based on this value, retrain or fallback/fall forward may be initiated if enabled by the **%E1** or **%E2** commands. The command reports an ERROR if the modem is not connected, or is connected at 300bps, V.23, or fax modes. In V.34, the symbol rate, SNR, THD, TX level and pre-emphasis are also reported.

AT\ Commands

\An Maximum MNP Block Size Setting. This sets the maximum allowable MNP block size. Block size is negotiated during the MNP handshaking. In general, the better the line quality, the larger the blocks. (See *S40*.)

\A0 64 characters.

\A1 128 characters.

\A2 192 characters.

\A3 256 characters.

\Bn Break Command. In reliable mode, the modem will signal a BREAK through the active error correction protocol. In non-error correction mode, the modem will transmit a BREAK signal to the remote modem that is a length n times 100 ms, where n is between 1 and 9 (the default for n is 3). When the modem receives a break from the remote modem, the break is passed as follows: 1) For non-corrected modes, the break length is passed; 2) For error-corrected modes a 300mS break is passed. (See *\Kn*.)

\Gn Modem-to-Modem Software Flow Control Setting. This command enables or disables software flow control between the local and remote modem. During a reliable connection, this setting is ignored. (See *S41*.)

\G0 Disable modem-to-modem software flow control.

\G1 Enable modem-to-modem software flow control.

\Kn Break Control Setting. This command allows you to send a BREAK to stop data transfer without disconnecting. (See *S40*.) The resulting behavior depends on the state of the modem:

1. Modem receives a BREAK from the computer while operating in data mode.

\K0 Modem enters on-line command mode. No BREAK is sent to remote modem.

\K1 Modem clears data buffers and sends BREAK to remote modem.

- \K2 Same as \K0.
- \K3 Sends BREAK to remote modem immediately.
- \K4 Same as \K0.
- \K5 **Sends break in sequence with transmitted data.**
- 2. Modem receives a BREAK from the computer while operating in command mode. (See \B.)
 - \K0 Clears data buffers and sends BREAK to remote modem.
 - \K1 Same as \K0.
 - \K2 Sends BREAK to remote modem immediately.
 - \K3 Same as \K2.
 - \K4 Sends BREAK to remote modem in sequence with data.
 - \K5 **Same as \K4.**
- 3. Modem receives BREAK from remote modem during non-error corrected connection:
 - \K0 Clears data buffers and sends BREAK to computer.
 - \K1 Same as \K0.
 - \K2 Sends a BREAK immediately to computer.
 - \K3 Same as \K2.
 - \K4 Sends a BREAK in sequence with received data to computer.
 - \K5 **Same as \K4**
- 4. Modem receives BREAK from remote modem during reliable connection: the modem passes a 300 mS BREAK to the host.

\Nn Error correction Mode Setting. This command selects the error correction mode to be negotiated in subsequent connections. (See &Qn, S36, and S48.)

- \N0 Selects a normal connection. A normal connection is a connection with flow control, but no error correction or data compression. (Equivalent to &Q6.)
- \N1 Same as &Q0.
- \N2 Selects a reliable connection (a connection that uses error correction). In this mode the modem will try to establish a V.42 (LAPM) or MNP connection. If the attempt fails, the modem will hang up. (Equivalent to &Q5 S36=4 S48=7.)
- \N3 **Selects an auto-reliable connection. In this mode the modem will first try to establish a reliable connection. If it fails, it will try to establish a normal connection.** (Equivalent to &Q5 S36=7 S48=7.)
- \N4 Selects LAPM error correction. If the attempt to make a LAPM connection fails, the modem will hang up the line. -K1 may override this command (Equivalent to &Q5 S48=0.)
- \N5 Selects MNP error correction. If an attempt to make an MNP connection fails, the modem will hang up the line. (Equivalent to &Q5 S36=4 S48=128.)

AT) Commands

-)Mn Cellular Power Level Setting. This command enables or disables the automatic transmit power level adjustment during MNP 10 link negotiation. The @Mn command sets the initial modem transmit level. (See S40.)
-)M0 **Disable power level adjustment.**
-)M1 Enable power level adjustment.
-)M2 Enable power level adjustment during MNP10 link

negotiation. After connection, the power level remains fixed.

AT* Commands

- **Hn* Link Negotiation Speed Setting. This command controls the initial connection speed for MNP 10 link negotiations. (See S28.)
 - ***H0** Link negotiation at highest speed supported.
 - ***H1** Link negotiation at 1200 bps.
 - ***H2** Link negotiation at 4800 bps.

- * * Download to Flash Memory. A flash programming algorithm must first be loaded into RAM, then the Flash PROM may be loaded. The terminal program must be set to accept hardware and software flow control and should be set to 8 bits, no parity, 1 stop bit. DTE speeds to 115 Kbps are supported. Turn off character and line spacing options. You must have both the Flash loading file and the modem hex code. **WARNING: Do not stop once the modem code is loading. The modem will be irreparably damaged. Before attempting this procedure, contact the factory for the latest object code and instructions. Procedure:** 1) Issue the *AT*** command. Response: "Downloading initiated..." 2) Perform an ASCII file transfer of the flash code. Response: "Downloading flash file..." 3) Perform an ASCII file transfer of the modem hex code. Response: "Download successful." 4) Issue the *ATZ* command.

AT: Commands

- :*En* Compromise Equalizer Setting. By default, the compromise equalizer is turned on. However, with some cellular lines, connections may be more reliable with the compromise equalizer turned off. (See S201.)
 - :**E0** Disable equalizer.
 - :**E1** Enable equalizer.

AT- Commands

- Kn* MNP Extended Services Setting. This command enables or disables conversion of a V.42 LAPM connection to an MNP 10 connection. (See S40.)
 - K0** Disable conversion.
 - K1** Enable conversion.
 - K2** Enable conversion, except during V.42 LAPM answer detection.

- Qn* V.22bis/V.22 Fallback Setting. This command enables or disables fallback to V.22bis or V.22. (See S41.)
 - Q0** Disable fallback so that it is limited to 4800 bps.
 - Q1** Enable fallback.

- SEC=X,Y* MNP 10EC Cellular Protocol Settings. This command enables or disables MNP 10EC and selects initial transmit level. Saved in nonvolatile memory.
 - X=0** Disable MNP 10EC mode.
 - X=1** Enable MNP 10EC mode.
 - Y=-10 to -30** Initial transmit level in dBm. Overwritten with *S91* on factory default.

-*SEC?* Display MNP 10EC parameters.

-*SDRn* Distinctive Ring. This command permits reporting of distinctive ringing cadences. There are three ring types: 1) 2 seconds on, 4 seconds off; 2) 0.8 seconds on, 0.4 seconds off, 0.8 seconds on, 4.0 seconds off; 3) 0.4 seconds on, 0.2 seconds off, 0.4 seconds on, 0.2 seconds off, 0.8 seconds on, 4.0 seconds off.

n=0	Disable distinctive ring. Any valid ring is reported as RING.
n=1	Enable Type 1 ring detection (RING1).
n=2	Enable Type 2 ring detection (RING2).
n=3	Enable Type 1 and Type 2 ring detection.
n=4	Enable Type 3 ring detection (RING3).
n=5	Enable Type 1 and Type 3 ring detection.
n=6	Enable Type 2 and Type 3 ring detection.
n=7	Enable Type 1, Type 2, and Type 3 ring detection.

AT+ Commands

+*MS=X,Y,MINRATE,MAXRATE* Sets protocol, automode, and speed range. Saved in nonvolatile memory.

X=0	V.21
X=1	V.22
X=2	V.22bis
X=3	V.23
X=9	V.32
X=10	V.32bis
X=11	V.34
X=64	B103
X=69	B212
X=74	V.FC

Y=0	Fixed mode
Y=1	Automode

MINRATE and *MAXRATE* equals one of the following: 300, 600, 1200, 2400, 4800, 7200, 9600, 12000, 14400, 16800, 19200, 24000, 26400, 28800, 33600

2. Fax and Voice Commands

The modem supports the CCITT Group 3, and Class 1 and 2 fax command sets. We suggest that you use your fax software to issue all the necessary fax commands to your modem. Programmers should refer to the CCITT specification.

This modem also supports voice functions. The supplied software is designed to work with the voice functions in this product. For further instructions on the use of the voice features, refer to the software User Guide.

3. Result Codes and Messages

The modem responds to most AT commands with a numeric result code (0, for example) or a verbose message (OK, for example). By default, the modem will respond with verbose messages. A description of all of the result codes and corresponding messages are shown in *Table 3-1*. The *Qn*, *Vn*, *Wn*, and *Xn* commands and the S95 register can be used to change which result codes or messages are displayed.

Table 3-1. Result Codes/Messages

<u>Numeric</u>	<u>Verbose</u>		<u>Xn Mode Meaning</u>
00	OK	0-4	Command executed.
01	CONNECT	0-4	Connection established.
02	RING	0-4	Ring is detected.
03	NO CARRIER	0-4	Modem hangs up because: a carrier is not detected, carrier is lost, or carrier has been inactive for the period of time set in the S30 register.
04	ERROR	0-4	Invalid command.
05	CONNECT 1200	1-3	1200 bps. CONNECT for X0.
06	NO DIALTONE	2-4	Did not receive expected dialtone. ERROR for X0 and X1.
07	BUSY	3-4	Detected a busy signal on the line. ERROR for X0, X1, and X2.
08	NO ANSWER	0-4	A continuous ringing signal is detected on the line when attempting to originate a call. The value in S7 determines how long the modem will wait for an answer.
09	CONNECT 600	1-4	600 bps.
10	CONNECT 2400	1-4	2400 bps.
11	CONNECT 4800	1-4	4800 bps DTE rate.
12	CONNECT 9600	1-4	9600 bps DTE rate.
13	CONNECT 7200	1-4	7200 bps DTE rate.
14	CONNECT 12000	1-4	12000 bps DTE rate.
15	CONNECT 14400	1-4	14400 bps DTE rate.
16	CONNECT 19200	1-4	19200 bps DTE rate.
17	CONNECT 38400	1-4	38400 bps DTE rate.
18	CONNECT 57600	1-4	57600 bps DTE rate.
19	CONNECT 115200	1-4	115200 bps DTE rate.
22	CONNECT 75TX/1200RX	1-4	V.23 originate connection.
23	CONNECT 1200TX/75RX	1-4	V.23 answer connection.
24	DELAYED	4	Delayed by blacklisting. ERROR for X0, X1, and X3.
32	BLACKLISTED	4	Blocked by blacklisting. ERROR for X0, X1, and X3.
33	FAX		Connection established in fax mode.
34	+FCERROR	4	Error in FAX mode.
35	DATA		Connection established in data mode.
40	CARRIER 300	4	300 bps DCE rate.
42	CARRIER 600	4	600 bps DCE rate.
44	CARRIER 1200/75	4	V.23 backward channel carrier detected.
45	CARRIER 75/1200	4	V.23 forward channel carrier detected.
46	CARRIER 1200	4	1200 bps DCE rate.
47	CARRIER 2400	4	2400 bps DCE rate.
48	CARRIER 4800	4	4800 bps DCE rate.
49	CARRIER 7200	4	7200 bps DCE rate.

50	CARRIER 9600	4	9600 bps DCE rate.
51	CARRIER 12000	4	12000 bps DCE rate.
52	CARRIER 14400	4	14400 bps DCE rate.
53	CARRIER 16800	4	16800 bps DCE rate.
54	CARRIER 19200	4	19200 bps DCE rate.
55	CARRIER 21600	4	21600 bps DCE rate.
56	CARRIER 24000	4	24000 bps DCE rate.
57	CARRIER 26400	4	26400 bps DCE rate.
58	CARRIER 28800	4	28800 bps DCE rate.
59	CONNECT 16800	1-3	16800 bps DTE rate.
60	CONNECT 19200	1-3	19200 bps DTE rate.
61	CONNECT 21600	1-3	21600 bps DTE rate.
62	CONNECT 24000	1-3	24000 bps DTE rate.
63	CONNECT 26400	1-3	26400 bps DTE rate.
64	CONNECT 28800	1-3	28800 bps DTE rate.
66	COMPRESSION: CLASS 5	4	Connected with MNP 5 compression.
67	COMPRESSION: V.42	4	Connected with V.42 compression.
69	COMPRESSION: NONE	4	Connected with no data compression.
70	PROTOCOL: NONE	4	Connected with no error correction.
77	PROTOCOL: LAPM	4	Connected with V.42bis LAPM error correction.
78	CARRIER 31200	4	31200 bps DCE rate.
79	CARRIER 33600	4	33600 bps DCE rate.
80	PROTOCOL: ALT	4	Connected with MNP 2, 3, or 4 error correction.
81	PROTOCOL:ALT-CELLULR	4	Connected with MNP 10EC.
84	CONNECT 33600	1-3	33600 bps DTE rate.
+F4	+F4ERROR	4	Error detected in fax mode.

4. S-Registers

A modem's S-registers store important configuration information about your modem. Some S-registers provide status information only and you cannot write to them (they are read-only). Often these read-only S-registers reflect the status of AT command settings. Other S-registers are writeable, and can be written to change the modem's behavior. To write to an S-register, you use the Sn=x command. Registers that are writeable are noted as such in this chapter.

Refer to *Table 4-1* for a summary of the S-Registers. The complete list of S-Registers occur later in this chapter.

Table 4-1. S-Register Summary

* Can be saved as part of a configuration profile.

† Subject to country limitations.

<u>No.</u>	<u>Function</u>	<u>Range</u>	<u>Units</u>	<u>Default</u>
*0	Rings to auto answer	0-255	rings	0
1	Ring counter	0-255	rings	0
*2	Escape character	0-255	ASCII	43
3	Carriage-return character		0-127	ASCII 13
4	Line-feed character	0-127	ASCII	10
5	Backspace character	0-255	ASCII	8

* 6	Wait time for dial tone	2-255	s	4	
* 7	Wait time for carrier	1-255	s	50	
* 8	Pause for dial delay modifier	0-255	s	2	
* 9	Carrier detect response time	1-255	0.1s	6	
* 10	Carrier loss disconnect time	1-255	0.1s	14	
* 11	DTMF tone duration	50-255	0.001s	95	
* 12	Escape code guard time	0-255	0.02s	50	
13	Reserved	—	—	—	
* 14	General bit-mapped options	—	—	—	138 (8Ah)
15	Reserved	—	—	—	
16	Test mode bit-mapped options	—	—	0	
17	Reserved	—	—	—	
* 18	Test timer	0-255	s	0	
19	Reserved	—	—	—	
20	Reserved	—	—	—	
* 21	General bit-mapped options	—	—	—	52 (34h)
* 22	General bit-mapped options	—	—	—	119 (77h)
* 23	General bit-mapped options	—	—	—	54 (36h)
* 24	Sleep inactivity timer	0-255	s	10	(in US)
25	Delay to DTR off	0-255	0.01s	5	
26	RTS-to-CTS delay	0-255	0.01s	1	
* 27	General bit-mapped options	—	—	—	9
* 28	General bit-mapped options	—	—	—	0
29	Flash dial modifier time	0-255	0.01s	0	
30	Disconnect inactivity timer	0-255	10s	0	
* 31	General bit-mapped options	—	—	—	194 (C2h)
32	XON character	0-255	ASCII	17	(11h)
33	XOFF character	0-255	ASCII	19	(13h)
34	Reserved	—	—	—	
35	Reserved	—	—	—	
* 36	LAPM failure control	—	—	—	7
* 37	Line connection speed	—	—	—	0
38	Delay before forced hangup	0-255	s	20	
* 39	Flow control	—	—	—	3
* 40	General bit-mapped options	—	—	—	168 (A9h)
* 41	General bit-mapped options	—	—	—	195 (C3h)
42	Reserved	—	—	—	
43	Reserved	—	—	—	
44	Reserved	—	—	—	
45	Reserved	—	—	—	
* 46	Data compression control	—	—	—	138
* 48	V.42 negotiation control	—	—	—	7
82	LAPM break control	—	—	—	128 (40h)
86	Call failure reason code	0-14	—	—	
†91	PSTN transmit attenuation level	0-15	-dBm	10	
†92	Fax transit attenuation level	0-15	-dBm	10	
* 95	Result code messages control	—	—	—	0
†99	Leased line transmit level	0-15	-dBm	10	
* 201	Cellular transmit level	—	—	50	(32h)
210	V.34 symbol rates	0-13	—	13	(Dh)

Example: Writing to an S-Register

If you wish to have your modem automatically answer incoming calls, you

would change the value in the *S0* register. This register determines whether your modem is in auto-answer mode or not, and is by default 0 (auto-answer is disabled). Setting the register to any other value will cause your modem to answer incoming calls after the specified number of telephone rings. So, for instance, if you want your modem to answer incoming calls after two rings, you would type *ATS0=2 <Enter>*.

Bit-Mapped Options S-Registers

Several S-registers are referred to in this guide as Bit-Mapped Options. This indicates that the S-register provides information on several modem options. To determine the value for a particular Bit-Mapped Option S-register, you need to add together the values associated with each of the appropriate options. The values for all the options described by a particular Bit-Mapped Option S-register are given in tables under the S-register description. The following example shows you how to determine the appropriate value to write to an S-register in order to set more than one option.

Example: Setting an S-Register

The *S95* register is often written to in order to increase the information returned by the modem when establishing remote connections. For instance, to enable the CONNECT, CARRIER, PROTOCOL, and COMPRESSION messages, you would compute the *S95* register value as follows:

0	Enable standard CONNECT message
4	Enable CARRIER message
8	Enable PROTOCOL message
<u>32</u>	<u>Enable COMPRESSION message</u>
44	Sum of these options

To set the register, you would type *ATS95=44 <Enter>*.

Example: Interpreting an S-Register

One simple method for interpreting the value in a read-only Bit-Mapped Option register is to look at the S-register description to find out which AT commands affect the S-register's value. Then, by typing *AT&V <Enter>*, you can view the active configuration for the status of these AT commands. By adding together the associated values given in the S-register description table, you can compute the S-register's expected value.

For instance, *S22* is affected by the status of the *Ln*, *Mn* and *Xn* commands. Supposing you were to type *AT&V <Enter>* and determine that the AT commands *L3*, *M1*, and *X4* were set. Adding the associated values obtained from the S-register description table, you get the following:

3	L3	
4	M1	
<u>112</u>	<u>X4</u>	
119		Expected S-register value

Typing *ATS22? <Enter>* will confirm this value.

Alternatively, you can always interpret a Bit-Mapped Options S-register using binary arithmetic. By convention, bit 0 (the rightmost bit) is the least

significant bit, and bit 7 is the most significant bit. If you conclude that bits 0, 2, 4, 5, and 6 are set (01110101, in binary notation), you would convert this number back to decimal by adding:
 $2^0 + 2^2 + 2^4 + 2^5 + 2^6 = 119$

Alphanumeric List of S-Registers

This section lists all the S-registers in alphanumeric order.

- S0* Rings to Auto-Answer. Sets the number of telephone rings required before the modem automatically answers a call. If *S0=0*, then auto-answer is disabled.
Range: 0-255
Units: rings
Default: 0
In Profile: Yes
Writeable: Yes
- S1* Ring Counter. Counts the number of telephone rings from an incoming call. The register is set to 0 if it detects no rings for 8 seconds.
Range: 0-255
Units: rings
Default: 0
In Profile: No
Writeable: No
- S2* Escape Character. The default value corresponds to the '+' character. Any value over 127 disables the escape process.
Range: 0-255
Units: ASCII decimal
Default: 43
In Profile: Yes
Writeable: Yes
- S3* Carriage Return Character.
Range: 0-127
Units: ASCII decimal
Default: 13
In Profile: No
Writeable: Yes
- S4* Line Feed Character.
Range: 0-127
Units: ASCII decimal
Default: 10
In Profile: No
Writeable: Yes
- S5* Backspace Character.
Range: 0-32
Units: ASCII decimal
Default: 8
In Profile: No
Writeable: Yes

- S6** Wait Time for Dialtone. Sets the length of time that the modem will wait before dialing. This register is ignored if the *X2* or *X4* commands have been issued. This register is also ignored when the *Wdial* command modifier has been processed. (See *Dn.*)
Range: 2-255
Units: seconds
Default: 4
In Profile: Yes
Writeable: Yes
- S7** Wait Time for Carrier. Sets the length of time that a) the modem waits for a carrier before hanging up, b) the modem waits for silence when processing the @ dial command modifier, c) the modem waits for a dialtone when processing the *Wdial* command modifier, and d) the modem waits for credit card bong when processing & dial command modifier. (See *Dn.*)
Range: 1-255
Units: seconds
Default: 50
In Profile: Yes
Writeable: Yes
- S8** Wait Time for Comma Dial Command Modifier. Sets the length of time that the modem pauses when processing the , (comma) dial command modifier. (See *Dn.*)
Range: 2-255
Units: seconds
Default: 2
In Profile: Yes
Writeable: Yes
- S9** Carrier Detect Response Time. Sets the time that the carrier must be present before the modem considers it valid and turns on carrier detect (CD). Increasing this delay decreases the chance of your modem incorrectly detecting a carrier due to noise on the telephone line.
Range: 1-255
Units: 0.1 seconds
Default: 6
In Profile: Yes
Writeable: Yes
- S10** Carrier Loss Disconnect Time. Sets the length of time that the modem waits to hang up the line after it detects a loss of carrier. If *S10* is set to 255, the modem will not hang up when the carrier is lost.
Range: 1-255
Units: 0.1 seconds
Default: 14
In Profile: Yes
Writeable: Yes
- S11** Touch-tone Duration/Spacing. Sets the tone duration and spacing of touch-tones.
Range: 50-255

Units: 0.001 seconds

Default: 95

In Profile: Yes

Writeable: Yes

S12 Escape Code Guard Time. This is the minimum delay required before and after entering the escape sequence +++ and the maximum delay allowed between consecutive + characters within the escape sequence.

Range: 0-255

Units: 0.02 seconds

Default: 50 (ONE SECOND)

In Profile: Yes

Writeable: Yes

S14 Bit-Mapped Options. By default the modem is set up to originate calls, use verbose result codes, and to echo commands.

Default: 138 (2+8+128)

In Profile: Yes

Writeable: No

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0	0	Not used
1	0	Command echo disabled (<i>E0</i>).
	2	Command echo enabled (<i>E1</i>).
2	0	Send result codes (<i>Q0</i>).
	4	Do not send result codes (<i>Q1</i>).
3	0	Numeric result codes (<i>V0</i>).
	8	Verbose result codes (<i>V1</i>).
4	0	Reserved.
5	0	Tone (<i>T</i>).
	32	Pulse (<i>P</i>).
6	0	Reserved.
7	0	Answer.
	128	Originate.

S16 Bit-Mapped Options (Test Mode). By default, all loopback testing is disabled.

Default: 0

In Profile: No

Writeable: No

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0	0	Disable local analog loopback test.
	1	Enable local analog loopback test (<i>&T1</i>).
1	0	Not used.
2	0	Disable local digital loopback test.
	4	Enable local digital loopback test (<i>&T3</i>).
3	0	Remote digital loopback test off.
	8	Remote digital loopback test in progress.
4	0	Disable remote digital loopback test.
	16	Enable remote digital loopback test (<i>&T6</i>).
5	0	Disable remote digital loopback with self-test.
	32	Enable remote digital loopback with self-test (<i>&T7</i>).
6	0	Disable local analog loopback with self-test.
	64	Enable local analog loopback with self-test (<i>&T8</i>).

S18 Test Timer. Sets the duration of the modem diagnostic tests initiated with the *&Tn* commands. If set to 0, tests will continue until forced to stop by another command, like *&T0*.

Range: 0-255

Units: seconds

Default: 0

In Profile: Yes

Writeable: Yes

S21 Bit-Mapped Options.

Default: 52 [4+16+32]

In Profile: Yes

Writeable: No

Bit	Value	Meaning
0	0	Not used.
1	0	Reserved.
2	0	Clear to send (CTS) always on (<i>&R0</i>).
	4	CTS follows request to send (RTS) (<i>&R1</i>).
3, 4	0	Data terminal ready (DTR) behaves according to <i>&D0</i> .
	8	DTR behaves according to <i>&D1</i> .
	16	DTR behaves according to <i>&D2</i>.
	24	DTR behaves according to <i>&D3</i> .
5	0	Carrier detect (CD) always on (<i>&C0</i>).
	32	CD follows state of carrier (<i>&C1</i>).
6	0	Data set ready (DSR) always on (<i>&S0</i>).
	64	DSR active after answer tone has been detected (<i>&S1</i>).
7	0	Disable long space disconnect (<i>Y0</i>).
	128	Enable long space disconnect (<i>Y1</i>).

S22 Bit-Mapped Options (Speaker/Results). By default, the speaker is on at low volume during call establishment, and result codes are limited according to *X4*.

Default: 119 (3+4+112)

In Profile: Yes

Writeable: No

Bit	Value	Meaning
0, 1	0	Speaker off (L0).
	1	Low speaker volume (L1).
	2	Low speaker volume (L2).
	3	Low speaker volume (L3).
2, 3	0	Speaker always off (M0)
	4	Speaker on during call establishment only (M1).
	8	Speaker always on (M2).
	12	Speaker on after receiving carrier (M3).
4, 5, 6	0	Limit result codes according to <i>X0</i> .
	64	Limit result codes according to <i>X1</i> .
	80	Limit result codes according to <i>X2</i> .
	96	Limit result codes according to <i>X3</i> .
	112	Limit result codes according to <i>X4</i>.
7	0	Reserved.

S23 Bit-Mapped Options. By default, the modem assumes 2400 bps DTE rate

with no parity. Remote digital loopback tests are allowed.

Default: 54 (6+48)

In Profile: Yes

Writeable: No

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0	0	Prohibit remote digital loopback (&T5).
	1	Allow remote digital loopback (&T4).
1, 2, 3	0	0-300 bps data terminal equipment (DTE) rate.
	2	600 bps DTE rate.
	4	1200 bps DTE rate.
	6	2400 bps DTE rate.
	8	4800 bps DTE rate.
	10	9600 bps DTE rate.
	12	19200 bps DTE rate.
4, 5	0	Even parity.
	16	Not used.
	32	Odd parity.
	48	No parity.
6, 7	0	No guard tone (&GO).
	64	No guard tone (&G1).
	128	1800 Hz guard tone (&G2).

S24 Sleep Inactivity Timer. Sets the length of time that the modem will operate in normal mode with no activity before entering low-power sleep mode. If set to 0, the low-power sleep mode is disabled.

Range: 0-255

Units: seconds

Default: 10 (in US)

In Profile: Yes

Writeable: Yes

S25 DTR Drop Detect Delay. Sets the length of time that the modem will ignore a DTR drop before hanging up.

Range: 0-255

Units: 0.01 seconds

Default: 5

In Profile: No

Writeable: Yes

S26 RTS to CTS Delay. Sets the length of time before the modem will respond to RTS with CTS.

Range: 0-255

Units: 0.01 seconds

Default: 1

In Profile: Yes

Writeable: Yes

S27 Bit-Mapped Options.

Default: 9

In Profile: Yes

Writeable: No

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0, 1, 3	0	Direct asynchronous mode connection (&MO or &QO).

9		Reliable asynchronous mode connection (&Q5).
10		Normal asynchronous mode connection (&Q6 or \N0).
2, 4, 5	0	Reserved.
6	0	Select CCITT mode (B0).
	64	Select Bell mode (B1).
7	0	Reserved.

S28 Bit-Mapped Options.

Default: 0

In Profile: Yes

Writeable: No

Bit	Value	Meaning
0, 1, 2	0	Reserved.
3, 4, 5		
6, 7	0	MNP 10 link negotiation at highest speed (*H0).
	64	MNP 10 link negotiation at 1200 bps (*H1).
	128	MNP 10 link negotiation at 4800 bps (*H2).

S29 Flash Dial Modifier Time. Sets the length of time that the modem will go on-hook when processing the ! dial command modifier. (See Dn.)

Range: 0-255

Units: 0.01 seconds

Default: 0

In Profile: No

Writeable: No

S30 Disconnect Inactivity Timer. Sets the length of time that the modem waits before disconnecting when no data is sent or received. When set to 0, the disconnect inactivity timer is disabled.

Range: 0-255

Units: 10 seconds

Default: 0

In Profile: No

Writeable: Yes

S31 Bit-Mapped Options.

Default: 194 (2+192)

In Profile: Yes

Writeable: No

Bit	Value	Meaning
0	0	Reserved.
1	0	Disable automatic line speed detection (N0).
	2	Enable automatic line speed detection (N1).
2, 3	0	Report DTE rate connection message only (WO).
	4	Full reporting of connection messages (W1).
	8	Report DCE rate connection message only (W2).
4, 5	0	Reserved.
6, 7	192	Restricted.

S32 XON Character.

Range: 0-255

Units: ASCII decimal

Default: 17
In Profile: No
Writeable: Yes

S33 XOFF Character.
Range: 0-255
Units: ASCII decimal
Default: 19
In Profile: No
Writeable: Yes

S36 Bit-Mapped Options (V.42 Control after LAPM Failure). This register specifies the behavior of the modem upon failure of the LAPM error-correction protocol.

Default: 7
In Profile: Yes
Writeable: Yes

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0, 1, 2	0	Modem disconnects if connection fails.
	1	Direct connection is established.
	2	Reserved.
	3	Normal connection is established.
	4	MNP connection is attempted and, if it fails, modem disconnects.
	5	MNP connection is attempted and if it fails, a direct connection is established.
	6	Reserved.
	7	MNP connection is attempted and if it fails, a normal connection is established.
3, 4, 5, 6, 7	0	Reserved.

S37 Line Speed. (See also *Nn*.)

Range: 0-12, 15-21

Default: 0

In Profile: Yes

Writeable: Yes

0 Automatic line speed detection (*NI*).

1 300 bps.

2 300 bps.

3 300 bps.

4 Reserved.

5 1200 bps.

6 2400 bps (V.22bis).

7 V.23.

8 4800 bps (V.32bis/V.32).

9 9600 bps (V.32bis/V.32).

10 12000 bps (V.32bis).

11 14400 bps (V.32bis).

12 7200 bps (V.32bis).

15 14400 bps (V.34)

16 16800 bps (V.34)

17 19200 bps (V.34)

- 18 21600 bps (V.34)
- 19 24000 bps (V.34)
- 20 26400 bps (V.34)
- 21 28800 bps (V.34)

S38 Delay Before Force Hang-up. Sets the length of time that your modem waits after receiving an H0 command (or a DTR drop if your modem is set to follow DTR) before it hangs up. An OK message indicates that all data was transmitted before disconnecting. A NO CARRIER message indicates that the timer expired before all the data was sent. If S38 is set to 255, then the modem will stay connected until all the data in its buffer is delivered or the connection is lost.

Range: 0-255
 Units: seconds
Default: 20
 In Profile: No
 Writeable: Yes

S39 Bit-Mapped Options (Flow Control).

Default: 3
 In Profile: Yes
 Writeable: No

Bit	Value	Meaning
0, 1, 2	0	Disable flow control (&K0).
	3	Hardware flow control (&K3).
	4	Software flow control (&K4).
	5	Transparent software flow control (&K5).
	6	Both hardware and software flow control (&K6).
3, 4, 5	0	Reserved.
6, 7		

S40 Bit-Mapped Options. By default, the MNP block is 128 characters, break control is set according to \K5, and MNP extended services are set according to -K1.

Default: 168 (40+128)
 In Profile: Yes
 Writeable: No

Bit	Value	Meaning
0, 1	0	Disable according to -K0.
	1	Enable according to -K1.
	2	Enable according to -K2.
2	0	Automatic cellular power level adjustment ()MO).
	4	Forced cellular power level adjustment (MI).
3, 4, 5	0	Break control according to \K0.
	8	Break control according to \K1.
	16	Break control according to \K2.
	24	Break control according to \K3.
	32	Break control according to \K4.
	40	Break control according to \K5.
6, 7	0	64 character MNP block size (\A0).
	64	128 character MNP block size (\A1).
	128	192 character MNP block size (\A2).
	192	256 character MNP block size (\A3).

S41 Bit-Mapped Options.

Default: 195 (3+64+128)

In Profile: Yes

Writeable: No

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
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0, 1	0	Disable compression (%C0).
	1	MNP 5 compression (%C1).
	2	V.42bis compression (%C2).
	3	V.42bis and MNP5 compression (%C3).
2, 6	0	Disable line quality monitor (%E0).
	4	Enable line quality monitor with auto-retrain (%E1).
	64	Enable line quality monitor with fallback/ fall forward (%E2).
3	0	Disable received data software control (\G0).
	8	Enable received data software contro(\G1).
4	0	Use MNP stream mode control (\LO).
	16	Use MNP block mode control (\L1).
5	0	Reserved.
7	0	Disable fallback from MNP 10 to V.22bis/V.22 (-Q0).
	128	Enable fallback from MNP 10 to V.22bis/V.22 (- Q1).

S46 Data Compression Control.

Range: 136 or 138

Default: 138

In Profile: Yes

Writeable: Yes

136 Disable compression.

138 Enable compression.

S48 V.42 Error Correction Negotiation.

Range: 0, 7, 128

Default: 7

In Profile: Yes

Writeable: Yes

0 Disable negotiation and proceed with LAPM.

7 Enable negotiation.

128 Disable negotiation and proceed once with fallback option in S36.

Use this setting to force MNP error correction.

S82 LAPM Break Control.

Range: 3, 7, 128

Default: 128

In Profile: No

Writeable: Yes

3 BREAK is sent immediately. Data integrity is maintained.

7 BREAK is sent immediately. Data is destroyed.

128 BREAK is sent in sequence with transmitted data.

Data integrity is maintained.

S86 Connection Failure Reason Code.

Range: 0-14

Default: None

In Profile: No

Writeable: No

When a connection fails and the modem sends NO CARRIER, this register will contain the reason for failure. This register is read-only.

0 Normal disconnect.

4 Loss of carrier.

5 V.42 negotiation failed with remote modem.

6 No response to feature negotiation.

7 This modem is asynchronous but the remote modem is synchronous.

9 Modems could not find a common protocol.

10 Bad response to feature negotiation.

12 Normal disconnect initiated by remote modem.

13 Remote modem does not respond after 10 attempts.

14 Protocol violation.

S95 Bit-Mapped Options (Result Code Message Control).

Default: 0

In Profile: Yes

Writeable: Yes

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0	0	CONNECT nnnn result code indicates DTE rate.
	1	CONNECT nnnn result code indicates DCE rate instead of DTE rate.
1	0	Standard CONNECT nnnn result code enabled.
	2	/ARQ appended to CONNECT nnnn result code in error correction mode.
2	0	Disable CARRIER nnnn result code.
	4	Enable CARRIER nnnn result code.
3	0	Disable PROTOCOL nnnn result code.
	8	Enable PROTOCOL nnnn result code.
4	0	Reserved.
5	0	Disable COMPRESSION nnnn result code.
	32	Enable COMPRESSION nnnn result code.
6, 7	0	Reserved.

S201 Bit-Mapped Options (Cellular Transmit Level).

Range: 0-255

Units: ASCII decimal

Default: 50 (18+32)

In Profile: Yes

Writeable: Yes

<u>Bit</u>	<u>Value</u>	<u>Meaning</u>
0-5	18	Initial power setting determined by @Mn.
5	0	Disable compromise equalizer (:E0)
	32	Enable compromise equalizer (:E1)
6	0	Reserved.
7	0	MNP 10EC mode off.
	128	MNP 10EC mode on.

S210 Bit-Mapped Options (Symbol Rates and Asymmetric Rate Select).

Range: 0-255

Units: ASCII decimal

Default: 13 (5+8)

In Profile: Yes

Writeable: Yes

Bit	Value	Meaning
0-2	0	2400
	1	2400
	2	2400, 2800
	3	2400, 2800, 3000
	4	2400, 2800, 3000, 3200
3	5	2400, 2800, 3000, 3200, 3429
	0	V.34 Asymmetric Disabled
	8	V.34 Asymmetric Enabled