



Host-Based Controller Modem AT Command Set

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Introduction

This document specifies the Lucent Technologies MTC AT Command Set for the host-based controller modem products. Note that if a particular modem board does not support a feature (such as voice), then the corresponding commands are disabled for that modem.

AT Command Summary

The following tables summarize the commands implemented by the modem. Commands may be executed when the modem is in COMMAND mode. COMMAND mode is entered upon under one of the following conditions:

- + After power up
- + At the termination of a connection
- + After the execution of a command other than dial or answer commands (ATO or AT&T)
- + Upon the receipt of the ESCAPE SEQUENCE (three consecutive characters matching the contents of S register 2) while on-line mode
- + Upon the on-to-off transition of DTR if &D1, &D2, or &D3 has been set

Table 1. AT Command Set Summary

Command	Description	Command	Description
A/	Repeat last command	&J	Auxiliary relay options
A	Answer command	&K	Local flow control selection
B	Communication standard setting	&M	Asynchronous communications mode
C	Carrier control	&Q	Asynchronous communications mode
D	Dial command	&S	Data set ready (DSR) option
E	Echo command	&T	Self-test commands
F	On-line data character echo command	&V	View the active configuration
H	Hook control	&W	Store current configuration
I	Request ID information	&Y	Select stored profile for hard reset
L	Monitor speaker volume	&Z	Store telephone number
M	Monitor speaker mode	\A	MNP block size
N	Modulation handshake	\B	Send break
O	Return to on-line data mode	\G	Modem port flow control
P	Select pulse dialing	\J	Adjust bits/s rate control
Q	Result code control	\K	Set break control
T	Select tone dialing	\N	Error control mode selection
V	DCE response format	\Q	Local flow control selection
W	Result code option	\R	Ring indicator off after answer
X	Result code selection and call progress monitoring	\T	Inactivity timer
Y	Long-space disconnect	\V	Protocol result code
Z	Reset and recall stored profile	\X	XON/XOFF pass through
&B	V.32 auto retrain	%B	View numbers in blacklist
&C	Data carrier detect (DCD) control	%C	Data compression control
&D	Data terminal ready (DTR)	%E	Automatic rate change
&F	Local factory settings	-C	Data calling tone
&G	V.22bis guard tone control	-V90	Enable/disable V.90 settings

AT Command Summary (continued)

Table 2. AT Testing and Debugging Command Set Summary

Command	Description	Command	Description
&&C	Write to/read from host interface	%T94	Test external DSP RAM
&&L	Line-to-line loopback	%T124	Return to on-chip DSP RAM
&&R	Write to/read from DSP RAM location	%T125	Load K56flex image to external DSP RAM
&&S	Speaker codec loopback	#UD	Unimodem diagnostics

Table 3. The S-Register Summary

Register	Default	Description
S0	0	Automatic answer ring number
S1	0	Ring counter
S2	43	AT escape character
S3	13	Command line termination character
S4	10	Response formatting character
S5	8	Command line editing character
S6	2	Wait before dialing
S7	50	Connection completion time-out
S8	2	Comma dial modifier time
S10	20	Automatic disconnect delay
S11	95	DTMF dialing speed
S12	50	Escape guard time
S14	8	General bit-mapped options status
S21	48	V.24 bit-mapped options status
S22	112	Results bit-mapped options status
S24	10	Timer to control sleep mode
S28	1	V.34 modulation enable/disable
S30	0	Inactivity timer
S32	16	Synthetic ring volume
S33	0	Synthetic ring frequency
S35	0	Data calling tone
S36	7	Negotiation fallback
S37	0	Dial line rate
S38	1	Enable/disable K56flex settings
S42*	1	Auto rate
S43*	1	Auto mode
S48	7	LAPM error control and feature negotiation
S89	10	Timer to control sleep mode
S90	10	Local phone status
S91	15	Line transmit level
S108	7	Network codec type

* S-registers 42, and 43 are for test and debugging purposes only.

AT Command Summary (continued)

Table 4. The Result Code Summary

Result Code	Numeric	Description
OK	0	Command executed
CONNECT	1	Modem connected to line
RING	2	A ring signal has been detected
NO CARRIER	3	Modem lost carrier signal, or does not detect carrier signal, or does not detect answer tone
ERROR	4	Invalid command
CONNECT 1200 EC*	5	Connection at 1200 bit/s
NO DIALTONE	6	No dial tone detected
BUSY	7	Busy signal detected
NO ANSWER	8	Remote end never answered
CONNECT 2400 EC*	10	Connection at 2400 bit/s
CONNECT 4800 EC*	11	Connection at 4800 bit/s
CONNECT 9600 EC*	12	Connection at 9600 bit/s
CONNECT 14400 EC*	13	Connection at 14400 bit/s
CONNECT 19200 EC*	14	Connection at 19200 bit/s
CONNECT 7200 EC*	24	Connection at 7200 bit/s
CONNECT 12000 EC*	25	Connection at 12000 bit/s
CONNECT 16800 EC*	86	Connection at 16800 bit/s
CONNECT 300 EC*	40	Connection at 300 bit/s
CONNECT 21600 EC*	55	Connection at 21600 bit/s
CONNECT 24000 EC*	56	Connection at 24000 bit/s
CONNECT 26400 EC*	57	Connection at 26400 bit/s
CONNECT 28800 EC*	58	Connection at 28800 bit/s
CONNECT 31200 EC*	59	Connection at 31200 bit/s
CONNECT 33600 EC*	60	Connection at 33600 bit/s
CONNECT 38400 EC*	28	Connection at 38400 bit/s (DTE rate)
CONNECT 57600 EC*	18	Connection at 57600 bit/s (DTE rate)
CONNECT 115200 EC*	87	Connection at 115200 bit/s (DTE rate)
DELAYED	88	Delay is in effect for the dialed number
BLACKLISTED	89	Dialed number is blacklisted
BLACKLIST FULL	90	Blacklist is full
CONNECT 32000 EC*	70	Connection at 32000 bit/s (K56flex mode) or V.90
CONNECT 34000 EC*	71	Connection at 34000 bit/s (K56flex mode)
CONNECT 36000 EC*	72	Connection at 36000 bit/s (K56flex mode) or V.90
CONNECT 38000 EC*	73	Connection at 38000 bit/s (K56flex mode)
CONNECT 40000 EC*	74	Connection at 40000 bit/s (K56flex mode) or V.90
CONNECT 42000 EC*	75	Connection at 42000 bit/s (K56flex mode)
CONNECT 44000 EC*	76	Connection at 44000 bit/s (K56flex mode) or V.90
CONNECT 46000 EC*	77	Connection at 46000 bit/s (K56flex mode)
CONNECT 48000 EC*	78	Connection at 48000 bit/s (K56flex mode) or V.90
CONNECT 50000 EC*	79	Connection at 50000 bit/s (K56flex mode)
CONNECT 52000 EC*	80	Connection at 52000 bit/s (K56flex mode) or V.90
CONNECT 54000 EC*	81	Connection at 54000 bit/s (K56flex mode)
CONNECT 56000 EC*	82	Connection at 56000 bit/s (K56flex mode)
CONNECT 28000 EC*	100	Connection at 28000 bit/s (V.90 mode)

AT Command Summary (continued)

Result Code	Numeric	Description
CONNECT 29333 EC*	101	Connection at 29333 bit/s (V.90 mode)
CONNECT 30666 EC*	102	Connection at 30666 bit/s (V.90 mode)
CONNECT 33333 EC*	103	Connection at 33333 bit/s (V.90 mode)
CONNECT 34666 EC*	104	Connection at 34666 bit/s (V.90 mode)
CONNECT 37333 EC*	105	Connection at 37333 bit/s (V.90 mode)
CONNECT 38666 EC*	106	Connection at 38666 bit/s (V.90 mode)
CONNECT 41333 EC*	107	Connection at 41333 bit/s (V.90 mode)
CONNECT 42666 EC*	108	Connection at 42666 bit/s (V.90 mode)
CONNECT 45333 EC*	109	Connection at 45333 bit/s (V.90 mode)
CONNECT 46666 EC*	110	Connection at 46666 bit/s (V.90 mode)
CONNECT 49333 EC*	111	Connection at 49333 bit/s (V.90 mode)
CONNECT 50666 EC*	112	Connection at 50666 bit/s (V.90 mode)
CONNECT 53333 EC*	113	Connection at 53333 bit/s (V.90 mode)
CONNECT 54666 EC*	114	Connection at 54666 bits/s (V.90 mode)

* EC only appears when the extended result codes configuration option is enabled. EC is replaced by one of the following symbols, depending upon the error control method used:

V42bis—V.42 error control and V.42bis data compression.

V42—V.42 error control only.

MNP 5—MNP class 4 error control and MNP class 5 data compression.

MNP 4—MNP class 4 error control only.

NoEC—No error control protocol.

AT Commands Reference

AT commands are issued to the modem to control the modem's operation and software configuration. AT commands can only be entered while the modem is in command mode. The format for entering AT commands is:

TYPE: ATXn where X is the AT command and n is the specific value for that command.

PRESS: Enter If n is omitted from a command that takes a parameter value, the value 0 (zero)

is assumed.

Any command issued is acknowledged with a response in either text or numeric values known as result codes.

Table 2 lists all the valid result codes.

In the following listing, all commands and command-values accepted by the modem are shown; any entries other than those shown cause the ERROR result code.

+++ Escape sequence

The escape sequence allows the modem to exit data mode and enter on-line command mode. While in on-line command mode, you may communicate directly to your modem using AT commands. Once you are finished, you may return to data mode using the ATO command.

A pause, the length which is set by the Escape Guard Time (S12), must be used before and after an escape sequence is issued. This pause prevents the modem from interpreting the escape sequence as data.

The value of the escape sequence character may be changed using Register S2.

A/ Repeat Last Command

This command repeats the last command string entered. Do not precede this command with an AT prefix or conclude it by pressing Enter.

A Answer Command

This command instructs the modem to go off-hook and answer an incoming call.

Bn Communication Standard Setting

This command determines CCITT vs. Bell standard.

- B0: Selects CCITT V.22 mode when the modem is at 1200 bits/s.
- B1: Selects Bell 212A when the modem is at 1200 bits/s (default).
- B2: Unselects V23 reverse channel (same as B3).
- B3: Unselects V23 reverse channel (same as B2).
- B15: Selects V.21 when the modem is at 300 bits/s.
- B16: Selects Bell 103J when the modem is at 300 bits/s (default).

Result Codes:

OK n = 0, 1, 2, 3, 15, 16
ERROR Otherwise

Cn Carrier Control

The modem will accept the C1 command without error in order to assure backward compatibility with communications software that issues the C1 command. However, this modem does not support the C0 command. The C0 command may instruct some other modems not to send carrier (i.e., it puts them in a receive-only mode).

- C0: Transmit carrier always off.
- C1: Normal transmit carrier switching.

Result Codes:

OK n = 1
ERROR Otherwise

AT Command Reference (continued)

Dn Dial

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

A dial string can be up to 60 characters long. Any digit or symbol (0—9, *, #, A, B, C, D) may be dialed as touch-tone digits. Characters such as spaces, hyphens, and parentheses do not count—they are ignored by the modem and may be included in the dial string to enhance readability.

The following may be used as dial string modifiers:

L	Redials last number. Should be the first character following ATD, ignored otherwise.
P	Pulse dialing.
T	Touch-tone dialing (default).
,	Pause during dialing. Pause for time specified in Register S8 before processing the next character in the dial string.
W	Wait for dial tone. Modem waits for a second dial tone before processing the dial string.
V	The modem switches to speakerphone mode and dials the number. An ATH command may be used to disconnect the voice call.
@	Wait for quiet answer. Wait for five seconds of silence after dialing the number. If silence is not detected, the modem sends a NO ANSWER result code back to the user.
!	Hook flash. Causes the modem to go on-hook for 0.5 seconds and then return to off-hook.
;	Return to command mode. Causes the modem to return to command mode after dialing the number, without disconnecting the call.
^	Disable data calling tone transmission.
S=n	Dial a telephone number previously stored using the &Zn=x command (see the &Zn=x command for further information). The range of n is 0—3.
\$	Bong tone detection

En Echo Command

This command controls whether or not the characters entered from your computer keyboard are echoed back to your monitor while the modem is in command mode.

E0:	Disables echo to the computer.
E1:	Enables echo to the computer (default).

Result Codes:

OK	n = 0, 1
ERROR	Otherwise

Fn Online Data Character Echo Command

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

F0:	Online data character echo enabled (NOT SUPPORTED).
F1:	Online character echo disabled.

Result Codes:

AT Command Reference (continued)

OK n = 1

ERROR Otherwise

Hn Hook Control

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

H0: Modem goes on-hook (default).

H1: Modem goes off-hook.

Result Codes:

OK n = 0, 1

ERROR Otherwise

In Request ID Information

This command displays specific product information about the modem.

I0: Returns modem identity string and driver version number, same as I3.

I1: Calculates ROM checksum and displays it on the DTE.

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

ERROR.

I3: Returns modem identity string and driver version number, same as I0.

I4: Returns firmware version for data pump.

I5: Returns the board/firmware ID and country ID in hexadecimal (for Apollo).

Returns the code ver, board ID, country ID and subsystem vendor ID in hexadecimal (for

MARS).

I6-8: Returns OK for compatibility.

I9: Returns country ID in English.

I11: Displays connection information as described in the following example.

Result Codes:

As described n = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11

ERROR Otherwise

AT Command Reference (continued)

The AT111 result has two pages; the user must hit a key to get the second page. See the following example:
ati11

Description	K56flex connection	V.90 Connection
1 Last Connection	56K	V.90
2 Initial Transmit Carrier Rate	28800	28800
3 Initial Receive Carrier Rate	50000	49333
4 Final Transmit Carrier Rate	28800	28800
5 Final Receive Carrier Rate	50000	49333
6 Protocol Negotiation Result	LAPM	LAPM
7 Data Compression Result	V42bis	V42bis
8 Estimated Noise Level	152	152
9 Receive Signal Power Level (-dBm)	25	25
10 Transmit Signal Power Level (-dBm)	16	16
11 Round Trip Delay (msec)	4	4

Press any key to continue; ESC to quit.

12 Near Echo Level (-dBm)	NA	NA
13 Far Echo Level (-dBm)	NA	NA
14 Transmit Frame Count	3	3
15 Transmit Frame Error Count	0	0
16 Receive Frame Count	0	0
17 Receive Frame Error Count	0	0
18 Retrain by Local Modem	0	0
19 Retrain by Remote Modem	0	0
20 Call Termination Cause	0	0
21 Robbed-Bit Signaling	00	00
22 Digital Loss (dB)	6	6
23 Remote Server ID	4342C3	NA

OK

The AT111 command may be issued from on-line command mode or after the end of a call. After a call, some of the values are no longer valid; it's useful to know which ones.

Each of the line items in the AT111 result is explained next:

1. V.90, 56K, V.34, or V.32 depending on the type of connection negotiated.
2. Initial upstream rate
3. Initial downstream rate
4. Current or final upstream rate
5. Current or final downstream rate
6. LAPM or MNP or None, depending on V.42 negotiation
7. V42bis or MNP or None, depending on V.42 negotiation
8. Mean-square error of received downstream signal. Difference between received constellation point and reference decision point. This is a dimensionless decimal number, only valid during a call. Higher numbers are worse. There's no absolute threshold of goodness; it depends on the downstream data rate. The number varies during a call, so it can be useful to sample it a few times.
9. The received signal power, although labeled -dBm, is only a relative measure for comparing calls to/from different locations. Only valid during a call.
10. Upstream transmit signal power.
11. Round-trip delay in milliseconds.
12. Echo levels are valid for V.34 only.
13. Echo levels are valid for V.34 only.
14. Number of LAPM frames sent upstream during this call. Count wraps around at 65535.
15. Number of REJ frames received at the analog client modem.
16. Number of LAPM frames received by client during this call. Count wraps around at 65535.
17. Number of frames received in error by the client.
18. Number of retrains or rate renegotiations requested by this modem.
19. Number of retrains or rate renegotiations requested by remote modem.

AT Command Reference (continued)

- 20. Reason for call ending, only valid after call ends:
 - 0 = Local modem command: ATH, DTR drop
 - 1 = Remote modem: clear-down, loss of signal
 - 2 = No answer, busy, etc.
 - 3 = Training failure V.90, K56flex or V.34.
 - 4 = Protocol failure if required by \N4, for example.
- 21. For PCM connection only, a hexadecimal 6-bit pattern of T1 frames with robbed-bit signaling.
- 22. For PCM connection only, the downstream digital loss.
- 23. For K56flex connection only, the V.8bis info sent by the server. Meaning is defined at the server and by convention. Example above is from a recent Ascend MAX in μ -Law.

Ln Monitor Speaker Volume

This command sets speaker volume to low, medium, or high.

- L0: Selects low volume.
- L1: Selects low volume.
- L2: Selects medium volume (default).
- L3: Selects high volume.

Result Codes:

- OK n = 0, 1, 2, 3
- ERROR Otherwise

Mn Monitor Speaker Mode

This command turns the speaker on or off.

- M0: The speaker is off.
- M1: The speaker is on until the modem detects the carrier signal (default).
- M2: The speaker is always on when modem is off-hook.
- M3: The speaker is on until the carrier is detected, except while dialing.

Result Codes:

- OK n = 0, 1, 2, 3
- ERROR Otherwise

Nn Modulation Handshake

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

- N0: When originating or answering, this is for handshake only at the communication standard specified by S37 and the ATB command.
- N1: When originating or answering, begin the handshake only at the communication standard specified by S37 and the ATB command. During handshake, fallback to a lower speed may occur (default).

Result Codes:

- OK n = 0, 1
- ERROR Otherwise

AT Command Reference (continued)

On Return On-line to Data Mode

- O0: Instructs the modem to exit on-line command mode and return to data mode (see AT Escape Sequence, +++).
- O1: This command issues a retrain before returning to on-line data mode.
- O3: This command issues a rate renegotiation before returning to on-line data mode.

Result Codes:

- OK n = 0, 1, 3
- ERROR Otherwise

P Select Pulse Dialing

This command configures the modem for pulse (non touch-tone) dialing. Dialed digits are pulsed until a T command or dial modifier is received. Tone dial is the default setting.

Qn Result Code Control

Result codes are informational messages sent from the modem and displayed on your monitor. Basic result codes are OK, CONNECT, RING, NO CARRIER, and ERROR. The ATQ command allows the user to turn result codes on or off.

- Q0: Enables modem to send result codes to the computer (default).
- Q1: Disables modem from sending result codes to the computer.

Result Codes:

- OK n = 0, 1
- ERROR Otherwise

T Select Tone Dialing

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

Vn DCE Response Format

This command controls whether result codes (including call progress and negotiation progress messages) are displayed as words or their numeric equivalents. For the result code, see table 4.

- V0: Displays result codes as digits.
- V1: Displays result codes as text (default).

Result Codes:

- OK n = 0, 1
- ERROR Otherwise

	ATV0	ATV1
Result Code Format	<numeric code> <CR>	<CR> <LF> <verbose code> <CR> <LF>

AT Command Reference (continued)

Wn Result Code Option

- W0: CONNECT result code reports DTE receive speed. Disable protocol result codes.
- W1: CONNECT result code reports DTE receive speed. Enable protocol result codes.
- W2: CONNECT result code reports DCE receive speed. Enable protocol result codes (default).

Result Codes:

- OK n = 0, 1, 2
- ERROR Otherwise

Xn Result Code Selection and Call Progress Monitoring

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

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

Extended Result Codes

- Disabled: Displays only the basic result codes OK, CONNECT, RING, NO CARRIER, and ERROR.
- Enabled: Displays basic result codes, along with the connect message and the modem's date rate, and an indication of the modem's error correction and data compression operation.

Dial Tone Detect

- Disabled: The modem dials a call regardless of whether it detects a dial tone. The period of time the modem waits before dialing is specified in register S6.
- Enabled: The modem dials only upon detection of a dial tone, and disconnects the call if the dial tone is not detected within 10 seconds.

Busy Tone Detect

- Disabled: The modem ignores any busy tones it receives.
- Enabled: The modem monitors for busy tones.

Result Codes:

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

AT Command Reference (continued)

Yn Long Space Disconnect

Long space disconnect is always disabled.

Y0: Disable long space disconnect (default).
Y1: Enable long space disconnect (NOT SUPPORTED).

Result Codes:

OK n = 0
ERROR Otherwise

Zn Recall Stored Profile

This command instructs the modem chip set to go on-hook and restore the profile saved by the last &W command. Either Z0 or Z1 restores the same single profile.

Result Codes:

OK n = 0, 1
ERROR Otherwise

&Bn V.32 Auto Retrain

This modem always auto retrains.

&B0: Disable V.32 auto retrain (NOT SUPPORTED).
&B1: Enable V.32 auto retrain (default).

Result Codes:

OK n = 1
ERROR Otherwise

&Cn Data Carrier Detect (DCD) Control

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

&C0: The state of the carrier from the remote modem is ignored. DCD circuit is always on.
&C1: DCD turns on when the remote modem's carrier signal is detected, and off when the carrier signal is not detected (default).

Result Codes:

OK n = 0, 1
ERROR Otherwise

AT Command Reference (continued)

&Dn DTR Control

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

&D0: Ignore. The modem ignores the true status of DTR and treats it as always on. This should only be

used if your computer does not provide DTR to the modem.

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

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

&D3: Reset modem on the on-to-off DTR transition.

Result Codes:

OK n = 0, 1, 2, 3
ERROR Otherwise

&Fn Load Factory Settings

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

Note: In voice mode (AT+FCLASS=8), if the AT&F command is placed on the same line as other commands, the command line is ignored. To load factory settings in voice mode, issue AT&F by itself.

Result Codes:

OK n = 0
ERROR Otherwise

&Gn V.22bis Guard Tone Control

This command determines which guard tone, if any, to transmit while transmitting in the high band (answer mode). This command is only used in V.22 and V.22bis mode. This option is not used in North America and is for international use only.

&G0: Guard tone disabled (default).

&G1: Sets guard tone to 550 Hz.

&G2: Sets guard tone to 1800 Hz.

Result Codes:

OK n = 0, 1, 2
ERROR Otherwise

&Jn Auxiliary Relay option

&J0: The auxiliary relay is never closed. (Default)

&J1: NOT SUPPORTED

Result Codes:

OK n = 0
ERROR Otherwise

AT Command Reference (continued)

&Kn Local Flow Control Selection

&K0: Disable flow control
&K1: Reserved
&K2: Reserved
&K3: Enable RTS/CTS (hardware) flow control (default)
&K4: Enable XON/XOFF flow control

Result Codes:

OK n = 0, 3, 4
ERROR Otherwise

&Mn Asynchronous Communications Mode

&M0: Asynchronous mode (default).
&M1: Reserved
&M2: Reserved
&M3: Reserved
&M4: Reserved

Result Codes:

OK n = 0
ERROR Otherwise

&Pn Pulse Dial Make-to-Break Ratio Selection

This Command is effective only for Japan.

&P0 39/61 make/break ratio, 10PPS
&P1 33/67 make/break ratio, 10PPS (default)
&P2 33/67 make/break ratio, 20PPS

Result Codes:

OK n = 0, 1, 2
ERROR Otherwise

&Qn Asynchronous Communications Mode

&Q0: Asynchronous Mode, buffered. Same as \N0.
&Q5: Error Control Mode, buffered (default). Same as \N3.
&Q6: Asynchronous Mode, buffered. Same as \N0.
&Q8: MNP error control mode. If an MNP error control protocol is not established, the modem will fallback according to the current user setting in S36.
&Q9: V.42 or MNP error control mode. If neither error control protocol is established, the modem will fallback according to the current user setting in S36.

Result Codes:

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

AT Command Reference (continued)

&Sn Data Set Ready (DSR) Option

This command selects DSR action.

&S0: DSR always ON (default).

&S1: DSR comes on when establishing a connection and goes off when the connection ends.

Result Codes:

OK	n = 0, 1
ERROR	Otherwise

&Tn Self-Test Commands

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

&T0 Abort. Stops any test in progress.

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

&T3 Local digital loopback test.

&T6 Remote digital loopback test. This test can verify the integrity of the local modem, the communications link, and the remote modem. Any data entered at the local DTE is sent to, and returned from, the remote modem. To work properly, the modems must be on-line with error control disabled.

Result Codes:

OK	n = 0
CONNECT	n = 1, 3, 6
ERROR	Otherwise

AT Command Reference (continued)

&V View Active Configuration and Stored Profile

This command is used to display the active profiles.

For example:

<u>Option</u>	<u>Selection</u>	<u>AT Cmd</u>
Comm Standard	Bell	B
CommandCharEcho	Enabled	E
Speaker Volume	Medium	L
Speaker Control	OnUntilCarrier	M
Result Codes	Enabled	Q
Dialer Type	Tone	T/P
ResultCode Form	Text	V
ExtendResultCode	Enabled	X
Dial Tone Detect	Enabled	X
Busy Tone Detect	Enabled	X
LSD Action	Standard RS232	&C
DTR Action	Standard RS232	&D

Press any key to continue; ESC to quit.

<u>Option</u>	<u>Selection</u>	<u>AT Cmd</u>
V22b Guard Tone	Disabled	&G
Flow Control	Hardware	&K
Error Control Mode	V42, MNP, Buffer	\N
Data Compression	Enabled	%C
AutoAnswerRing#	0	S0
AT Escape Char	43	S2
CarriageReturnChar	13	S3
Linefeed Char	10	S4
Backspace Char	8	S5
Blind Dial Pause	2 sec	S6
NoAnswer Timeout	50 sec	S7
“, “ Pause Time	2 sec	S8

Press any key to continue; ESC to quit.

<u>Option</u>	<u>Selection</u>	<u>AT Cmd</u>
No Carrier Disc	2000 msec	S10
DTMF Dial Speed	95 msec	S11
Escape GuardTime	1000 msec	S12
Data Calling Tone	Disabled	S35
Line Rate	33600	S37
DSVD mode	Disabled	-SSE

Stored Phone Numbers

&Z0=
&Z1=
&Z2=
&Z3=

OK

AT Command Reference (continued)

&Wn Store Current Configuration

This command stores certain command options and S-register values except S3, S4, and S5. The ATZ command or a power-up reset of the modem restores this profile.

Result Codes:

OK n = 0
ERROR Otherwise

&Yn Select Stored Profile for Hard Reset

This command does not change the behavior of the modem but is included for compatibility with applications that issue the &Y0 command

&Y0: Select stored profile 0 on power-up

&Y1: ERROR

Result Codes:

OK n = 0
ERROR Otherwise

&Zn=x Store Telephone Number

This command is used to store up to four dialing strings for later dialing. The format for the command is &Zn = "stored number" where n is the location 0—3 to which the number should be written. The dial string may contain up to 40 characters. The ATDS = n command dials using the string stored in location n.

Result Codes:

OK n = 0, 1, 2, 3
ERROR Otherwise

\An Select Maximum MNP Block Size

The modem will operate an MNP error corrected link using a maximum block size controlled by the parameter supplied.

\A0: 64 characters.
\A1: 128 characters.
\A2: 192 characters.
\A3: 256 characters (default).

Result Codes:

OK n = 0, 1, 2, 3
ERROR Otherwise

\Bn Transmit Break to Remote

In non-error-control mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100ms according to parameter specified. The command works in conjunction with the \K command.

\B1 - \B9: Break length in 100ms units. (Default = 3.) (Non-error-control mode only.)

Result Codes:

OK If connected in data modem mode.
NO CARRIER If not connected or connected in fax modem mode.

\G Modem Port Flow Control

\G0: Modem process XON/XOFF flow control characters locally (default).
\G1: Modem passes XON/XOFF flow control characters.

Result Codes:

OK n = 0, 1
ERROR Otherwise

AT Command Reference (continued)

\J Bits/s Rate Adjusted

This command determines whether or not the negotiated connect speed of the modem forces the adjustment of the speed of the DTE to the modem's speed.

\J0: Buffer mode. Error control selected (or not) by \Nn command (default).
\J1: Force the max DCE rate to the DTE rate.

Result Codes:

OK n = 0 or 1
ERROR Otherwise

\Kn Break Control

Controls the response of the modem to a break received from the DTE or the remote modem or the \B command. The response is different in three separate cases.

The first case is where the modem receives a break from the DTE when the modem is operating in data transfer mode:

\K0: Enter on-line command mode, no break sent to the remote modem.
\K1: Clear data buffers and send break to remote modem.
\K2: Same as 0.
\K3: Send break to remote modem immediately.
\K4: Same as 0.
\K5: Send break to remote modem in sequence with transmitted data. (Default.)

The second case is where the modem is in the on-line command state (waiting for AT commands) during a data connection, and the \B is received in order to send a break to the remote modem:

\K0: Clear data buffers and send break to remote modem.
\K1: Clear data buffers and send break to remote modem. (Same as 0.)
\K2: Send break to remote modem immediately.
\K3: Send break to remote modem immediately. (Same as 2.)
\K4: Send break to remote modem in sequence with data.
\K5: Send break to remote modem in sequence with data. (Same as 4.) (Default.)

The third case is where there a break is received from a remote modem during a connection:

\K0: Clear data buffers and send break to the DTE.
\K1: Clear data buffers and send break to the DTE. (Same as 0.)
\K2: Send a break immediately to DTE.
\K3: Send a break immediately to DTE. (Same as 2.)
\K4: Send a break in sequence with received data to DTE.
\K5: Send a break in sequence with received data to DTE. (Same as 4.) (Default.)

Result Codes:

OK n = 0,1, 2, 3, 4, 5
ERROR Otherwise

\Nn Error Control Mode Selection

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

\N0: Buffer mode. No error control (same as &Q6).
\N1: Direct mode.
\N2: *MNP** or disconnect mode. The modem attempts to connect using MNP 2—4 error control procedures. If this fails, the modem disconnects. This is also known as MNP reliable mode.

AT Command Reference (continued)

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

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

\N5: V.42. *MNP* or buffer (same as \N3).

\N7: V.42. *MNP* or buffer (same as \N3).

Result Codes:

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

ERROR Otherwise

\Q Local Flow Control Selection

\Q0: Disable flow control. Same as &K0.

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

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

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

Result Codes:

OK n = 0, 1, 3

ERROR Otherwise

\Rn Ring indicator signal off after the telephone call is answered (Compatibility command)

\R0: ring indicator signal is off after the telephone call is answered

Result Codes:

OK n = 0

ERROR Otherwise

AT Command Reference (continued)

\Tn Inactivity Timer

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

\T0: Inactivity timer disabled (default).

Result Codes:

OK n = 0 - 255
ERROR Otherwise

\Wn Protocol Result Code

\W0: Disable protocol result code appended to DCE speed.
\W1: Enable protocol result code appended to DCE speed (default).
\W2: Same as \W1.

Result Codes:

OK n = 0, 1
ERROR Otherwise

\Xn XON/XOFF Pass Through

\X0: Modem process XON/XOFF flow control characters locally (default).
\X1: Modem passes XON/XOFF flow control characters.

Result Codes:

OK n = 0, 1
ERROR Otherwise

-Cn Data Calling Tone

Data Calling Tone is a tone of certain frequency and cadence as specified in V.25 which allows remote Data/FAX/Voice discrimination. The frequency is 1300 Hz with a cadence of .5 s on and 2 s off.

-C0: Disabled (default).
-C1: Enabled.

Result Codes:

OK n = 0, 1
ERROR Otherwise

-V90 = <n> command to enable/disable V.90 and change downstream rate

-V90=0 will disable V.90
-V90=1 will enable V.90 Auto Rate (default value)
-V90=X - controls the downstream rate

-V90? - Shows the current value
-V90=? - Shows the range [0-21]

See next page for the values of n.

AT Command Reference (continued)

The table below shows the possible values:

"AT-V90=X"	Downstream Rate
0	V.90 disabled
1	Auto Rate (default)
2	28000 kbit/s
3	29333 kbit/s
4	30666 kbit/s
5	32000 kbit/s
6	33333 kbit/s
7	34666 kbit/s
8	36000 kbit/s
9	37333 kbit/s
10	38666 kbit/s
11	40000 kbit/s
12	41333 kbit/s
13	42666 kbit/s
14	44000 kbit/s
15	45333 kbit/s
16	46666 kbit/s
17	48000 kbit/s
18	49333 kbit/s
19	50666 kbit/s
20	52000 kbit/s
21	53333 kbit/s

%B View Numbers in Blacklist

If blacklisting is in effect, this command displays the numbers for which the last call attempted in the past two hours failed. The ERROR result code appears in countries that do not require blacklisting.

AT Command Reference (continued)

%Cn Data Compression Control

This command determines the operation of V.42bis and *MNP* class 5 data compression. Online changes do not take effect until a disconnect occurs first.

%C0: V.42bis/*MNP* 5 disabled. No data compression.

%C1: V.42bis/*MNP* 5 enabled. Data compression enabled (default).

Result Codes:

OK n = 0, 1

ERROR Otherwise

%En Enable/Disable Auto-Retrain and Fallback/Fall Forward

Provides option for the modem to automatically monitor line quality to fall back when line quality is insufficient and to fall forward when line quality is sufficient.

%E0: Disable fallback/fall forward

%E1: Enable fallback, Disable fall forward

%E2: Enable fallback/fall forward (Default)

Result Codes:

OK n = 0,1, 2

ERROR Otherwise

Test and Debug AT Commands

The following commands are to be used for testing and debugging only and are not meant for general use.

&&C Write to / Read from DSP Register

AT&&C<loc>,<val> writes the value <val> to DSP register at location <loc>.
AT&&C<loc> reads from location <loc>.

&&L Line-to-Line Loopback

This command provides a loopback for line-to-line.

&&R Write to/Read from DSP RAM Location

AT&&R<loc>,<val> writes the value <val> to DSP RAM location <loc>.
AT&&R<loc> reads from location <loc>.

&&S Speaker Codec Loopback

This command provides a loopback from the microphone to the speaker.

%T94 Test External RAM

This command "AT%T94" is used for testing the external RAM. If the external RAM is good, this command returns "PASS". If the external ram is not good, this command returns "FAIL".

Example :

```
AT%T94  
PASS      - external ram is good
```

%T125, %T124 Test DSP 56K Version in External Ram

The command "AT%T125" is used for testing the DSP 56K code version and checksum running in external ram. After issuing "AT%T125" the user may then issue "ATI4" to get DSP Version or "ATI1" to get the DSP checksum. (The command "AT%T125" is not valid for ramless version of the DSP 56K code.)
The command "AT%124" is for internal ram version.

#UD Unimodem Diagnostics

The reference for the #UD command is Microsoft's Draft Reference Specification rev.0.85. The Lucent Technologies modem implements a subset of the parameters in that document.
#UD is an action command. It does not take parameters. It shall be the last command in the command line.
The modem logs aspects of its operation for each call, and saves these results (in volatile memory) until cleared by one of the following events:

1. Power off (or D1 or D3 state entered)
2. Hard reset (e.g. negate DTR with &D3 set, reset button)
3. Soft reset = ATZ or AT&F
4. ATD command issued
5. ATA command issued
6. Automatic answer (e.g. set register S0>0 and ring detected)

These results are NOT cleared by changing DTR, V.24 circuit 108.2, if &D0, &D1 or &D2.

In response to this command, the modem reports one or more lines of information text as defined below. Information text format is defined in ITU V.25ter: each line is preceded by a <CR><LF> pair, and terminated by <CR><LF>. (Note: as per V.25ter, CR and LF characters may be changed by writing new values to the contents of registers S2 and S3 respectively.)

Test and Debug AT Commands (continued)

The modem may generate a single line or multiple lines, based on modem capabilities and call results, followed by a standard OK final result code. For example, if call setup failed, only that result is useful. Each information text line shall be formatted as follows, including one or more key=value pairs:

DIAG <token key=value [[key=value] [key=value]] ...>
 DIAG 5 characters, hex: 44, 49, 41, 47, 20
 < left angle bracket (less than sign), hex: 3C
 token unique 32-bit hexadecimal string 2A4D3263, hex: 32, 41, 34, 44, 33, 32, 36, 33
 space space character, hex 20
 key single hexadecimal numeric digit, see Table 1
 = equal sign, hex: 3D
 value any string as defined below (Tables 1-3, etc.)
 > right angle bracket (greater than sign), hex: 3E

Unless otherwise noted, all values are hexadecimal numbers. Any numeric values from tables in ITU V.58 are converted to hexadecimal. Multi-digit values are reported MSD first. Leading 0's may be deleted.

The following table¹ includes all the items listed in Microsoft's specification for the AT#UD command. Within these items, the one that has a check mark in the "Implemented" column is implemented in this release of the modem product. For an item that has an extra option table, please check the corresponding option table to see exactly which option has been implemented.

Table 1 - AT#UD Last Call Status Report Format

Key	value(s)	required	Definition	Implemented
0	2 digits	yes	Diagnostic Command Specification revision number, digit.digit	X
1	Table 2	0-A	Call Setup Result code	X
2	Table 3	0-1	Multi-media mode	
3	Table 4	0	DTE-DCE interface mode	
4	String	yes	V.8 CM octet string, same format as V.25ter Annex A, in quotes	
5	String	yes	V.8 JM octet string, same format as V.25ter Annex A, in quotes	
6-F			Reserved for call negotiation reports	
10	2 digits	Note 4 ²	Received signal power level, in -dBm (0-43)	X
11	2 digits	Note 4	Transmit signal power level, in -dBm (0-17)	X
12	2 digits	Note 4	Estimated noise level, in -dBm (10-90)	X
13	2 digits	Note 4	Normalized Mean Squared error, 100 (0x64) = minimum inter-symbol distance	
14	2 digits	Note 4	Near echo loss, in units of dB	X
15	2 digits	Note 4	Far echo loss, in units of dB	X
16	4 digits	Note 4	Far echo delay, in units of ms	
17	2 digits	Note 4	Round Trip delay, in units of ms	X
18	Table 5	Note 4	V.34 INFO bit map	
19-1F			Reserved for modulation setup and training reports (Note 5)	
20	Table 6	Note 6	Transmit Carrier Negotiation Result	X
21	Table 6	Note 6	Receive Carrier Negotiation Result	X
22	4 digits	0-1F40	Transmit Carrier symbol rate (0-8000)	X
23	4 digits	0-1F40	Receive Carrier symbol rate (0-8000)	X
24	4 digits	0-FA0	Transmit Carrier frequency (0-4000)	
25	4 digits	0-FA0	Receive Carrier frequency (0-4000)	
26	4 digits	0-FA00	Initial transmit carrier data rate (0-64000)	X
27	4 digits	0-FA00	Initial receive carrier data rate (0-64000)	X
28-2F			Reserved	
30	2 digits	0-FF	Temporary carrier loss event count	
31	2 digits	0-FF	Carrier Rate re-negotiation event count	
32	2 digits	0-FF	Carrier Retrains requested	X
33	2 digits	0-FF	Carrier Retrain requests granted	X
34	4 digits	0-FA00	Final transmit carrier rate	X
35	4 digits	0-FA00	Final receive carrier rate	X
36-3F			Reserved	
40	Table 7	0-2	Protocol Negotiation Result (Note 7)	X

¹ Tables are numbered separately within this #UD section to be consistent with the Microsoft specification.

² Notes refer to notes in the Microsoft specification

Test and Debug AT Commands (continued)

41	3 digits	0-400	Error Control frame size	
42	2 digits	0-FF	Error control link timeouts	X
43	2 digits	0-FF	Error control link NAKs	
44	Table 8	0-1	Compression Negotiation Result (Note 7)	X
45	4 digits	0-200	Compression dictionary size (Note 7)	
46-4F			Reserved	
50	1 digit	0-2	Transmit flow control: 0 = off; 1 = DC1/DC3; 2 = V.24 ckt 106/133	
51	1 digit	0-2	Receive flow control: 0 = off; 1 = DC1/DC3; 2 = V.24 ckt 106/133	
52	8 digits	0-FFFFFFF	Transmit characters sent from DTE (Note 8)	
53	8 digits	0-FFFFFFF	Received characters sent to DTE (Note 8)	
54	8 digits	0-FFFF	Transmit characters lost (data overrun errors from DTE) (Note 9)	
55	8 digits	0-FFFF	Received characters lost (data overrun errors to DTE) (Note 9)	
56	8 digits	0-FFFFFFF	Transmit Frame count, if error control protocol running (Note 8)	X
57	8 digits	0-FFFFFFF	Received Frame count, if error control protocol running (Note 8)	X
58	8 digits	0-FFFF	Transmit Frame error count, if error control protocol running (Note 9)	X
59	8 digits	0-FFFF	Received Frame error count, if error control protocol running (Note 9)	X
5A-5F			Reserved	
60	Tables 9-10	Note 10	Termination Cause	X
61	2 digits	0-FF	Call Waiting event count	
62-7F			Reserved for future versions of this specification	
80-FF			Reserved for manufacturer proprietary keys	

Table 2 - Call Setup Result Codes

Code	Definition	Implemented
0	No previous call (modem log has been cleared since any previous calls)	X
1	No dial tone detected	X
2	Reorder signal detected, network busy	
3	Busy signal detected	X
4	No recognized signal detected	X
5	Voice detected	
6	Text telephone signal detected (see V.18)	
7	Data Answering signal detected (e.g. V.25 ANS, V.8 ANSam)	X
8	Data Calling signal detected (e.g. V.25 CT, V.8 CI)	
9	Fax Answering signal detected (e.g. T.30 CED, DIS)	
A	Fax Calling signal detected (e.g. T.30 CNG)	
B	V.8bis signal detected	
C-F	Reserved	

Table 6 - gstnModulationSchemeActive from 3.7.2/V.58

Value (hex)	Description	Implemented
0	V.17	
1	V.21	
2	V.22	
3	V.22bis	
4	V.23 Constant Carrier (1200/75)	
5	V.23 Switched Carrier (half duplex)	
6	V.26bis	
7	V.26ter	
8	V.27ter	
9	V.29 HD	
A	V.32	X
B	V.32bis	
C	V.34	X
D	V.34 HD	
E	V.pcm (asymmetric)	
F	V.pcm (symmetric)	
E-7F	Reserved (V.58)	
80	"X2™"	
81	"K56FLEX™"	X
82	"V.FC"	
83	"V.32terbo"	
80-FF	Reserved for mfgs	

Test and Debug AT Commands (continued)

Table 7 - errorControl Active from 3.5.2/V.58

Value	Description	Implemented
0	Disable/none	X
1	V.42 LAPM	X
2	V.42 Alternative protocol (MNP™)	X
3-7F	Reserved (V.58)	
80	MNP10™	
81	ECP™ Enhanced Cellular Protocol	
82	ETC	
82-FF	Reserved for mfgs	

Table 8 - compressionActive from 3.2.2/V.58

Value	Description	Implemented
0	None	X
1	V.42bis	X
2-7F	Reserved (V.58)	
80	MNP5™	X
81-FF	Reserved for mfgs	

Table 9 - Additional callCleared codes (3.6.4/V.58)

Code	Definition	Implemented
1	No Previous call	X
2	Call is still in progress	X
3	Call Waiting signal detected	
4	Delayed - see ETS 300 001	X

Table 10 - callCleared codes from 3.6.4/V.58-1994

callCleared: Indicates that the DCE has gone on hook and that the previously existing network connection has been cleared. These values are hexadecimal, converted from decimal in V.58.

Value	Description	Notes	Implemented
0	CauseUnidentified	Call setup issues	X
1-3	See Table 9 above		X
A	NMSinitiatedDialCall	-- Network Management System	
B	NMSinitiatedLeasedLineRestoral		
C	NMSinitiatedRedial		
D	NMSinitiatedDialDisconnect		
14	PowerLoss	DCE	
15	EquipmentFailure		
16	FrontPanelDisconnectRequested		
17	FrontPanelLeasedLineRestoral		
18	AutomaticLeasedLineRestoral		
19	InactivityTimerExpired		X
1E	cct116RestoralRequest	DTE Interface	
1F	cct108isOffInhibitsDial		
20	cct108turnedOff		
28	NoNumberProvided	Line Interface	
29	BlacklistedNumber		X

Test and Debug AT Commands (continued)

2A	CallAttemptsLimitExceeded		X
2B	ExtensionPhoneOffHook		
2C	CallSetupFailTimerExpired		X
2D	IncomingCallDetected		X
2E	LoopCurrentInterrupted		
2F	NoDialTone		X
30	VoiceDetected		
31	ReorderTone		
32	SitTone		
33	EngagedTone		
34	LongSpaceDisconnect		
3C	CarrierLost	Signal Converter	X
3D	TrainingFailed		X
3E	NoModulationinCommon		
3F	RetrainFailed		X
40	RetrainAttemptCountExceeded		
41	GstnClearDownReceived		
42	FaxDetected		
46	InTestMode	Test	
47	IntrusiveSelfTestInitiated		
50	AnyKeyAbort	Call Control	X
51	DteHangupCommand		X
52	DteResetCommand		
5A	FrameReject	Error Control	
5B	NoErrorControlEstablished		X
5C	ProtocolViolation		
5D	n400exceeded		X
5E	NegotiationFailed		
5F	DisconnectFrameReceived		
60	SabmeFrameReceived		
64	LossOfSynchronization	Data Compression	

AT Commands Reference S-Registers

S-registers generally affect how the AT commands perform. Contents of the registers can be displayed or modified when the modem is in command mode.

To display the value of an S-register:

TYPE: ATSn? where n is the register number.

PRESS: Enter

To modify the value of an S-register:

TYPE: ATSn = r

where n is the register number, and r is the new register value.

PRESS: Enter

S0 Auto Answer Ring Number

This register determines the number of rings the modem will count before automatically answering a call. Enter 0 (zero) if you do not want the modem to automatically answer at all. When disabled, the modem can only answer with an ATA command.

Range: 0—255

Default: 0

Units: rings

S1 Ring Counter

This register, Ring Counter, is read only. The value of S1 is incremented with each ring. If no rings occur over a six second interval, this register is cleared.

Range: 0—255

Default: 0

Units: rings

S2 AT Escape Character (user defined)

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

Range: 0—255

Default: 43

Units: ASCII

S3 Command Line Termination Character (user defined)

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

Range: 0—127, ASCII decimal

Default: 13 (carriage return)

Units: ASCII

Note: This register value is not stored with &W command.

AT Commands Reference S-Registers (continued)

S4 Response Formatting Character (user defined)

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

Range: 0—127, ASCII decimal
Default: 10 (line feed)
Units: ASCII

Note: This register value is not stored with &W command.

S5 Command Line Editing Character (user defined)

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

Range: 0—127, ASCII decimal
Default: 8 (backspace)
Units: ASCII

Note: This register value is not stored with &W command.

S6 Wait Before Dialing

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

Range: 2—65
Default: 2
Units: seconds

S7 Connection Completion Time-Out

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

Range: 1—255
Default: 50
Units: seconds

AT Commands Reference S-Registers (continued)

S8 Comma Dial Modifier Time

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

Range: 0—65
Default: 2
Units: seconds

S10 Automatic Disconnect Delay

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

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

Range: 1—254
Default: 20
Units: .1 seconds

S11 DTMF Dialing Speed

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

Range: 50—150
Default: 95
Units: .001 seconds

S12 Escape Guard Time

This register sets the value (in 20 ms increments) for the required pause after the escape sequence (default 1 s).

Range: 0—255
Default: 50
Units: .02 seconds

S14 General Bit Mapped Options Status

Indicates the status of command options. Only bit 3 and bit 6 are used, read-only.

Bit 3 Result codes (Vn)
 0 = Numeric (V0)
 1 = Verbose (VI) (Default)
Bit 6 Pulse dial PPS selection (&Pn)
 0 = 10 PPS (&p0, &p1) (Default)
 1 = 20 PPS (&p2)
Default: 8 (00001000b)

AT Commands Reference S-Registers (continued)

S21 V.24/General Bit Mapped Options Status

Indicates the status of command options. Only bits 3, 4 and 5 are used, read-only.

Bits 3-4 DTR behavior (&Dn)
0 = &D0 selected
1 = &D1 selected
2 = &D2 selected (Default)
3 = &D3 selected
Bit 5 DCD behavior (&Cn)
0 = &C0 selected
1 = &C1 selected (Default)
Default: 48 (00110000b)

S22 Results Bit Mapped Options Status

Indicates the status of command options. Only bits 4, 5 and 6 are used, read only.

Bits 4-6 result codes (Xn)
0 = X0 selected
4 = X1 selected
5 = X2 selected
6 = X3 selected
7 = X4 selected (Default)
Bit 7 Pulse dial make/break ratio (&Pn)
0 = 33/67 make/break ratio (&P1, &P2) (Default)
1 = 39/61 make/break ratio (&P0)
Default: 112 (01110000b)

S24 Timer to Control Sleep Mode

This command displays the number of seconds of inactivity (no characters sent from the DTE, no RING) in the off-line command state before the modem places itself into standby mode. A value of zero prevents standby mode. S24 is an alias for S89.

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

Range: 0, 5—65
Default: 10

S28 V.34 Modulation Enable/Disable

This register enables/disables V.34 modulation.

0 = disabled, 1 = enabled
Range: 0 —1
Default: 1

AT Commands Reference S-Registers (continued)

S30 Inactivity Timer

S30 specifies the length of time (in minutes) that the modem will wait before disconnecting when no data is sent or received. This function is only applicable to buffer mode..

Range: 0—255
Default: 0

S32 Synthetic Ring Volume

This register specifies a synthetic ring volume.

Range: 0—255 (allowed, but not meaningful)
Default: 10

S33 Synthetic Ring Frequency

This register specifies a synthetic ring frequency. There are five choices, with 0 meaning disabled.

Range: 0—5
Default: 0

S35 Data Calling Tone

Data Calling Tone is a tone of certain frequency and cadence as specified in V.25 which allows remote Data/FAX/Voice discrimination. The frequency is 1300 Hz with a cadence of .5 s on and 2 s off.

0 = disabled, 1 = enabled

Range: 0—1
Default: 0

S37 Dial Line Rate (default 0)

This register sets the maximum line data rate. In K56flex and V.90 mode, S37 controls the upstream V.34 rate.

S37 = 0	auto rate
S37 = 1	reserved
S37 = 2	1200/75 bit/s (V.23)
S37 = 3	300 bit/s
S37 = 4	reserved
S37 = 5	1200 bit/s
S37 = 6	2400 bit/s
S37 = 7	4800 bit/s
S37 = 8	7200 bit/s
S37 = 9	9600 bit/s
S37 = 10	12000 bit/s
S37 = 11	14400 bit/s
S37 = 12	16800 bit/s
S37 = 13	19200 bit/s
S37 = 14	21600 bit/s
S37 = 15	24000 bit/s
S37 = 16	26400 bit/s
S37 = 17	28800 bit/s
S37 = 18	31200 bit/s
S37 = 19	33600 bit/s

AT Commands Reference S-Registers (continued)

S38 K56flex Downstream Rate

To force a particular K56flex downstream rate, use S-register S38. S38=0 disables K56flex, and may allow a more reliable V.34 connection. S38=1 default allows the modem to select the downstream rate automatically. Other values of S38 force the downstream rate, with fallback to V.34 if unsuccessful at the configured rate:

S38=0	Disable K56flex
S38=1	Automatic rate selection (default)
S38=2	32 kbit/s
S38=3	34 kbit/s
S38=4	36 kbit/s
S38=5	38 kbit/s
S38=6	40 kbit/s
S38=7	42 kbit/s
S38=8	44 kbit/s
S38=9	46 kbit/s
S38=10	48 kbit/s
S38=11	50 kbit/s
S38=12	52 kbit/s
S38=13	54 kbit/s
S38=14	56 kbit/s

The number of robbed-bit signaling (RBS) frames detected decreases the true DCE rate per the following table:

RBS links	Rate hit (kbit/s)
0	0
1	2
2	4
3	4
4	6
5	8
6	8

For example, if S38=10 and there are 3 RBS links, the K56flex downstream rate will be 48-4=44 kbit/s. The exception to this is for 32 kbit/s and 34 kbit/s, which are the true rates regardless of the number of RBS frames detected.

One special value of S38, S38 = 251, is used for back-to-back (factory) testing of V.34 rates, with DSP code running in external memory. Set S38=251 on both originating and answering modems. (This feature is not valid with ramless solution.)

S42 Auto Rate (default 1, range 0—1)

This command is used for testing and debugging only.

V.32bis and V.22bis auto rate is disabled. Retrain operation is disabled or enabled in data mode, and fallback is disabled in data mode. In K56flex mode, S42=0 forces connection at the rate specified by S38 (even if the rate cannot be sustained), without fallback to V.34.

0 = auto rate disabled, 1 = enabled.

Range: 0—1
Default: 1

AT Commands Reference S-Registers (continued)

S43 Auto Mode (default 1, range 0—1)

This command is used for testing and debugging only.

V.32bis startup auto mode operation disabled.

0 = auto mode disabled, 1 = enabled.

Range: 0—1

Default: 1

S48 LAPM Error Control and Feature Negotiation (default 7)

S48 = 7 Negotiation enabled

S48 = 128 Negotiation disabled; forces immediate fallback options specified in S36

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

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

S89 Timer to Control Sleep Mode

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

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

Range: 0, 5—65

Default: 10

S90 Read-only Local Phone

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

0 = on-hook

1 = off-hook

S91 Line Transmit Level

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

Range: 6—15

Default: 15

Units: 1 dB

S108 Network Codec Type

S108=22 μ -Law

S108=33 A-law

S108=7 default, or any other value: Coding as specified by digital modem in V.8bis information. If an old server does not tell its code type in V.8bis, then the client modem chooses based on its country ID. μ -law regions are Japan, Taiwan, Korea, Hong Kong, North America, and Latin America. Everywhere else is A-law. (This S – Register is valid only in K56flex mode.)

AT FAX Command Set (Class 1 FAX)

The Lucent Technologies modem supports FAX commands conforming to EIA standard 578. These commands are given here with short descriptions; complete explanations are given in the standard, available from the Electronic Industries Association.

Table 5. The AT FAX Command Set Summary

Command	Description
+FCLASS?	Service class indication
+FCLASS = ?	Service class capabilities
+FCLASS = n	Service class selection
+FTS = <n>	Transmission silence
+FRS = <n>	Receive silence
+FTM = <m>	Transmit FAX data with <m> carrier
+FRM = <m>	Receive FAX data with <m> carrier
+FTH = <m>	Transmit HDLC data with <m> carrier
+FRH = <m>	Receive HDLC data with <m> carrier
+FTM = ?	Transmit FAX modulation
+FRM = ?	Receive FAX modulation
+FTH = ?	Transmit HDLC Data modulation
+FRH = ?	Receive HDLC Data modulation
+FMI?	Manufacturer Identification
+FMM?	Product Identification
+FMR?	Version/Revision Information
+FPR = <n>	Set DTE-DCE Fax port rate
+FPR = ?	Reports all fax port rate that DCE supports
+FPR?	Reports the current fax port rate of DTE-DCE
+FAA = <n>	Set DCE Adaptive answer mode
+FAA = ?	Display valid adaptive answer values that DCE supports
+FAA?	Display current set value of adaptive answer mode

AT FAX Commands Reference

+FCLASS? **Service Class Indication**

This command causes the modem to display the current setting. The modem can operate either as a Class 0 data modem or a class 1 FAX modem.

Typical responses:

+FCLASS? 000 if in data mode; 001 if in FAX class 1, 008 if in voice mode, and 080 if in *VoiceView*[†] mode.

+FCLASS=? **Service Class Capabilities**

This command causes the modem to display the classes it supports.

Typical responses:

+FCLASS = ? 0, 1, 8, 80

+FCLASS=n **Service Class Selection**

This command sets the modem for class n operation, where n is either a 0 or 1.

Parameters: 0, 1, 8, 80

Default: 0

Command options:

+FCLASS = 0 Select data mode.
+FCLASS = 1 Select Facsimile Class 1.
+FCLASS = 8 Select voice mode.
+FLCASS = 80 Select *VoiceView* mode.

+FTS=<n> **Transmission Silence**

This command causes the modem to stop transmitting data and pause for 10 * n ms. At the end of this period, the modem then responds **OK**. You can specify any number from 0 through 255 as the value of n; for example, a value of 5 specifies a period of 50 ms.

n = 0—255 (10 ms intervals)

+FRS=<n> **Receive Silence**

This command causes the modem to listen and wait for a 10 * n ms period of silence on the line. At the end of this period, the modem then responds **OK**. You can specify any number from 0 through 255 as the value of n; for example, a value of 5 specifies a period of 50 ms.

n = 0—255 (10 ms intervals)

AT Fax Commands Reference (continued)

+FTM=<m> Transmit FAX Data with <m> Carrier

This command causes the modem to transmit data at the modulation specified by <m>. The following table shows the values you can enter for this command and the meaning of those values.

Command Option	Modulation	Speed (bits/s)
+FTM=3	V.21 Channel 2	300
+FTM=24	V.27ter	2400
+FTM=48	V.27ter	4800
+FTM=72	V.29	7200
+FTM=96	V.29	9600
+FTM=73	V.17	7200
+FTM=74	V.17 (short train)	7200
+FTM=97	V.17	9600
+FTM=98	V.17 (short train)	9600
+FTM=121	V.17	12000
+FTM=122	V.17 (short train)	12000
+FTM=145	V.17	14400
+FTM=146	V.17 (short train)	14400

+FRM=<m> Receive FAX Data with <m> Carrier

This command causes the modem to receive data at the modulation specified by <m>.

Command Option	Modulation	Speed (bits/s)
+FRM=3	V.21 Channel 2	300
+FRM=24	V.27ter	2400
+FRM=48	V.27ter	4800
+FRM=72	V.29	7200
+FRM=96	V.29	9600
+FRM=73	V.17	7200
+FRM=74	V.17 (short train)	7200
+FRM=97	V.17	9600
+FRM=98	V.17 (short train)	9600
+FRM=121	V.17	12000
+FRM=122	V.17 (short train)	12000
+FRM=145	V.17	14400
+FRM=146	V.17 (short train)	14400

AT Fax Commands Reference (continued)

+FTH=<m> Transmit HDLC Data with <m> Carrier

This command causes the modem to transmit data framed in the HDLC protocol at the modulation specified by <m>.

Command Option	Modulation	Speed (bits/s)
+FTH=3	V.21 Channel 2	300
+FTH=24	V.27ter	2400
+FTH=48	V.27ter	4800
+FTH=72	V.29	7200
+FTH=96	V.29	9600
+FTH=73	V.17	7200
+FTH=74	V.17 (short train)	7200
+FTH=97	V.17	9600
+FTH=98	V.17 (short train)	9600
+FTH=121	V.17	12000
+FTH=122	V.17 (short train)	12000
+FTH=145	V.17	14400
+FTH=146	V.17 (short train)	14400

+FRH=<m> Receive HDLC Data with <m> Carrier

This command causes the modem to receive data framed in the HDLC protocol at the modulation specified by <m>.

Command Option	Modulation	Speed (bits/s)
+FRH=3	V.21 Channel 2	300
+FRH=24	V.27ter	2400
+FRH=48	V.27ter	4800
+FRH=72	V.29	7200
+FRH=96	V.29	9600
+FRH=73	V.17	7200
+FRH=74	V.17 (short train)	7200
+FRH=97	V.17	9600
+FRH=98	V.17 (short train)	9600
+FRH=121	V.17	12000
+FRH=122	V.17 (short train)	12000
+FRH=145	V.17	14400
+FRH=146	V.17 (short train)	14400

AT Fax Commands Reference (continued)

+FPR=<n> Select Fax port rate

This command sets the DTE to DCE fax port rate.

DTE command	DCE action	Description or notes
•FPR • 0	Execute •IPR • 0	Select automatic rate detection
•FPR • 1	Execute •IPR • 2400	Set DTE-DCE to 2400 bit/s
•FPR • 2	Execute •IPR • 4800	Set DTE-DCE rate to 4800 bit/s
•FPR • 4	Execute •IPR • 9600	Set DTE-DCE rate to 9600 bit/s
•FPR • 8	Execute •IPR • 19 200	Set DTE-DCE rate to 19 200 bit/s
•FPR • 10	Execute •IPR • 38 400	Set DTE-DCE rate to 38 400 bit/s
•FPR • 18	Execute •IPR • 57 600	Set DTE-DCE rate to 57 600 bit/s
•FPR • ? (if all values listed above are supported)	Report (0,1,2,4,8,10,18)	DCE supports 2400, 4800, 9600, 19 200, 38 400 and 57 600 bit/s
•FPR? (if •IPR • 0)	Report 0	DTE-DCE rate is automatically detected
•FPR? (if •IFC • 2400)	Report 1	DTE-DCE rate is 2400 bit/s
•FPR? (if •IFC • 4800)	Report 2	DTE-DCE rate is 4800 bit/s
•FPR? (if •IFC • 9600)	Report 4	DTE-DCE rate is 9600 bit/s
•FPR? (if •IFC • 19 200)	Report 8	DTE-DCE rate is 19 200 bit/s
•FPR? (if •IFC • 38 400)	Report 10	DTE-DCE rate is 38 400 bit/s
•FPR? (if •IFC • 57 600)	Report 18	DTE-DCE rate is 57 600 bit/s
•FPR? (all other •IPR settings)	Report 255	255 indicates invalid setting

AT Fax Commands Reference (continued)

+FAA Adaptive answer

A Service Class 1 Facsimile DCE may have the ability to answer as a data modem DCE or as a Facsimile DCE. It also may be able to adaptively change from Class 1 facsimile mode (**•FCLASS•1.0**) to data modem operation (**•FCLASS•0**) in response to the incoming call. The **•FAA** parameter controls this feature.

- Write syntax: **•FAA•<value>**
- Valid values: 0, 1
- Default value: 0
- Mandatory value: 0

•FAA•0 The DCE shall answer only as a Class 1 facsimile device. No automatic switching of service class shall occur based on the calling device type.

•FAA•1 The DCE can answer and automatically determine whether to answer as a facsimile DCE or as a data modem. If a data modem is detected, the DCE shall operate as described in 8.3.2.4.

NOTE – The **•FAA** parameter controls automatic switching only from Class 1 to Class 0, for call answering only. It does not affect call origination, switching to Class 1 from other classes, or switching to classes other than Class 0.

Manufacturer Identification (+FMI)

Read Syntax: **AT+FMI**

Result: **Lucent Data/Fax**
 Lucent Data/Fax/Voice/VoiceView (depending on product)

Product Identification (+FMM)

Read Syntax: **AT+FMM**

Result: **Data/Fax**
 Data/Fax/Voice/VoiceView (depending on product)

Version / Revision Information (+FMR)

Read Syntax: **AT+FMR**

Result: Lucent driver version number (e.g. **1.5.05**)

AT Voice Command Set

The AT Voice Command set follows a modified IS-101 architecture. The commands are sent through the comm port, but the data path is sent either through the comm port or through a DMA channel using the wave driver. Tables 1 and 2 show a summary of the AT Voice Command Set.

Summary of the AT Voice Command Set

Table 6. The AT Voice Command Set

Voice Commands	
Command	Description
AT+FCLASS=8	Enter voice mode
AT+VIP	Initialize voice parameters
AT+VCID	Caller ID
AT+VDR	Distinctive ring
AT+VGT	Speaker volume control
AT+VIT	DTE/DCE inactivity timer
AT+VNH	Automatic hang-up control
AT+VTD	Set beep tone duration timer
AT+VLS	Analog source/destination selection and DTMF/tone reporting
AT+VSD	Set silence detection timer
AT+VRA	Set ringback goes away timer
AT+VRN	Set ringback never came timer
AT+VTS	DTMF/tone generation
AT+VTR	Start full duplex voice transmission and reception process
AT+VTX	Enter voice transmit state (see examples)
AT+VRX	Enter voice receive state (see examples)
AT+VSM	Voice compression method
AT+VEM	Event reporting and masking
AT+VGR	Receive gain selection
AT+VPR	Select DTE/DCE interface rate

Table 7. The AT Voice Command Set Not Defined In IS-101 Specification

Command	Description
ATS32	Synthetic ring volume
ATS33	Synthesized ring frequency

AT Voice Commands Reference

AT+FCLASS=8 Enter Voice Mode

The command AT+FCLASS=8 puts the modem in voice mode. Speakerphone and TAD modes are subsumed under the more general heading of voice mode, and use a particular subset of voice mode commands to implement their respective features and functions.

The modem controller will maintain the overall state of the system so as to know when voice commands are issued in the context of using the speakerphone versus TAD or other voice contexts.

AT+FCLASS? Returns the current DCE mode
AT+FCLASS=? Queries the DCE for the range of modes supported DCE returns: 0, 1, 8, 80 (data, FAX, voice, VoiceView)

AT+VIP Initialize Voice Parameters

The command AT+VIP causes the modem to initialize all the voice parameters to their default values. The command has no effect on the +FCLASS setting.

AT+VCID=<pmode> Caller ID

With this command caller identification is enabled/disabled.

- Disable caller ID: <pmode>=0
- Enable, formatted caller report: <pmode>=1
- Enable, unformatted caller report: <pmode>=2

AT+VCID? Returns the current caller ID pmode
AT+VCID=? Queries the DCE for the range of supported caller ID report formats DCE returns: 0, 1, 2

AT+VDR=<enable>,<report> Distinctive Ringing & Cadence Report

This command will enable the distinctive ringing feature. This will allow a report of DROF/DRON to follow an exact ring cadence coming over the phone line.

AT+VDR? Returns the current values of <enable> and <report>
AT+VDR=? Queries the DCE for the range of supported distinctive ring configurations DCE returns: (0, 1), (0—255)

AT+VGT=<level> Speaker Volume Control

This command will enable the speaker volume control.

- + <level> is 0—255
- + <level>=128: Nominal volume level for sending to speaker
- + <level>=<value greater than 128>: Increase volume above nominal level
- + <level>=<value less than 128>: Decrease volume below nominal level

AT+VGT? Returns current value
AT+VGT=? Returns range of supported values

AT Voice Commands Reference (continued)

AT+VGR=<gain> Receive Gain Selection

This command will enable the receive microphone gain control.

- + <gain> is 0—255: the only useful range is 121—134
- + <gain>=128: nominal level for receive gain from microphone
- + <gain>=<value greater than 128>: increase gain above nominal level
- + <gain>=<value less than 128>: decrease gain below nominal level

TAD mode—This command may be used in TAD local recording to control the recording level from the microphone.

Speakerphone mode—This command may be used to control the gain to the remote caller.

- AT+VGR? Returns current value of receive gain
- AT+VGR=? Returns range of supported gain values

AT+VEM=<mask> Event Reporting and Masking

The DTE can use this command to disable an event report regardless of the DCE state, or of the analog signal source or destination configuration. Mask is Bits 0—33 (i.e., FFFFFFFFC). See the IS-101 specification for defined bit values.

- AT+VEM? Returns the current values of the mask
- AT+VEM=? Queries the DCE for the range of supported service level events

AT+VIT = <Timer> DTE/DCE Inactivity Timer

This command sets the DCE's value for the DTE/DCE inactivity timer. The units are in one seconds.

- AT+VIT? Returns the current value of the timer
- AT+VIT=? Queries the DCE for the range of supported values

AT+VNH = <Hook> Automatic Hang-up Control

This command causes the DCE to enable or disable automatic hangups in the data and facsimile modes. See the IS-101 specification for the detailed description of this command and its interaction with the +FCLASS and ATH commands.

- + <hook> = 0 The DCE retains automatic hangups (which is the way in the other non-voice modes).
- + <hook> = 2 The DCE disables automatic hangups in the other non-voice modes. The DTE only performs a logical hangup (returns the "OK" result code).

- AT+VNH? Returns the current value
- AT+VNH=? Returns the supported values

AT Voice Commands Reference (continued)

AT Commands: Speakerphone Operation

AT+VLS=<label> Analog Source/Destination Selection

This is a general purpose analog source/destination command that attaches various analog devices to the system in voice mode.

+ *Speakerphone on*: AT+VLS=7.

Attach internal speaker and internal microphone, DCE off-hook.

+ *Speakerphone off*: AT+VLS=0.

Detach analog devices, DCE on-hook.

+ *Microphone Control/Phone Muting*:

AT+VLS=5 disables/detaches microphone analog source (leaving speaker only) when speakerphone is in operation (phone mute feature).

AT+VLS=7 restores/attaches microphone along with speaker (normal speakerphone operation).

AT+VLS? Reports the current analog source/destination configuration, along with a listing of all event codes reported from the modem to the DTE under that configuration.

AT+VLS=? Queries the DCE for the range of supported configurations and the list of unsolicited event codes that the modem will report to the DTE under each configuration. For speakerphone, the configurations supported are 0, 5, and 7—as explained above.

AT Commands: Telephone Answering Device

AT+VTD=<dur> Beep Tone Duration Timer

This command sets the default duration for DTMF/tone generation in 0.01 s increments.

For DTMF digits, beep tone duration is the interdigit time. For tone generation, this number is the actual tone duration.

AT+VTS=<string> DTMF and Tone Generation in Voice Mode

This command will cause the modem to produce a sequence of DTMF tones (or other tones, such as dial tone, busy, silence, etc.) as specified in the string parameter. Specifications for the format of tone strings are detailed in IS-101.

■ AT+VTS? reports the current <string> parameter.

■ AT+VTS=? reports the range of frequencies supported for tone generation, as well as tone duration.

Example: (200—3300), (200—3300), (0—500).

AT+VTR Start voice transmission and reception process

This command will cause DCE to start full duplex voice mode. In this mode, the DTE selects the analog source and sink through the +VLS command; the selections can be microphone and speaker or GSTN. The DCE is not required to perform any Acoustic Echo Cancellation nor any Line Echo Cancellation.

AT Voice Commands Reference (continued)

AT+VLS=? Analog Source/Destination Selection and DTMF/Tone Reporting

Requests for the modem's DTMF/Tone reporting capabilities are made using this command. For each system configuration in voice mode (i.e., speakerphone and answering machine), the modem reports the capabilities that are enabled for the configuration.

Also, for each configuration, the modem indicates tone-reporting capabilities for each of the three different voice states: voice transmit data, voice receive data, and voice command state (voice idle).

TAD supports each of the following IS-101 analog source/destination configurations:

<u>Label #</u>	<u>Description</u>
0	DCE on-hook, local phone connected to Telco.
1	DCE off-hook, DCE connected to Telco.
2	DCE off-hook, local phone connected to DCE.
3	DCE off-hook, local phone connected to Telco, DCE to local phone.
4	Speaker connected to DCE, DCE on-hook (playback messages)
5	Speaker connected to DCE, DCE off-hook (call screening)
6	Microphone connected to DCE, DCE on-hook (record greeting)
7	Microphone and speaker connected, DCE off-hook (speakerphone)

AT+VSD=<sds, sdi> Silence Detection (QUIET and SILENCE)

This command sets both the **silence detection sensitivity** (<sds>) and **silence detection interval** (<sdi>).

- Larger values of <sds> indicate that the modem is to treat noisier line conditions as silence.
<sds> = 128 ; Nominal level of sensitivity; -40 dBm (default) .
<sds> > 128 ; More aggressive ; <sds>=129 is -39 dBm.
<sds> < 128 ; Less aggressive; <sds>=127 is -41 dBm.
- The <sdi> specifies the amount of time the modem shall wait before reporting silence to the DTE. It is used for determining :
Presumed hang-up (SILENCE), after which the modem sends <DLE>-s to DTE.
Default is 5 seconds.

AT+VSM=<cml>,<vsr> Compression Method and Sampling Rate Specifications

This command enables the compression method and sampling specifications where cml = compression method label and vsr = voice sampling rate.

AT+VSM? Returns the numeric and string labels of the compression method currently in use, and the sampling rate currently in use.

AT+VSM=? Reports the voice compression methods supported by the DCE, and the voice sampling rates at which they are supported: The default is 129,8000 (16-bit linear, 8.0 kHz)

- † 128, 8-bit linear, (7200, 8000, 11025)
- † 129, 16-bit linear, (7200, 8000, 11025)
- † 130, 8-bit A-law, (8000)
- † 131, 8-bit μ -law, (8000)
- † 132, IMA ADPCM, (8000)

AT Voice Commands Reference (continued)

AT+VRA=<interval> Ringback Goes Away Timer

The modem uses the ringback goes away timer when originating a call.

This command sets this timer to the amount of time the modem shall wait between ringbacks before assuming that the remote station has gone off-hook.

AT+VRA? Returns the current value.
AT+VRA=? Returns the range of supported values.

AT+VRN=<interval> Ringback Never Appeared Timer

The modem uses the ringback never appeared timer when originating a call.

The AT+VRN command sets this timer to the amount of time that the modem shall spend looking for an initial ringback. If ringback is not detected within this interval, the modem shall assume that the remote station has gone off-hook.

AT+VRN? Returns the current value.
AT+VRN=? Returns the supported values.

AT+VPR=<rate> Select DTE/DCE Interface Rate

The AT+VPR command returns an OK for any rate but has no action.

Events Reported to the DTE :

The modem will return OK when going off-hook in voice mode (+FCLASS=8). After answering in voice mode, the modem may send any of the following <DLE> shielded event codes to the DTE, as appropriate:

<DLE> Shielded Codes Sent from DCE to DTE

<u>Code Character</u>	<u>Description</u>
0—9, A—D, #, *	DTMF tones
a	Answer tone
b	Busy tone
c	Fax calling tone
d	Dial tone
e	Data calling tone
h	Local phone on-hook
H	Local phone off-hook
R	Ring
s	Silence timer has expired
<ETX>	End of voice data transmission
@	CAS tone detected

<DLE> Codes Sent to DCE:

For simple actions in voice mode, the modem may send any of the following <DLE> shielded event codes (in ASCII) to the DTE, as appropriate:

<DLE> Shielded Codes Sent from DTE to DCE

<u>Code Character</u>	<u>Description</u>
u	Bump up the volume by 1 dB
d	Bump down the volume by 1 dB
<ETX>	End of voice data transmission
!	End receive data state

AT Voice Commands Reference (continued)

AT Voice Command Set Not Defined In IS-101 Specifications

S32 Synthetic Ring Volume

This command will provide a synthetic ring volume in dB with an implied minus sign. The default = 10.

S33 Synthetic Ring Frequency

This command will provide a synthetic ring frequency. The valid values are 0—5, with 0 = disabled and 1—5 = five varying ring frequencies. The default = 0.

AT+VTS=!

This does a flash hook.

AT Voice Commands Reference (continued)

Voice Modem Command Examples

The application issues AT commands to request actions by the modem, and the modem responds with standard TIA-602 result codes to tell the application that the requested action has been completed.

Notes for Speakerphone Examples

1. If the user decides to pick up his **local** (parallel) phone while in the middle of a speakerphone call, the DCE will sense the transition and send the application a **<DLE>-H** sequence. The application—which should always be screening for DLE-shielded codes in the background when the modem is in the voice mode—can then respond to the **<DLE>-H** (for example, by resetting speakerphone buttons or doing whatever else needs to be done with the speakerphone interface).

2. **DLE-shielded codes** that the modem will send to the application while in speakerphone mode are:

<u>Command</u>	<u>Description</u>
DLE - c	FAX calling tone detect.
DLE - e	Data calling tone detect.
DLE - h	Local phone went on-hook (hung up).
DLE - H	Local phone went off-hook (picked up).

3. When the user is in the middle of a speakerphone call, **call waiting** (hold operation) can be initiated when the user hears the call-waiting signal through the speaker. Call waiting entails the following communication between the application and the modem.

<u>Command</u>	<u>Description</u>
ATD!	Put the current call on hold, and answer the new incoming call.
OK	DCE responds. Original call is on hold, and the speakerphone user is connected to the second call.

To terminate the second call and return to the first, the application should again send the modem the ATD! command.

ATD!	Terminate the second call and return to the original call.
OK	DCE responds. Second call is terminated and the user is again connected to the original call.

AT Voice Commands Reference (continued)

Example # 1: Initiating a speakerphone call (with phone muting during conversation)

The speakerphone application is loaded. The modem is initially idle, in data mode. The user then decides to pick up the phone to place a speakerphone call. Picking up the phone should initiate the following chain of events.

<u>Command</u>	<u>Description</u>
AT+FCLASS=8	The modem enters voice mode.
OK	DCE responds. Now in voice mode.
AT+VGT=128	Set speaker volume to normal level.
OK	DCE responds. Volume level is set.
AT+VLS=7	Attach internal speaker and microphone, DCE off-hook.
OK	DCE responds. Now in speakerphone mode. Phone off hook, dial tone audible, speaker and microphone ready to use.
ATD5551234	Provide dial string for DCE to place the call.
OK	DCE responds. Number is dialed.

Call is placed through phone network. Caller can hear ringback or busy signal from the phone being called. If the person at the other end picks up the phone, caller and callee converse. If the speakerphone user decides to **mute** his speakerphone, the application sends the following to mute the speakerphone.

<u>Command</u>	<u>Description</u>
AT+VLS=5	Enter Mute Mode . Mic is disconnected from the line, leaving the speaker only.
OK	DCE responds. The mic is no longer connected to the line, and the speakerphone is mute.

After a while, the speakerphone user decides to turn the mic back on (**mute off**). This is done when the application issues the following command.

<u>Command</u>	<u>Description</u>
AT+VLS=7	No Mute . Microphone is reattached to system along with speaker.
OK	DCE responds. Speakerphone with both mic and speaker is operational.

Conversation ends, and user hangs up.

<u>Command</u>	<u>Description</u>
ATH	Application tells the modem to terminate the call with standard AT command.
OK	DCE responds.
	Speakerphone is now on-hook. The speaker and mic have been detached from the system, and the modem is now in data mode (+FCLASS=0).

AT Voice Commands Reference (continued)

Example # 2: Initiating a stored number speakerphone call

The speakerphone application is loaded. The modem is initially idle, in data mode. The user then decides to place a speakerphone call either by entering the number without going off-hook first or selecting a number previously stored in the application. When the user tells the application to dial, the following events occur:

<u>Command</u>	<u>Description</u>
ATD5551234;	Provide a dial string appended with a semicolon (;) for the DCE to place the call and go to command mode.
OK	The DCE responds, and the number is dialed.

The call is placed through the phone network in data mode. The modem stays in command mode, and the application should wait for the OK before sending next command.

<u>Command</u>	<u>Description</u>
AT+FCLASS=8	Put the modem into voice mode.
OK	DCE responds: The modem is now in voice mode.
AT+VGT=128	Set the speaker volume to normal level.
OK	DCE responds: The volume level is set.
AT+VLS=7	Start the speakerphone by attaching the internal speaker and mic to the line; DCE off-hook.
OK	DCE responds: Speakerphone mode is active. The phone is off hook; dial tone is audible, and the speaker and mic are ready to use.

The caller can hear ringback or busy signal from the phone being called. If the person at the other end picks up, the caller and callee converse.

The conversation ends, and the speakerphone user hangs up.

<u>Command</u>	<u>Description</u>
ATH	The application tells the modem to terminate the call with a standard AT command.
OK	DCE responds: The speakerphone is now on-hook. The speaker and microphone have been detached from the system, and the modem is now in data mode (+FCLASS = 0).

AT Voice Commands Reference (continued)

Example # 3: Answering a speakerphone call

The speakerphone application is loaded. The modem is initially idle, in data mode. In this mode, the modem is always screening for incoming calls.

<u>Command</u>	<u>Description</u>
RING	DCE reports ringing from remote station. The user decides to pick-up the phone, which should initiate the following:
AT+FCLASS=8	Modem enters voice mode.
OK	DCE responds. Now in voice mode.
AT+VGT=128	Speaker volume set to normal.
OK	DCE responds. Volume level is set.
AT+VLS=7	Call is answered: Attach internal speaker and microphone to the line, DCE off-hook.
OK	DCE responds. Now in speakerphone mode, connected to the line (call is answered).

Speakerphone user picks up the phone and hears the caller from the other end. Conversation continues for awhile. When it ends, the speakerphone user hangs up.

<u>Command</u>	<u>Description</u>
ATH	DTE issues standard command to terminate call.
OK	DCE responds. Speakerphone goes on-hook. Speaker and microphone are detached from system, and modem returns to data mode (+FCLASS=0).

Note 1: When the local phone goes off-hook in the middle of a speakerphone call, the speakerphone disconnects, and the DCE returns <DLE>-H to the DTE.

Note 2: When the speakerphone is on, *call waiting* (hold operation) is initiated by:

<u>Command</u>	<u>Description</u>
ATD!	DTE sends hold command to DCE.
OK	DCE responds.

Example # 4: Receiving an incoming FAX call in speakerphone or TAD mode and switching to FAX mode

In this example, the sequence begins at the point of the user or telephone answering device (TAD) taking the speakerphone off-hook and detecting a FAX calling tone from the other end.

<u>Command</u>	<u>Description</u>
<DLE>-c	DCE detects FAX calling tone from the remote FAX and informs the application by sending DLE-c sequence.
AT+FCLASS=1	Application switches modem out of voice mode, and into FAX mode.
OK	DCE responds. Now in FAX mode, still off-hook and connected to incoming call.
ATA	Application instructs modem to answer FAX call using standard AT commands.
OK	DCE responds. The call is answered, and modem continues with procedures to establish connection and receive FAX transmission. The application software will then take care of disconnecting the call when the FAX is done, and returns to data mode (+FCLASS=0).

AT Voice Commands Reference (continued)

Example # 5: Receiving an incoming data call in speakerphone or TAD mode and switching to data mode

In this example, the sequence begins at the point of the user or telephone answering device (TAD) taking the speakerphone off-hook and detecting a data calling tone from the other end.

<u>Command</u>	<u>Description</u>
<DLE>-e	DCE detects data calling tone from the remote modem and informs the application by sending DLE-e sequence.
AT+FCLASS=0	Application switches modem out of voice mode, and into data mode.
OK	DCE responds. Now in data mode, still off-hook and connected to incoming call.
ATA	Application instructs modem to answer data call using standard AT commands.
CONNECT	DCE responds. The call is answered, and modem continues with procedures to establish connection.

Example # 6: Switching from speakerphone mode to TAD mode

In this example, the sequence begins at the point of the user in speakerphone mode and at some point in time wants to put the other end in hold. The application may switch to TAD mode in hold state and play some music wave file to the line.

<u>Command</u>	<u>Description</u>
AT+VLS=1	Applications switches modem out of speakerphone mode and into TAD mode.
OK	DCE responds. Now in TAD mode.
AT+VTX	DTE selects voice transmit mode.
CONNECT	DCE responds.
<Data>	DTE plays music through modem to remote caller.
<DLE><ETX>	DTE indicates end of voice transmit data.
OK	DCE acknowledges switch back to voice command state.

The Application may switch back to speakerphone mode by following the example to switch from TAD mode to speakerphone mode.

Example # 7: Call screening & recording a message using TAD - IS101 <dle> shielded method.

The TAD application is loaded. The modem is initially idle, in data mode (+FCLASS=0).

<u>Command</u>	<u>Description</u>
RING	DCE reports ringing from remote station.
AT+FCLASS=8	The modem enters voice mode.
OK	DCE responds.
AT+VGT=128	Set speaker volume to normal.
OK	DCE responds.
AT+VSM=132,8000	DTE selects IMA ADPCM with 8.0 kHz sampling rate.
OK	DCE responds.

AT Voice Commands Reference (continued)

AT+VSD=128,0	DTE selects normal silence detection sensitivity, and a silence detection interval of 0 seconds. Disable silence detection.
OK	DCE responds.
<DLE>-R	DCE detects another ring, and notifies DTE.
AT+VLS=1	The modem answers the call.
OK	DCE is off-hook.

The TAD next plays its greeting message, issues a beep, and records the caller's message.

<u>Command</u>	<u>Description</u>
AT+VTX	DTE selects voice transmit mode.
CONNECT	DCE responds.
<Data>	DTE plays greeting through modem to remote caller.
<DLE><ETX>	DTE indicates end of voice transmit data.
OK	DCE acknowledges switch back to voice command state.
AT+VTS=[933,0,120]	DTE annotates greeting message with a 1.2 second beep.
OK	DCE responds.
AT+VSD=128,50	DTE selects normal silence detection sensitivity and a silence detection interval of 5 seconds. Enable silence detection.
OK	DEC responds.
AT+VLS=5	The speaker is attached to the system, and the modem is off-hook.
OK	DCE is off-hook.
AT+VRX	DTE selects voice receive mode.
CONNECT	DCE agrees.
<Data>	DCE delivers <DLE> shielded voice message to DTE.

The caller leaves a message, and hangs up. The modem detects silence for a specified period of time, and then notifies the DTE that the message being recorded has ended.

<u>Command</u>	<u>Description</u>
<DLE>-s	DCE issues presumed end of message after silence detection interval has elapsed.
<DLE>-!	DTE signals end of voice receive state.
<DLE><ETX>	DCE ends voice transmission to DTR, with this code, and returns back to voice command state.
ATH	DTE issues standard command to terminate call. Speakerphone goes on-hook, speaker and microphone are detached from system, and modem returns to data mode (+FCLASS=0).
OK	DCE responds.

AT Voice Commands Reference (continued)

Example # 8: Call screening & recording a message with TAD—using the wave driver to transmit and receive voice samples

The TAD application is loaded. The modem is initially idle, in data mode (+FCLASS=0).

<u>Command</u>	<u>Description</u>
RING	DCE reports ringing from remote station.
AT+FCLASS=8	The modem enters voice mode.
OK	DCE responds.
AT+VGT=128	Set speaker volume to normal.
OK	DCE responds.
AT+VSD=128,0	DTE selects normal silence detection sensitivity, and a silence detection interval of 0 seconds. Disable silence detection.
OK	DCE responds.
AT+VSM=129,8000	DTE selects 16-bit linear voice compression with 8.0 kHz sampling rate.
OK	DCE responds.
<DLE>-R	DCE detects another ring, and notifies DTE.
AT+VLS=1	The modem answers call.
OK	DCE is off-hook

The TAD next plays its greeting message, issues a beep, and records the caller's message.

The Application may transmit voice samples using the wave driver. The application may issue WAVE_OUT_OPEN and WAVE_OUT_WRITE messages to the wave driver.

At the end of the greeting message the application may issue the WAVE_OUT_STOP message to the wave driver.

AT+VTS=[933,0,120]	DTE annotates greeting message with a 1.2 second beep.
OK	DCE responds.

The Application may receive voice samples using the wave driver. The application may issue WAVE_IN_OPEN and WAVE_IN_START messages to the wave driver.

AT+VSD=128,50	DTE selects normal silence detection sensitivity and a silence detection interval of 5 seconds. Enable silence detection.
OK	DCE responds.
AT+VLS=5	Speaker is attached to system, and modem is off-hook.
OK	DCE is off-hook

The caller leaves a message, and hangs up. The modem detects silence for a specified period of time, and then notifies the DTE.

<DLE>-s	DCE issues presumed end of message after silence detection interval has elapsed.
---------	--

At the end of the message the application may issue the WAVE_IN_STOP message to the wave driver.

ATH	DTE issues standard command to terminate call. DCE goes on-hook, speaker and microphone are detached from system, and modem returns to data mode (+FCLASS=0).
OK	DCE response.

AT DSVD Commands

In order to use the DSVD without a local phone, a ring 3 application can be used to simulate the local phone. In the absence of such an application, the voice connection needs to be auto enabled. This is accomplished by the following DSVD custom AT commands:

Command	Description
AT-SSE-OF	Simulates virtual offhook event.
AT-SSE-ON	Simulates virtual onhook event.
AT-SSE-AC	Enables auto call whereby the voice channel is established as soon as the connection is made with the DSVD modem. There is a single request for each new call. **Both sides can be programmed in this mode and the voice channel will be activated by one of the modems. The voice channel will stay enabled until the line is dropped.
AT-SSE-AA	Enables Auto Answer mode allowing the modem to always accept and answer the voice channel request.
AT-SSE-AM	Enables Auto Multiple Call mode allowing a new connection every 30 seconds with a 5 second delay between calls.
AT-SSE- A -	Cancels Auto mode
AT-SSE-&W	Writes system audio parameters into the VoiceEeprom registry.
AT-SSE-&R	Reads the current registry parameters from the VoiceEeprom registry.
AT-SSE-SN	Sets silence detection as default mode
AT-SSE-SF	Disables silence detection for the modem
AT-SSE-FN	Sets full duplex mode (with headset) as default
AT-SSE-FF	Disables full duplex mode (with speakerphone), reverting to half duplex mode as default
AT-SSE+VGT= = =? ?	Sets speakerphone gain level = ? Displays range available ? Displays current setting
AT-SSE+VGR= = =? ?	Sets microphone gain level = ? Displays range available ? Displays current setting
Standard AT Commands	
AT-SSE= = =? ?	= 0 Disables DSVD = 1 Enables DSVD =? Displays range available ? Displays current setting
ATD	Initiates transition from voice to DSVD
ATH	Hang up modem
AT+VNH= = = 2	Used in conjunction with ATH command for hook control: = 0 the DCE will hang up the line when it does not detect a carrier = 2 the DCE will remain offhook when it detects no carrier to allow the DTE to switch the DCE to another mode
AT+VIT= = x	= x to set the inactivity timer

V.25ter AT Commands

The +GMx commands are required by the Microsoft PC98 specifications.

Manufacturer Identification (+GMI?)

Read Syntax: **AT+GMI?**

Result: **Lucent Data/Fax**
Lucent Data/Fax/Voice/VoiceView (depending on product)

Version / Revision Information (+GMR?)

Read Syntax: **AT+GMR?**

Result: Lucent driver version number (e.g. **1.5.05**)

Modem Identification (+GMM?)

Read Syntax: **AT+GMM?**

Result: H.324 video-ready rev. 1.0

The chip set supports the following functionalities of the V.25ter for a H.324 call.

- * The modified function of the ATD command when issued while the analog voice connection is established. This command will not cause the DTMF dialing and tone detection associated with the usual ATD # command.
- * The following AT commands, sub-parameters and values are supported

Table 8. V.25ter AT Commands

Command	Sub-parameter	Values	Description
AT+A8E=<v8o>,<v8a>,<v8cf>	v8o	1 The default value disables the CI option while in V.8 origination negotiation. However, the modem, when initiating the call as a data call, detects ANSam and is capable of starting in V.34 mode). 6 Enables DCE control of V.8 and CI option.	Defined for two conditions: as a parameter to configure V.8originating and answering operation while the DCE is on-hook. It initiates an action if the DCE is off-hook. If enabled, V.8 negotiation does not preclude simultaneous implementation of other negotiation means like V.8bis, V.18, V.32bis.
	v8a	1 The default value disables the CI option while in V.8 negotiation. However, the modem, when answering a call, sends the ANSam and is capable of starting in V.34 mode) 5 Enables DCE control of V.8 and CI option.	
	v8cf	21h Call function for H.324 calls c1h Call function for DSVD calls	
AT+A8E?			Report current values of sub-parameters
AT+A8E=?			Report supported ranges of values

V.25ter AT Commands (continued)

+A8I:<v8cf><CR>			<v8o>, <v8a>, and <v8cf> This indication is used by an answering DCE, if +A8E,<v8a> !=0, to indicate detection of a V.8 CI signal, and report the recovered Call Function octet(s). Value <v8cf> is a hexadecimal code octet that can take values as shown above in +A8E command.
+A8M=<hexadecimal coded CM or JM octet string>	Coded CM or JM octet	Refer to V.8 document for coding.	Directs the DCE to send a V.8 CM or JM signal using the specified hexadecimal coded string.
+A8A:<type><CR>	<type>	1 Indicates V.8 ANSam signal flags 0 Indicated no ANSam signal detected	This indication is used by a calling DCE, if +A8E <v8o> #0, to indicate detection of an answering signal.

V.80 AT Commands

The chip set supports the Synchronous Access Mode and most of the commands specified in V.80 standards. The commands are either AT commands issued in the command mode, or in-band commands transmitted in the data stream. These in-band commands are delimited by the hexadecimal characters EM (or numerically, 19h.)

A) Synchronous Access Mode AT commands

Table 9. V.80 AT Commands

Command	Sub-parameters	Values	Description
+ES=[<orig_rqst>[,<ans_fbk>]]	Orig_rqst ans_fbk	6 Initiate Synchronous Access Mode when the data state is entered. 8 Initiate Synchronous Access Mode when connection is completed and Data State is entered.	Control the manner of operation of the V.42 protocol in the DCE
+ES?			Read Syntax command to query the current values of the +ES sub-parameters. The DCE shall transmit a string of information text to the DTE consisting of +ES:<orig_rqst>, ,<ans_fbk>.
+ES=?			Test Syntax command to obtain all defined values of the +ES sub-parameters. The DCE shall transmit a string of information text to the DTE consisting of +ES:(list of supported <orig_rqst> values), ,(list of supported <ans_fbk> values).

V.80 AT Commands (continued)

Table 10. V.80 AT Commands (continued)

Command	Sub-parameters	Values	Description
+ESA=[<trans_idle>[,<framed_idle>[,<crc_type>[,<nrzi_en>]]]]	trans_idle	0 In transparent sub-mode, DCE transmits marks (ones) on idle.	
	framed_idle	0 In Framed sub-mode, DCE transmits HDLC flags on idle. 1 In Framed sub-mode, DCE transmits marks (ones) on idle.	
	crc_type	0 Disable CRC generation and checking 1 In Framed sub-mode, the 16 bit CRC specified in V.42 is generated by the DCE in the transmit direction and checked by the DCE in the receive direction.	
	nrzi_en	0 Disable NZRI encoding and decoding.	
+ESA?			Read Syntax command to query the current values of the +ESA sub-parameters
+ESA=?			Test Syntax command to obtain all supported values of the +ESA sub-parameters
+ITF= [<off>[, <on>]]	<off>	Determines the threshold, in octets, above which the DCE shall generate a flow off signal.	Transmit Flow Control Thresholds. This command allows the DTE to determine the input buffer size in the DCE for data on circuit 103 from the DTE, to control the thresholds used for flow control of such data.
	<on>	Determines the threshold, in octets, below which the DCE shall generate a flow on signal.	
+ITF=?			The DCE shall transmit a string of information to the DTE consisting of : ITF: (list of supported <off> values), (list of supported <on> values).

AT Commands for Homologation Testing and Debugging

This section lists the homologation testing and debugging commands and homologation parameter values for different countries.

Table 11. The Homologation Testing and Debugging Commands

Name	Description	Value	Comments
%Txx	Test Commands	—	AT%T<val>.
		01	Data voice relay on
		02	Data voice relay off
		03	Caller-ID relay on
		04	Caller-ID relay off
		05	Audio codec on
		06	Audio codec off
		07	Shunt relay on
		08	Shunt relay off
		09	ac off-hook relay on
		10	ac off-hook relay off
		11	Loop limit on
		12	Loop limit off
		13	Loop VI on
		14	Loop VI off
		15	Ring impedance on
		16	Ring impedance off
		18	—
	Write to EEPROM	19	AT%T19, <loc>, <val> (<loc> and <val> are in hex)
	Read from EEPROM	20	AT%T20, <loc> (<loc> is in hex).
	Modify homologation parameter	21	AT%T21, <param#>, <param_value> (<param#> and <param_value> are in hex as defined in the parameters table).
	Read homologation parameter	22	AT%T22, <param#> (<param#> is in hex as defined in the parameters table).
	Generate DTMF 0 - 9	23—32	—
	Generate DTMF *	33	—
	Generate DTMF #	34	—
	Generate DTMF A - D	35—38	—
	V.25 answer tone (2100Hz)	39	—
	V.25 data calling tone (1300Hz)	40	—
	FAX calling tone (1100Hz)	41	—
	1800Hz guard tone	42	—
	V.21 channel 1 mark symbol originate	90	Set S37 = 3, ATB0
	V.21 channel 1 mark symbol answer	91	Set S37 = 3, ATB0
	V.21 channel 1 space symbol originate	92	Set S37 = 3, ATB0
	V.21 channel 1 space symbol answer	93	Set S37 = 3, ATB0
	V.23 originate channel mark symbol	90	Set S37 = 2
	V.23 answer channel mark symbol	91	Set S37 = 2
	V.23 originate channel space symbol	92	Set S37 = 2
	V.23 answer channel space symbol	93	Set S37 = 2

AT Commands for Homologation Testing and Debugging (continued)

Table 11. The Homologation Testing and Debugging Commands (continued)

Name	Description	Value	Comments
%Txx	V.22 1200 originate signaling	90	Set S37 = 5
	V.22 1200 answer signaling	91	Set S37 = 5
	V.22bis/V.34 2400 originate signaling*	90	Set S37 = 6
	V.22bis/V.34 2400 answer signaling*	91	Set S37 = 6
	V.32/V.34 4800 originate signaling*	90	Set S37 = 7
	V.32/V.34 4800 answer signaling*	91	Set S37 = 7
	V.32/V.34 7200 originate signaling*	90	Set S37 = 8
	V.32/V.34 7200 answer signaling*	91	Set S37 = 8
	V.32bis/V.34 9600 originate signaling*	90	Set S37 = 9
	V.32bis/V.34 9600 answer signaling*	91	Set S37 = 9
	V.32bis/V.34 12000 originate signaling*	90	Set S37 = 10
	V.32bis/V.34 12000 answer signaling*	91	Set S37 = 10
	V.32bis/V.34 14400 originate signaling*	90	Set S37 = 11
	V.32bis/V.34 14400 answer signaling*	91	Set S37 = 11
	V.32ter/V.34 16800 originate signaling*	90	Set S37 = 12
	V.32ter/V.34 16800 answer signaling*	91	Set S37 = 12
	V.32ter/V.34 19200 originate signaling*	90	Set S37 = 13
	V.32ter/V.34 19200 answer signaling*	91	Set S37 = 13
	V.21 Channel 2 mark symbol	91	Set S37 = 3
	V.21 Channel 2 space symbol	93	Set S37 = 3
	V.27 2400 signaling	76	—
	V.27 4800 signaling	77	—
	V.29 7200 signaling	78	—
	V.29 9600 signaling	79	—
	V.17 12000 signaling	80	—
	V.17 14400 signaling	81	—
	Off-Hook	82	This puts the modem in off-hook state.
	V.34 21600 originate signaling	90	Set S37 = 14
	V.34 21600 answer signaling	91	Set S37 = 14
	V.34 24000 originate signaling	90	Set S37 = 15
	V.34 24000 answer signaling	91	Set S37 = 15
	V.34 26400 originate signaling	90	Set S37 = 16
	V.34 26400 answer signaling	91	Set S37 = 16
V.34 28800 originate signaling	90	Set S37 = 17	
V.34 28800 answer signaling	91	Set S37 = 17	
V.34bis 31200 originate signaling	90	Set S37 = 18	
V.34bis 31200 answer signaling	91	Set S37 = 18	
V.34bis 33600 originate signaling	90	Set S37 = 19	
V.34bis 33600 answer signaling	91	Set S37 = 19	

- The default is V.34 with register S28 = 1. To disable, set S28 = 0.

The following example shows how to use the V.22bis 2400 originate signaling homologation test command:

```
S28 = 0
S37 = 6
AT%T90
```

AT Commands for Homologation Testing and Debugging (continued)

Configuring for Different Countries

To configure for a specific country, execute the following AT commands:

AT%T19,0,country_code in HEX (refer to Table 2)

Verify with the AT19 command (which displays the country name) that the right country has been configured.

Table 12. The Country Codes

Country	Country_Code in HEX
USA	19
Australia	1
Belgium	2
Denmark	3
Finland	4
France	5
Germany	6
The Netherlands	7
Italy	8
New Zealand	9
Norway	A
Spain	B
Sweden	C
Switzerland	D
United Kingdom	E
Austria	F
Japan	10
People's Republic of China	11
Korea	12
Malaysia	13
Singapore	14
Taiwan	15
Thailand	16
Indonesia	17
Portugal	18
Ireland	1A
Hong Kong	1B
Canada	1C
Mexico	1D
India	1E
Vietnam	1F
Philippines	20
Greece	21
Hungary	22
Turkey	23
South Africa	24

AT Commands for Homologation Testing and Debugging (continued)

Modifying Homologation Parameters

Once the modem is configured for a country, the homologation parameters shown in Table 3 can be temporarily altered for that country with the following AT command

AT%T21,*par#*,*param_value*

where *par#* and *param_value* should be entered in HEX. For example, **AT%T21,7,28** sets the call progress threshold to -40 dB. **AT%T22,*par#*** displays the current value of the parameter in HEX. The *par#* parameter descriptions are shown in Table 3. The country specific default values (*param_value*) are shown in Table 4.

Note: If a parameter is changed with the AT%T21 command, the ATZ and AT&F commands do not reset the homologation parameters to the default values (i.e., the changes made are not reset until the power is turned off).

AT Commands for Homologation Testing and Debugging (continued)

Homologation Parameters

Table 13. The Homologation Parameters

Par #	Parameter Description	Range	Reference
1	Pulse dial make time	0—255	ATD
2	Pulse dial break time	0—255	ATD
3	Pulse dial digit pattern	1 = normal, 2 = Sweden, 3 = Norway	ATD
4	DTMF high tone level in dB with implied minus sign	0—255	ATD
5	Min. DTMF dial speed in ms	0—255	S11
6	Max. DTMF dial speed in ms	0—255	S11
7	Call progress detection threshold in dB with implied minus sign	0—255	
8	Dial tone delay, i.e., waiting time before dial tone detection begins in multiples of 10 ms	0—255	
9	Dial tone hole time in ms	0—255	
a	Delay before resetting ring count to 0, in multiples of 100 ms	0—255	
b	Min. ring count for auto-answer	0—255	S0
c	Max. ring count for auto-answer	0—255	S0
d	Min. ring signal period = $1000/(0.833 \times \text{Max. ring frequency})$	0—255	
e	Max. ring signal period = $1000/(0.833 \times \text{Min. ring frequency})$	0—255	
f	Min. ring cadence on time, in multiples of 10 ms	0—255	
10	Min ring cadence off time, in multiple of 20 ms	0—255	
11	Min. busy cadence on time, in multiples of 10 ms	0—255; If 0, use the standard busy detection algorithm; otherwise, use the country specific values for cadence	
12	Max. busy cadence on time, in multiples of 10 ms	0—255; If 0, use the standard busy detection algorithm; otherwise, use the country specific values for cadence	
13	Number of busy cycles required to detect busy condition	0—255	
14	Min. busy cadence off time, in multiples of 10 ms	0—255; If 0, use the standard busy detection algorithm; otherwise, use the country specific values for cadence	
15	Max. busy cadence off time, in multiples of 10 ms	0—255; If 0, use the standard busy detection algorithm; otherwise, use the country specific values for cadence	
16	Continuous # unavailable detection flag	0 = disabled, 1 = enabled	
17	Answer tone validation time in multiples of 10 ms	0—255	
18	Blacklisting/delayed flag	0 = disabled, 1 = enabled	ATD

AT Commands for Homologation Testing and Debugging (continued)

Table 13. The Homologation Parameters (continued)

Par #	Parameter Description	Range	Reference
19	Number of failed attempts allowed before blacklisting	0—255	ATD
1a	Troubled call delay in minutes	0—255	ATD
1b	Ineffective call delay in minutes	0—255	ATD
1c	Erroneous call delay in minutes	0—255	ATD
1d	Blacklisting duration in multiple of 10 minutes	0—255; 0 = only delayed and no blacklisting 255 = no limit (i.e., till power turned off)	ATD
1e	Over-current sense validation time in multiples of 10 ms	0—255, 0 = current sense disabled.	ATA, ATD
1f	Calling tone flag	0 = disabled 1 = enabled, and disable with ^ dial modifier permitted 2 = enabled, and disable with ^ dial modifier not permitted	ATD , S35
20	Blind dial flag	0 = not permitted 1 = permitted 2 = permitted with speaker on	ATD , ATX
21	Busy detect disable (with ATX) flag	0 = not permitted 1 = permitted	ATD , ATX
22	Guard tone type	0 = not present & adjustable 1 = 550 Hz, 2 = 1800 Hz	S37
23	Bell modes permitted flag	0 = not permitted 1 = permitted	ATB
24	Off-hook (ATH1) restrictions	0 = no restrictions 1 = restricted by S7 duration 2 = not allowed	ATH1
25	Shunt relay on time during off-hook in multiples of 10 ms.	0—255 0 = shunt relay disabled	ATD
26	Hook flash time in multiples of 10 ms	0—255 0 = hook flash not allowed	ATD
27	Min. blind dial pause in seconds	0—65	S6
28	Max. blind dial pause in seconds	0—65	S6
29	Min. no answer time-out in seconds	0—65	S7
2a	Max. no answer time-out in seconds	0—65	S7
2b	Min. dial pause time in seconds	0—65	S8
2c	Max. dial pause time in seconds	0—65	S8
2d	Min. no carrier disconnect time in multiples of 100 ms	1—65	S10
2e	Max. no carrier disconnect time in multiples of 100 ms	1—255	S10
2f	Transmit level in dB with implied minus sign	0—255	ATD
30	Dial modifier validation	0 = if an invalid dial modifier is found, treat the entire dial string as null (no digits dialed) 1 = ignore invalid dial modifiers	—

AT Commands for Homologation Testing and Debugging (continued)

Table 13. The Homologation Parameters (continued)

Par #	Parameter Description	Range	Reference
31	TAD receive gain	0—255	—
32	Half/full wave ring detection	0 = halfwave, 1 = fullwave	—
33	Number of failed attempts allowed in first stage delayed dialing	0—255	ATD
34	Number of all failed attempts (to any number) allowed before any further dial attempts are blocked	0—255 255 = not applicable	ATD
35	Erroneous call increment count	0—255	ATD
36	Dial tone validation time in multiples of 100 ms	0—255	ATD
37	Busy tone detection during dial tone detection flag	0 = not required, 1 = required	ATD
38	DTMF high and low tone level difference in dB	0—255	—
39	Local phone detection in speakerphone	0 = enabled; 1 = disabled	—
3a	Pulse dialing flag	0 = enabled; 1 = disabled	ATD
3b	Dial tone/call progress filter index	0 = 340—560 Hz 1 = 310—485 Hz 2 = 363—502 Hz 3 = 276—504 Hz 4 = 415—460 Hz 5 = 310—640 Hz	—
3c	Dial tone detection threshold in dB	0—255	—
3d	ABCD dialing permitted flag	0 = permitted, 1 = not permitted	ATD
3e	Comma pause duration limit in seconds. (If there are multiple commas between digits, the total pause duration is limited to the duration set by this parameter).	0—255	ATD
3f	TAD transmit level in dB	0—255	—
40	Data/FAX carrier receive threshold in dB. There is a 6 dB offset in DSP. This parameter value should set to: (required threshold [6 dB] DAA gain)	0—255	—
41	No dialtone time-out duration while detecting dialtone with W dial modifier, in seconds	0—255	ATD
42	FAX/Data answer tone detection threshold in dB	0—255	—
43	Dialtone level (absolute value)	0—255	—
44	FAX receive threshold in dB	0—255	—
45	Pulse and tone dial in same dial string permitted flag	0 = permitted, 1 = not permitted	ATD
46	Ringer impedance relay flag	0 = off, 1 = on	
47	DC loop V/I characteristics relay flag	0 = off, 1 = on	
48	DC loop limiting relay flag	0 = off, 1 = on	
49	Real/complex impedance	0x0X = real, Tx & Rx gains set by mercury internal components. X = Don't care 0x10 = real, Tx gain set by mercury internal components & Rx gain set by external components. 0x12 = complex, Tx gain set by mercury internal components & Rx gain set by external components. Mercury internal switch used to select complex impedance.	
4a	Mercury register CIOCA MSB value—receive gain	This parameter is relevant only when a Mercury line codec is used.	—

AT Commands for Homologation Testing and Debugging (continued)

Par #	Parameter Description	Range	Reference
4b	Mercury register CIOCA LSB value—hybrid, impedance, etc.	This parameter is relevant only when a Mercury line codec is used.	—
4c	Mercury register CIOCB MSB value—transmit gain	This parameter is relevant only when a Mercury line codec is used.	—
4d	Mercury register CIOCB LSB value—BOM control	This parameter is relevant only when a Mercury line codec is used.	—
4e	TAD Mercury register CIOCB MSB value—transmit gain in TAD mode	This parameter is relevant only when a Mercury line codec is used.	
4f	FDSP Mercury register CIOCB MSB value—transmit gain in speakerphone mode	This parameter is relevant only when a Mercury line codec is used.	

AT Commands for Homologation Testing and Debugging (continued)

Country Specific Homologation Parameters

Country specific values for the homologation parameters are shown in Table 14.

Note: The values listed in Table 14 are typical values and change based on OEM preferences.

Table 14. The Country Specific Homologation Parameters

Par. #	NA	Australia	Belgium	Denmark	Finland	France	Germany
1	36	33	33	36	40	34	41
2	64	64	67	64	60	67	60
3	1	1	1	1	1	1	1
4	6	8	6	4	8	6	13
5	50	80	90	90	90	90	90
6	150	150	90	90	90	90	90
7	43	43	37	39	43	38	43
8	0	0	0	0	0	5	0
9	255	100	30	50	28	40	50
a	60	80	80	100	100	70	60
b	1	2	2	2	1	2	1
c	255	6	5	4	4	3	6
d	18	21	18	18	18	15	20
e	80	92	80	80	80	66	63
f	15	15	15	15	15	24	15
10	30	30	30	30	30	30	30
11	18	0	40	0	10	40	9
12	60	0	60	0	66	63	55
13	4	4	4	4	4	2	4
14	18	0	40	0	10	37	20
15	60	0	60	0	65	63	60
16	0	1	0	1	0	0	0
17	10	80	15	32	20	45	20
18	0	1	1	1	1	1	1
19	5	10	4	10	4	6	12
1a	1	1	1	1	1	1	1
1b	1	1	1	1	1	1	1
1c	1	120	1	1	60	1	1
1d	12	12	6	255	6	255	6
1e	0	0	0	0	0	0	0
1f	1	1	1	2	2	1	1
20	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1
22	0	0	0	0	0	2	0
23	1	1	1	1	1	0	1

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	NA	Australia	Belgium	Denmark	Finland	France	Germany
24	0	0	0	0	0	0	0
25	5	30	5	5	5	5	5
26	50	50	12	9	9	27	18
27	2	2	4	4	4	2	4
28	65	5	4	4	4	2	4
29	1	30	30	30	30	30	30
2a	255	60	60	60	60	60	60
2b	2	2	4	2	4	2	4
2c	65	5	8	20	8	2	6
2d	1	1	1	1	1	1	1
2e	255	255	255	255	255	255	255
2f	10	9	9	9	9	9	14
30	0	0	1	1	1	1	1
31	3	3	3	3	3	3	3
32	0	0	0	0	0	0	0
33	1	1	1	1	1	0	2
34	255	255	255	255	255	255	12
35	1	1	1	1	1	1	1
36	25	25	8	25	25	16	19
37	1	0	0	0	0	0	0
38	2	2	2	2	2	2	3
39	0	0	0	0	0	0	0
3a	0	0	0	1	0	0	0
3b	5	1	4	0	1	1	5
3c	43	43	24	38	39	36	43
3d	0	0	0	0	0	0	0
3e	255	30	30	30	30	30	30
3f	10	10	6	10	10	10	12
40	37	37	37	37	37	32	37
41	50	50	50	50	50	10	50
42	43	43	43	43	43	36	43
43	0	0	0	0	0	0	0
44	43	43	43	43	43	43	43
45	0	0	0	0	0	0	1
46	0	1	1	0	0	1	1
47	0	1	0	0	0	0	1
48	0	0	0	0	0	1	0
49	0x00	0x12	0x10	0x10	0x10	0x10	0x12
4a	0x88	0x00	0x00	0x00	0x00	0x00	0x00
4b	0x80	0x06	0x0c	0x0c	0x0c	0x0c	0x06
4c	0x6b	0x6b	0x6b	0xaa	0x6b	0x6b	0x6b

AT Commands for Homologation Testing and Debugging (continued)

Par. #	NA	Australia	Belgium	Denmark	Finland	France	Germany
4d	0x1e	0x17	0x1e	0x1e	0x1e	0x1e	0x17
4e	0x13	0x13	0x13	0x13	0x13	0x13	0x13
4f	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	Netherlands	Italy	New Zeal.	Norway	Spain	Sweden	Switzerland
1	40	41	33	36	33	40	40
2	60	65	67	64	67	60	60
3	1	1	3	1	1	2	1
4	8	6	8	8	6	8	3
5	90	90	90	90	90	90	90
6	90	90	90	90	90	90	90
7	30	50	43	40	43	50	37
8	0	0	0	0	0	0	0
9	30	10	30	50	120	50	30
a	80	80	80	100	80	100	80
b	2	1	3	1	1	2	2
c	4	4	4	4	4	2	9
d	44	18	18	18	18	23	18
e	80	80	80	80	80	60	60
f	15	15	15	15	75	15	15
10	30	30	30	30	30	30	30
11	15	0	0	10	0	20	8
12	65	0	0	66	0	30	80
13	4	2	4	2	4	4	2
14	11	0	0	10	0	20	8
15	65	0	0	65	0	85	80
16	0	0	1	1	0	0	0
17	20	20	80	32	20	12	12
18	1	1	0	1	0	1	1
19	5	4	5	10	4	10	5
1a	1	1	1	1	1	1	1
1b	1	1	1	1	1	1	1
1c	1	1	1	1	1	1	1
1d	6	6	12	3	6	6	6
1e	0	0	0	0	0	0	0
1f	2	1	1	2	2	2	1
20	1	1	1	1	1	1	1
21	1	0	1	1	1	1	1
22	2	2	0	2	2	2	2
23	1	1	1	1	1	1	1

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	Netherlands	Italy	New Zeal.	Norway	Spain	Sweden	Switzerland
24	0	2	0	0	0	0	0
25	27	5	5	5	5	5	5
26	10	9	50	10	10	10	10
27	5	4	4	4	4	4	4
28	5	10	4	4	4	4	4
29	30	30	30	30	30	30	30
2a	60	60	60	60	60	60	60
2b	2	2	4	4	5	4	4
2c	2	65	8	8	5	8	8
2d	1	1	1	1	1	1	1
2e	255	255	255	255	255	255	255
2f	9	9	9	9	9	9	9
30	1	1	0	1	1	1	1
31	3	3	3	3	3	3	3
32	0	0	0	0	0	0	0
33	1	1	1	1	1	0	1
34	15	255	255	255	255	10	24
35	1	1	1	1	1	1	6
36	15	15	25	7	12	4	10
37	0	0	0	0	0	0	1
38	2	2	2	2	2	3	2
39	0	0	0	0	0	1	0
3a	0	0	0	1	0	1	0
3b	5	4	1	0	5	3	0
3c	27	40	43	39	41	36	39
3d	0	0	0	0	0	0	0
3e	30	30	30	30	30	30	30
3f	10	10	10	10	10	14	7
40	37	36	37	37	37	37	37
41	50	50	50	50	11	50	50
42	46	43	43	43	43	43	43
43	9	0	0	0	0	0	0
44	43	43	43	43	43	43	43
45	1	0	0	0	0	0	0
46	0	1	1	0	1	1	1
47	0	0	1	0	0	1	1
48	0	0	0	0	0	0	0
49	0x10	0x10	0x10	0x10	0x10	0x10	0x12

AT Commands for Homologation Testing and Debugging (continued)

Par. #	Netherlands	Italy	New Zeal.	Norway	Spain	Sweden	Switzerland
4a	0x00	0x00	0x00	0x00	0x00	0x00	0x00
4b	0x0c	0x0c	0x0c	0x0c	0x0c	0x0c	0x06
4c	0x6b	0x6b	0x6b	0x6b	0x6b	0x6b	0x6b
4d	0x1e	0x1e	0x16	0x1e	0x1e	0x16	0x17
4e	0x13	0x13	0x13	0x13	0x13	0x13	0x13
4f	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	UK	Austria	Japan	China	Korea	Malaysia	Singapore
1	34	40	34	36	32	34	32
2	68	60	66	64	64	66	64
3	1	1	1	1	1	1	1
4	6	6	7	6	6	7	7
5	90	90	50	50	50	70	70
6	90	90	150	150	150	150	150
7	43	45	43	43	43	43	43
8	0	0	0	0	0	0	0
9	50	100	250	50	50	30	30
a	60	80	80	60	60	80	80
b	1	1	1	1	1	1	1
c	4	4	15	15	15	15	15
d	18	18	18	18	18	18	18
e	80	80	80	80	80	80	80
f	15	15	15	15	15	15	15
10	30	30	30	30	30	30	30
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	4	2	4	4	4	4	4
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	1	0	0	0	0	1	1
17	80	20	50	80	80	80	80
18	1	0	1	0	0	1	1
19	5	6	5	5	5	10	10
1a	1	1	1	1	1	1	1
1b	1	1	1	1	1	1	1
1c	1	1	1	1	1	1	1
1d	12	12	0	12	12	0	0
1e	0	0	0	0	0	0	0
1f	1	2	1	1	1	0	0
20	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1
22	2	0	0	0	0	0	0
23	1	1	1	1	1	1	1
24	0	0	0	0	0	0	0
25	0	5	5	5	5	5	5

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	UK	Austria	Japan	China	Korea	Malaysia	Singapore
26	7	9	50	50	50	9	9
27	4	4	4	2	4	3	3
28	4	4	255	65	65	20	20
29	30	30	35	35	35	5	5
2a	60	60	59	65	48	35	35
2b	4	4	2	2	2	2	2
2c	8	6	65	65	65	65	65
2d	1	1	1	1	1	1	1
2e	255	255	255	255	255	255	255
2f	9	9	14	10	11	11	11
30	0	1	0	0	0	0	0
31	3	3	3	3	3	3	3
32	0	0	0	0	0	0	0
33	1	1	0	1	1	0	0
34	255	6	255	255	255	255	255
35	1	1	1	1	1	1	1
36	25	8	25	25	25	25	25
37	0	0	0	0	0	0	0
38	3	2	2	2	2	2	2
39	0	0	0	0	0	0	0
3a	0	0	0	0	0	0	0
3b	3	6	1	1	1	1	1
3c	43	45	43	43	43	43	43
3d	0	0	0	0	0	0	0
3e	30	30	30	30	30	30	30
3f	10	10	13	10	10	10	10
40	37	37	37	37	37	37	37
41	50	50	50	50	48	35	35
42	43	43	43	43	43	43	43
43	0	0	0	0	0	0	0
44	43	43	43	43	43	43	43
45	0	0	0	0	0	0	0
46	1	1	1	1	1	1	1
47	1	0	0	0	0	0	0
48	0	0	0	0	0	0	0
49	0x12	0x10	0x00	0x10	0x10	0x10	0x10
4a	0x00	0x00	0x88	0x00	0x00	0x00	0x00
4b	0x06	0x0c	0x80	0x0c	0x0c	0x0c	0x0c

AT Commands for Homologation Testing and Debugging (continued)

Par. #	UK	Austria	Japan	China	Korea	Malaysia	Singapore
4c	0x6b	0x6b	0x6b	0x6b	0x6b	0x6b	0x6b
4d	0x17	0x1e	0x1e	0x1e	0x1e	0x1e	0x1e
4e	0x13	0x13	0x13	0x13	0x13	0x13	0x13
4f	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	Taiwan	Thailand	Indonesia	Ireland	Portugal	Hong Kong
1	36	40	36	34	33	36
2	64	60	64	67	67	64
3	1	1	1	1	1	1
4	6	6	6	6	6	6
5	50	50	50	90	90	50
6	150	150	150	90	90	150
7	43	35	43	43	43	43
8	0	0	0	0	0	0
9	50	30	50	50	250	50
a	60	80	60	60	60	60
b	1	1	1	1	1	1
c	15	15	15	4	4	15
d	18	18	18	18	18	18
e	80	80	80	80	86	80
f	15	15	15	15	24	15
10	30	30	30	30	30	30
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	4	4	4	4	4	4
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	1	0	0
17	80	5	80	9	30	80
18	0	0	0	1	0	0
19	5	5	5	4	5	5
1a	1	1	1	1	1	1
1b	1	1	1	1	1	1
1c	1	1	1	1	1	1
1d	12	12	12	6	6	12
1e	0	0	0	0	0	0
1f	1	0	1	1	1	1
20	1	1	1	1	1	1
21	1	1	1	1	1	1
22	0	0	0	2	0	0

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	Taiwan	Thailand	Indonesia	Ireland	Portugal	Hong Kong
23	1	1	1	1	1	1
24	0	0	0	0	0	0
25	5	5	5	0	5	5
26	50	9	50	7	20	50
27	3	2	2	4	4	2
28	65	10	65	4	4	65
29	35	35	35	10	30	35
2a	65	65	65	39	60	65
2b	2	2	2	4	2	2
2c	65	10	65	8	5	65
2d	1	1	1	1	1	1
2e	255	255	255	255	255	255
2f	10	10	10	9	9	10
30	0	0	0	0	1	0
31	3	3	3	3	3	3
32	0	0	0	0	0	0
33	1	1	1	1	0	1
34	255	255	255	255	255	255
35	1	1	1	1	1	1
36	25	25	25	25	25	25
37	0	0	0	0	0	0
38	2	2	2	3	2	2
39	0	0	0	0	0	0
3a	0	0	0	0	0	0
3b	1	1	1	2	3	1
3c	43	35	43	43	35	43
3d	0	0	0	0	1	0
3e	30	30	30	30	30	30
3f	10	10	10	10	10	10
40	37	37	37	33	37	37
41	50	50	50	39	50	50
42	43	43	43	43	43	43
43	0	0	0	0	0	0
44	43	43	43	43	43	43
45	0	0	0	0	0	0
46	1	1	1	1	1	1
47	0	0	0	1	0	0
48	0	0	0	0	0	0

AT Commands for Homologation Testing and Debugging (continued)

Par. #	Taiwan	Thailand	Indonesia	Ireland	Portugal	Hong Kong
4g	0x10	0x10	0x10	0x12	0x10	0x10
4a	0x00	0x00	0x00	0x00	0x00	0x00
4b	0x0c	0x0c	0x0c	0x06	0x0c	0x0c
4c	0x6b	0x6b	0x6b	0x6b	0x6b	0x6b
4d	0x1e	0x1e	0x1e	0x17	0x1e	0x1e
4e	0x13	0x13	0x13	0x13	0x13	0x13
4f	0xcd	0xcd	0xcd	0xcd	0xcd	0xcd

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	Canada	Mexico	India	Vietnam	Philippines
1	36	36	36	36	36
2	64	64	64	64	64
3	1	1	1	1	1
4	6	6	6	6	6
5	50	50	50	50	50
6	150	150	150	150	150
7	43	43	43	43	43
8	0	0	0	0	0
9	255	50	50	50	50
a	60	60	60	60	60
b	1	1	1	1	1
c	255	15	15	15	15
d	18	18	18	18	18
e	80	80	80	80	80
f	15	15	15	15	15
10	30	30	30	30	30
11	18	0	0	0	0
12	60	0	0	0	0
13	4	4	4	4	4
14	18	0	0	0	0
15	60	0	0	0	0
16	0	0	0	0	0
17	10	80	80	80	80
18	0	0	0	0	0
19	5	5	5	5	5
1a	1	1	1	1	1
1b	1	1	1	1	1
1c	1	1	1	1	1
1d	12	12	12	12	12
1e	0	0	0	0	0
1f	1	1	1	1	1
20	1	1	1	1	1
21	1	1	1	1	1
22	0	0	0	0	0

AT Commands for Homologation Testing and Debugging (continued)

Table 15. The Country Specific Homologation Parameters (continued)

Par. #	Canada	Mexico	India	Vietnam	Philippines
23	1	1	1	1	1
24	0	0	0	0	0
25	5	5	5	5	5
26	50	50	50	50	50
27	2	2	2	2	2
28	65	65	65	65	65
29	1	35	35	35	35
2a	255	65	65	65	65
2b	2	2	2	2	2
2c	65	65	65	65	65
2d	1	1	1	1	1
2e	255	255	255	255	255
2f	10	10	10	10	10
30	0	0	0	0	0
31	3	3	3	3	3
32	0	0	0	0	0
33	1	1	1	1	1
34	255	255	255	255	255
35	1	1	1	1	1
36	25	25	25	25	25
37	1	0	0	0	0
38	2	2	2	2	2
39	0	0	0	0	0
3a	0	0	0	0	0
3b	5	1	1	1	1
3c	43	43	43	43	43
3d	0	0	0	0	0
3e	255	30	30	30	30
3f	10	10	10	10	10
40	37	37	37	37	37
41	50	50	50	50	50
42	43	43	43	43	43
43	0	0	0	0	0
44	43	43	43	43	43
45	0	0	0	0	0
46	0	1	1	1	1
47	0	0	0	0	0
48	0	0	0	0	0

AT Commands for Homologation Testing and Debugging (continued)

Par. #	Canada	Mexico	India	Vietnam	Philippines
4g	0	0x10	0x10	0x10	0x10
4a	0x88	0x00	0x00	0x00	0x00
4b	0x80	0x0c	0x0c	0x0c	0x0c
4c	0x6b	0x6b	0x6b	0x6b	0x6b
4d	0x1e	0x1e	0x1e	0x1e	0x1e
4e	0x13	0x13	0x13	0x13	0x13
4f	0xcd	0xcd	0xcd	0xcd	0xcd

AT Commands for Homologation Testing and Debugging (continued)

Country Specific S Register Defaults

Note: The values listed in Table 15 are typical values and change based on OEM preferences.

Table 156. Country Specific Defaults for S Registers

S Reg.	Australia	Belgium	Denmark	Finland	France	Germany
s0	000	000	000	000	000	000
s6	004	004	004	004	002	004
s7	050	050	050	050	140	050
s8	002	004	002	004	002	004
s10	020	020	020	002	002	020
s11	095	090*	090*	090*	090*	090*
s30	000	000	000	000	000	000
s35	001	001	001*	001*	001	001

* Changing this value with the ATS command is not permitted.

Table 16. Country Specific Defaults for S Registers (continued)

S Reg.	Netherlands	Italy	New Zeal.	Norway	Spain	Sweden
s0	000	000	000	000	000	000
s6	005	004	004	004	004	004
s7	050	050	050	050	050	050
s8	002	002	004	004	005	004
s10	020	020	015	009	020	020
s11	090*	090*	090	090*	090*	090*
s30	000	000	000	000	000	000
s35	001*	001	001	001*	001*	001*

* Changing this value with the ATS command is not permitted.

Table 16. Country Specific Defaults for S Registers (continued)

S Reg.	Switzerland	UK	Austria	Japan	China	Korea
s0	000	000	000	000	000	000
s6	004	004	004	004	002	004
s7	050	050	050	050	050	045
s8	004	004	004	002	002	002
s10	020	020	020	020	020	020
s11	090*	090	090*	095	095	095
s30	000	000	000	000	000	000
s35	001	001	001*	000	001	001

* Changing this value with the ATS command is not permitted.

AT Commands for Homologation Testing and Debugging (continued)

Table 16. Country Specific Defaults for S Registers (continued)

S Reg.	Malaysia	Singapore	Taiwan	Thailand	Indonesia	Portugal
s0	000	000	000	000	000	000
s6	003	003	003	002	002	004
s7	035	035	050	050	050	050
s8	002	002	002	002	002	002
s10	020	020	020	020	020	002
s11	095	095	095	095	095	090*
s30	000	000	000	000	000	004
s35	000	000	001	000	001	001

* Changing this value with the ATS command is not permitted.

Table 16. Country Specific Defaults for S Registers (continued)

S Reg.	NA	Ireland	Hong Kong	Mexico	India	Vietnam	Philippines
s0	000	000	000	000	000	000	000
s6	002	004	002	002	002	002	002
s7	050	039	050	050	050	050	050
s8	002	004	002	002	002	002	002
s10	020	020	020	020	020	020	020
s11	095	090	095	095	095	095	095
s30	000	000	000	000	000	000	000
s35	000	001	001	000	000	000	000

AT Commands for Homologation Testing and Debugging (continued)

Changing the DTMF Dial Speed Default Value

To change the DTMF dial speed default value, follow these steps:

1. Set par# 5 (Min DTMF dial speed) and par# 6 (Max DTMF dial speed) to the required DTMF dial speed with the AT%T21 command.
2. Issue an ATZ command.
3. Issue an ATS11? command to display the new value. The following example shows how to set the current default value from 80 to 85:

```
ATS11?  
080  
OK  
AT%T21,5,55  
OK  
AT%T21,6,55  
OK  
ATZ  
OK  
ATS11?  
085  
OK
```

If you do not want to change both par#5 and par#6, set par#5 to the new default DTMF duration if you are increasing the default value from the current value; otherwise, set par#6 to the new default DTMF duration. The following two example show how to set one parameter:

1. This example shows how to set the current default value of S11 from 80 to 85:

```
ATS11?  
080  
OK  
AT%T21,5,55  
OK  
ATZ  
OK  
ATS11?  
085  
OK
```

2. This example shows how to set the current default value of S11 from 85 to 80:

```
ATS11?  
085  
OK  
AT%T21,6,50  
OK  
ATZ  
OK  
ATS11?  
080  
OK
```

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