

Compact Global V.22 Modem Board

Description

The Xecom XE2422SM provides a low-cost, low data rate modem for embedded systems applications. It is a complete 2400 bps modem on a miniature printed circuit board that can be easily integrated into process, control, point-or-sale, automated meter reading or remote diagnostic systems.

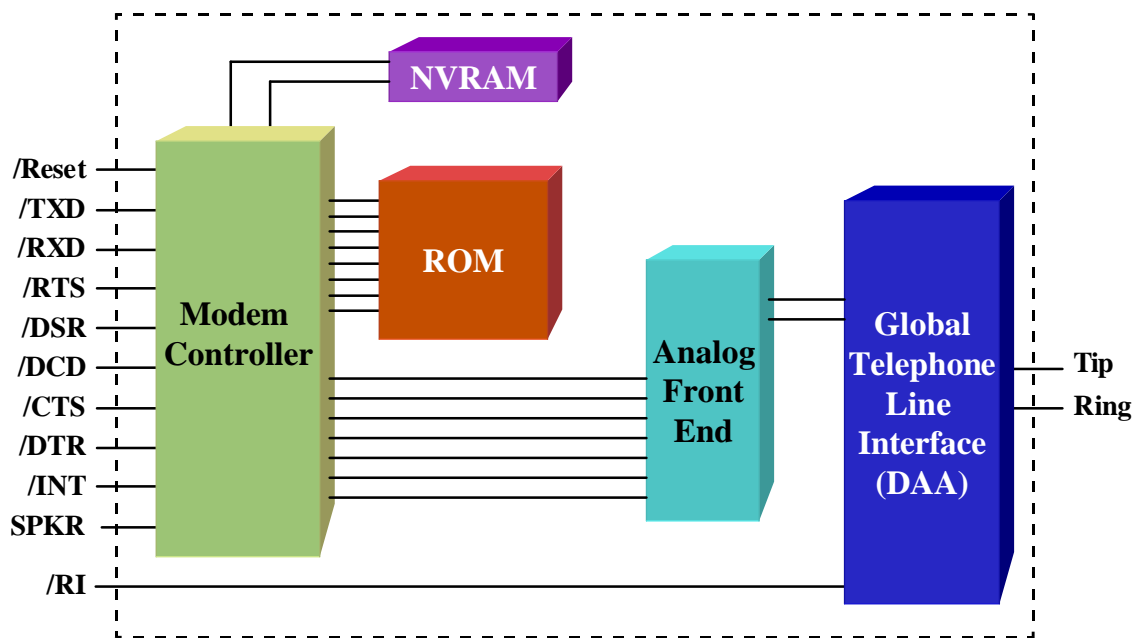
In the XE2422SM Xecom is a complete modem solution. It includes a global compliant DAA which permits Xecom to provide transferable FCC Part 68 Registration and compliance with telephone systems around the world. The XE2422SM also includes features which allow the modem to unobtrusively share the telephone line with a handset.

If there is a need for higher speed, the XE2422SM is pin compatible with the XE5690SM and XE5692SM. You can design in one modem and select from three models.

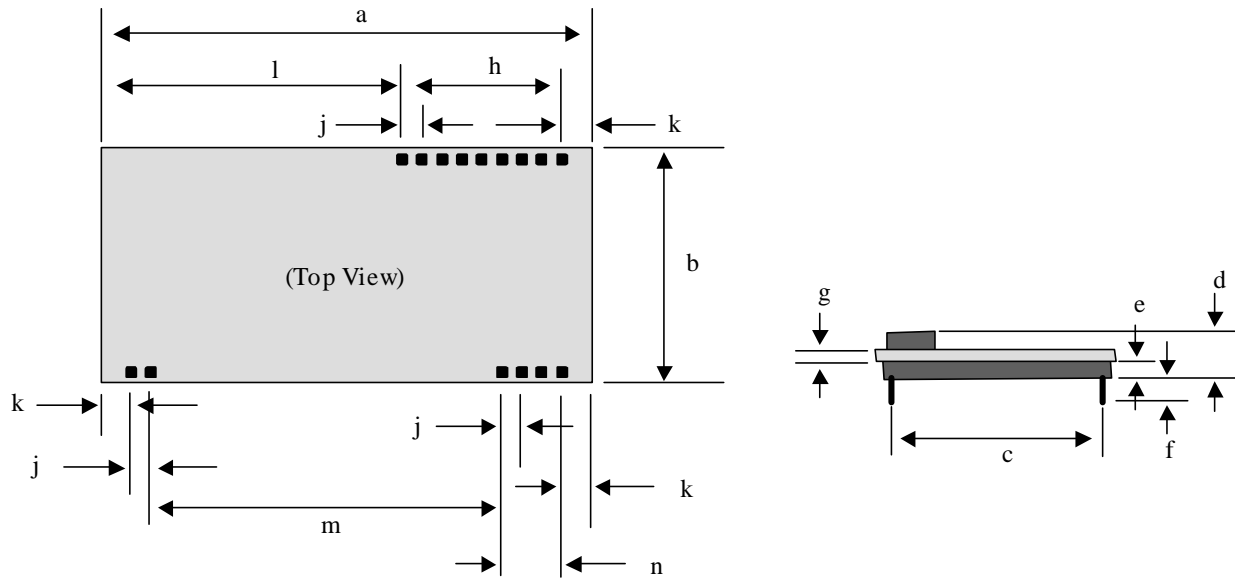
Features

- * Small Size: 2.175" by 1.00" by 0.3"
- * Data transfer at rates from 300 bps to 2400 bps
- * Modem Control and Configuration via industry standard AT Commands.
- * 3.3 and 5 volt compatible Serial Interface
- * Supports V.42 and MNP error correction
- * Shared Line Features prevent modem operation from interfering with voice communications.
- * Nonvolatile memory stores modem configuration.
- * Complete integrated DAA.
- * User Transferrable FCC Part 68 Registration
- * Complies with telephone networks around the world.
- * UL60950 Recognition
- * Low Power operation, 3.3 Volts, 100 milliwatts;

XE2422SM BLOCK DIAGRAM



XE2422SM Mechanical Specifications

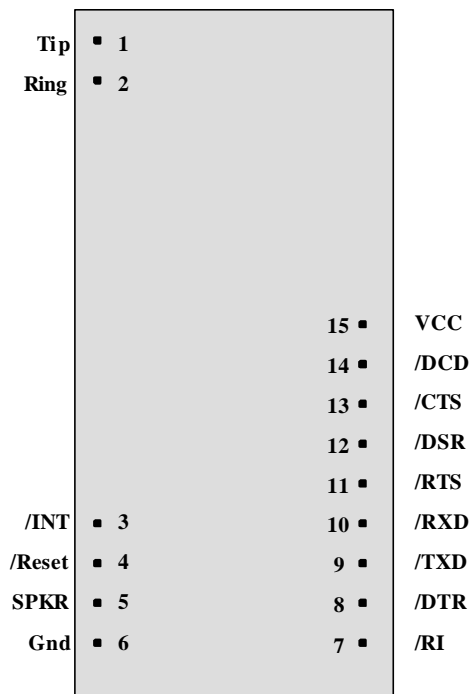


| Dimension | Inches | | | Millimeters | | |
|-----------|--------|--------|-------|-------------|-------|-------|
| | Min | Typ | Max | Min | Typ | Max |
| a | 2.170 | 2.175 | 2.180 | 55.12 | 55.24 | 55.37 |
| b | 0.995 | 1.000 | 1.005 | 25.27 | 25.40 | 25.53 |
| c | 0.890 | 0.900 | 0.910 | 22.61 | 22.86 | 23.11 |
| d | 0.242 | 0.252 | 0.262 | 6.15 | 6.40 | 6.65 |
| e | 0.090 | 0.100 | 0.110 | 2.29 | 2.54 | 2.79 |
| f | 0.140 | 0.150 | 0.160 | 3.56 | 3.81 | 4.06 |
| g | 0.059 | 0.062 | 0.065 | 1.50 | 1.57 | 1.65 |
| h | 0.790 | 0.800 | 0.810 | 20.07 | 20.32 | 20.83 |
| j | 0.090 | 0.100 | 0.110 | 2.29 | 2.54 | 2.79 |
| k | 0.137 | 0.1375 | 0.138 | 3.48 | 3.49 | 3.51 |
| l | 1.230 | 1.240 | 1.250 | 31.24 | 31.50 | 31.75 |
| m | 1.490 | 1.500 | 1.510 | 37.85 | 38.10 | 38.35 |
| n | 0.290 | 0.300 | 0.310 | 7.37 | 7.62 | 7.87 |

Note: All pins are .025" square

XE2422SM Pin Configuration

Top View



Pin Descriptions

| PIN | NAME | DESCRIPTION |
|-----|------|--|
| 1 | Tip | <p>The Ring and Tip signals connect the modem to the telephone line. FCC Part 68 Rules require a 1500 volt isolation barrier between the telephone line and all other circuits. This isolation must be preserved throughout the system.</p> <p>The telephone company places a DC “Battery” voltage across Tip and Ring on public switched telephone lines. The XE2422SM operates regardless of the polarity of this “Battery” voltage. The “Battery” voltage drives up to 100 milliamperes of DC loop current.</p> <p>UL60950 requires minimum creepage and clearances distances between the Tip and Ring traces and all other circuits. Clearance is the shortest distance between conductive circuits; creepage is the distance between conductive points along the surface.</p> |
| 2 | Ring | <p>The Ring and Tip signals connect the modem to the telephone line. FCC Part 68 Rules require a 1500 volt isolation barrier between the telephone line and all other circuits. This isolation must be preserved throughout the system.</p> <p>The telephone company places a DC “Battery” voltage across Tip and Ring on public switched telephone lines. The XE2422SM operates regardless of the polarity of this “Battery” voltage. The “Battery” voltage drives up to 100 milliamperes of DC loop current.</p> |

XE2422SM Pin Descriptions (continued)

| PIN | NAME | DESCRIPTION |
|-----|--------|---|
| | | UL60950 requires minimum creepage and clearances distances between the Tip and Ring traces and all other circuits. Clearance is the shortest distance between conductive circuits; creepage is the distance between conductive points along the surface. |
| 3 | /INT | /INT provides an active low hardware interrupt signal from the XE2422SM. The operation of this interrupt pin is programmable using the modem's register U70. |
| 4 | /RESET | /RESET is an active low input which initiates a modem hardware reset. /RESET must be active for a minimum of 100 milliseconds for a proper modem reset sequence. No external reset is required; if none is used, the RESET signal should be left open. |
| 5 | SPKR | SPKR allows connection of a speaker to monitor modem operations. SPKR cannot directly drive a speaker; an amplifier with a minimum input impedance of 300 ohms is required. The signal on SPKR is controlled by the ATL and ATM commands. |
| 6 | Ground | Ground provides the reference voltage for all host interface signals. |
| 7 | /RI | The /RI signal reports on the presence of an incoming ring signal. When a ring occurs across Tip and Ring, the /RI output goes low and toggles with the cadence of the ring signal. |
| 8 | /DTR | /DTR is an active low input to the modem. The operation of /DTR is controlled by bit 15 of register U70 and is normally disabled. When enabled, /DTR indicates the Host is ready to communicate, and if /DTR is removed while the modem is on-line, the modem will exit data mode and enter command mode. |
| 9 | /TXD | /TXD provides the path for transmitted data and modem commands to be passed from the host controller to the modem. |
| 10 | /RXD | /RXD provides the path for received data and modem responses to be sent from the modem to the host controller. |
| 11 | /RTS | /RTS is an active low input to the modem. When hardware flow control is set, an active /RTS indicates to the modem that the host has data to send. |
| 12 | /DSR | /DSR is forced active within the XE5690SM module. |
| 13 | /CTS | /CTS is an active low output from the modem. When hardware flow control is set, the modem asserts /CTS to indicate that it can accept data from the terminal equipment on /TXD. |
| 14 | /DCD | /DCD is an active low output from the modem. An active /DCD indicates the presence of a valid carrier signal. The AT&C command controls when the XE2422SM asserts /DCD. |
| 15 | VCC | VCC provides 3.3 volt power to the modem. |

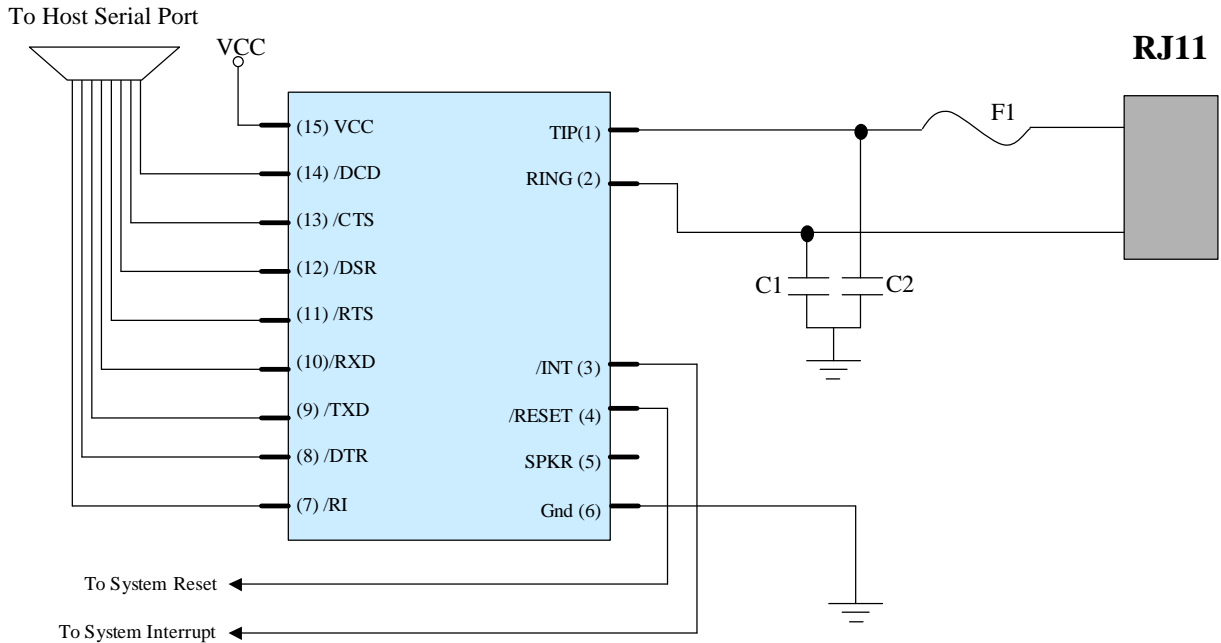
XE2422SM Electrical Specifications

| Parameter | Min | Typ | Max | Units | Comments |
|-------------------------|-----|-------|------|-------|---|
| VCC | 3.0 | 3.3 | 3.6 | Volts | |
| ICC | | 30 | 40 | ma | On Line |
| | | 5 | | ma | Sleep Mode |
| | | 200 | | ua | Power Down |
| Ring Voltage Detected | 26 | | 150 | VRMS | Type B Ringer |
| Ring Frequency Detected | 15 | | 68 | Hz | Type B Ringer |
| Telephone Loop Current | 10 | 40 | 120 | ma | |
| Line Impedance | | 600 | | Ohms | |
| Data Transmit level | | -12.0 | -9.0 | dBm | |
| DTMF Transmit Level | | -2.5 | 0 | dBm | Avg over 3 second interval |
| Hardware Reset Delay | 300 | | | ms | Delay until an AT command can be accepted |
| Voh | 2.4 | | 5.0 | Volts | |
| Vol | | | 0.4 | Volts | |
| Vih | 2.0 | | 5.0 | Volts | |

XE2422SM ABSOLUTE MAXIMUM RATINGS

| | |
|--|--------------------|
| VCC | 4.1 Volts |
| Storage Temperature | -25° C to +85° C |
| ¹ Maximum Operating Temperature Range | 0° C to +70° C |
| Maximum Time Above Eutectic (183° C) | 90 seconds |
| Preheat Dwell Time | 120 to 180 seconds |
| ¹ The XE5692SM can be ordered with an Operating Temperature of -40° C to +85° C at extra cost. Order XE2422SM-ITR or to specify Industrial Temperature Range (ITR). | |

XE2422SM Typical Connection Diagram



Parts List for XE2422SM Typical Connection Diagram

| Reference Designation | Qty | Description |
|-----------------------|-----|------------------------------|
| C1, C2 | 2 | Cap. 1000 pfd, 1500V minimum |
| F1 | 1 | PTC, TR600-150 |

Notes:

- 1 Capacitors, C1 and C2, may be required for EMI filtering in your system. Without these components you may experience unintended radiation when the telephone cable is attached. C1 and C2 are high-voltage capacitors. We recommend the Novocap LS1808N102K302NX080T. This 1000 pfd, 3000 volt capacitor will direct the high frequency harmonics to the system ground. These capacitors must be rated at a minimum of 1500 volts to maintain the isolation required by FCC Part 68 Rules.
- 2 F1 is a positive thermal coefficient (PTC) device which protects the modem from excessive current flow. These devices are required for your system to pass UL60950. Fuses may be used in place of the PTC's

XE2422SM Shared Line Features

The XE2422SM includes the ability to monitor telephone line conditions before, after and during calls. This allows the XE2422SM to avoid conflicts with other equipment connected to the telephone line. There are two modes of operation for the XE2422SM Shared Line Features; Connect Detect and Handset Interrupt.

Connect Detect:

The Connect Detect mode is active when the XE2422SM is on-hook. With AT%V2 selected the XE2422SM verifies the availability of the telephone line by checking the DC loop voltage before going off-hook for dialing or answering a call. The nominal value of loop voltage is stored in register U85, typically 48 volts. The XE2422SM can detect either the lack of a telephone line connection or that the connected line is in use.

NO LINE If the telephone line has been disconnected from the modem, the voltage on Tip and Ring will approach 0 volts. If the modem reads a DC loop voltage of around 3 volts or less, the modem will not go off-hook and will issue the “NO LINE” response.

LINE IN USE If a telephone handset, fax machine or other piece of equipment connected to the telephone line is in use, the DC loop voltage will drop. Typically the DC loop voltage will be between 5 and 12 volts while any pieces of equipment is using the telephone line. If the modem sees a DC loop voltage between about 3 volts and 85% of the nominal loop voltage, the modem will not go off-hook but will transmit the “LINE IN USE” response

If neither the No Line or Line in Use conditions is true, the XE2422SM goes off-hook and completes the original command as requested.

Handset Interrupt:

The Handset Interrupt feature permits the modem to yield the telephone line to another piece of equipment connected to the same telephone line. This prevents the XE2422SM from blocking outgoing emergency calls when the line is shared in a residential application. Handset Interrupt is accomplished by monitoring the loop current through the modem while it is off-hook. Loop current drops when another piece of equipment goes off-hook on the same telephone line.

Handset Interrupt function is controlled by registers U77 and U78. U78 defines when the Handset Interrupt is operable and U77 allows the operator to configure the modem to disconnect immediately upon detecting another piece of equipment on the telephone line.

U77 Bit 11 of U77 permits the XE2422SM to be set to automatically disconnect any time another piece of equipment connects to the line while the XE2422SM is off-hook. This configuration is recommended when the modem will be sharing a line with a telephone handset as it provides the quickest access to the phone line for emergency calls. If U77 bit 11 is not set, then U70 bit 10 should be. U70 bit 10 causes the modem to provide an interrupt when the parallel line seizure is detected.

U78 Bits 14 and 15 of U78 control when the Handset Interrupt will be active.

- If both bits are reset Handset Interrupt is disabled.
- If only bit 14 is set, the XE2422SM will begin monitoring the line for a Handset Interrupt as soon once dialing is completed.
- If only bit 15 is set, the XE2422SM activate the Handset Interrupt function when the timer set by bits 0 to 7 expires. Bits 0-7 set this timer inn 500 millisecond increments.
- If both bits 14 and 15 are set, the XE2422SM starts the Handset Interrupt monitoring after the modem handshake is completed.

XE2422SM AT Commands

The XE2422SM uses "AT" commands for configuration and control. This section describes the AT command format and lists the AT commands, registers and result codes. XE2422SM "AT" commands have two operational modes; command mode and data mode.

Data Mode: The XE2422SM enters data mode after it connects to a remote modem and issues the appropriate result code. In the data mode the modem sends all data presented on Transmit Data (/TXD) to the remote modem and puts data from the remote modem onto Received Data (/RXD). When the modem exits data mode, it issues a "NO CARRIER" result code.

Command Mode: The XE2422SM enters command mode on power-up, reset, a lost connection, or receipt of the escape code. In command mode the modem accepts commands from the host on transmit data. Appropriate result codes are returned on received data.

Command Line Format

Command lines issued to the modem follow a strict format. Each command begins with the prefix AT. The command buffer stores the command line and executes it upon receipt of a carriage return. Until executed, the command line can be edited with the backspace key.

Command Prefix - Each command, except the A/ command, begins with the AT prefix. The "A" and "T" may be both upper case or both lower case but cannot be of different cases. The prefix identifies the speed and parity of the commands sent to the modem. The modem determines data rate by measuring the width of the incoming bits. Parity is determined by comparing the parity bits of the "A" and the "T."

Command Line - Commands may be strung together in a single command line of up to 48 characters. Commands are executed in the sequence they appear. Spaces may be inserted into the command line but do not fill space in the command buffer. If the command buffer overflows, the modem issues an "ERROR" result code and commands are not executed. A carriage return terminates the command line and causes the commands to be executed. Register S3 allows the user to select a character other than a carriage return to terminate the command line.

Command Line Editing - The backspace edits a command line before it is executed. The backspace key, (Control and H simultaneously on some systems), erases the previous character in the command line. Register S5 allows the user to select a character other than a backspace to edit the command line.

Re-Execute Last Command - The A/ command causes the modem to re-execute the last command line. This is the only command which does not require the "AT" prefix.

Omitted Parameters - Most commands include a parameter which determines how the functions will be set. When the command parameter is omitted from the command string, it is assumed to be a 0.

Escape Characters - A 3 character escape sequence may be entered to switch the modem into command mode while on line. The escape character, set by Register S2, must be entered 3 times in succession to execute the escape. An AT command must then be entered within the period defined by S12 to enter command mode. The default escape sequence is "+++."

Result Codes - The modem issues a result code after each action. Result codes may be sent as full words, one or two digit numeric codes, or may be disabled all together. Each result code ends with a carriage return when numeric result codes are chosen. When full word result codes are chosen, a Line Feed and Carriage Return precede and follow each result code.

XE2422SM Boot Command

The XE2422SM allows a default command string to be automatically loaded into the modem on power-up or modem reset. A series of commands loads the default command string in Hex form into the modem's EEPROM. The EEPROM has 256 bytes available for command storage.

The sequence to load the default commands into EEPROM must begin with the Boot command and ends with a double carriage return. All commands are loaded into the EEPROM in Hex form beginning with address M0000. Up to 8 addresses may be loaded with each command in the sequence.

The following example uses a typical configuration for an embedded application. ATE0 disables command echo; ATQ1 disabled modem responses, and ATS0=1 sets the modem to automatically answer on the first ring. This sequence is loaded into the modem EEPROM with the Boot command using the command sequence below. This places the modem into the desired configuration each time power is applied or the modem is reset

Boot Command Sequence

| Command | Description |
|----------------------------------|---|
| AT:M0000,42,4F,4F,54,0D,41,54,45 | Load characters "B,O,O,T,<CR>,A,T,E" in EEPROM beginning at address M0000 |
| AT:M0008,30,0D,41,54,51,31,0D,41 | Load characters "0,<CR>,A,T,Q,1,<CR>,A" in EEPROM beginning at address M0008 |
| AT:M0010,54,53,30,3D,31,0D,0D,0D | Load characters "T,S,0,=,1,<CR>,<CR>,<CR>" in EEPROM beginning at address M0010 |

XE2422SM AT Commands

An asterisk indicates the factory default

\$ - Display current AT settings.

A - Answer Command -

D - Dial Command -

0-9, A-D, #, * = Dialing Digits

P = Pulse dial

T = Tone dial

W = Wait for dial tone

, = Pause for the duration of S8

! = Switch hook flash

; = Return to the command state

En - Command Echo

n=0 Do not echo commands

n=1 Enable command echo *

Hn - Switch Hook Control -

n=0 Switch hook relay opens

n=1 Switch hook relay closes

In - Modem Identification

Ln - Speaker Volume -

n=1 Speaker volume low

n=2 Speaker volume medium

n=3 Speaker volume high

Mn - Speaker Activity -

n=0 Speaker off *

n=1 Speaker on until carrier received

n=2 Speaker remains on

n=3 Speaker on after dialing until DCD detected.

On - On Line

n=0 Return On Line with no retrain *

n=1 Initiate retrain while returning On line.

n=2 Initiate rate renegotiation while returning On line.

Qn - Responses

n=0 Send responses *

n=1 No Responses

Sr? - Interrogate Register -

Sr=n - Set Register Value -

S\$ - List values of all S-Registers -

Vn - Result Codes -

n=0 Numeric Result Codes

n=1 English Word Result Codes*

Xn - Result Code Set -

n=0 Responses 0-4

n=1 Responses 0-5 & 10

n=2 Responses 0-6 & 10

n=3 Responses 0-5, 7 & 10

n=4 Responses 0-8 & 10*

n=5 All Responses

Yn - Long Space Disconnect -

n=0 Disabled*

n=1 Disconnect on receipt of 1.5 sec of steady Space.

Z - Reset -

&\$ - Display current AT& settings.

&Dn - DTR

n=0 DTR is ignored

n=1 When the modem is on-line loss of DTR switches it to the command mode and issues OK response.*

n=2 Modem disconnects if the host revokes DTR.

n=3 The modem performs a soft reset when DTR is revoked.

&F - Reset Modem to Factory Defaults

&Gn - Maximum Data Rate Selection

n=3 1200 bps

n=4 2400 bps

&Hn - Protocol Selection

n=6 V.22bis (2400 or 1200 BPS) *

n=7 V.22 (1200 BPS)

n=8 Bell 212 (1200 BPS)

n=9 Bell 103 (300BPS)

n=10 V.21 (300 BPS)

n=11 V.23 (1200/75)

&Tn - Modem Test Modes

n=0 Cancel Test Mode

n=3 Initiate Analog Loopback

&Z - Enable Sleep Mode; wake on incoming Ring signal

%B - Report Blacklisted Numbers

%On - Answer Mode

n=1 Answer in Answer Mode *

n=2 Answer in Originate Mode

%Vn - Shared Line Use

n=0 No automatic detection of local line status *

n=2 Check line voltage before going off-hook. Issue "NO LINE" response if line is unavailable and "LINE IN USE" if line is off hook.

XE2422SM AT Commands

%%\$ - Display current AT% settings.

\Bn - Character Length

- n=0 6N1; Data Bits, no Parity, 1 stop bit, 1 start bit
- n=1 7N1; 7 data bits, no parity, 1 start bit, 1 stop bit
- n=2 7P1; 7 data bits, 1 stop bit, 1 start bit, parity \.
- n=3 8N1; 8 data bits, no parity, 1 stop bit, 1 start bit *
- n=5 8P1; 8 data bits, 1 stop bit, 1 start bit, parity \
- n=6 8X1; 8 data bits, 1 stop bit, 1 start bit, 1 escape bit enabling 9th bit escape mode.

\Nn - Error Control Mode

- n=0 Normal Mode
- n=2 MNP Required
- n=3 V.42 auto reliable mode *
- n=4 LAPM required for connection
- n=5 V.42 or MNP required

\Pn - Parity Setting Automatically set in Autobaud mode

- n=0 Even Parity selected *
- n=1 Space Parity selected
- n=2 Odd Parity selected
- n=3 Mark Parity selected

\Qn - Modem to DTE Flow Control

- n=0 No Flow Control
- n=2 CTS Flow Control only *
- n=3 RTS/CTS Flow Control
- n=4 XON/XOFF Flow Control

\Tn -DTE Rate

- n=0 300 bps
- n=1 600 bps
- n=2 1200 bps
- n=3 2400 bps
- n=4 4800 bps
- n=5 7200 bps
- n=6 9600 bps
- n=11 57.6 kbps
- n=12 115.2 kbps
- n=13 230.4 kbps
- n=14 245.76 kbps
- n=15 307.2 kbps
- n=16 Autobaud on AT command *

\Vn - Connect Response

- n=0 Issue Connect and Protocol Responses *
- n=2 Issue Connect Response only

:I - Read Interrupts - Reports the lower 8 bits of User Register U70. Reading the interrupts clears them and resets the /INT pin.

:M - Load Active Profile to EEPROM.

:R- Read all User Registers

:Rnn - Read user Register nn

:Unn,xxxx - Write hex value xxxx to User Register nn.

Note multiple User Registers can be written in the same command line by addressing only the first register in the sequence. Subsequent values will be loaded into successive registers. The :U command uses the format AT:Unn, xxxx, yyyy, zzzz, ...<CR>.

AT+GCI=n - Country Configuration

- 0 = Japan
- 9 = Australia
- A = Austria
- F = Belgium
- 16 = Brazil
- 1B = Bulgaria
- 20 = Canada
- 26 = China
- 27 = Columbia
- 2E = Czech Republic
- 31 = Denmark
- 35 = Equador
- 3C = Finland
- 3D = France
- 42 = Germany
- 46 = Greece
- 50 = Hong Kong
- 51 = Hungary
- 53 = India
- 57 = Ireland
- 58 = Israel
- 59 = Italy
- 61 = South Korea
- 69 = Luxembourg
- 6C = Malaysia
- 73 = Mexico
- 7B = Netherlands
- 7E = New Zealand
- 82 = Norway
- 87 = Paraguay
- 89 = Philippines
- 8A = Poland
- 8B = Portugal
- 9C = Singapore
- 9F = South Africa
- A0 = Spain
- A5 = Sweden
- A6 = Switzerland
- B4 = United Kingdom
- B5 = United States *
- B8 = Russia
- FE = Taiwan

XE2422SM AT Commands

+GCI? - Report Country Configuration

+MR=n - Modulation Reporting - AT+MR command determines if the modulation code will be reported during the link negotiations.

n=0 Disabled *

n=1 Enabled

+MS - Select Modulation - AT+MS sets the modulation and data rates to be supported by the modem. The format for the +MS command is shown below.

AT+MS=a, b, c, d, e, f<CR>

a - modulation type

V21 - V.21 (300 BPS)

V22 - V.22 (1200 BPS)

V.22B - V.22bis (1200 or 2400 BPS)

b - Automode Detection

0 - Automatic Negotiation Disabled

1 - Automatic Negotiation Enabled

c - Minimum Receive Data Rate (300 to 2400 BPS)

d - Maximum Receive Data Rate (300 to 2400 BPS)

e - Minimum Transmit Data Rate (300 to 2400 BPS)

f - Maximum Transmit Data Rate (300 to 2400 BPS)

+VCID=n - Caller ID Enable

n=0 No Caller ID *

n=1 Formatted Caller ID Data presented

n=2 Row Caller ID Data presented

+VCDT=n - Caller ID Type

n=0 On only after first ring *

n=1 CID Always On

n=2 UK CID Format

n=3 Japanese CID Format

XE2422SM RESPONSES

| <u>Digits</u> | <u>Verbose</u> | <u>Description</u> |
|---------------|--------------------------------|--|
| 0 | OK | Command Successful |
| 1 | CONNECT | 300 bps or higher connection |
| 2 | RING | Ring signal detected |
| 3 | NO CARRIER | Carrier not detected |
| 4 | ERROR | Error in command line |
| 5 | CONNECT 1200 | 1200 bps Connection |
| 6 | NO DIAL TONE | No dial tone detected |
| 7 | BUSY | Busy signal detected |
| 8 | NO ANSWER | Remote does not answer |
| 9 | RINGING | Ringback signal detected |
| 10 | CONNECT 2400 | 2400 bps Connection |
| 30 | CIDM | Caller ID Detected |
| 31 | FLASH | Hookswitch Flash detected |
| 32 | STAS | UK Caller ID Alert detected |
| 33 | X | Over current Condition |
| 40 | BLACKLIST FULL | The buffer for storing blacklisted numbers is full |
| 41 | BLACKLISTED | Attempted Number is Blacklisted |
| 42 | NO LINE | No Telephone line is connected to the modem |
| 43 | LINE IN USE | The attached Telephone line is in use |
| 70 | PROTOCOL: NONE | No Link Protocol negotiated |
| 75 | CONNECT 75 | 75 bps connection |
| 77 | PROTOCOL V.42 | V.42 error correction protocol negotiated |
| 79 | PROTOCOL V.42bis | V.42bis data compression protocol negotiated |
| 80 | PROTOCOL: ALTERNATE, + CLASS 2 | MNP2 error correction negotiated |
| 81 | PROTOCOL: ALTERNATE, + CLASS 3 | MNP3 error correction negotiated |
| 82 | PROTOCOL: ALTERNATE, + CLASS 4 | MNP4 error correction negotiated |
| 102 | UN-OBTAINABLE NUMBER | DTMF Dial attempt on Pulse only Line |

XE2422SM REGISTER SETTINGS

- S0 Answer on nth Ring:** S0 sets the modem to automatically answer on the nth ring. Setting S0 to 0 disables automatic answer.
Range: 0 to 255
Units Rings
Default 0
- S1 Ring Count:** S1 is a read-only register showing the number of rings detected. If a ring is not detected within 8 seconds, S1 is reset to zero.
Range: 0 to 255
Units Rings
Default 0
- S2 Escape Character:** S2 determines the ASCII escape character. Values of 0-127 select valid characters; values from 128 to 255 disable the escape sequence.
Range: 0 to 255
Units ASCII Character
Default 43 (+)
- S3 Line Termination Character:** S3 determines the ASCII character which will terminate commands and modem responses.
Range: 0 to 255
Units ASCII Character
Default 13 (Carriage Return)
- S4 Line Feed Character:** S4 sets the ASCII character to act as a line feed character in modem responses.
Range: 0 to 255
Units ASCII Character
Default 10 (Line Feed)
- S5 Backspace Character:** S5 defines the ASCII character used as a backspace to edit the command line.
Range: 0 to 255
Units ASCII Character
Default 8 (Back Space)
- S6 Dial Tone Wait Time:** S6 determines how long the modem waits for dial tone before dialing. The Dial Tone Wait Time cannot be set to less than two seconds.
Range: 1 to 255
Units Seconds
Default 2
- S7 Wait for Carrier after Dialing:** S7 determines how long the modem waits for a valid carrier signal after dialing.
Range: 0 to 255
Units Seconds
Default 80
- S8 Comma Pause Time:** S8 defines the duration of the pause initiated by a comma in the dialing string. The pause is generally used when waiting for a second dial tone.
Range: 0 to 255
Units Seconds
Default 2
- S9 Carrier Detect Response Time:** S9 establishes the length of time the remote modem's carrier must be present to be recognized as valid.
Range: 1 to 255
Units 0.1 Seconds
Default 6
- S10 Carrier Off Disconnect Delay:** S10 selects how long carrier must be lost before the modem disconnects.
Note: If S10 is smaller than the value of S9 or S10 is set to 255, the modem will not automatically disconnect on any loss of carrier.
Range: 1 to 255
Units 0.1 Seconds
Default 14
- S12 Escape Code Guard Timer:** S12 sets the escape sequence guard timer. If characters are received before or after the escape sequence, within the guard timer, the modem aborts the escape attempt and remains in data mode.
Range: 10 to 255
Units 0.02 Seconds
Default 50
- S14 Wait for Dial Tone Delay:** S14 determines how long the modem will wait for dial tone when the W dial modifier is used.
Range: 0 to 255
Units Seconds
Default 12

XE2422SM REGISTER SETTINGS

- S24 **Sleep Inactivity Timer:** S24 determines the length of inactivity before the modem enters sleep mode. When set to 0, sleep mode is disabled.
Range: 0 to 255
Units: Seconds
Default: 0
- S30 **Disconnect Inactivity Timer:** S30 controls how long the modem will remain on line with no data flowing. A 0 disables the inactivity time out.
Range: 0-255
Units: Minutes
Default: 0
- S38 **Hang Up Delay Timer:** S38 determines the maximum delay between receipt of the ATH0 command and modem disconnect. .
Range: 0-255
Units: Seconds
Default: 20
- S40 **Test Data Pattern:** S40 sets the test pattern to be used by the AT&T4 and AT&T5 commands
0 = All Spaces (0)
1 = A Marks (1)
2 = Random Data
- S42 **Blacklisting** - S42 controls the Blacklisting function within the XE2422SM. Blacklisting regulates how frequently the modem can dial the same number. An attempt to dial beyond the limit will result in the "BLACKLISTED" result code being sent.
S42 = 0 Disabled
S42 = 1 Enabled
Default: 0
- S43 **Dial Attempts before Blacklisting** - S44 determines how many dial attempts will be allowed before Blacklisting blocks a call
Range: 0-4
Units: Number of Calls
Default: 4
- S44 **Blacklisting Timer** - S44 sets the duration of the Blacklisting period.
Range: 0-255
Units: Seconds
Default: 180
- S50 **Minimum Off-Hook Duration** - S50 determines the minimum length of time the modem will remain off-hook. An attempt to drop the line before this timer expires, will be ignored by the modem until the timer expires.
Range: 0-255
Units: Seconds
Default: 3

XE2422SM User-Registers

The registers described below are controlled by the AT:U command and read with the AT:R command. The user Registers that control the modem's country configuration are described elsewhere in this data sheet.

- U65 Modem Power Down:** U65 permits the XE2422SM to enter power down mode to reduce power consumption for battery powered applications. The modem can only be awakened by applying an active Reset signal to pin 4.
AT:U65,2008 - Select Powerdown Mode
- U70 Modem Interrupt Register:** U70 allows the user to select the events that will cause the hardware interrupt line, Pin 3, to be activated. It also stores the Interrupt status. The interrupts are cleared after this register is read.
- Bit 15 - Hardware Escape Pin
 - Bit 14 - Reserved
 - Bit 13 - Enables the on line escape sequence “+++”; Default Active!
 - Bit 12 - Caller ID activates hardware interrupt; Default Inactive!
 - Bit 11 - Activate interrupt on over current detect; Default Inactive!
 - Bit 10 - Parallel handset detection activates interrupt; Default Active!
 - Bit 9 - Activate interrupt on Ring Detect; Default Active!
 - Bit 8 - Activate interrupt on Carrier Detect; Default Active!
 - Bit 7 - Reserved
 - Bit 6 - Reserved
 - Bit 5 - Reserved
 - Bit 4 - Indicates Caller ID Detected
 - Bit 3 - Indicates Over current Detection
 - Bit 2 - Indicates Parallel Telephone Detection
 - Bit 1 - Indicates Ring Detection
 - Bit 0 - Indicates Carrier Detected
- U77 Auto Disconnect on Handset Interrupt** - U77 bit 11 allows the user to configure the XE2422SM to automatically disconnect on a Handset Interrupt condition.
Bits 12-15 - Reserved (Bit 14 normally active)
Bit 11 - When set the modem automatically disconnects when on a Handset Interrupt condition. This bit is reset in the default state.
Bits 0-10 - Reserved - (bits 2, 3, 4, and 5 are normally set.)
- U78 Handset Interrupt control** - U78 controls when the Handset Interrupt functions will be active.
- Bits 14 -15 - 00 - Handset Interrupt Disabled (default)
 - 01 - Handset Interrupt Disabled during dialing
 - 10- Handset Interrupt Disabled from start of dialing to expiration of Handset Interrupt timer set by bits 0 to 7 of this register
 - 11 - Handset Interrupt Disabled until modem negotiations are complete.
- Bits 8-13 - Reserved
Bits 0-7 - Handset Interrupt Timer in 500 millisecond increments. (default = 0)

FCC Instructions

The XE2422SM complies with Part 68 of the FCC Rules and Regulations. With each device shipped, there is a label which contains the FCC Registration Number. The FCC Registration number incorporates the Model Number, Manufacturer Identifier, Product Type identifier and Ringer Equivalence Number (REN) for this product. You must, upon request, provide this information to your telephone company. The format of the FCC Registration Number is shown below.

US: DWEMM00BXE2422SM

The mounting of this device in the final assembly must be made in such a manner as to preserve the high voltage protection between the TIP/RING Connection and the rest of the system. Typically, this may be accomplished by maintaining a minimum spacing 100 mils between the TIP/RING Traces to the RJ-11C Jack and low voltage portion of the system. No additional circuitry may be attached between TIP/RING and the telephone line connection, unless specifically allowed in the rules.

The REN is useful to determine the quantity of devices you may connect to a telephone line and still have all of these devices ring when the number is called. In most, but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to the line, as determined by the REN, you should contact the local telephone company to determine the maximum REN for you calling area.

If your system causes harm to the telephone network, the telephone company may discontinue service temporarily. If possible, they will notify you in advance. If advance notification is not practical, you will be notified as soon as possible.

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

If you experience trouble with this device, please contact XECOM at (408) 945-6640 for information on obtaining service or repairs. The telephone company may ask you to disconnect this device from the network until the problem has been corrected or until you are sure that the device is not malfunctioning.

Terms of Sale

Devices sold by XECOM are covered by the warranty provisions appearing in its Terms of Sale only. XECOM makes no warranty, express, statutory, implied, or by description regarding the information set forth herein, or regarding the freedom of the described devices from patent infringement. XECOM makes no warranty of merchantability or fitness for any purposes. XECOM reserves the right to discontinue production and change specifications and prices at any time and without notice. This product is intended for use in normal commercial applications. Applications requiring extended temperature range, unusual environmental requirements, or high reliability applications, such as military, medical life-support or life-sustaining equipment, are specifically not recommended without additional processing and authorization by XECOM for such application.

Xecom assumes no responsibility for the use of any circuitry other than circuitry embodied in a Xecom product. No other circuits, patents, or licenses are implied.

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Life Support Devices or Systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions provided in the labeling, can be reasonably expected to result in significant injury to the user.

A Critical Component is any component of a life support device or system whose failure to perform can be reasonably expected to cause failure of the life support device or system, or to affect its safety or effectiveness.

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