

V.22bis Data Modem



QUALITY COMMUNICATIONS PRODUCTS
Made in the U.S.A.

11-1001-002

1.0 INTRODUCTION

STANDARDS - The 2400 provides a complete implementation of ITUT V.22 and V.22bis. It also offers Bell 103 and 212A compatibility.

SMART MODE (THE AT COMMAND SET) - A complete implementation of the standard AT command set is provided for control of configuration, and auto-dial/auto-answer sequences.

DUMB MODE - The 2400 provides a jumper that allows it to simulate a "dumb" modem. When configured as such, the modem automatically answers, when called, and provides standard DTE signaling to indicate that a connection has been established.

2.0 FRONT PANEL LIGHTS

The following front panel lights are provided:

MR	Modem ready
TR	Terminal ready
SD	Send data
RD	Receive data
OH	Off hook
CD	Carrier Detect
AA	Auto answer (on = enabled)
HS	High speed (on = 2400, off = 1200)

3.0 THE AT COMMAND SET

The 2400 operates in one of two states; the command state or the on-line state. When power is applied to the 2400, it will assume the command state. In command state, the user may enter commands that will configure and control the modem. When the modem is connected to another modem and is prepared to transmit and receive data, it is in the on-line state. This section defines all commands that may be entered when the modem is in command state.

3.1 COMMAND GUIDELINES

ATTENTION CODE - Command lines must begin with the characters AT and must be entered as all upper or all lower case characters.

CARRIAGE RETURN (CR) - The command line must end with a carriage return (CR). The modem will not execute the command until it receives a CR.

BACKSPACE KEY - Prior to pressing carriage return, editing can be done with the backspace key. The backspace key deletes the last character in the command buffer but will not delete the AT from the beginning of the command line.

MISSING PARAMETERS - Missing parameters are interpreted as a 0. For example, the H command can have a parameter of zero (H0) or one (H1). If H is entered without a parameter, it will be interpreted as H0.

COMMAND BUFFER - The command buffer has a capacity of 40 characters. If a command line exceeds 40 characters, the modem will not execute the command line and will return an ERROR result code.

ESCAPE CODE SEQUENCE - The three digit escape code sequence forces the modem to the command state from the on-line state. The factory default escape code sequence is: +++.

RESULT CODES - Result codes are responses by the modem to commands. Result codes may be English words or digits 0-10. Word codes are preceded and followed by a CR and LF sequence. Digit codes are followed by a CR. The following table defines result codes and their associated digits:

DIGIT	WORD	MEANING
0	OK	Command line executed without errors.
1	CONNECT	Connection at 300 bps.
2	RING	Ringling signal detected.
3	NO CARRIER	Carrier lost or never present.
4	ERROR	Invalid command, checksum, error in command line, or command line exceeded 40 characters.
5	CONNECT 1200	Connection at 1200 bps.
6	NO DIALTONE	No dialtone detected.
7	BUSY	Busy signal detected.
8	NO ANSWER	No silence detected when dialing a system not providing dial tone.
10	CONNECT 2400	Connection at 2400 bps.

3.2 AT COMMANDS AND PARAMETERS

The table presented in this section describes the format and options associated with each AT command in the 2400 modem.

Command	Factory Default	Parameters/Description
AT		Attention Code. AT is the command line prefix (Attention code). AT precedes the command line except for + + + (escape) and A/ (repeat) commands. Parameters: none
A		Answer Command. A forces the modem to go off-hook in the answer mode without waiting for a ring. This is useful in manually answering a call or establishing a back-to-back connection with another modem which is in the originate mode. Parameters: none
A/		Repeat Last Command. A/ repeats the previous command such as redialing a telephone number. No carriage return is required. The previously executed command remains in the command buffer until AT is entered or power to the modem is turned off. Both actions clear the buffer and make the A/ command invalid since there is no command to repeat. Parameters: none
Bn	n = 1	Communications Standard Option. Bn is the Bell/CCITT command. Bn sets the modem to either CCITT mode or Bell mode. (1200 bps operation only) Parameters: n = 0, 1 n = 0 V.22 2100 Hz answer tone is selected n = 1 Bell 212A 2225 Hz answer tone is selected (factory default)
Cn	n = 1	Carrier Control Option. This command is reserved for controlled carrier mode. The RC224ATF operates in constant carrier. Parameters: n = 0, 1 n = 0 Returns ERROR result code n = 1 Returns OK result code (factory default)
D		Dial Command. D causes the modem to dial the number which follows the D in the command line. Valid dial characters are 0 to 9, A to D, #, and *. Other valid dial modifier characters are: ", P, R, S=n, T, W, ";, @, and I. The dial digit and dial modifier characters are defined in Table 3-3. In pulse dialing, non-digit characters have no meaning. Parameters: none
En	n = 1	Off-line Echo Character Option. En controls command echo to the host. Parameters: n = 0, 1 n = 0 Disables echo n = 1 Enables echo (factory default)
Fn	n = 1	On-line Echo Character Option. Fn determines whether characters are echoed to the host from the modem in the on-line state. This command is reserved for echoing of characters in the on-line state. The RC224ATF does not echo characters in the on-line state. Parameters: n = 0, 1 n = 0 Returns ERROR result code n = 1 Returns OK result code (factory default)

Command	Factory Default	Parameters/Description
Hn	n = 0	<p>Switch Hook Control Option. Hn controls the on-hook relay.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 Modem on-hook (relay open) (factory default)</p> <p>n = 1 Modem off-hook (relay closed)</p>
In	n = 0	<p>Identification/Checksum Option. In interrogates the modem for its product identification code, ROM checksum, or ROM checksum status.</p> <p>Parameters: n = 0, 1, 2</p> <p>n = 0 Product identification code (factory default). The RC224ATF returns 242</p> <p>n = 1 ROM checksum request. Modem returns the date code.</p> <p>n = 2 ROM checksum status request; Modem returns OK result code.</p> <p>n = 3 ROM part number and revision level request: RC224ATF returns Axyz-C2501-H0</p> <p>Where: x = F when fax is present, = N when fax is not present,</p> <p>Where: y = E when RPI is present, = N when RPI is not present,</p> <p>Where: z = P for parallel card, = S for serial card.</p>
Ln	n = 2	<p>Speaker Volume Option. Ln selects the speaker volume.</p> <p>Parameters: n = 0, 1, 2, 3</p> <p>n = 0 or 1 Low speaker volume</p> <p>n = 2 Medium speaker volume (factory default)</p> <p>n = 3 High speaker volume</p>
Mn	n = 1	<p>Speaker Control Option. Mn controls speaker on/off operation.</p> <p>Parameters: n = 0, 1, 2, 3</p> <p>n = 0 Speaker off</p> <p>n = 1 Speaker on until carrier is detected (factory default)</p> <p>n = 2 Speaker always on</p> <p>n = 3 Speaker on after dialing until carrier detected</p>
On		<p>On-line Command. On forces the modem to the on-line state from the command state. When the modem is in the on-line state, it will return to the command state upon receipt of the escape code.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 On-line state</p> <p>n = 1 On-line state with equalizer retrain</p>
Qn	n = 0	<p>Result Code Display Option. Qn enables the modem to send result codes.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 Enables return of result codes (factory default)</p> <p>n = 1 Disables return of result codes (Quiet)</p>
Sn		<p>Select an S Register. Sn sets the pointer to a particular S Register, where "n" is the number of the register. Until another register is specified, the value of "n" can be read with AT? and changed with AT=.</p> <p>Parameters: none</p> <p>Range: n = 0-27</p>

Command	Factory Default	Parameters/Description
Sn=		<p>Write to an S Register. Sr=x sets register "n" to the value "x". Configuration registers are provided to retain modem configuration parameters. The contents of these registers can be modified with this command.</p> <p>Parameters: none</p> <p>Range: n = 0-27 (register no.) x = 0-255 (value)</p>
Sn?		<p>Read an S Register. Sn? causes the contents stored in register "n" to be returned.</p> <p>Parameters: none</p> <p>Range: n = 0-27</p>
Vn	n = 1	<p>Result Code Form Option. Vn determines the type of result code.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 Result code is sent as digits (short form) n = 1 Result code is sent as words (long form or verbose) (factory default)</p>
Xn	n = 4	<p>Result Code Set/Call Progress Option. Xn selects the result code set and selects dialing functions. The Vn command determines if the result code is sent as words or digits.</p> <p>Parameters: n = 0, 1, 2, 3, 4</p> <p>n = 0 CONNECT result codes are enabled. CONNECT XXXX result codes are disabled. Busy signal and dial tone are not detected.</p> <p>n = 1 The modem blind dials; CONNECT XXXX result codes are enabled. Busy signal and dial tone are not detected.</p> <p>n = 2 The modem waits for dial tone before dialing. CONNECT XXXX result codes are enabled. Busy signal is not detected.</p> <p>n = 3 The modem blind dials; CONNECT XXXX result codes are enabled. The modem sends BUSY result code if busy signal is detected.</p> <p>n = 4 The modem waits for dial tone before dialing. CONNECT XXXX result codes are enabled. The modem sends BUSY result code if busy signal is detected. (factory default)</p>
Yn	n = 0	<p>Long Space Disconnect Option. Yn selects long space disconnect operation.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 Long space disconnect disabled (factory default) n = 1 Long space disconnect enabled</p>

Command	Factory Default	Parameters/Description
P		<p>Pulse Dial. P instructs the modem to use pulse dialing when dialing a number. P may be used between digits of a telephone number to pulse dial the digits following the command. The factory default dial command is P.</p> <p>The number of momentary breaks is equal to the digit dialed except for the "0" which is equal to 10 breaks. The accuracy of the pulse duration is ± 2 ms.</p> <p>For U.S. and Canada (USA/Canada), the break interval limits are 53 ms minimum and 80 ms maximum. The modem is programmed for 61 ms nominal. For United Kingdom and Hong Kong (UK/HK), the break interval is 67 ms. The UK/HK option is selected with the &P command.</p> <p>For USA/Canada, the make interval limit is 33 ms minimum. The modem is programmed for 30 ms nominal. For UK/HK, the make interval is 33 ms. This option is also controlled by the &P command.</p> <p>The pulse rate limits are 8 pulses per second minimum and 11 pulses per second maximum. The modem is programmed for a nominal rate of 10 pulses per second.</p> <p>The inter-digit interval limits are 700 ms minimum and 3 seconds maximum. The modem is programmed for a nominal interval of 789 ms.</p> <p>Parameters: none</p>
R		<p>Originate Call In Answer Mode. R places the modem in answer mode from the originate mode after the telephone number has been dialed. The R is usually entered at the end of the telephone number. The command is used to dial originate-only modems.</p> <p>Parameters: none</p>
S=n		<p>Dial Stored Telephone Number. S=n causes the modem to dial one of four telephone numbers previously stored in NVRAM with the &Zn command.</p> <p>Parameters: n = 0, 1, 2, 3</p> <p>S<CR> S=<CR> S=n<CR> where n=0-3</p> <p>A <CR><LF> sequence is first sent to the DTE. If the delimiter (=) is not present, the string stored in location 0 is sent to the DTE. If the delimiter is present, the character following it (which must be in the range 0-3) specifies which stored string to use. If there is no character following the delimiter, the string found in location 0 is sent to the DTE. After the string is sent to the DTE, execution of the string is started.</p>
T		<p>Touch Tone Dial. T instructs the modem to use DTMF tones to dial the characters following the T.</p> <p>The DTMF frequencies are within 1.5% of the nominal values specified in CS-03 Section 3.13 or RS-496 Section 4.3.2.2. Valid dial characters are 0 to 9, A to D, #, and *.</p> <p>The DTMF duration and inter-digit duration is specified in ms by the S11 register.</p> <p>Parameters: none</p>
W	30 seconds	<p>Wait for Dial Tone. W causes the modem to wait up to a specified time for the dial tone to occur. The telephone number is dialed immediately upon dial tone detection. The S7 register value determines the maximum wait time. If a busy signal is detected instead of dial tone, the modem returns a BUSY result code and goes on-hook, abandoning subsequent instructions on the command line.</p> <p>Parameters: none</p>

Command	Factory Default	Parameters/Description
;(semicolon)		<p>Return to Idle State. ";" forces the modem to remain in the command state after dialing a number without disconnecting. The semicolon must be placed at the end of the dial command.</p> <p>Parameters: none</p>
@		<p>Wait for Quiet Answer Command. "@" causes the modem to look for rings followed by 5 seconds of silence before processing the next symbol in the dialing string. The S7 register value determines the maximum wait time. If quiet answer is detected, the dial modifiers following the command are executed. If busy is detected, the modem returns a BUSY result code and goes to the hang-up process, aborting further execution of commands.</p> <p>Parameters: none</p>
!		<p>Flash Hook Command. "!" causes the modem to go on-hook for 0.75 seconds.</p> <p>Parameters: none</p>
,(comma)	2 seconds	<p>Pause Command. "," causes the modem to pause for a specified time during dialing. The S6 register value determines the pause time. Multiple commas may be used to increase the pause time.</p> <p>Parameters: none</p>
0 to 9, A to D, #, *		<p>Dial Digits/Characters. Characters 0 to 9, A, B, C, D, #, and * are valid. Characters A, B, C, D, #, and * represent specific tone pairs (Table 1-6) and, therefore, can be used only when tone dialing is selected.</p> <p>Parameters: none</p>

Command	Factory Default	Parameters/Description
&Cn	n = 0	<p>Data Carrier Detect Option. &Cn controls the Data Carrier Detect (DCD) options.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 DCD is always ON; the state of the data carrier from the remote modem is ignored. (factory default)</p> <p>n = 1 DCD is ON when data carrier is detected; DCD is OFF when data carrier is not detected.</p>
&Dn	n = 0	<p>Data Terminal Ready Option. &Dn controls the Data Terminal Ready (DTR) options.</p> <p>Parameters: n = 0, 1, 2, 3</p> <p>n = 0 Modem ignores DTR (factory default)</p> <p>n = 1 Modem assumes command state when ON-to-OFF transition is detected on DTR.</p> <p>n = 2 Modem hangs up, assumes command state and disables auto-answer upon detecting ON-to-OFF transition on DTR.</p> <p>n = 3 Modem assumes initialization state upon detecting an ON-to-OFF transition on DTR.</p> <p>Result codes: OK</p>
&F		<p>Load Factory Defaults. &F resets the S registers and commands to the factory default values.</p> <p>Parameters: none</p> <p>S Registers: S0=0, S1=0, S2=43, S3=13, S4=10, S5=8, S6=0, S7=30, S8=2, S9=6, S10=14, S11=95, S12=50, S18=0, S25=5, S26=1, and S28 = 0.</p> <p>Commands: B1, C1, E1, F1, L2, M1, P, Q0, V1, Y0, X4, &C0, &D0, &G0, &J0, &M0/&G0, &P0, &R0, &S0, &T4, and &X0.</p>
&Gn	n = 0	<p>Guard Tone Option. &Gn controls the generation of guard tones. Guard tones are always disabled in Bell 212 mode.</p> <p>Parameters: n = 0, 1, 2</p> <p>n = 0 No guard tone (factory default)</p> <p>n = 1 Reserved</p> <p>n = 2 1800 Hz guard tone</p>
&Jn	n = 0	<p>Auxiliary Relay Control. &Jn determines how the auxiliary relay is controlled.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 The auxiliary telco relay is commanded to stay open. Suitable for RJ-11, RJ-41S, or RJ-45S type phone jack. (factory default)</p> <p>n = 1 The auxiliary telco relay is controlled by off-hook/on-hook. If the modem is off-hook, the relay is commanded to close (connecting A to A1); if the modem is on-hook, the relay is commanded to open (disconnecting A from A1). Suitable for RJ-12 or RJ-13 type phone jack.</p>
&Ln	n = 0	<p>Line Type. &Ln selects dial-up or leased line operation.</p> <p>Parameters: n = 0, 1.</p> <p>n = 0 Dial-up (factory default)</p> <p>n = 1 Leased line (not supported). The modem will respond with OK result code.</p>

Command	Factory Default	Parameters/Description															
&Mn	n = 0	<p>Asynchronous Communications Mode. The &Mn command selects the asynchronous communications mode. The &Mn and &Qn commands may be used interchangeably.</p> <p>Parameters: 0-3</p> <p>n = 0 Asynchronous (factory default) n = 1 Reserved n = 2 Reserved n = 3 Reserved</p>															
&Pn	n = 0	<p>Make-to-Break Ratio Selection. &Pn selects the make-to-break ratio used for pulse dialing.</p> <p>Parameters: n = 0, 1, 2, 3</p> <p>n = 0 Pulse dial make/break ratio = 39/61 @ 10 pps (USA/Canada) n = 1 Pulse dial make/break ratio = 33/67 @ 10 pps (UK/HK) n = 2 Pulse dial make/break ratio = 39/61 @ 20 pps n = 3 Pulse dial make/break ratio = 33/67 @ 20 pps</p>															
&Qn	n = 0	<p>Asynchronous Communications Mode Option. The &Qn command selects the asynchronous communications mode.</p> <p>Parameters: n = 0 - 3</p> <table> <thead> <tr> <th></th> <th>Idle State</th> <th>On-line State</th> </tr> </thead> <tbody> <tr> <td>n = 0</td> <td>Normal</td> <td>Asynchronous (factory default)</td> </tr> <tr> <td>n = 1</td> <td>Reserved</td> <td>Reserved</td> </tr> <tr> <td>n = 2</td> <td>Reserved</td> <td>Reserved</td> </tr> <tr> <td>n = 3</td> <td>Reserved</td> <td>Reserved</td> </tr> </tbody> </table>		Idle State	On-line State	n = 0	Normal	Asynchronous (factory default)	n = 1	Reserved	Reserved	n = 2	Reserved	Reserved	n = 3	Reserved	Reserved
	Idle State	On-line State															
n = 0	Normal	Asynchronous (factory default)															
n = 1	Reserved	Reserved															
n = 2	Reserved	Reserved															
n = 3	Reserved	Reserved															
&Sn	n = 0	<p>Data Set Ready Options. &Sn selects the Data Set Ready (DSR) option.</p> <p>Parameters: n = 0, 1</p> <p>n = 0 DSR is always ON. DSR ON indicates that the modem is connected to a communication channel and is ready. (factory default) n = 1 DSR is turned ON at start of handshaking and off when in a test mode or idle state. DSR is turned OFF when there is no carrier. Not supported in parallel mode; modem will respond with OK result code.</p>															
&Tn	n = 4	<p>Test Command Selection. &Tn selects one of eight test commands.</p> <p>Parameters: n = 0, 1, 3, 4, 5, 6, 7, 8</p> <p>n = 0 Terminate test in progress. n = 1 Initiate local analog loopback. n = 3 Initiate local digital loopback. n = 4 Grant RDL request from remote modem. n = 5 Deny RDL request from remote modem. n = 6 Initiate remote digital loopback. n = 7 Initiate remote digital loopback with self test. n = 8 Initiate local analog loopback with self test</p>															

Commands	Factory Default	Parameters/Description
&V		<p>View Active Configuration and User Profiles. The active and stored profiles are displayed (commands and S register settings) along with the stored telephone numbers. Inputs from the DTE are ignored while the view information is being sent to the DTE.</p> <p>The information text is:</p> <pre>ACTIVE PROFILE:<CR><LF> B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 &Y0<CR><LF> S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:002 S07:030<CR><LF> S08:002 S09:006 S10:014 S12:050 S14:AAH S16:00H S 18:000 S21:00H <CR><LF> S22:76H S23:15H S25:005 S26:001 S27:40H S28:00H<CR><LF> <CR><LF> STORED PROFILE 0:<CR><LF> B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 <CR><LF> S00:000 S14:AAH S18:000 S21:00H S22:76H S23:17H S25:005 S26:001<CR><LF> S27:40H S28:00H<CR><LF> STORED PROFILE 1:<CR><LF> B1 E1 L2 M1 Q0 V1 X4 Y0 &C0 &D0 &G0 &J0 &L0 &P0 &Q0 &R0 &S0 &X0 <CR><LF> S00:000 S14:AAH S18:000 S21:00H S22:76H S23:17H S25:005 S26:001<CR><LF> S27:40H S28:00H<CR><LF> <CR><LF> TELEPHONE NUMBERS:<CR><LF> &Z0= 5551212<CR><LF> &Z1=<CR><LF> &Z2=<CR><LF> &Z3=</pre> <p>Notes:</p> <ol style="list-style-type: none"> The format of the information text and result code are determined by which Vn command is selected. The telephone number shown after &Z0 and the S register values are examples.
&Wn	n = 0	<p>Store Active Profile. &Wn writes the storable parameters of the active configuration to one of two profiles in NVRAM. The current values of the following commands and registers are stored:</p> <p>Commands: Bn, En, Ln, Mn, Qn, Vn, Yn, Xn, &Cn, &Dn, &Gn, &Jn, &Ln, &Pn, &Qn, &Rn, &Sn, &Xn, and &Yn</p> <p>Registers: S0, S14, S18, S21, S22, S23, S25, S26, S27, and S28</p> <p>The last DTE speed and parity are also stored. The stored values will be used upon a powerup or hard reset.</p> <p>Parameters: 0, 1</p> <p>n = 0 Store active profile in location 0 (factory default) n = 1 Store active profile in location 1</p>
&Xn	n = 0	<p>Asynchronous Data Transmission. &Xn selects the source of the transmit clock.</p> <p>Parameters: 0, 1, 2</p> <p>n = 0 Modem sources transmit clock (factory default) n = 1 Reserved n = 2 Reserved</p>

Command	Factory Default	Parameters/Description										
%Dn	n = 0	<p>DTMF Attenuation. %Dn command sets the DTMF transmit level attenuation.</p> <p>n = 0 0 dB attenuation n = 1 2 dB attenuation n = 2 4 dB attenuation n = 3 6 dB attenuation n = 4 8 dB attenuation n = 5 10 dB attenuation n = 6 12 dB attenuation n = 7 14 dB attenuation</p>										
%Ln	n = 0	<p>Transmit Attenuation. %Ln command sets the transmit level attenuation.</p> <p>n = 0 0 dB attenuation n = 1 2 dB attenuation n = 2 4 dB attenuation n = 3 6 dB attenuation n = 4 8 dB attenuation n = 5 10 dB attenuation n = 6 12 dB attenuation n = 7 14 dB attenuation</p>										
%J		<p>Secondary Defaults. %J command resets all S registers and commands to the &F defaults with the following exceptions:</p> <table> <thead> <tr> <th>S Register/Command</th> <th>%J Defaults</th> </tr> </thead> <tbody> <tr> <td>S6</td> <td>3 seconds; range: 3-255</td> </tr> <tr> <td>S11</td> <td>95 ms; range: 60-255</td> </tr> <tr> <td>%Ln</td> <td>6 dB (%L3)</td> </tr> <tr> <td>%Dn</td> <td>2 dB (%D1)</td> </tr> </tbody> </table>	S Register/Command	%J Defaults	S6	3 seconds; range: 3-255	S11	95 ms; range: 60-255	%Ln	6 dB (%L3)	%Dn	2 dB (%D1)
S Register/Command	%J Defaults											
S6	3 seconds; range: 3-255											
S11	95 ms; range: 60-255											
%Ln	6 dB (%L3)											
%Dn	2 dB (%D1)											

4.0 S REGISTERS

The table contained in this section summarizes the S registers available in the 2400 modem. Those registers described as bit mapped are typically set through commands in the AT command set.

REGISTER	RANGE	UNITS	DEFAULT	DESCRIPTION
S0*	0-255	Rings	00	Ring to answer on
S1	0-255	Rings	00	Ring count
S2	0-127	ASCII	43	Escape code character
S3	0-127	ASCII	13	Carriage return character
S4	0-127	ASCII	10	Line feed character
S5	0-32, 127	ASCII	08	Back space character
S6	2-255	Seconds	02	Wait for dial tone
S7	1-255	Seconds	30	Wait time for data carrier
S8	0-255	Seconds	02	Pause time for comma
S9	1-255	1/10 seconds	06	Carrier detect response time
S10	1-255	1/10 seconds	14	Lost carrier hang-up delay
S11	50-255	ms	95	DTMF dialing speed
S12	0-255	1/50 seconds	50	Escape code guard time
S12-S24*	Bit mapped	none	various	Bit maps set through AT commands
S25*	0-255	1/10 seconds	5	Lost DTR hang-up delay
S26*	0-255	.01 seconds	1	RTS to CTS interval
S26-S27*	Bit mapped	none	various	Bit maps set through AT commands

NOTES: * These S- Registers are stored in the modem NVRAM upon receipt of the &W command.

5.0 CONFIGURING THE MODEM FOR DUMB MODE

The 2400 modem may be configured to operate in dumb mode by entering the proper AT command sequence and selecting the necessary jumper settings on the modem board. To place the modem in dumb mode, enter the following command string and then press the carriage return:

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AT&F&C1&D0EQ1S0=1&W
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In most installations requiring dumb mode, it will also be necessary to set J5 which is inside the modem case. To do this, it is necessary to remove the 2 screws in the bottom of the modem case and then remove the top of the case.

The sleeve on J5 is usually set to cover pins 2 and 3 and in this configuration, CTS is always on. For most dumb mode installations, it will be necessary for the sleeve on J5 to cover pins 1 and 2. In this configuration, CTS will follow the state of DCD. This is typically required to notify the DTE of an active connection. For reference, the following summary of J5 is provided:

CONFIGURATION	J5
CTS ALWAYS ON (typical smart mode operation)	Jumper sleeve on pins 2 and 3
CTS FOLLOWS DCD (typical dumb mode operation)	Jumper sleeve on pins 1 and 2

CERTIFICATIONS

FCC Part 68

This equipment complies with U.S. Code of Federal Regulations, Title 47, FCC Rules and Regulations Part 68. Located on the equipment is the FCC Registration Number and Ringer Equivalence Number (REN). You must provide this information to the telephone company if requested.

The Registration Number and REN will be on a label attached to the unit. The FCC requires these numbers be prominently displayed on an outside surface of the equipment.

The REN is used to determine the number of devices you may legally connect to your telephone line. In most areas, the sum of the REN of all devices connected to one line must not exceed five (5.0). You should contact your telephone company to determine the maximum REN for your calling area. The telephone company may change technical operations or procedures affecting your equipment. You will be notified of changes in advance to give you ample time to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact StarComm Products, Inc. at (714) 375-1241 for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been resolved. If your equipment continues to disrupt the network, the telephone company may temporarily disconnect service. If this occurs you will be informed of your right to file a complaint with the FCC.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

FCC Part 15

This equipment has been tested and complies with the limits for i Class A computing device according to U.S. Code of Federal Regulations, Title 47, FCC Rules and Regulations Part 15. Operation is subject to the following two conditions:

- (1) This device may cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.