V.3225/V.3225L
Manual

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Chapter 6
Status Registers

STATUS REGISTERS TUTORIAL

Most modem configuration information is stored in a part of memory called status (S) registers. During operation this information is used to determine modem functions.

The information stored in the S-registers can be changed by the AT or V.25 command sets and by pushbuttons in response to the LCD prompt. These are the preferred methods. Some software programs also access the S-registers via the AT command set, but this action is transparent to the user. The command indicates which memory bit(s) to alter to select a particular option or to perform a certain function. The S-register values comprise the configuration profile.

Caution: The purpose of this tutorial is to show the versatility of option selection and register function. It is strongly recommended that the preferred methods of option selection be used. This tutorial uses S22 as the example register. Certain modems may use S22 differently or may not have an S22.

Generally the user should not directly alter S-register values. However, the user has the option of changing S-register values via ATS commands. This is called "writing" to the S-register. Writing to an S-register is not a preferred method and should only be used by programmers who need to manipulate S-registers for custom purposes.

Certain S-registers cannot be changed by the ATS command series. These are called "read only" S-registers. Appendix D contains a listing of S-registers and indicates if they are read only or read and write.

Figure 6-1 illustrates how the different inputs to an S-register (S22 in this case) are used to select a particular option. Bits 3 and 2 of S22 control speaker options. Some communication software packages may use the AT command set. For example purposes bit values are arbitrary.
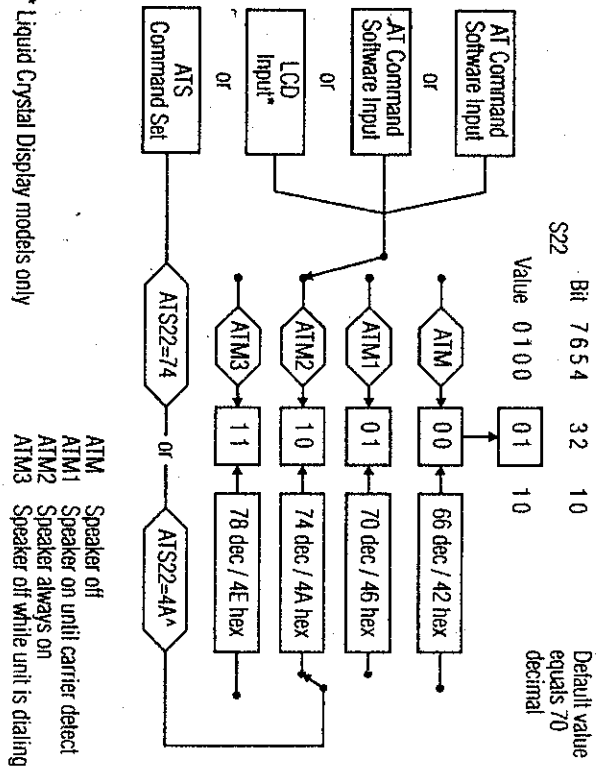
AT Command Software Input

or

AT Command Software Input / LCD Input*

or

ATS Command Set

S22
Value 0100

Bit 7654 32 10
     0100 10

Default value equals 70 decimal

ATM	00	01	66 dec / 42 hex
ATM1	01		70 dec / 46 hex
ATM2	10		74 dec / 4A hex
ATM3	11		78 dec / 4E hex

ATS22=74   or   ATS22=4A^

* Liquid Crystal Display models only

ATM	Speaker off
ATM1	Speaker on until carrier detect
ATM2	Speaker always on
ATM3	Speaker off while unit is dialing

Figure 6-1
Changing S-Register Values

Bit values for S-registers must not be confused with the total register value. Bit values are counted separately for each option group, called bit mapping, while the register value is the cumulative decimal or hexadecimal total. The decimal value counts all eight bits as a single group. Hexadecimal values split the bits into two groups of four each. Writing to an S-register changes the total value.

Figure 6-2 illustrates the difference between decimal calculation and hexadecimal calculation.

Bit	7	6	5	4	3	2	1	0	
Decimal Value	128	64	32	16	8	4	2	1	
S22 Value	0	1	0	0	0	1	1	0	
Decimal Total		64			+		4 + 2		= 70

Hexidecimal Value	8	4	2	1	8	4	2	1	
S22 Value	0	1	0	0	0	1	1	0	
Hexidecimal Total		4		and		4 + 2			= 46

Figure 6-2
Calculating S-Register Values

Note: Refer to Appendix G for decimal/ hexadecimal values.

S-REGISTER OPERATION

To   Read a register value

Enter   ATSn?   (n=register number) for
                   decimal value

or   ATSn?^   for hexadecimal value

For example, to determine the current backspace character

Enter   ATS5?

The screen will show the ASCII value of the backspace character stored in register S5.

To   Change (write to) a register value

Enter   ATSn=v   (n=register number,
                   v=decimal value)

or   ATSn=^v   (^v=hexadecimal value)

Note: Not all registers can be set by the ATSn=v (or ^v) command. Some registers are for reference only.

To   Change the escape character from + to the ESC key (ASCII value of 27)

Enter   ATS2=27

To return the modem to the command mode press the ESC key three times:

         (pause) ESC ESC ESC (pause)

Individual Bit Command Sn .(bit#) = v

Most operators use AT commands as the primary method of changing S-register options. However, some options stored in registers do not have an associated AT command. For these options, an individual

bit AT command can be used to change the setting of the bit controlling the option.

To   Change a single bit value within a register

Enter   ATSn . (bit#) = v   where
                             n= register number
                             v= bit value 1 or 0

Example:

S-register 27, bit 2 selects between dial-up or leased line operation.

• AT command method:

AT&L   selects dial-up operation
          (sets S27 bit 2 to 0)

AT&L1   selects leased line operation
          (sets S27 bit 2 to 1)

• Individual bit method:

ATS27.2=0   selects dial-up operation
            (sets S27 bit 2 to 0)

ATS27.2=1   selects leased line operation
            (sets S27 bit 2 to 1)

Note: This method of option selection can be used on all S-registers except read only registers.

Autoanswer
S0 = 0-255

This register turns the option on or off. Set the register to 0 to turn autoanswer off.

Set the register to any nonzero (1-255) value to turn autoanswer on. The number selected is the ring count the modem answers on. For example, if S0 equals 4, the modem answers the call on the fourth ring. The default value is 1.

Ring Count
S1 = 0-255

This register contains the ring count for each incoming call. There is no need to change its value since it is reset by each call or if no rings occur after 8 seconds. If developing communications software, the program can read the register to determine the ring total.

Escape Character
S2 = 0-255

The standard escape character is a + sign (ASCII value of 43). To change the character, set S2 to the desired ASCII value.

To disable the escape command, set S2 to any value greater than 127.

End-of-Line
Character
S3 = 0-127

The standard character is the carriage return (ASCII value of 13). This character ends each command as it is sent to the modem. It is also sent by the modem after each status message or number code.

To change the character, set S3 to the desired ASCII value (0-127).

Line Feed
Character
S4 = 0-127

The standard character is the line feed (ASCII value of 10). This character is sent by the modem after each status message. To change it, set S4 as desired (0-127).

Backspace
Character
S5 = 0-127

The standard character is the backspace (ASCII value of 8). To change it, set S5 to the desired value (0-127).

Pause Before
Dialing
S6 = 0-255

When dial tone detection is disabled (command X, X1, or X3 in effect), the modem waits the number of seconds (0-255) stored in this register before dialing. The default value is 2 (seconds).

Pause for Ring
Back Detection/
Pause for Carrier
Detection
S7 = 1-30

If no ring back is detected in the number of seconds in S7 (1-30), the modem disconnects and sends the NO CARRIER message or code. If ring back is detected, the modem begins to look for a carrier.

If no carrier is detected within the number of seconds in S7, the modem hangs up and sends the NO CAR-RIER message or code.

Values between 1 and 30 may be used. The default value is 30 (seconds).

Pause Interval for
Comma
S8 = 0-255

When a dial command contains a comma, the modem pauses the number of seconds in S8. Change S8 to change the basic pause interval (0-255), or use several commas in a row for greater delay during dialing.

The default value is 2 (seconds).

Carrier Detect
Time
S9 = 0-255

Amount of time (0-255) in 0.1 second increments the carrier must be present to be recognized. The default value is 6 (0.6 second). Data Carrier Detect (DCD) will be raised when carrier is recognized. This timer can be extended to lessen the likelihood of false detection of carrier.

Lost Carrier Detect
Time
S10 = 0-255

Amount of time (0-255) in 0.1 second increments needed to recognize the loss of carrier. Data carrier detect (DCD) will be dropped when the loss of carrier is recognized and the modem disconnects. The default value is 14 (1.4 seconds).

S11
DTMF Tone Duration

> *Note: If S10 is less than S9, any loss of carrier results in a disconnect. When S10 is larger than S9, the length of time that a carrier loss can be tolerated is the difference between S10 and S9.*

Determines the length of DTMF tones in 1 ms increment. The period of silence is equal to the duration of the tone. The value of this register must be entered in multiples of 10. Default value is 80 (80 ms).

S12 = 0-255
Escape Sequence Pause Interval

Using the escape sequence to return to command mode from data mode requires two pauses, one before and one after the escape characters.

The pauses prevent the modem from responding to a character sequence which might contain the escape sequence as part of its normal data transmission.

S12 contains the pause interval in 0.02 second increments. The factory setting is 50, equivalent to 1 second (50 x 0.02 sec). When S12 is 0 then timing is not a factor.

The timing between the 3 escape characters must be less than the pause interval or the escape sequence will not be detected. The data rate also affects the timing and must be taken into account when changing the pause interval.

To disable the escape command, set S2 to a value greater than 127 instead of changing S12. Values between 0 and 255 may be used for S12.

> *Note: When S-registers have parallel AT commands, the commands are listed in the register tables as a cross reference. If no command exists for the option the column is left blank.*

S13 Not used

S14
Bit Mapped

Bit	Value	Command	Description
0	–	–	Reserved
1	0	E	Local character echo off
	*1	E1	Local character echo on
2	*0	Q	Response displays on
	1	Q1	Response displays off
3	0	V	Response digit messages
	*1	V1	Response word message
4	*0		Ignore
	1	Q2	Response display on in originate mode only
5	*0	T	Tone dial
	1	P	Pulse dial
6	0	H2	V.32 cleardown enabled
	*1	H3	V.32 cleardown disabled
7	0	*OR1	Forced answer
	*1	*OR	Normal originate

* default

S15 Not used

> *Note: If status bits are of interest, read the register value to find which bits are set.*

System Tests
S16

Contains the status of system test option settings.

Bit	Value	Command	Description
0	0	–	Analog loopback inactive
	1		Analog loopback in progress
1	–	–	Reserved
2	0		Digital loopback inactive
	1		Digital loopback in progress
3	0		Slaved digital loopback inactive
	1		Slaved digital loopback in progress
4	0		Remote digital loopback inactive
	1		Remote digital loopback in progress
5	0		Self test remote digital loopback inactive
	1		Self test remote digital loopback in progress
6	0		Self test analog loopback inactive
	1		Self test analog loopback in progress
7	–	–	Reserved

S17

Not used

Test Timeout
S18

Amount of time (0-255) in 1 second increments, that a diagnostic test will run. A value of 0 disables the timer. The default value is 0.

S19, 20

Not used

Bit Mapped
S21

Bit	Value	Command	Description
6, 0	*00	&S	DSR always on
	10	&S1	DSR on when off hook in data mode
	01	&S2	DSR off 5 seconds after disconnect
	11	&S3	DSR follows off hook (OH)
5, 1	*00	&C	DCD always on
	10	&C1	DCD follows carrier from remote modem
	01	&C2	DCD on except for 5 seconds after disconnect
	11	&C3	DCD follows RTS on remote modem; in reliable mode follows carrier only
2	0	&R	CTS follows RTS by S26 delay
	*1	&R1	CTS always on
4, 3	*00	&D	DTR ignored
	01	&D1	DTR on/off transition recalls asynchronous command state
	10	&D2	DTR on/off transition causes disconnect
	11	&D3	DTR on-to-off transition disconnects and resets modem to current stored configuration
7	0	Y	Long space disconnect disabled
	*1	Y1	Long space disconnect enabled

* default

Bit Mapped S22

Bit	Value	Command	Description
1,0	00	L	Speaker volume low
	*01	L1	Speaker volume low
	*10	L2	Speaker volume medium
	11	L3	Speaker volume high
3,2	00	M	Speaker off
	*01	M1	Speaker on until carrier detect
	10	M2	Speaker always on
	11	M3	Speaker off when modem is dialing
6,5,4	000	X	CONNECT message only, blind dials, no busy detect
	001	X1	CONNECT/appropriate code for rate, blind dials, no busy detect
	010	X2	CONNECT/appropriate code for rate, waits for dial tone, no busy detect
	011	X3	CONNECT/appropriate code for rate, blind dials, reports BUSY
	*100	X4	CONNECT/ appropriate code for rate, waits for dial tone, reports BUSY
7	*0	&P	Make/break ratio (US) 39/61
	1	&P1	Make/break ratio (UK) 33/67

*default

Bit Mapped S23

Bit	Value	Command	Description
0	0	&T5	Remote commanded digital loopback disabled
	*1	&T4	Remote commanded digital loopback enabled
5-1	--	--	Reserved
7,6	*00	&G	No guard tone
	*01	&G1	550 Hz guard tone
	10	&G2	1800 Hz guard tone
	11	--	Not used

S24

Not used

DTR State Recognition Time S25

The S25 register specifies the amount of time (0–255) in 0.01 second (10 ms) increments that DTR must stay high or low in order to be recognized as such. The default value is 5 (0.05 second).

RTS/CTS Delay S26

The S26 register specifies the amount of time (0–255) in 0.01 second (10 ms) increments between the RTS signal and the CTS signal. The default value is 0.

Bit Mapped S27

Bit	Value	Command	Description
1,0	*00	&M	Async
	01	&M1	Sync data / async dial
	10	&M2	Sync data / dial through DTR
	11	&M3	Sync data / manual dial
2	*0	&L &L1	Dial up line
	1	&L1 and &L2	Leased line
3	--	--	Reserved
5, 4	*00	&X	Internal clock
	01	&X1	External clock
	10	&X2	Receive clock
	11	--	Not used
6	1		Enable async DTR dialer
	0		Disable async DTR dialer
7	--	--	Reserved

*default

Lookback Timer S28

Amount of time in 1.0 minute increments that the modem will remain in dial backup mode before re-trying leased line mode. This is only used if automatic dial backup is enabled. A zero will disable automatic lookback to leased line mode. The default value is 15 minutes.

Bit	Value	Command	Description
7-0	0-255		Time in 1 minute increments (0 = disabled)

Bit Mapped
S29

Bit	Value	Command	Description
0	*0	*NT	Enable AT command set
0	1		Disable AT command set
1	*0	*RO	Options retained at disconnect
1	1	*RO1	Options restored at disconnect
2	*0	*FT	Disable V.32 fast train
2	1	*FT1	Enable V.32 fast train
6-3	-	-	Reserved
7	*0	*FB	DTE fallback disabled
7	1	*FB1	DTE fallback enabled

* default

Bit Mapped
S30

Bit	Value	Command	Description
0	-	-	Reserved
1	*0		V.25 ASCII
1	1		V.25 EBCDIC
4-2	-	-	Reserved
5	*0		NRZ
5	1		NRZI
7, 6	00		V.25 disabled
	01	&M4	V.25 Bisync
	*10	&M5	V.25 SDLC
	11	-	Reserved

* default

S31

Reserved

Bit Mapped
S32

Bit	Value	Command	Description
0	0	&L1	2-wire (leased line only)
0	1	&L2	4-wire (leased line only)
1	0	*LC1	Line current disconnect = short
1	*1	*LC2	Line current disconnect = long
2	0	*LC or *LC1	Line current disconnect = disable
2	*1	*LC2	Line current disconnect = enable
3	*0	*DB	Dial backup = manual
3	1	*DB1	Dial backup = automatic
7-4	-	-	Reserved

* default

S33

Reserved

Bit Mapped
S34

Bit	Value	Command	Description
0	*0	*AN	Bilateral analog = disable
0	1	*AN1	Bilateral analog = enable
1	*0	*DG	Bilateral digital = disable
1	1	*DG1	Bilateral digital = enable
2	*0	*LA	DTE commanded LAL = disable
2	1	*LA1	DTE commanded LAL = enable
3	*0	*RD	DTE commanded RDL = disable
3	1	*RD1	DTE commanded RDL = enable
7-4	-	-	Reserved

* default

S35-38

Reserved

Bit Mapped
S39

Bit	Value	Command	Description
0-4	--		Reserved
5	*0		DTE rate is sent with CONNECT message
	1		DCE rate is sent with CONNECT message
6-7	--		Reserved

default

S40-51

Reserved

Bit Mapped
S52

Selects leased line transmit level from 0 to -15 dBm in 1 dB increments.

Bit	Value	Command	Description
3-0	*0 to 15	*TLn (n = 0-15)	Transmit level in dB (0 dB through -15 dB)
7-4	--	--	Reserved

default

801 V.32 Timeout
S53

Selects 801 (ACU) V.32 timeout.

Bit	Value	Command	Description
0	*0		801 V.32 timout long
	1		80 V.32 timeout short
7-1	--	--	Reserved

default

Flow Control
S54

Selects flow control options.

Bit	Value	Command	Description
1,0	00	\Q	Disable DTE flow control
	*01	\Q1	Enable DTE XON/XOFF flow control
	10	\Q2	Enable DTE CTS flow control
	11	\Q3	Enable bilateral CTS/RTS flow control
2	--	--	Reserved
3	*0	\G	Disable modem port flow control
	1	\G1	Enable modem port XON/XOFF flow control
4	*0	\X	No XON/XOFF characters to remote
	1	\X1	Pass XON/XOFF characters to remote
7-5	--	--	Reserved

default

S55, 56

Reserved

Number Code
Application
S57

Bit	Value	Command	Description
0	*0	*RC	Standard number codes 15 - 4800 bps 18 - 9600 bps
	1	*RC1	Alternate number codes 11 - 4800 bps 12 - 9600 bps
7-1	--		Reserved

default

MNP Inactivity Timer S58

Specifies the number of minutes the modem waits before terminating a call when no data is sent or received. 0 disables timer.

AT\Tn load inactivity timer, n=0-255 minutes.

Bit	Value	Command	Description
7-0	*0	\T	Disable
	1-255 (n = 1-255)	\Tn	Timer value in minutes

default

MNP Break Control S59

Determines action taken when a break is encountered. Refer to the Break Control section in Chapter 5 for further explanation.

Bit	Value	Command	Description
2, 1, 0	000	\K	MNP break option 0
	001	\K1	MNP break option 1
	010	\K2	MNP break option 2
	011	\K3	MNP break option 3
	100	\K4	MNP break option 4
	*101	\K5	MNP break option 5
7-3	-	-	Reserved

default

Bit Mapped S60

Bit	Value	Command	Description
0	0	%E	Disable auto retrain
	*1	%E1	Enable auto retrain
1	0	%C	Disable data compression
	*1	%C1	Enable data compression
2	*0	\C	Disable auto reliable data buffer
	1	\C1	Buffer data for 4 seconds or 200 characters
5, 4, 3	111	\O	Originate a MNP link
	110	\U	Accept a MNP link
	101	\Y	Switch to MNP from normal
	100	\Z	Switch to normal from MNP
	*001-000		Normal mode selected from S70
6	0	\R	RI blinks for ring and remains on for duration of call
	*1	\R1	RI blinks for ring and turns off when call is answered
7	*0	\V	Disable protocol result codes
	1	\V1	Enable protocol result codes

default

DTE Speed S61

Indicates DTE rate. Works in conjunction with the DCE rate in S69.

This register is for reference only.

Bit	Value	Command	Description
2, 1, 0	001		0-300
	010		1200
	011		2400
	100		4800
	--		Not used
	*110		9600
	111		19200
	--		Not used
3	0		7 bit word length
	1		8 bit word length
5, 4	01		No parity
	10		Odd parity
	11		Even parity
7,6	-		Reserved

default

Disconnect Buffer Delay
S62

Determines delay to allow buffers to empty before disconnect when disconnect conditions exist.

Bit	Value	Command	Description
7-0	*0	%D	Buffer disabled
	1-255	%Dn	Disconnect buffer delay value (seconds)

* default

Maximum MNP Block Size
S63

Sets maximum transmit block size.

Bit	Value	Command	Description
7-0	63	\A	Maximum block size = 64
	127	\A1	Maximum block size = 128
	191	\A2	Maximum block size = 192
	*255	\A3	Maximum block size = 256

Auto-Reliable Fallback Character
S64

Stores the selected ASCII value of the auto-reliable fallback character.

Bit	Value	Command	Description
6-0	*0	%A	Disable auto-reliable fallback character
	1-127	%An	ASCII value 1-127
7	-	-	Reserved

S65-66   Reserved

Link Speed Status
S67

Indicates the true data link speed. This register is for reference only.

Bit	Value	Command	Description
2,1,0	001		300 bps
	010		1200 bps
	011		2400 bps
	100		4800 bps
	101		9600 bps
7-3	-	-	Reserved

S68   Reserved

DCE Independent Speed
S69

Selects DCE independent rate operation. When S69 is 0, DTE and DCE rates are equal and the maximum originate connect rate is determined by S61. When S69 is non-zero, the maximum originate connect rate is determined by S69.

Bit	Value	Command	Description
2,1,0	000	%B	Use rate indicated by S61
	001	%B1	0-300 bps
	010	%B2	1200 bps
	011	%B3	2400 bps
	100	%B4	4800 bps
	101	%B5	9600 bps uncoded
	*110	%B6	9600 bps trellis
7-3	-	-	Reserved

* default

Operating Mode
S70

Bit	Value	Command	Description
1,0	00	\N	Normal mode (no error control, data is buffered)
	01	\N1	Direct mode (no error control, no buffering)
	10	\N2	MNP mode (reliable only)
	*11	\N3	Auto reliable mode (try MNP, fall back to normal)
7-2	-	-	Reserved

* default

Operating Mode Status S71

Indicates level of MNP error controlling protocol. This register is for reference only.

Bit	Value	Command	Description
2, 1, 0	000		No MNP
	001		Negotiating MNP
	010		MNP level 2
	011		MNP level 3
	100		MNP level 4
	*101		MNP level 5
7-3	--	--	Reserved

*default

Bit Mapped S72

Bit	Value	Command	Description
0	0*	\J	Disable slaved DTE/DCE (constant speed DTE on)
	1	\J1	Enable slaved DTE/DCE (constant speed DTE off)
1	0*		Link parity option disabled
	1		Link parity option enabled
2	0*		No link parity error
	1		Link parity error received (cleared on read)
3	0*	&R2	CTS does not follow DCD
	1		CTS follows DCD
4	0*	&R9	CTS does not equal RTS
	1		CTS equals RTS
6-5	--	--	Reserved
7	0*		Disable autocallback
	1		Enable autocallback

*default

S73-77

Reserved

Autocallback Timer S78

Specifies the time in seconds that the modem waits for autocallback. Default is 30 seconds.

Bit	Value	Command	Description
7-0	0-255		Time in seconds to wait for autocallback

Break Length S79

Sets length of the break sent to the DTE when a break signal is received. Range from 1-255 in 20 ms increments. Default is 35 (700 ms).

Bit	Value	Command	Description
7-0	1-255	\B	Send break
		\Bn	Set break length (n = 1-255)

S80-83

Reserved

Bit Mapped S84

Bit	Value	Command	Description
0	0*		Any key abort enabled
	1		Any key abort disabled
1	0*		Remote DCD goes low in RDL and remote configuration
	1		Remote DCD stays high in RDL and remote configuration
2	0*		Fallback to V.22 rates normally
	1		Reduced time to fallback to V.22 rates
3	0*		Answerback normally
	1		Reduces answerback time
4	0*		With DTR disconnects, 4 DTR transitions initiate autodial backup
	1		With DTR disconnects, 1 DTR transition initiates autodial backup
5	--		Reserved
6	0*		Allow switch hook capability while in leased line
	1		Disallow switch hook capability while in leased line
7	0*		Pin 25 of DTE used for test mode status
	1		Pin 25 of DTE used for in dial backup status

*default

S85-90

Reserved