Express Modem: Hayes AT Command Set (3/93)

Article Created: 29 March 1993

TOPIC ---

This article lists the AT command set for the PowerBook Express Modem.

DISCUSSION ---

STANDARD AT COMMANDS

AT Attention code
-- --------------
All commands must begin with the attention code AT or at; the remainder of the command line contains commands for the modem. If AT is sent alone (that is, it is followed by <CR>), no command is executed but an OK result code is returned.

, Pause
- -----
This modifier introduces a delay time before dialing the next dial character or executing the next modifier in the dial string. The pause time is the value of the S8 register. Default = 2 seconds.

A Enter answer mode
- -----------------
The A command forces the modem to go off-hook in answer mode. The modem then starts sending the answer tone (CCITT answer tone independent from the B setting) unless the modem is set for leased line mode (&L command). If no carrier signal is received from the telephone line within the number of seconds specified by register S7, the modem goes on-hook, sends the NO CARRIER result code to the host, and returns to command state. If a dial tone is found, NO CARRIER is sent as a result code. Otherwise, the modem attempts to set up the carrier and, if successful, sends the appropriate CONNECT XXX result code.

This command must be the last on a command line. Sending any character to the modem during call establishment cancels the command and generates a NO CARRIER result code. This command is not valid while the Express Modem is connected to a remote modem and in command state (after the escape sequence).

Bn Modulation protocol preference
-- ------------------------------
This command determines which protocol standard will be used for the next connection. Settings B0 and B1 apply only when ATN0 is selected and register S37 ≠ 0. Setting B2 overrides all settings of ATN and register S37.

B0	Default - When negotiating between a Bell or CCITT mode, selects CCITT V.21 or V.22 modes.
B1	When negotiating between a Bell or CCITT mode, selects Bell 103 or Bell 212A modes.
B2	Uses CCITT V.23 modulation only.

Cn Carrier control option
-- ----------------------
This command always returns OK. It is ignored and not saved in any profile.

Ds Dialing
-- -------
The dialing command first makes a connection on the telephone network with the telephone number specified in the character string s (call setup). If the remote modem answers, it continues with the carrier handshake procedure. After connection or failure to connect, the modem returns a result code with a status of the connection. (The precision of the result code depends on the last Xn command issued.) Sending any character to the modem during call establishment cancels the command and generates a NO CARRIER result code. In the simplest form, s consists of actual dial digits. This set of dial digits consists of the following characters: 0 to 9 (in pulse mode these are the only valid digits), A or a, B or b, C or c, D or d, *, and #.

Before sending the first digit, the modem waits for the dial tone, unless a comma begins the string or “blind dialing” is enabled. (See the X command.) Several dial modify subcommands, which can be part of the dial string, allow the modem to perform special dialing functions. These additional subcommands (also called dial modifiers) can precede, be embedded in, or follow the actual number to be dialed. Other characters not included in this set of modifiers are ignored while dialing and do not interrupt the dial process.

P Pulse dial
- ----------
The P modifier determines the use of Pulse dialing. Dialing speed is determined by the value of S11; the Make/Break ratio is determined by the &Pn command. These parameters can be changed only in certain countries. Any dial characters following the P modifier are dialed using pulse dialing until the T modifier is encountered. This modifier can appear anywhere in the dial string.

T Touch-tone dial (DTMF)
- ----------------------
The T modifier determines the use of Touch-tone dialing. Any dial characters following the T modifier are dialed using DTMF dialing until the P modifier is encountered. This modifier can appear anywhere in the dial string. Default in U.S.

R Reverse mode

The R modifier changes the modem from originate mode to answer mode after the dialing process is complete. This modifier, used for compatibility with old originate-only modems, must be put at the end of the dial string.

S=n Dial phone number stored at location n

This subcommand dials the telephone number stored in location n, where n is 0, 1, or 2. This number has been previously saved using the AT&Z command.

W Dial tone detect

The W modifier makes the modem detect a dial tone before sending the next digit. If the tone has been detected by the modem before the S7 register time delay, the modem continues dialing the rest of the dial characters in the dial string. If no tone is received, the modem goes on-hook, returns the NO DIAL TONE result code to the host, and enters the local command state. This modifier can be embedded anywhere in the dial string, for example: ATDT9W5551234

: Calling card tone detect

Same as W. The colon modifier can detect most calling card tones and can be used to detect a wider range of frequencies.

@ Wait for quiet answer before dialing

For the time specified in the S7 register (default = 50 seconds), the modem attempts to detect 5 seconds of silence. This period of silence confirms that the call has been answered. If the 5 seconds of silence is detected, the modem dials the remaining numbers in the command line. The remaining numbers might be a security code, another telephone number, or an extension.

This modifier can be embedded anywhere in the dial string and can be used to access a system that requires entering additional dial characters after answering the initial call (for example, an answering machine).

Note that rings are detected reliably only when calling locally (that is, within the same country). If the ringing tone does not stop, the modem returns the NO ANSWER result code.

! Flash

This modifier causes the modem to go on-hook for a very short time and then back off-hook, as if the switch-hook button on the telephone set had been pressed. This modifier can be placed anywhere in the dial string.

; Return to local command state after dialing

This modifier forces the modem back to the local command state after dialing a number, allowing the modem to be used as a dialer (and the user must pick up

the telephone handset at the end of the dial command) or to dial numbers in two or more steps. The semicolon (;) modifier must be put at the end of the dialing command.

En Echo off / on
-- -------------
This command controls the echoing of characters sent to the modem from the host back to the host when the modem is in command state.

E0 Disables the echo of characters sent by the host.
E1 Echoes characters sent by the host. Default

Fn Data echo to terminal
-- ---------------------
This command has no effect and remains for compatibility. F1 returns OK; all other values return ERROR.

Hn Off / on hook
-- -------------
When the modem is in on-line state, this command must be preceded by the +++ escape sequence.

H0 Forces the modem on-hook. If the modem is connected to the telephone line, the connection is dropped. Default.
H1 Forces the modem off-hook.

In Checksum, product information
-- ----------------------------

I0 Requests the modem to return its product ID code. Default.
I1 Reserved for Apple Computer, Inc.
I2 Returns OK.
I3 Requests the country code of the DAA. In verbose mode, the name of the country is returned; in terse mode, only the code is returned. The following is a list of the country codes thus far defined:

E1	Sweden
E2	Switzerland
E3	United Kingdom
E4	United States
E5	Finland
F1	Australia
F2	Austria
F3	Belgium
F4	Canada
F5	Denmark
F6	France
F7	Germany
F8	Holland
F9	Ireland
FA	Italy
FB	Japan
FC	Luxembourg

FD Norway
FE Spain

NO DAA DAA code does not correspond to a known country
Last country code / NO DAA: If no DAA is presently attached to the modem, it returns also the last country code ever attached (if any).

I4 Lists features of the modem.
I9 Returns the Apple Computer, Inc. product code and version information, as stored in the Express Modem file 'VERS' resource.

Ln Speaker volume
-- --------------
This command has no effect in the Express Modem, as the speaker is a component of the Macintosh computer and controlled by the user in the Sound control panel. The command remains for compatibility. L0-3 return OK; all other values return ERROR.

Mn Speaker on / off / auto
-- ----------------------

M0 Disables the speaker.
M1 Turns on the speaker until the carrier is established or until disconnection. Default
M2 Leaves the speaker on throughout the entire connection.
M3 Turns on the speaker until the carrier is established, except during dialing.

Nn Communication protocol preference
-- ---------------------------------
This command setting takes precedence over the ATB0 or ATB1 commands and over register S37. If either ATN1 or (ATN0 and S37 = 0) have been selected, the modem automatically determines Bell or CCITT mode or V.23 modulation.

Note ATB2 takes precedence over any settings of ATN or register S37. If ATB2 is selected, the modem attempts to connect at V.23 modulation, disregarding settings of ATN and S37.

N0 Uses register S37 for speed selection. If S37 = 0, uses automode, connecting at the highest possible speed and falling back as necessary, automatically determining Bell or CCITT mode, ignoring ATB0 or ATB1 settings. If S37 ≠ 0, uses only the speed specified in S37, regarding ATB0 or ATB1 setting to determine between CCITT and Bell modes. Default.
N1 Automode. Connects at the highest possible speed, falling back as necessary, automatically determining Bell or CCITT mode. Ignores ATB0 or ATB1 settings. If ATN = 1 and S37 ≠ 0, the value of S37 determines the maximum connection speed. This command is identical to setting N0 and S37 = 0.
N2 Identical to N1.

On Return to on-line state
-- ----------------------

This command brings the modem to on-line state from command state and returns ERROR if the modem is not connected to the telephone line.

O0	Returns to the on-line state after having entered command state from the escape sequence.
O1	As above but triggers retrain before reentering on-line state.

P Enable pulse dialing

Sets the default dialing mode to pulse mode. This command can also be used as a subcommand of the D command.

Qn Quiet / verbose mode

Q0	Sends result codes to the host. Default.
Q1	Disables sending result codes to the host.
Q2	Returns result codes in originate mode and not in answer mode.

Sn Select an S register

This command selects the default S register to be used in subsequent commands when no S register number is given.

Sn? Read an S register

The Sn? command is used to read the contents of a register (n = register number). The response is always expressed as a three-digit decimal number, where the leading digits or all digits may be zero. OK is returned after the display of the register contents.

Sn=m Write to an S register

This command places the value m into the register n. See the section “S Registers” for specifics of the registers and their values.

T Enable tone (DTMF) dialing

Sets the default dialing mode to Touch-Tone mode. Can be used in the dial string. Default.

Vn Numeric / verbose result codes

V0	The modem sends the result code in numeric form without line feed characters.
V1	The modem sends the result code in verbal (English) form with line feed characters. Default.

Supported result codes are as follows:

Verbose	Terse	Meaning

OK	0	Command completed
CONNECT	1	Connection established
RING	2	Incoming ring detected
NO CARRIER	3	No connection or lost the carrier
ERROR	4	Bad command
CONNECT 1200	5	Connection established at 1200 bps
NO DIALTONE	6	Dial tone not detected in S7 seconds
BUSY	7	Busy tone detected
NO ANSWER	8	See ATD with the @ dial modifier
CONNECT 2400	10	Connection established at 2400 bps
CONNECT 4800	11	Connection established at 4800 bps
CONNECT 9600	12	Connection established at 9600 bps
CONNECT 14400	13	Connection established at 14400 bps
CONNECT 7200	15	Connection established at 7200 bps
CONNECT 12000	16	Connection established at 12000 bps
CONNECT 1200/75	22	Connection V.23 transmitting 1200 bps
CONNECT 75/1200	23	Connection V.23 transmitting 75 bps
CONNECT 300/REL	24	Connection with MNP 300 bps
CONNECT 1200/REL	25	Connection with MNP 1200 bps
CONNECT 2400/REL	26	Connection with MNP 2400 bps
CONNECT 4800/REL	27	Connection with MNP 4800 bps
CONNECT 9600/REL	28	Connection with MNP 9600 bps
CONNECT 7200/REL	29	Connection with MNP 7200 bps
CONNECT 12000/REL	30	Connection with MNP 12000 bps
CONNECT 14400/REL	31	Connection with MNP 14400 bps
CARRIER 300	40	Carrier detected at 300 bps
CARRIER 1200/75	44	Carrier detected at 1200 bps sending; 75 bps receiving
CARRIER 75/1200	45	Carrier detected at 75 bps sending; 1200 bps receiving
CARRIER 1200	46	Carrier detected at 1200 bps
CARRIER 2400	47	Carrier detected at 2400 bps
CARRIER 4800	48	Carrier detected at 4800 bps
CARRIER 7200	49	Carrier detected at 7200 bps
CARRIER 9600	50	Carrier detected at 9600 bps
CARRIER 12000	51	Carrier detected at 12000 bps
CARRIER 14400	52	Carrier detected at 14400 bps
COMPRESSION: CLASS 5	66	MNP class 5
COMPRESSION: V.42BIS	67	V.42 bis compression
COMPRESSION: NONE	69	No compression
PROTOCOL: NONE	70	Asynchronous mode
PROTOCOL: LAP-M	77	Error control mode with LAP-M protocol
PROTOCOL: LAP-M/HDX	78	LAP-M protocol Half duplex
PROTOCOL: ALT	80	Error control mode with MNP protocol
MODEM IN USE	128	Modem already in use for this or another association
DIALING DISABLED	129	Blacklisting table is full
BLACKLISTED NUMBER	130	Modem momentarily refuses to dial this number
LINE CURRENT DETECTED	131	
NO LINE CURRENT	132	
UNKNOWN COUNTRY CODE	133	Unknown DAA Country Code

FORBIDDEN NUMBER 134 Number dialed is forbidden

Codes 129 and 130 appear only in those countries where the “blacklisting” of unsuccessful telephone numbers is mandatory. The number of telephone numbers in the list will be set according to regulations in each country.

Wn Progress result codes
-- ---------------------

The ATW setting determines whether progress result codes will be displayed in addition to the ATX codes. Register S95 determines which progress result codes will be displayed.

W0	Disables progress codes 40 through 80.
W1	Enables progress codes 40 through 80. Default.
W2	Disables progress codes 40 through 80; identical to W0.

When writing a CCL script, pay attention to result codes for scripts that require a specific response. If progress codes are enabled, the following strings appear on the screen during a connection (in this example, a V.22 bis connection with no error control):

```
CARRIER 2400
PROTOCOL:NONE
CONNECT 2400
```

As the modem is a bus modem and the modem-to-DTE interface is software based, only modem-to-modem speeds are returned.

Xn Activate result codes
-- ---------------------

The result codes listed in Vn are divided into subsets that can be selected by the X command.

X0	Activates result codes [0..4, 8, 128..134].
X1	Activates result codes [0..5, 8..134].
X2	Activates result codes [0..6, 8..134].
X3	Activates result codes [0..5, 7..134].
X4	Activates result codes [0..134]. Default

Dial tone detection is enabled and disabled by X2 and X4. Busy tone detection is enabled and disabled by X3 and X4.

X0, X1, and X3 set the autodialer in “blind dialing” mode (that is, no dial tone is expected after going off-hook) in those countries where blind dialing is allowed. If X0 is set, the CONNECT result code means that a connection was established whatever the speed is. However, if X1 to X4 are set, CONNECT means that a connection was established at either 110 or 300 bps only. See the MNP-specific modifier applicable to codes 24-28.

Yn Break handling
-- --------------

This command controls the behavior of the modem on reception of a long-space (break) signal from the remote modem of longer than 1.6 seconds for an

asynchronous connection or an attention frame for MNP or V.42 connections.

  Y0 Disables long-space handling. The long-space is ignored. Default.
  Y1 Enables long-space handling. If the modem receives a long-space, it replies with a break of 4 seconds, disconnects (goes on-hook), and returns to command state.
  Y2 Enables long-space handling. If the modem receives a break when it is in data mode, it replies with a break of 4 seconds and returns to command state, remaining connected to the remote modem.

Zn Reset
-- -----
The Z command tells the modem to perform a software reset. After reset, the optional parameter profile specified in the command argument is restored.
  Z0 Loads saved profile 0 into the active profile. Default
  Z1 Loads saved profile 1 into the active profile.

&Cn DCD options
--- -----------
This command has no effect and remains for compatibility. Values 0, 1, and 2 return OK; all other values return ERROR.

&Dn DTR options
--- -----------
Since internal, or bus, modems do not have a DTR line, this command should determine modem response when the user closes the connection or the application currently using the modem (that is, when the modem is off-hook). In this situation, the Express Modem drops the connection and hangs up. Therefore, AT&D has no effect and remains for compatibility. Values 0 through 3 return OK; all other values return ERROR. Default = 3

&F Recall factory profile
-- ----------------------
This command restores the factory configuration as the active profile.

&Gn Guard tones
--- -----------
This command specifies whether guard tones should be transmitted and, if so, at what frequency. Some telephone systems use guard tones to allow proper data transfer over the network. Guard tones are not used in the United States. The modem does not recognize the value of 1 (550Hz guard tone) and returns ERROR.

  &G0 Disables guard tone (default in the United States).
  &G1 Sends 1800 Hz guard tone (default outside of the United States).
  &G2 Same as &G1.

&Kn Local flow control
--- ------------------
This command specifies which kind of local flow control is used between the communications application and the Express Modem software. Since flow control mechanisms are built in, this command has no effect and remains for scripting compatibility. Flow control characters generated by the communications application are always passed to the line. See the section “Flow Control” in

this chapter. The &K command setting will not be stored or displayed in the profile. &K0–&K5 respond OK, and no action is taken. Other values generate ERROR.

&Ln Switched / leased line

This command affects the modem's behavior during the call-setup and the carrier-handshake phases at the beginning of a connection.

- &L0 Selects switched (dial-up) line. All timeouts are active according to the definition of the handshake protocols. Default.
- &L1 Selects leased line. All timeouts are ignored during the handshake process. Calling and answer tones are not exchanged while executing D and A command (that is, the carrier handshake is started immediately).

&Mn Asynchronous / synchronous operation

This command has no effect and remains for compatibility. &M0 returns OK; all other values return ERROR. See also &Q.

&Pn Pulse mode make / break ratio

- &P0 Make = 39%, break = 61% Default
- &P1 Make = 33%, break = 67%

Note: Pulse mode specifications vary from country to country, as set by national regulatory bodies, and are not available for change. Correct settings for each country are made automatically by the Express Modem firmware.

&Qn Connection mode

The &Q command setting has precedence over the \N command setting and registers S36 and S48.

- &Q0 Asynchronous mode (no error control, disables V.42 and MNP). Returns OK.
- &Q1–4 Synchronous mode (data transparent synchronous mode). Returns ERROR.
- &Q5 Error-control mode (enables V.42 and MNP); coupled with the register values set in S36 and S48. Returns OK. Default.
- &Q6 Same as Q0. Returns OK.

&Rn CTS / RTS

This command has no effect and remains for compatibility. &R0 and &R1 return OK; all other values return ERROR.

&Sn DSR

This command has no effect and remains for compatibility. Values0, 1, and 2 return OK; all other values return ERROR.

&Tn Self-Tests

The following diagnostic tests are available only when no error protocol is engaged. The duration of each test is controlled by register S18.

- &T0 Terminate the self-test; terminates (escapes) a test in progress and returns the modem to command state, if S18 = 0.
- &T1 Local analog loopback; initiates a local analog loopback test. The escape sequence must be entered to terminate this test. This mode tests the Express Modem and the host Macintosh computer. The modem responds with the CONNECT message when the loopback connection has been established.
- &T3 Local digital loopback; initiates a local digital loopback test. The Express Modem echoes characters back to the remote modem exactly as received.
- &T4 Enable remote digital loopback; enables the Express Modem to respond to a remote modem that is attempting to place it in a digital loopback test. If the remote modem places the Express Modem in remote digital loopback mode, the Express Modem echoes characters back to the remote modem exactly as received.
- &T5 Disable remote digital loopback; disables the Express Modem from responding to a remote modem that is attempting to place it in the digital loopback mode.
- &T6 Initiates remote digital loopback; tests both the Express Modem and the remote modem as well as the telephone circuits. Characters sent to the remote modem are echoed back to the Express Modem exactly as they were received.
- &T7 Remote digital loopback with self-test; initiates a remote digital loopback (like &T6) with self-test data pattern generation and error checking.
- &T8 Local analog loopback with self-test; initiates a local analog loopback (like &T1) with self-test data pattern generation and error checking. The modem responds with the CONNECT message when the loopback connection has been established. The tests terminate when the host issues an AT&T0 command or the register S18 time delay expires. The self-test data pattern is an internally generated $511 sequence. In the self-test modes, an error counter counts the number of errors and sends the final result to the host at the end of the test. The maximum number of errors that can be counted is 255.

Note: &T1 takes an optional, single-character parameter to indicate whether the analog loopback must be done in originate mode (O or o, the default) or answer mode (A or a).

&Un Trellis coding

This command enables and disables Trellis code modulation in V.32.

- &U0 Enable Trellis coding. Default.
- &U1 Disables Trellis coding.

&V Display profiles

-- ----------
This command displays the active profile, stored profile 0, stored profile 1, and stored telephone numbers (see AT&Z). The MNP settings are not displayed by this command.

&Wn Profile saving
--- ----------
This command saves the current active profile.

  &W0 Saves the active profile into profile 0.
  &W1 Saves the active profile into profile 1.

&Xn Synchronous clock source
--- ----------
This command, included for compatibility, is ignored and not saved in any profile. It always returns OK.

&Yn Start-up profile
--- ----------
This command sets the profile to be used at start up.

  &Y0 Specifies profile 0 as the start-up configuration. Default.
  &Y1 Specifies profile 1 as the start-up configuration.

&Zn=s Store telephone number
----- ----------
This command stores the dial string s (a maximum of 64 characters) in location n (equal to 0, 1, or 2). Note that the dial string s is constructed in the same fashion as for the ATD command: it must be the last command on the command line and have no other characters following the dial string. The dial string is not validated before being saved.

Keywords: <None>

==========

This information is from the Apple Technical Information Library.

19960215 11:05:19.00