

User's Manual

AT Command Reference Manual

MODEL:FM300

Table of Contents

Table of Contents	1
FCC Regulations	2
FCC Part 15	2
FCC Part 68	2
AT COMMAND SET	3
AT Commands	3
AT& Commands	8
AT% Commands	11
ATI Commands	12
AudioSpan and DSVD Command	14
56k Modem Extended Commands	16
AT ** Command	19
Download to Flash Memory	19
Procedure	19
S Register Reference	21
S-Register Summary	21
S-Register Definitions	22

FCC Regulations

FCC Part 15

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
 - Increase the separation between the equipment and receiver
 - Connect the equipment into an outlet in a circuit different from that to which the receiver is connected
 - Consult the dealer or an experienced radio/TV technician for help
- Shielded cables (except telephone line) must be used in order to comply with emission limits.

FCC Part 68

This equipment complies with Part 68 of the FCC Rules. On the bottom of this equipment is a label that contains, among other information, The FCC Registration number and Ringer Equivalence Number for this Equipment. You must, upon request, provide this information to your telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring when your telephone number is called. In most but not all areas, the REN's of all devices connected to one line should not exceed five (5). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your telephone company to determine the maximum REN for your calling area.

If your telephone equipment causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be notified of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

AT COMMAND SET

AT Commands

A/ - Re-execute Command

The modem behaves as though the last command line had been re-sent by the DTE. "A" will repeat all the commands in the command buffer. --

ATSn=x - Write to Selected S-Register

This command writes the value x to the currently selected S-Register. An S-Register can be selected by using the ATSn command. All of the S-Registers will return the OK response if x is a number. Some registers may not be written due to country specific PTT limitations.

ATSn=? - Read Selected S-Register

This command reads and displays the selected S-Register. An S-Register can be selected by using the ATSn command.

A - Answer

The modem will go off-hook and attempt to answer an incoming call if correct conditions are met. Upon successful completion of answer handshake, the modem will go on-line in answer mode. This command may be affected by the state of Line Current Sense, if enabled. (Most countries do not require Line Current Sense.) Operation is also dependent upon +FCLASS command and country-specific requirements.

Bn - CCITT or Bell

B0 Selects CCITT operation at 300 or 1200 bps during Call Establishment and a subsequent connection. (Default for W-class models.)

B1 Selects BELL operation at 300 or 1200 bps during Call Establishment and a subsequent connection. (Default for US models.)

Cn - Carrier Control

This command is included for compatibility only, and has no effect other than returning a result code. The only valid parameter is 1.

D - Dial

- 0-9 DTMF digits 0 to 9
- . The "star" digit (tone dialing only)
- # The "gate" digit (tone dialing only)

J Perform MNP 10 link negotiation at 1200 bps
 K Enable power level adjustment during MNP 10
 L Re-dial last number
 P Select pulse dialing
 T Select tone dialing
 S=n Dial the number stored in the directory (n=0 to 3)
 W Wait for dial tone
 0 wait for silence; the modem will wait for at least 5 seconds of silence
 . Dial pause
 ; Return to command state

En - Command Echo

The modem enables or disables the echo of characters to the DTE according to the parameter supplied. The parameter value, if valid, is written to S14 bit 1.

E0 Disables command echo.
 E1 Enables command echo. (Default.)

Fn - Select Line Modulation (RC144 Models Only)

F0 Selects auto-detect mode
 F1 Selects V.21 or Bell 103
 F2 Not supported, OK response returned
 F3 Selects V.23
 F4 Selects V.22 or Bell 212 A
 F5 Selects V.22
 F6 Selects V.32 bis 4800 or V.32
 F7 Selects V.32 bis 7200
 F8 Selects V.32 bis 9600 or V.32 9600
 F9 Selects V.32 bis 12000
 F10 Selects V.32 bis 14400

Hn - Disconnect (Hang-Up)

H0 On-hook
 H1 Off-hook

In - Identification

I0 Reports product code.
 I1 Calculates the ROM checksum and reports the least significant byte of the Checksum in decimal
 I2 Calculates the ROM checksum and compares it with the prestored checksum
 I3 Reports the firmware version
 I4 Reports OEM defined identifier string in either Hayes-compatible binary format (default) or ASCII format (selectable by configure).
 I5 Reports Country Code parameter.
 I6 Reports modem data pump model and internal code revision.
 I7 Reports the DAA code resulting from MCU inter2222rogation of the DAA for auto DAA recognition.

Ln - Speaker Volume

L0 Low volume
 L1 Low volume (Default.)
 L2 Medium volume
 L3 High volume

Mn - Speaker Control

This command selects when the speaker will be on or off. The parameter value, if valid, is written to S22 bits 2 and 3.

M0 Speaker is always off.

M1 Speaker is on during call establishment, but off when receiving carrier. (Default.)

M2 Speaker is always on.

M3 Speaker is off when receiving carrier and during dialing, but on during answering.

Nn - Automode Enable

This command enables or disables automode detection. The parameter value, if valid, is written to S31 bit 1.

N0 Automode detection is disabled

N1 Automode detection is enabled

On - Return to On-Line Data Mode

O0 Enters on-line data mode without a retrain.

O1 Enters on-line data mode with a retrain before returning to on-line data mode.

Qn - Quiet Results Codes Control

Q0 Enables result codes to the DTE. (Default.)

Q1 Disables result codes to the DTE.

Sn - Read/Write S-Register

n Establishes S-Register n as the last register accessed

n=v Sets S-Register n as the value v

n? Reports the value of S-Register n

T - Set Tone Dial Default

Vn - Result Code Form

V0 Enables short-form

V1 Enables long-form

Wn - Connect Message Control

W0 Upon connection, the modem reports only the DTE speed. Subsequent responses are disabled. (Default.)

W1 Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed, respectively.

W2 Upon connection, the modem reports the DCE speed

Xn - Extended Result Codes:

X0 CONNECT result codes are enabled. CONNECT XXXX result codes are disabled. Busy signal and dial tone are not detected.

X1 The modem blind dials. CONNECT XXXX result codes are enabled. Busy signal and dial tone are not detected.

X2 The modem wait for dial tone before dialing. CONNECT XXXX result codes are enabled. Busy signal is not detected.

X3 The modem blind dials. CONNECT XXXX result codes are enabled. The modem sends BUSY result code if busy signal is detected.

X4 The modem wait for dial tone before dialing. CONNECT XXXX result codes are enabled. The modem sends BUSY result code if busy signal is detected.

Result Codes

Short Form	Long Form	n Value in ATXn Command				
		0	1	2	3	4
0	OK	x	x	x	x	x
1	CONNECT	x	x	x	x	x
2	RING	x	x	x	x	x
3	NO CARRIER	x	x	x	x	x
4	ERROR	x	x	x	x	x
5	CONNECT 1200	1	x	x	x	x
6	NO DIALTONE	3	3	x	x	x
7	BUSY	3	3	3	x	x
8	NO ANSWER	x	x	x	x	x
9	CONNECT 0600	1	x	x	x	x
10	CONNECT 2400	1	x	x	x	x
11	CONNECT 4800	1	x	x	x	x
12	CONNECT 9600	1	x	x	x	x
13	CONNECT 7200	1	x	x	x	x
14	CONNECT 12000	1	x	x	x	x
15	CONNECT 14400	1	x	x	x	x
16	CONNECT 19200	1	x	x	x	x
17	CONNECT 38400	1	x	x	x	x
18	CONNECT 57600	1	x	x	x	x
19	CONNECT 115200	1	x	x	x	x
22	CONNECT 75TX/1200RX	1	x	x	x	x
23	CONNECT 1200TX/75RX	1	x	x	x	x
24	DELAYED	4	4	4	4	4
32	BLACKLISTED	4	4	4	4	4
33	FAX	x	x	x	x	x
35	DATA	x	x	x	x	x
40	CARRIER 300	x	x	x	x	x
44	CARRIER 1200/75	x	x	x	x	x
45	CARRIER 75/1200	x	x	x	x	x
46	CARRIER 1200	x	x	x	x	x

51	CARRIER 12000	x	x	x	x	x
52	CARRIER 14400	x	x	x	x	x
53	CARRIER 16800	x	x	x	x	x
54	CARRIER 19200	x	x	x	x	x
55	CARRIER 21600	x	x	x	x	x
56	CARRIER 24000	x	x	x	x	x
57	CARRIER 26400	x	x	x	x	x
58	CARRIER 28800	x	x	x	x	x
59	CONNECT 16800	1	x	x	x	x
61	CONNECT 21600	1	x	x	x	x
62	CONNECT 24000	1	x	x	x	x
63	CONNECT 26400	1	x	x	x	x
64	CONNECT 28800	1	x	x	x	x
66	COMPRESSION: CLASS 5	x	x	x	x	x
67	COMPRESSION: V 42 bis	x	x	x	x	x
69	COMPRESSION: NONE	x	x	x	x	x
76	PROTOCOL: NONE	x	x	x	x	x
77	PROTOCOL: LAPM	x	x	x	x	x
80	PROTOCOL: ALT	x	x	x	x	x
81	PROTOCOL: ALT-CELLULAR	x	x	x	x	x
84	CONNECT 33600	1	x	x	x	x
91	CONNECT 31200	1	x	x	x	x
150	CARRIER 32000	x	x	x	x	x
151	CARRIER 34000	x	x	x	x	x
152	CARRIER 36000	x	x	x	x	x
153	CARRIER 38000	x	x	x	x	x
154	CARRIER 40000	x	x	x	x	x
155	CARRIER 42000	x	x	x	x	x
156	CARRIER 44000	x	x	x	x	x
157	CARRIER 46000	x	x	x	x	x
158	CARRIER 48000	x	x	x	x	x
159	CARRIER 50000	x	x	x	x	x
160	CARRIER 52000	x	x	x	x	x
161	CARRIER 54000	x	x	x	x	x
162	CARRIER 56000	x	x	x	x	x
165	CONNECT 32000	x	x	x	x	x
166	CONNECT 34000	x	x	x	x	x
167	CONNECT 36000	x	x	x	x	x
168	CONNECT 38000	x	x	x	x	x
169	CONNECT 40000	x	x	x	x	x
170	CONNECT 42000	x	x	x	x	x
171	CONNECT 44000	x	x	x	x	x
172	CONNECT 46000	x	x	x	x	x
173	CONNECT 48000	x	x	x	x	x
174	CONNECT 50000	x	x	x	x	x
175	CONNECT 52000	x	x	x	x	x
176	CONNECT 54000	x	x	x	x	x
177	CONNECT 56000	x	x	x	x	x
+F4	+FCERROR	x	x	x	x	x

Note: An 'x' in a column indicates that the message (either the long form if verbose, or the value only for short form) will be generated when that particular value of 'n' (shown at the top of the

column) has been selected by the use of ATXn. If the column is blank, then no message will be generated for that x option. A numeral indicates which less explicit message (verbose or short form) will be output for that X option.

Yn - Long Space Disconnect

- Y0 Long space disconnect disable (default.)
- Y1 Long space disconnect enables

Zn - Soft Reset and Restore Profile

The modem performs a soft reset and restores (recalls) the configuration profile according to the parameter supplied. If no parameter is specified, zero is assumed.

- Z0 Soft reset and restore stored profile 0.
- Z1 Soft reset and restore stored profile 1.

AT& Commands

&Cn - RLSD (DCD) Option

The modem controls the RLSD output in accordance with the parameter supplied. The parameter value, if valid, is written to S21 bit 5.

- &C0 RLSD remains ON at all times
- &C1 RLSD follows the state of the carrier. (Default.)

&Dn - DTR Option

- &D0 DTR is ignored.
- &D1 Modem return to asynchronous command state.
- &D2 DTR drop caused the modem to hang up. Auto answer is inhibited.
- &D3 DTR drop causes the modem to perform soft reset as if the Z command were received.

&Fn - Restore Factory Configuration (Profile)

The modem loads the factory default configuration (profile).

- &F0 Restore factory configuration 0.
- &F1 Restore factory configuration 1.

&Gn - Select Guard Tone

The modem generates the guard tone selected by this command according to the parameter supplied (DPSK modulation modes only). The parameter value, if valid, is written to S23 bits 6 and 7.

- &G0 Disables guard tone. (Default for US models.)
- &G1 Disables guard tone.
- &G2 Selects 1800 Hz guard tone. (Default for W-class models.)

&Jn - Telephone Jack Control

This command is included only for compatibility and performs no function except to load the S-Register. The parameter value, if valid, is written S21 bit 1.

- &J0 &J0 command. (Default.)
- &J1 &J1 command

&Kn - Flow Control

This command defines the DTE/DCE (terminal/modem) flow control mechanism. The parameter value, if valid, is written to S39 bits 0, 1, and 2.

- &K0 Disables flow control.
- &K3 Enables RTS/CTS flow control. (Default for data modem modes.)
- &K4 Enables XON/XOFF flow control.
- &K5 Enables transparent XON/XOFF flow control.
- &K6 Enables both RTS/CTS and XON/XOFF flow control. (Default for fax modem and voice modes.)

&Ln - Leased Line Operation

- &L0 Selects dial-up line operation
- &L1 Selects leased line operation.

&Pn - Select Pulse Dial Make/Break Ratio

- &P0 Selects 39%-61% make/break ratio at 10 pulses per second. (Default.)
- &P1 Selects 33%-67% make/break ratio at 10 pulses per second.
- &P2 Selects 39%-61% make/break ratio at 20 pulses per second.
- &P3 Selects 33%-67% make/break ratio at 20 pulses per second.

&Qn - Sync/Async Mode

- &Q0 Select direct asynchronous operation.
- &Q1 Reserved
- &Q2 Reserved
- &Q3 Reserved
- &Q4 Selects Auto sync Operation.
- &Q5 Asynchronous mode with error correction
- &Q6 Selects Asynchronous operation in normal mode.

&Rn - RTS/CTS Option

- &R0 CTS tracks RTS.
- &R1 CTS is always active.

&Sn - DSR Override

- &S0 DSR will remain ON at all times. (Default.)
- &S1 DSR will become active after answer tone has been detected and inactive after the carrier has been lost.

&Tn - Test and Diagnostics

- &T0 Terminates test in progress.
- &T1 Initiates local analog loopback.
- &T2 Returns ERROR.
- &T3 Initiates local digital loopback.
- &T4 Enables digital loopback acknowledgment for remote request.
- &T5 Disables digital loopback acknowledgment for remote request.
- &T6 Requests a remote digital loopback.
- &T7 Requests a remote digital loopback and self test.
- &T8 Initiates local analog loopback.

&V - View configuration profiles

- &V Display the modem's active configuration profile stored configuration profile 0 profile 1, and the four stored telephone numbers

&V1 - Display Last Connection Statistics

Displays the last connection statistics in the following format (shown with typical result):

TERMINATION REASON	LOCAL REQUEST
LAST TX data rate	33600 BPS
HIGHEST TX data rate	33600BPS
LAST RX data rate	33600BPS
HIGHEST RX data rate	33600 BPS
Error correction PROTOCOL	LAPM
Data COMPRESSION	V42Bis
Line QUALITY	028
Receive LEVEL	025
Highest SPX Receive State	67
Highest SPX Transmit State	67
EQM Sum Value	0000
RBS Pattern detected	FF
Data Rate Dropped in kbps	FF
Digital Pad Detected	N/A

&Wn - Store the current configuration to nonvolatile RAM.

The &W command tells the modem to store the active configuration, specified by the modem register to memory.

- &W0 Store the current configuration as profile 0.
- &W1 Store the current configuration as profile 1.

&Xn - Select Synchronous Clock Source

- &X0 Select internal timing for the transmit clock.
- &X1 Select external timing for the transmit clock.
- &X2 Select slave receive timing for the transmit clock.

1 0

&Yn - Select stored configuration profile after power up or reset.

- &Y0 The modem will use profile 0 on power up or reset.
 - &Y1 The modem will use profile 1 on power up or reset.
- #### &Zn - Store telephone numbers in nonvolatile memory.

Store one of four dial strings(including a telephone number) of up to 36 digits in nonvolatile RAM for later recall by the Ds dial stored number command.

AT% Commands

%C - Enable/Disable Data Compression

Enables or disables data compression negotiation. The modem can only perform data compression on an error corrected link. The parameter value, if valid, is written to S41 bits 0 and 1.

%C0 Disables data compression. Resets S46 bit 1.

%C1 Enables MNP 5 data compression negotiation. Resets S46 bit 1.

%C2 Enables V.42 bis data compression. Sets S46 bit 1.

%C3 Enables both V.42 bis and MNP 5 data compression. Sets S46 bit 1. (Default.)

%En - Enable/Disable Line Quality Monitor and Auto-Retrain or Fallback/Fail Forward

Controls whether or not the modem will automatically monitor the line quality and request a retrain (%E1) or fall back when line quality is insufficient or fall forward when line quality is sufficient (%E2). The parameter value, if valid, is written to S41 bits 2 and 6.

If enabled, the modem attempts to retrain for a maximum of 30 seconds.

%E0 Disable line quality monitor and auto-retrain.

%E1 Enable line quality monitor and auto-retrain.

%E2 Enable line quality monitor and fallback/fail forward. (Default.)

%L - Line Signal Level

Returns a value which indicates the received signal level. The value returned is a direct indication (DAA dependent) of the receive level at the MDP, not at the telephone line connector. For example, 009 = -9 dBm, 043 = -43 dBm, and so on.

%Q - Line Signal Quality

Reports the line signal quality (DAA dependent). Returns the higher order byte of the EQM value. Based on the EQM value, retrain or fallback/fail forward may be initiated if enabled by %E1 or %E2.

AT Commands

^An - Select Maximum MNP Block Size

1 1

The modem will operate an MNP error corrected link using a maximum block size controlled by the parameter supplied. The parameter value, if valid, is written to S40 bits 6 and 7.

VA0 64 characters.

VA1 128 characters. (Default.)

VA2 192 characters.

VA3 256 characters.

VBn - Transmit Break to Remote

In non-error correction mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100 ms according to parameter specified. If a number in excess of 9 is entered, 9 is used. The command works in conjunction with the VK command.

In error correction mode, the modem will signal a break through the active error correction protocol, giving no indication of the length.

VB1-VB9 Break length in 100 ms units. (Default = 3.) (Non-error corrected mode only.)

VGn - Modem to Modem Flow Control.

In non-error correction mode, the modem enables or disables the generation or recognition of modem-to-modem XON/XOFF flow control according to the parameter supplied.

In error correction mode, the setting of modem-to-modem XON/XOFF flow control is ignored. However, the serial port flow control settings (AT&K) remain active during a reliable link.

VG0 Disables modem-to-modem flow control (XON/XOFF).

VG1 Enables modem-to-modem flow control (XON/XOFF).

VKn - Break Control

Controls the response of the modem to a break received from the DTE or the remote modem or the VB command according to the parameter supplied. The parameter value, if valid, is written to S40 bits 3, 4, and 5.

The response is different in three separate states.

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

VK0 Enter on-line command mode, no break sent to the remote modem.

VK1 Clear data buffers and send break to remote modem.

VK2 Same as 0.

VK3 Send break to remote modem immediately.

VK4 Same as 0.

VK5 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 VB is received in order to send a break to the remote modem:

VK0 Clear data buffers and send break to remote modem.

VK1 Clear data buffers and send break to remote modem. (Same as 0.)

VK2 Send break to remote modem immediately.

VK3 Send break to remote modem immediately. (Same as 2.)

VK4 Send break to remote modem in sequence with data.

VK5 Send break to remote modem in sequence with data. (Same as 4.) (Default.)

The third case is where a break is received from a remote modem during a non-error corrected connection:

VK0 Clears data buffers and sends break to the DTE.

VK1 Clears data buffers and sends break to the DTE. (Same as 0.)

VK2 Send a break immediately to DTE.

VK3 Send a break immediately to DTE. (Same as 2.)

VK4 Send a break in sequence with received data to DTE.

VK5 Send a break in sequence with received data to DTE. (Same as 4.) (Default.)

VLn - MNP Block/Stream mode select.

Determines whether the modem will use Block or Stream mode for MNP link.

VL0 Use stream mode for MNP link connections.

VL1 Use interactive block mode for MNP link connections.

WN - Operating Mode

This command controls the preferred error correcting mode to be negotiated in a subsequent data connection. This command is affected by the OEM firmware configuration.

WN0 Selects normal speed buffered mode (disables error-correction mode). (Forces &Q6.)

WN1 Serial interface selected - Selects direct mode and is equivalent to &M0, &Q0 mode of operation. (Forces &Q0.) Parallel interface selected - Same as WN0.

WN2 Selects reliable (error-correction) mode. The modem will first attempt a LAPM connection and then an MNP connection. Failure to make a reliable connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=7.)

WN3 Selects auto reliable mode. This operates the same as WN2 except failure to make a reliable connection results in the modem falling back to the speed buffered normal mode. (Forces &Q5, S36=7, and S48=7.)

WN4 Selects LAPM error-correction mode. Failure to make an LAPM error-correction connection results in the modem hanging up. (Forces &Q5 and S48=0.) Note: The K1 command can override the WN4 command.

WN5 Selects MNP error-correction mode. Failure to make an MNP error-correction connection results in the modem hanging up. (Forces &Q5, S36=4, and S48=128.) AudioSpan and DSVD Commands

AudioSpan and DSVD Command

AudioSpan and DSVD are two technologies that allow simultaneous voice and data operation using Rockwell modem connected to a telephone line. AudioSpan and DSVD implementations differ in the manner that voice and modem data are combined. Voice and data channels are combined in the analog domain for AudioSpan and in the digital domain for DSVD.

Establishing a AudioSpan or DSVD connection is analogous to establishing a regular data modem connection. Initiate the call using normal dialing (ATD) and answering (ATA) procedures. The modem can switch form regular phone conversation into AudioSpan or DSVD mode and back to phone conversation. A handset, headset, or microphone/speaker can be used for voice communication during AudioSpan or DSVD mode.

AudioSpan operates in normal (non-error corrected) or error-corrected/compression mode (MNP 5 or V.42 -*, depending on the error correction settings of the modems). The DTE rate must be equal to or greater than the anticipated DCE connection speed. In general, DTE speed of 38400 bps or higher should be used.

-SMS = x, y, z, t - Select AudioSpan/SVD Mode

The x parameter selects Data, AudioSpan, or DSVD mode, or enables automatic mode selection. The y, z, t parameters are optional and are required only if the user wishes to control connection speeds. For example, AT -SMS=2 is sufficient to enable SVD.

x: AudioSpan/DSVD/Data mode select and automatic mode select enable

- 0 = Data mode
- 1 = DSVD mode (A modem not supporting DSVD will respond with ERROR)
- 2 = AudioSpan mode (A modem not supporting AudioSpan will respond with ERROR)
- 3 = Automatic mode select (DSVD/AudioSpan/Data) (Default)

Note: AT-SMS=1 performs the same operation at AT-SSE=1.

y: Minimum data speed (bps) with audio for AudioSpan mode.
z: Maximum data speed (bps) with audio for AudioSpan mode.

#VLS = x - Voice Line Select

- 0 = Telephone handset (default)
- 5 = Headset
- 6 = Speakerphone

The AT#VLS setting must be issued prior to establishing a DSVD or AudioSpan connection if a voice line other than the default telephone handset is desired.

-SSE = x - Enable/Disabled DSVD

- 0 = Disable DSVD (Default)
- 1 = Enable DSVD (A modem not supporting DSVD will respond with ERROR)

Note: DSVD mode can be enabled by either AT-SSE=1 or AT-SMS=1, and disabled by either AT-SSE=0 or AT-SMS=0.

56k Modem Extended Commands

Voice and Data= Blank for Data mode only.

SVD for AudioSpan analog simultaneous audio/voice and data.

DSVD for G.729A or DigiTalk digital simultaneous voice and data.

+MS-Select Modulation

This extended-format command selects the modulation and, optionally, enables or disables, specifies the lowest and highest connection rates, selects μ -Law or A-Law codec type and enables or disables robbed bit signaling generation (server modem) or detection (client modem) using one to five subparameters. The command format is:

+MS=<mod>[,<automode>][,<min_rate>][,<max_rate>][,<x_law>][,<rb_signaling>]]]]]]<CR>

Notes:

1. For 14400 bps and lower speeds. The Nn command and S37 register can alternatively be used, in which case the +MS sub parameters will be modified to reflect the Nn and S37=x settings. Use of the Nn and S37=x commands is not recommended but is provided for compatibility with existing communication software (S37 is not updated by the +NS command).
2. Subparameters not entered (enter a comma only or <CR> to skip the last subparameter) remain at their current values.

Reporting Selected Options

The modem can send a string of information to the DTE consisting of selected options using the following command:

+MS?

The response is:

+MS:<mod>,<automode>,<min_rate>,<rb_signaling>

For example,

```
+MS: 56,1,300,56000,0,0,33600 [RC56 default values]
+MS: 1,1,300,33600,0,0 [RC336 default values]
+MS: 10,1,300,14400,0,0 [RC144 default values]
```

Reporting Supported Options

The modem can send a string of information to the DTE consisting of supported options using the following command: +MS=?

The response is:

```
+MS:(list of supported <mod>values),(list of supported <automode>values),
(list of supported <min_rate>values),(list of supported <max_rate>values),
(list of supported <x_law>values),(list of supported <rb_signaling> values)
```

For example,

+MS(0,1,2,3,9,10,11,56,64,69),(0,1),(300-33600),(300-56000),(0,1),(0,1) (RC56)
 +MS(0,1,2,3,9,10,11,64,69),(0,1),(300-33600),(300-33600),(0,1),(0,1) (RC336)
 +MS(0,1,2,3,9,10,64,69),(0,1),(300-14400),(300-14400),(0,1),(0,1) (RC144)

Subparameter Definitions

<mod>=A decimal number which specifies the preferred modulation (automode enabled) or the modulation (automode disabled) to use in originating or answering a connection are:

mode	modulation	Possible Rates(bps)	Note
0	V.21	300	
1	V.22	1200	
2	V.22bis	2400 or 1200	
3	V.23	1200	See Note2
9	V.32	9600 or 4800	
10	V.32bis	14400, 12000, 9600, 7200, or 4800	Default for RC144
11	V.34	33600, 31200, 28800, 26400, 2400, Default for 21600, 19200, 16800, 14400,	RC56/RC336/RC288
		12000, 9600, 7200, 4800, or 2400	[RC56/RC336/RC288only]
56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000	[RC56 only]
64	Bell 103	300	
69	Bell 212	1200	

Notes:

For See optional <automode>, <min_rate>, and <max_rate>subparameters. V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

1. The modem may also automatically switch to another modulation (automode), subject to the following constraints:

- The modem may not be able to automatically switch from the current modulation (specified by <mod>) to some other modulation. For example, There is no standard way to automode from Bell 103 to V.23.
 - The DTE may disable automode operation (see <automode>below).
 - The DTE may constrain the range of modulations available by specifying the lowest and highest rates (see <min_rate>below).
2. <automode> is an optional numeric value which enables or disables automatic modulation negotiation using V.8 bis/ or V.32 bis Annex A. The options are:

<automode>	Option Selected	Notes
0	Automode disabled	
1	Automode enabled using V.8 bis/v.8 or V.32 Annex A	Default

The default value is 1. Which enables automode. Note, however, there are modulation for which there is no automode negotiation. e.g., Bell 212 (<mod>=69).

- For <automode> = 0 (automode disabled, i.e., fixed modulation):
- If <max_rate> is within the rates supported by the selected modulation, the selected rate is that specified by <max_rate> For example:
 +MS=10,0,1200,4800 selects V.32 bis 4800 bps fixed rate.
 If <max_rate> is greater than the highest speed supported by the modulation specified by <mod>, the starting rate is the highest rate supported by the selected modulation. For example:
 +MS=10,0,2400,14400 selects V.32 bis 14400, 12000, 9600, or 4800bps.

- To emulate issuance of the NOS37=x command sequence to select fixed mode operation, specify the <max_rate> both to be the (same) requested speed, and <mod> to be modulation for that speed. For example:
 +MS=11,0,16800,16800 selects V.34 16800 bps fixed mode (no comparable S37 command)
 +MS=10,0,12000 selects V.32 bis 12000 bps fixed mode (same as NOS37=10).

For <automode>= 1 (automode enabled, i.e., automatically speed and modulation):

The modem connects at the highest possible rate in accordance with V.8, or V.32 bis/V.8 is not supported by the remote modem.

- If <max_rate> is greater than the highest rate supported by the modulation specified by <mod>, the modem automodes down from the highest rate of the selected modulation. For example:
 +MS=10,1,1200,24000 selects automodding down from V.32 bis 14400 bps.
 To emulate issuance of the N1S37=xsequence command, specify the modulation and the rate to start automodding down from using <max_rate>, respectively. Set <min_rate> to 300 to allow automodding all the way down to V.21 300 dps. For example:
 +MS=11,1,300,16800 selects automode starting at V.34 16800 bps (no comparable S37 command).

+MS=9,1,300,12000 selects automode starting at V.32 bis (same as N1S37=10).

<min_rate> is an optional number which specifies the lowest rate at which the modem may establish a connection. The value is decimal coded, in units of bps, e.g., 2400 specifies the lowest rate to be 2400 bps. The default is 300 for 300 bps.

<max_rate> is an optional number which specifies the highest rate at which the modem may establish a connection. The value is decimal coded, in units of bps, e.g., 14400 specifies the highest rate to be 14400 bps. The default is 28800 for 28800 bps.

<xLaw> is an optional number which specifies the codec type. The options are:

0 = μ -Law
 1 = A-Law

Note that ATZ will reset the <xLaw> selection to 0 (μ -Law).

<rb_signaling> is an optional number which enables or disables robbed bit signaling generation in a server modem or enables or disables robbed bit signaling detection in a client modem. The options are:

0 = Robbed signaling generation (server modem) or detection (client modem) disabled (default)
 1 = Robbed bit signaling generation (server modem) or detection (client modem) enabled Note that AVZ will reset the <rb_signaling> selection to 0 (disabled).

Result Codes:

OK	Valid subparameter string
ERROR	Otherwise

+HU - Enable/Disable RPI and DTE Speed

This command enables or disables Rockwell Protocol Interface (RPI) processing and sets the DTE speed. (Applicable only to modems supporting RPI and RPI+).

- +H0 Disable protocol interface and video ready mode.
- +H1 Enable RPI mode and set DTE speed to 19200 bps.
- +H2 Enable RPI mode and set DTE speed to 38400 bps.
- +H3 Enable RPI mode and set DTE speed to 57600 bps.
- +H11 Enable RPI+ mode (applicable only to modems supporting RPI+). When in RPI+ mode a link is established between the modem and the WinRPI or WinRPI95 host are driver to allow the modem to support protocol (V.42bis/LAP-M/MNP2-5) connections with a remote modem. This command should only be used when the WinRPI or WinRPI95 driver software is installed in the PC.
- +H16 Enable video ready mode.

Result Codes:

OK	n = 0 to 3, 11, 16.
ERROR	Otherwise.

AT ** Command

Download to Flash Memory

The linear flash memory downloader in the modem firmware allows flash memory connected to the modem external memory bus to be upgraded with revised modem firmware. This process transfers (uploads) the upgraded modem firmware (data) from the host computer to the modem which transfers (downloads) the data to the flash memory device. Note that this downloader function must be provided in modem MCU firmware initially installed in external flash memory, i.e., the downloader does not support the programming of blank flash memory.

Programming the flash memory device is a two-step process.

When the AT ** command is issued, the modem firmware boot loader is invoked and the user will first load a flash load module (FLM) into the modem's RAM. The FLM contains the programming algorithm for the flash memory device being programmed and any messages that may be sent during the load process.

The user will then load the new modem firmware, which the FLM will then program into the flash memory device.

Procedure

Install in the modem a flash memory programmed with the modem firmware, ensure that the flash memory device is programmed with the sector secure mode set to UNSECURE (AMD only), otherwise the device cannot be re-programmed in the modem.

Put the FLM file and the new modem firmware file (e.g., V1400DS.S37) in an appropriate directory on the computer's hard disk

Configure the communications application program for a DTE rate of between 9600 bps and 57600 bps (57600 bps is faster) and RTS/CTS flow control. A load at 57600 bps will take approximately 2 minutes; a load at 19200 bps will take approximately 6 minutes. Check the modem for response by typing AT.

Initiate the download process using the AT ** n command, where:

AT ** or AT ** 0	Download speed is the last sensed speed (recommended command).
AT ** 1	Download speed is 38.4k bps.
AT ** 2	Download speed is 57.6k bps.

The "Download Initiated" message appears upon issuing the AT ** n command.

Perform an ASCII upload of the FLM file (e.g., AMDE.S37) from the host computer to the modem RAM using an industry standard communications software or an equivalent process (ensure that all ASCII translation or pacing is turned off). To abort the load at this point, wait for the FLM download process to time-out, send a bad S37 record, or reset (POR) the modem. If the load process times-out, the modem must be reset (ATZ) before the FLM can be loaded again.

After the FLM has been loaded perform an ASCII upload of the new modem firmware hex file (e.g., RC288Aci.S37) from the host computer to the modem RAM using an industry standard communications software or an equivalent process. There will be a 3-second pause after the first record of the RC288AXX.S37 file is sent, which is the FLASH erase cycle. There is no turning back at this point.

If the flash download fails (because of a bad S37 record for example) or the upload is aborted, as long as the modem is not turned off or reset, it will remain in the flash load cycle and the upload can be re-attempted at step 7.

A "Wrong Device" message is displayed if an incorrect FLM is used. In this case, restart at step 5 and upload the correct FLM file.

A "Wrong Hex file or flow control" message is displayed if an incompatible hex file format is used (non-Motorola S3 format) or if the DTE ignores flow control (the flash download uses both Xon/Xoff and RTS CTS flow control). If the wrong format was used, Reinitiate the upload at step 7 using a correct firmware hex file.

A "Device successfully programmed" message is displayed by the FLM at the completion of a successful download and the modem will do a cold start.

communications software or an equivalent process. There will be a 3-second pause after the first record of the RC288AXX S37 file is sent, which is the FLASH erase cycle. There is no turning back at this point.

If the flash download fails (because of a bad S37 record for example) or the upload is aborted, as long as the modem is not turned off or reset, it will remain in the flash load cycle and the upload can be re-attempted at step 7.

A "Wrong Device" message is displayed if an incorrect FLM is used. In this case, restart at step 5 and upload the correct FLM file.

A "Wrong Hex file or flow control" message is displayed if an incompatible hex file format is used (non-Motorola S3 format) or if the DTE ignores flow control (the flash download uses both Xon/Xoff and RTS CTS flow control). If the wrong format was used, Reinitiate the upload at step 7 using a correct firmware hex file.

A "Device successfully programmed" message is displayed by the FLM at the completion of a successful download and the modem will do a cold start.

S-Register Reference

The default values shown in Table 4-1 may vary by modem firmware configuration. Consult the MCU firmware release notes for exact configuration.

The factory default values may be loaded at any time by entering the &Fn Command

S-Register Summary

Register	Function	Range	Units	Saved Default**
S0	Rings to Auto Answer	0-255	rings *	0
S1	Ring Counter	0-255	Rings	0
S2	Escape Character	0-255	ASCII *	43
S3	Carriage Return Character	0-127	ASCII	13
S4	Line Feed Character	0-127	ASCII	10
S5	Backspace Character	0-255	ASCII	8
S6	Wait Time for Dial Tone	2-255	s *	2
S7	Wait Time for Carrier	1-255	s *	50
S8	Pause Time for Dial Delay Modifier	0-255	s *	2
S9	Carrier Detect Response Time	1-255	0.1s *	6
S10	Carrier Loss Disconnect Time	1-255	0.1s *	14
S11	DTMF Tone Duration	50-255	0.001s *	95
S12	Escape Prompt Delay	0-255	0.02s *	50
S13	Reserved	-	-	-
S14	General Bit Mapped Options Status	-	-	138 (8Ah)
S15	Reserved	-	-	-
S16	Test Mode Bit Mapped Options Status (&t)	-	-	0
S17	Reserved	-	-	-
S18	Test Timer	0-255	s *	0
S19	AutoSync Options	-	-	0
S20	AutoSync HDLC Address or BSC Sync Character	0-255	- *	0
S21	V.24/General Bit Mapped Options Status	-	- *	52 (34h)
S22	Speaker/Results Bit Mapped Options Status	-	- *	117 (75h)
S23	General Bit Mapped Options Status	-	- *	62 (3Dh)
S24	Sleep Inactivity Timer	0-255	s *	0
S25	Delay to DTR Off	0-255	s or 0.01s	5
S26	RTS-to-CTS Delay	0-255	0.01s	1
S27	General Bit Mapped Options Status	-	- *	73 (49h)
S28	General Bit-Mapped Options S Status	-	- *	0
S29	Flash Dial Modifier Time	0-255	10 ms	70
S30	Disconnect Inactivity Timer	0-255	10 s	0
S31	General Bit-Mapped Options Status	-	- *	194 (C2h)
S32	XON Character	0-255	ASCII	17 (11h)
S33	XOFF Character	0-255	ASCII	19 (13h)
S34-S35	Reserved	-	-	-

S36	LAPM Failure Control	-	-	7
S37	Line Connection Speed	-	-	0
S38	Delay Before Forced Hang up	0-255	S	20
S39	Flow Control Bit Mapped Options Status	-	-	3
S40	General Bit Mapped Options Status	-	-	104 (68h)
S41	General Bit Mapped Options Status	-	-	195 (C3h)
S42-S45	Reserved	-	-	-
S46	Data Compression Control	-	-	138
S48	V.42 Negotiation Control	-	-	7
S82	LAPM Break Control	-	-	128(40h)
S86	Call Failure Reason Code	0-255	-	-
S91	PSSTN Transmit Attenuation Level	0-15	dBm	10
S92	Fax Transmit Attenuation Level	0-15	dBm	10
S95	Result Code Messages Control	-	- *	0

- Register value may be stored in one of two user profiles with the &W command
- ** Default values may be modified using Configuration.

S-Register Definitions

S0 - Number of Rings to Auto-Answer

Sets the number of the rings required before the modem automatically answers a call. Setting this register to zero disables auto-answer mode.

Range: 0-255 rings

Default: 0

S1 - Ring Counter

S1 is incremented each time the modem detects a ring signal on the telephone line. S1 is cleared if no rings occur over an eight-second interval.

Range: 0-255 rings

Default: 0

S2 - Escape Character

S2 holds the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII '+'. A value over 127 disables the escape process, i.e., no escape character will be recognized.

Range: 0-255, ASCII decimal

Default: 43 (+)

S3 - Carriage Return Character

Sets the command line and result code terminator character. Pertains to Asynchronous operation only.

Range: 0-127, ASCII decimal

Default: 13 (Carriage Return)

S4 - Line Feed Character

Sets the character recognized as a line feed. Pertains to asynchronous operation only. The Line Feed control character is output after the Carriage Return control character if verbose result codes are used.

Range: 0-127, ASCII decimal

Default: 10 (Line Feed)

S5 - Backspace Character

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

Range: 0-32, ASCII decimal

Default: 8 (Backspace)

S6 - Wait Time for Dial Tone Before Blind Dialing, or After "W" Dial Modifier

1. Sets the length of time, in seconds, that the modem will wait before starting to dial after going off-hook when blind dialing. This operation, however, may be affected by some ATX options according to country restrictions. The "Wait for Dial Tone" call progress feature (W dial modifier in the dial string) will override the value in register S6.

2. For W-class models, S6 sets the length of time, in seconds, that the modem will wait for dial tone when encountering a "W" dial modifier before returning NO DIAL TONE result code.

The modem always pauses for a minimum of 2 seconds, even if the value of S6 is less than 2 seconds.

Range: 2-255 seconds

Default: 2

S7 - Wait Time For Carrier After Dial, For Silence, or For Dial Tone after "W" Dial Modifier (US Models)

1. Sets the length of time, in seconds, that the modem will wait for carrier before hanging up. The timer is started when the modem finishes dialing (originate), or 2 seconds after going off-hook (answer). In originate mode, the timer is reset upon detection of answer tone if allowed by country restrictions.

2. Sets the length of time, in seconds, that modem will wait for silence when encountering the @ dial modifier before continuing with the next dial string parameter.

3. For US models, S7 sets the length of time, in seconds, that the modem will wait for dial tone when encountering a "W" dial modifier before continuing with the next dial string parameter.

Range: 1-255 seconds

Default: 50

S8 - Pause Time For Dial Delay

Sets the time, in seconds, that the modem must pause when the "*" dial modifier is encountered in the dial string.

Range: 0-255 seconds

Default: 2

S9 - Carrier Detect Response Time

Sets the time, in tenths of a second, that the carrier must be present before the modem considers it valid and turns on RLSD. As this time is increased, there is less chance to detect a false carrier due to noise from the telephone line.

Range: 1-255 tenths of a second

Default: 6 (0.6 second)

S10 - Lost Carrier To Hang Up Delay

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. When register S10 is set to 255, the modem functions as if a carrier is always present.

The actual interval the modem waits before disconnecting is the value in register S10 minus the value in register S9. Therefore, the S10 value must be greater than the S9 value or else the modem disconnects before it recognizes the carrier.

Range: 1-255 tenths of a second

Default: 14 (1.4 seconds)

S11 - DTMF Tone Duration

Sets the duration of tones in DTMF dialing (US models only). This value has no effect on pulse dialing.

For W-class models, this parameter is a country parameter loaded by ConfiguRACE.

Range: 50-255 milliseconds

Default: 95 (95 milliseconds)

S12 - Escape Prompt Delay (EPD)

Defines the maximum period, in fiftieths of a second, allowed between receipt of the last character of the three escape character sequence from the DTE and sending of the OK result code to the DTE. If any characters are detected during this time, the OK will not be sent. Note that sending of the OK result code does not affect entry into command mode.

Range: 0-255 1/50 of a second

Default: 50 (1 second)

S13 - Reserved

S14 - General Bit Mapped Options Status

Indicates the status of command options.

Default: 138 (8Ah) (10001010b)

Bit 0 This bit is ignored.

Bit 1 Command echo (En)

0 = Disabled (E0)

1 = Enabled (E1) (Default.)

Bit 2 Quiet mode (Qn)

0 = Send result codes (Q0) (Default.)

1 = Do not send result codes (Q1)

Bit 3 Result codes (Vn)

0 = Numeric (V0)

1 = Verbose (V1) (Default.)

Bit 4 Reserved

Bit 5 Tone (T)/Pulse (P)

0 = Tone (T) (Default.)

1 = Pulse (P)

Bit 6 Reserved

Bit 7 Originate/Answer

0 = Answer
1 = Originate (Default)

S15 - Reserved

S16 - General Bit Mapped Test Options Status

Indicates the test in progress status.

Default: 0

Bit 0 Local analog loopback

0 = Disabled (Default)

1 = Enabled (&T1)

Bit 1 Not used

Bit 2 Local digital loopback

0 = Disabled (Default)

1 = Enabled (&T3)

Bit 3 Remote digital loopback (RDL) status

0 = Modem not in RDL (Default)

1 = RDL in progress

Bit 4 RDL requested (&T6)

0 = RDL not requested (Default)

1 = RDL requested (&T6)

Bit 5 RDL with self test

0 = Disabled (Default)

1 = Enabled (&T7)

Bit 6 Local analog loopback (LAL) with self test

0 = Disabled (Default)

1 = Enabled (&T8)

Bit 7 Not used

S17 - Reserved

S18 - Test Timer

Sets the length of time, in seconds, that the modem conducts a test (commanded by &Tn) before returning to the command mode. If this register value is zero, the test will not automatically terminate; the test must be terminated from the command mode by issuing an &T0 or H command. When S18 is non-zero, the modem returns the OK message upon test termination.

Range: 0-255 seconds

Default: 0

S19 - AutoSync Bit Mapped Options

Defines the options for AutoSync operation (see &Q4 command). S19 must be set to the desired value before &Q4 is issued

Default: 0

Bit 0 Reserved

Bit 1 BSC/HDLC format select

0 = BSC selected (Default)

1 = HDLC selected

Bit 2 Address detection enable/disable

0 = Disabled (Default)

1 = Enabled

Bit 3 NRZI/NZI coding select

0 = NRZI (Default)

1 = NZI

Bit 4 Idle indicator select

0 = Mark idle (Default)

1 = Flag or sync idle

Bits 5 - 7 Reserved

S20 - AutoSync HDLC Address or BSC Sync Character

Defines the HDLC address (S19 bit 1 = 1) or BSC Sync Character (S19 bit 1 = 0) for AutoSync operation (see &Q4 command). S20 must be set to the desired value before &Q4 is issued.

Range: 0-255

Default: 0

S21 - V 24/General Bit Mapped Options Status

Indicates the status of command options.

Default: 52 (34h) (00110100b)

Bit 0 Set by &Jn command but ignored otherwise.

0 = &J0 (Default)

1 = &J1

Bit 1 Reserved

Bit 2 CTS behavior (&Rn)

0 = CTS tracks RTS (&R0)

1 = CTS always on (&R1) (Default.)

Bits 3-4 DTR behavior (&Dn)

0 = &D0 selected

1 = &D1 selected

2 = &D2 selected (Default.)

3 = &D3 selected

Bit 5 RLSD (DCD) behavior (&Cn)

0 = &C0 selected

1 = &C1 selected (Default.)

Bit 6 DSR behavior (&Sn)

0 = &S0 selected (Default.)

1 = &S1 selected

Bit 7 Long space disconnect (Yn)

0 = Y0 (Default.)

1 = Y1

S22 - Speaker/Results Bit Mapped Options Status

Indicates the status of command options.

Default: 117 (75h) (01110101b)

Bits 0-1 Speaker volume (Ln)

0 = Off (L0)

1 = Low (L1) (Default.)

2 = Medium (L2)

3 = High (L3)

Bits 2-3 Speaker control (Mn)

0 = Disabled (M0)

1 = Off on carrier (M1) (Default.)

2 = Always on (M2)

3 = On during handshake (M3)

Bits 4-6 Limit result codes (Xn)

0 = X0

4 = X1

5 = X2

6 = X3

7 = X4 (Default.)

Bit 7 Reserved

S23 - General Bit Mapped Options Status

Indicates the status of command options.

Default: 62 (3Dh) (00111110b)

Bit 0 Grant RDL

0 = RDL not allowed (&T5) (Default.)

1 = RDL allowed (&T4)

Bits 1-3 DTE Rate

0 = 0 - 300 bps

1 = 600 bps

2 = 1200 bps

3 = 2400 bps

4 = 4800 bps

5 = 9600 bps

6 = 19200 bps

7 = 38400 bps or higher (Default.)

Bits 4-5 Assumed DTE parity

0 = even

1 = not used

2 = odd

3 = none (Default.)

Bits 6-7 Guard tone (&Gn)

0 = None (&G0) (Default.)

1 = None (&G1)

2 = 1800 Hz (&G2)

S24 - Sleep Inactivity Timer

Sets the length of time, in seconds, that the modem will operate in normal mode with no detected telephone line or DTE line activity before entering low-power sleep mode. The timer is reset upon any DTE line or telephone line activity. If the S24 value is zero, neither DTE line nor telephone inactivity will cause the modem to enter the sleep mode.

Range: 0-255 seconds

Default: 0

S25 - Delay To DTR

Sets the length of time that the modem will ignore DTR for taking the action specified by &Dn. Its units are seconds for synchronous modes and one hundredths of a second for other modes.

Range: 0-255 (1 second for synchronous modes 1; 0.01 second otherwise)

Default: 5

S26 - RTS to CTS Delay

Sets the time delay, in hundredths of a second, before the modem turns CTS ON after detecting an OFF-to-ON transition on RTS when &R0 is commanded. Pertains to synchronous operation only.

Range: 0-255 hundredths of a second

Default: 1

S27 - Bit Mapped Options Status

Indicates the status of command options

Default: 73 (49h) (01001001b)

Bits 0,1,3 Synchronous/asynchronous selection (&Mn/&Qn)

3 1 0

0 0 0 = &M0 or &Q0

0 0 1 = &M1 or &Q1

0 1 0 = &M2 or &Q2

0 1 1 = &M3 or &Q3

1 0 0 = &Q4

1 0 1 = &Q5 (Default)

1 1 0 = &Q6

Bit 2 Leased line control (&Ln)

0 = Dial up line (&L0) (Default)

Bits 4 - 5 Internal clock select (&Xn)

0 = Internal clock (&X0) (Default)

1 = External clock (&X1)

2 = Slave clock (&X2)

Bit 6 CCITT/Bell mode select (Bn)

0 = CCITT mode (B0)

1 = Bell mode (B1) (Default)

Bit 7 - Reserved

S28 - Bit Mapped Options Status

Default: 0

Bits 0 - 1 Reserved

Bit 2 Reserved (always 0).

Bits 3 - 4 Pulse dialing (&Pn)

0 = 39%-61% make/break ratio at 10 pulses per second (&P0) (Default)

1 = 33%-67% make/break ratio at 10 pulses per second (&P1)

2 = 39%-61% make/break ratio at 20 pulses per second (&P2)

3 = 33%-67% make/break ratio at 20 pulses per second (&P3)

Bit 5-7 Reserved

S29 - Flash Dial Modifier Time

Sets the length of time, in units of 10 ms, that the modem will go on-hook when it encounters the flash (!) dial modifier in the dial string. The time can be limited as it is a country dependent parameter.

Range: 0-255 10 ms intervals

Default: 70 (700 ms)

S30 - Disconnect Inactivity Timer

Sets the length of time, in tens of seconds, that the modem will stay online before disconnecting when no data is sent or received. In error-correction mode, any data transmitted or received will reset the timer. In other modes, any data transmitted will reset the timer. The timer is inoperative in synchronous mode.

Range: 0-255 tens of seconds (0-2550 seconds)

Default: 0 (disabled)

S31 - Bit Mapped Options Status

Default: 194 (C2h) (11000010b)

Bit 0 Single line connect message enable/disable (&Vn)

0 = Messages controlled by S95, Wn and Vn (&V0) (Default)

1 = Single line connect message (&V1)

Bit 1 Auto line speed detection (Nn)

0 = Disabled (N0)

1 = Enabled (N1) (Default)

Bits 2-3 Error correction progress messages (Wn)

0 = DTE speed only (W0) (Default)

1 = Full reporting (W1)

2 = DCE speed only (W2)

Bits 4-5 Caller ID (&CID)

0 = Caller ID disabled (&CID=0) (Default)

1 = Short (formatted) Caller ID enabled (&CID=1)

2 = Long (unformatted) Caller ID enabled (&CID=2)

Bits 6-7 Reserved (Default = 11b)

S32 - XON Character

Sets the value of the XON character.

Range: 0-255, ASCII decimal

Default: 17 (11h)

S33 - XOFF Character

Sets the value of the XOFF character.

Range: 0-255, ASCII decimal

Default: 19 (13h)

S34-S35 - Reserved

S36 - LAPM Failure Control

Default: 7 (00000111b)

Bits 0-2 this value indicates what should happen upon a LAPM failure. These fallback options are initiated immediately upon connection if S48=128. If an invalid number is entered, the number is accepted into the register, but S36 will act as if the default value has been entered.

- 0 = Modem disconnects.
- 1 = Modem stays on-line and a Direct mode connection is established.
- 2 = Reserved.
- 3 = Modem stays on-line and a Normal mode connection is established.
- 4 = An MNP connection is attempted and if it fails, the modem disconnects.
- 5 = An MNP connection is attempted and if it fails, a Direct mode connection is established.
- 6 = Reserved.
- 7 = An MNP connection is attempted and if it fails, a Normal mode connection is established. (Default.)

Bits 3-7 Reserved

S37 - Desired Line Connection Speed

This register specifies the desired line connection speed.

Notes:

1. When the Nn command is issued or the S37 register value is modified, the +MS command subparameters are updated to reflect the speed and modulation specified by the S37 value (see +MS command). For example:

If N0 command is active, S37=10 updates the +MS command subparameters to reflect +MS=10,1,300,12000

If N1 command is active, S37=10 updates the +MS command subparameters to reflect +MS=10,0,12000,12000

2. S37 is not updated by the +MS command.

3. Use of the +MS command is recommended instead of the Nn and S37=x commands. Nn and S37=x commands are supported for compatibility with existing communication software.

Default: 0

Bits 0-4 Desired line connection speed. This is interlinked with the Fn command (RC144). If an invalid number is entered, the number is accepted into the register, but S37 will act as if the default value has been entered.

0 = Attempt autmode connection. If N0 is active, connection is attempted at the most recently sensed DTE speed (+MS command settings are updated to the appropriate values). If N1 is active, connection is attempted at the highest possible speed (+MS settings are updated to 11,1,300,2880 to reflect V 34, autmode, 300 bps minimum speed, and 28800 bps maximum speed). (Default.)

1-3 = Attempt to connect at 300 bps. F1 command (RC144).

4 = Reserved.

5 = Attempt to connect at V 22 1200 bps. F4 command (RC 144).

6 = Attempt to connect at V 22 bis 2400 bps. F5 command (RC144).

7 = Attempt to connect at V 23.

8 = Attempt to connect at V 32 bis/V 32 4800 bps. F6 command (RC144).

9 = Attempt to connect at V 32 bis/V 32 9600 bps. F8 command (RC144).

10 = Attempt to connect at V 32 bis 12000 bps. F9 command (RC144).

11 = Attempt to connect at V 32 bis 14400 bps. F10 command (RC144).

12 = Attempt to connect at V 32 bis 7200 bps. F7 command (RC144).

Bits 5-7 Reserved

S38 - Delay Before Forced Hang Up

This register specifies the delay between the modem's receipt of the H command to disconnect (or ON-to-OFF transition of DTR if the modem is programmed to follow the signal), and the disconnect operation, applicable to error-correction connection only. This register can be used to ensure that data in the modem buffer is sent before the modem disconnects.

1. If S38 is set to a value between 0 and 254, the modem will wait that number of seconds for the remote modem to acknowledge all data in the modem buffer before disconnecting. If time expires before all data is sent, the NO CARRIER result code will be issued to indicate that data has been lost. If all data is transmitted prior to time-out, the response to the H0 command will be OK.

2. If S38 is set to 255, the modem does not time-out and continues to attempt to deliver data in the buffer until the connection is lost or the data is delivered.

Range: 0-255 seconds

Default: 20

S39 - Flow Control Bit Mapped Options Status

Default: 3 (00000011b)

Bits 0-2 Status of command options

- 0 = No flow control
- 3 = RTS/CTS (&K3) (Default.)
- 4 = XON/XOFF (&K4)
- 5 = Transparent XON (&K5)
- 6 = Both methods (&K6)

Bits 3-7 Reserved

S40 - General Bit Mapped Options Status

Indicates the status of command options

Default: 104 (68h) (01101000b)

Bits 0-1 MNP Extended Services (-Kn)

- 0 = Disable extended services (-K0) (Default)
- 1 = Enable extended services (-K1)
- 2 = Enable extended services (-K2)

Bit 2 Reserved

Bits 3-5 Break Handling (VKn)

- 0 = VK0
- 1 = VK1
- 2 = VK2
- 3 = VK3
- 4 = VK4
- 5 = VK5 (Default.)

Bits 6-7 MNP block size (VAn)

- 0 = 64 chars (VA0)
- 1 = 128 chars (VA1) (Default.)
- 2 = 192 chars (VA2)
- 3 = 256 chars (VA3)

S41 - General Bit Mapped Options Status

Indicates the status of command options.

Default: 195 (C3h) (11000011b)

Bits 0-1 Compression selection (%Cn)

- 0 = Disabled (%C0)
- 1 = MNP 5 (%C1)
- 2 = V.42 bis (%C2)
- 3 = MNP 5 and V.42 bis (%C3) (Default.)

Bits 2, 6 Auto retrain and fallback/fail forward (%En)

Bit 6 Bit 2

- 0 0 = Retrain and fallback/fail forward disabled (%E0)

- 0 1 = Retrain enabled (%E1)
- 1 0 = Fallback/fail forward enabled (%E2) (Default.)

Bit 3 Reserved

Bits 4-5 Reserved

Bit 7 Reserved

S46 - Data Compression Control

Controls selection of compression. The following actions are executed for the given values:

Range: 136 or 138

Default: 138

- S46=136 Execute error correction protocol with no compression.
- S46=138 Execute error correction protocol with compression. (Default.)

S48 - V.42 Negotiation Action

The V.42 negotiation process determines the capabilities of the remote modem. However, when the capabilities of the remote modem are known and negotiation is unnecessary, this process can be bypassed if so desired.

Range: 0, 7, or 128 If an invalid number is entered, it is accepted into the S-Register, but S48 will act as if 128 has been entered.

Default: 7

S48=0 Disable negotiation; bypass the detection and negotiation phases; and proceed with LAPM.

S48=7 Enable negotiation. (Default.)

S48=128 Disable negotiation; bypass the detection and negotiation phases; and proceed at once with the fallback action specified in S36. Can be used to force MNP.

S82 - Break Handling Options

S82 is for compatibility purposes only; changing this register will not have any affect.

S86 - Call Failure Reason Code

When the modem issues a NO CARRIER result code, a value is written to this S-Register to help determine the reason for the failed connection. S86 records the first event that contributes to a NO CARRIER message. The cause codes are:

Range: 0, 4, 5, 9, 12, 13, or 14

3-1).

Bit 4 Reserved.

Bit 5 Enable COMPRESSION result code (XXXX = compression type; see Table 3-1).

Bit 6 Reserved.

Bit 7 Reserved.

Default:

S86=0 Normal disconnect, no error occurred.

S86=4 Loss of carrier.

S86=5 V.42 negotiation failed to detect an error-correction modem at the other end.

S86=9 The modem could not find a common protocol.

S86=12 Normal disconnect initiated by the remote modem.

S86=13 Remote modem does not respond after 10 re-transmissions of the same message.

S86=14 Protocol violation.

S91 - PSTN Transmit Attenuation Level

Sets the transmit attenuation level from 0 to 15 dBm for the PSTN mode, resulting in a transmit level from 0 to -15 dBm. In some countries, the transmit level may not be changed and there are checks to prevent transmit attenuation level change using Configure.

Range: 0 to 15 dBm (Corresponding to 0 to -15 dBm transmit level)

Default: 10 (-10 dBm transmit level)

S92 - Fax Transmit Attenuation Level

Sets the transmit attenuation level from 0 to 15 dBm for the fax mode, resulting in a transmit level from 0 to -15 dBm. In some countries, the transmit level may not be changed and there are checks to prevent transmit attenuation level change using Configure.

Range: 0 to 15 dBm (Corresponding to 0 to -15 dBm transmit level)

Default: 10 (-10 dBm transmit level)

S95 - Extended Result Codes

The bits in this register can be set to override some of the Wn command options. A bit set to a 1 in this register will enable the corresponding result code regardless of the Wn setting. Also, refer to Table 3-1.

Default: 0

Bit 0 CONNECT result code indicates DCE speed instead of DTE speed.

Bit 1 Append/APQ to CONNECT XXXX result code in error-correction mode (XXXX = rate; see Table 3-1).

Bit 2 Enable CARRIER XXXX result code (XXXX = rate; see Table 3-1. If a V.FC connection is established, VFC is appended to the CARRIER XXXX message, e.g., CARRIER 28800/VFC; note that there is no short form for this message (RC288).

Bit 3 Enable PROTOCOL XXXX result code (XXXX = protocol identifier; see Table