

**2400 BPS Surface-Mountable Integrated Sealed-Hybrid Modem**

**Description**

Xecom's XE2420 provides a complete 2400 BPS modem into an inexpensive miniature, surface-mount package. Xecom's new HyPLCC™ package (Hybrid PLCC) makes it possible to meet the conflicting goals of small size, low cost and surface-mountability. The XE2420 targets remote monitoring applications in industrial, commercial and residential locations

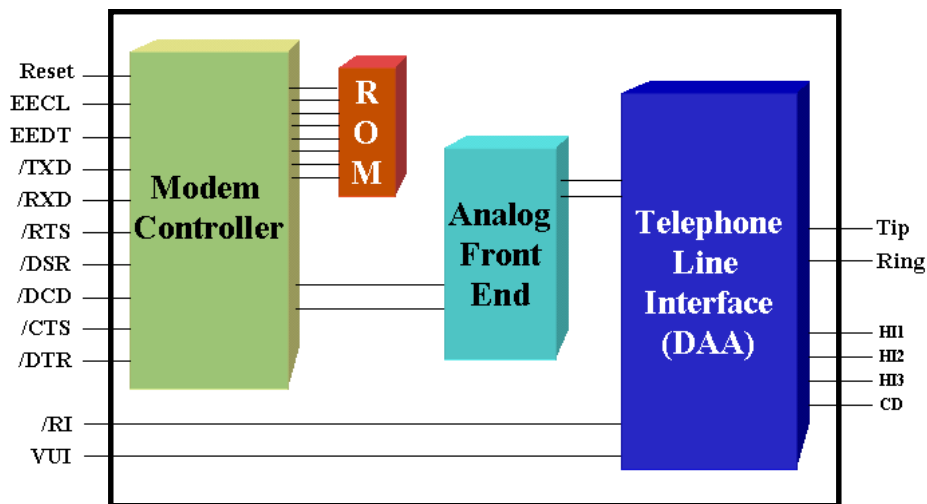
As a complete modem, the XE2420 includes not only all modem circuitry but also user transferrable FCC Part 68 Registration and UL60950 recognition. This allows the XE2420 to be safely integrated into your embedded application.

Xecom's new HyPLCC™ package infuses the XE2420 with both its small size and surface mountability. The HyPLCC package allows complex hybrid circuits to fit the 68-Pin PLCC footprint. The HyPLCC™ package provides a completely sealed environment protecting the XE2420 during assembly and board cleaning operations.

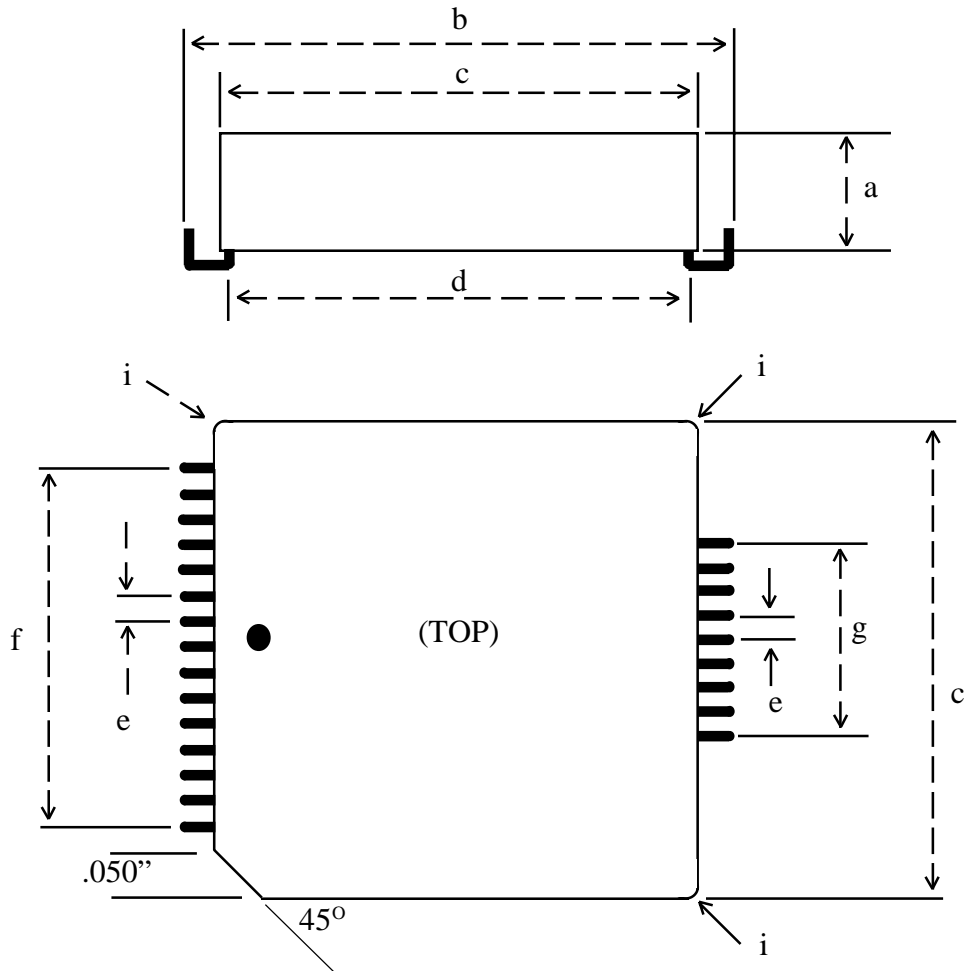
**Features**

- \* Small Size: The HyPLCC™ measures less than 1 inch by 1 inch square and 0.290 inches thick
- \* Surface-mountable: The HyPLCC™ package is equivalent to a 68-Pin PLCC device.
- \* Data transfer at 2400, 1200 and 300 BPS using V.22bis, V.22, V.23, V.21, Bell 202, Bell 212A, and Bell 103 Protocols
- \* Modem Control and Configuration via industry standard AT Commands.
- \* Supports external shared line features permitting unobtrusive sharing of a local telephone line.
- \* Complete integrated DAA includes, Ring Detect, Loop Current Holding Circuit, Hook Switch, Metallic Surge Protection, and Telephone Line Transformer
- \* User Transferrable FCC Part 68 Registration
- \* UL60950 Recognition
- \* Low Power operation, 330 milliWatt; Power down operation less than 1 microWatt

**XE2420 BLOCK DIAGRAM**

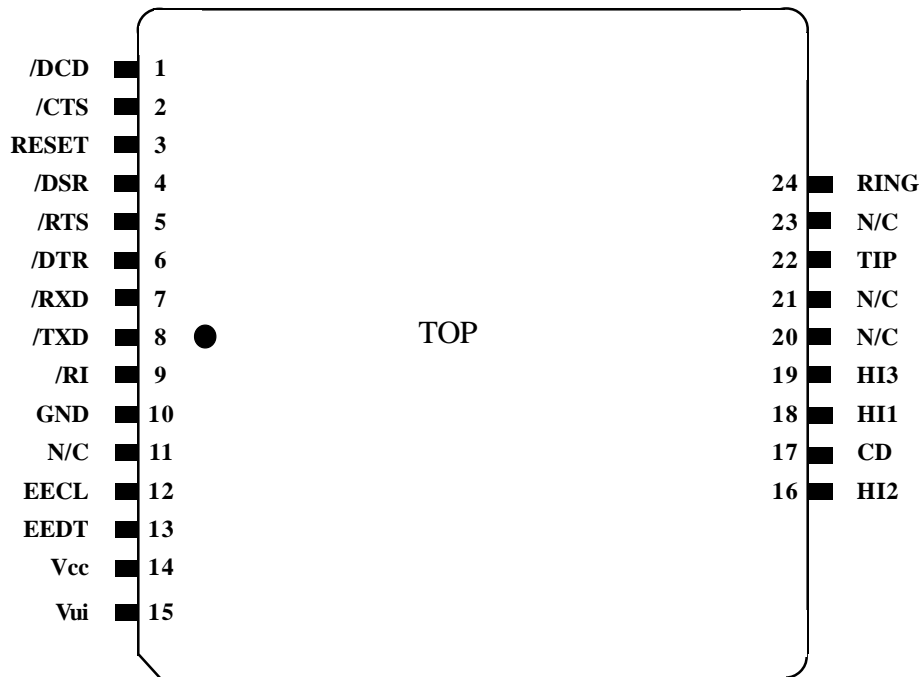


**XE2420 Mechanical Specifications**



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
a	0.280	0.285	0.290	7.11	7.24	7.37
b	0.985	0.990	0.995	25.02	25.15	25.27
c	0.950	0.955	0.960	24.13	24.26	24.38
d	0.910	0.920	0.930	23.11	23.37	23.62
e	0.045	0.050	0.055	1.15	1.27	1.40
f	0.695	0.700	0.705	17.65	17.78	17.91
g	0.395	0.400	0.405	10.03	10.16	10.29
i(radius)	0.015	0.020	0.025	0.13	0.25	0.38

## XE2420 Pin Configuration



### Pin Descriptions

PIN	NAME	DESCRIPTION
1	/DCD	/DCD is an active low output from the modem. The AT&C command controls when the XE2420 asserts /DCD.
2	/CTS	/CTS is an active low output from the modem. The modem asserts /CTS to indicate that it can accept data from the terminal equipment on /TXD.
3	RESET	RESET is an active high 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.
4	/DSR	/DSR is an active low output from the modem. The AT&S command controls when the XE2420 asserts /DSR.
5	/RTS	/RTS is an active low input to the modem. /RTS indicates to the modem that the host has data to send.
6	/DTR	/DTR is an active low input to the modem. The AT&D command determines how the modem will interpret activity on /DTR.
7	/RXD	/RXD provides the path for received data and modem responses to be sent from the modem to the host terminal equipment.

## XE2420 Pin Descriptions (continued)

PIN	NAME	DESCRIPTION
8	/TXD	/TXD provides the path for transmitted data and modem commands to be passed from the host terminal equipment to the modem.
9	/RI	The /RI signal reports on the presence of an incoming ring signal. When a ring occurs across Tip and Ring, the /RI output toggles at the ring frequency. The /RI output is powered by Vui and therefore operates even when VCC is removed from the modem.
10	Ground	Ground provides the reference voltage for all host interface signals.
11	N/C	No internal connection
12	EECL	EECL provides the clock to the optional external non-volatile memory. The XE2420 requires a serial 8 by 256 Byte EEPROM for telephone number storage. If the non-volatile memory is not used, EECL should remain unconnected.
13	EEDT	EEDT provides the serial data connection for the optional, external non-volatile memory. The XE2420 requires a serial 8 by 256 Byte EEPROM for telephone number storage. If the non-volatile memory is not used, EEDT should remain unconnected.
14	VCC	VCC provides 5 volt power to the modem. The RI output is not powered by VCC but by Vui.
15	Vui	Vui provides uninterrupted power to the XE2420 ring detect circuit. Placing 5 volt power on Vui insures that the /RI output will operate when VCC is removed from the modem.
16	HI2	HI2 is one of the four hardware hooks for connecting shared line features to the XE2420. HI2 interfaces to the 911 Interrupt circuit. This circuit detects changes in the loop current when an extension handset is lifted as when making an emergency call. The system host should immediately abort the modem connection to permit the user to complete their call. See the Application Note on Page 10 of this data sheet to see how these line monitoring circuits interface with the XE2420.
17	CD	CD provides another of the four hardware hooks for connecting shared line features to the XE2420. CD interfaces to the Connect Detect circuit. Connect Detect allows the system host to check the status of the telephone line before going off-hook to initiate a call. If the phone line is in use, the host can delay its call until the telephone line is free. See the Application Note on Page 10 of this data sheet to see how these line monitoring circuits interface with the XE2420.
18	HI1	HI1 is one of the four hardware hooks for connecting shared line features to the XE2420. HI1 interfaces to the 911 Interrupt circuit. This circuit detects changes in the loop current when an extension handset is lifted as when making an emergency call. The system host should immediately abort the modem connection to permit the user to complete their call. See the Application Note on Page 9 of this data sheet to see how these line monitoring circuits interface with the XE2420.

**XE2420 Pin Descriptions (continued)**

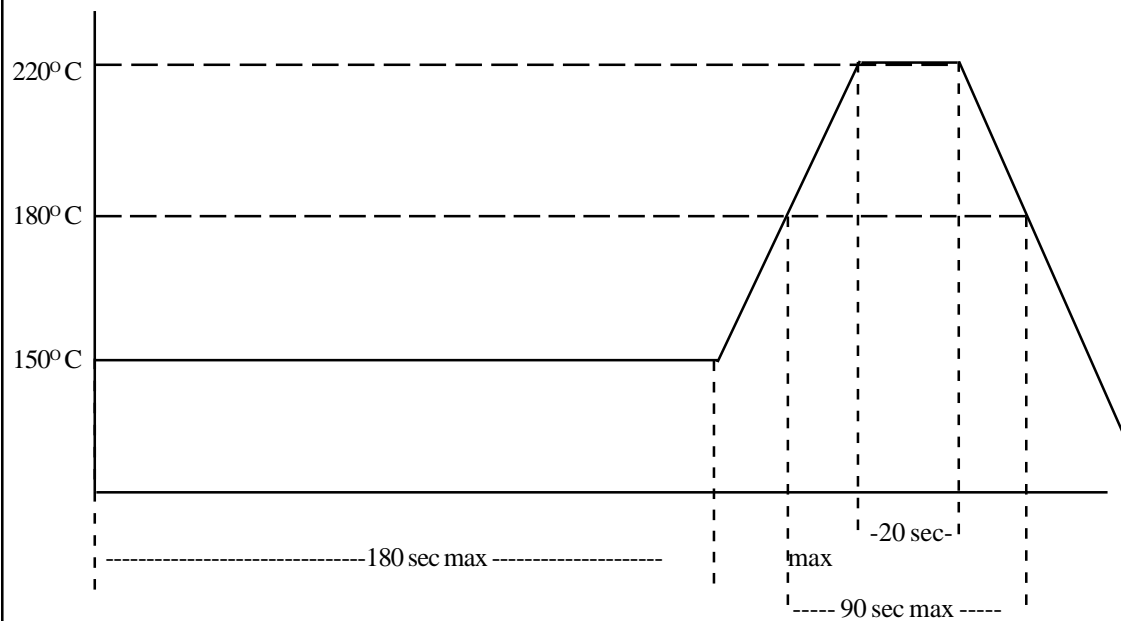
PIN	NAME	DESCRIPTION
19	HI3	<p>HI3 is one of the four hardware hooks for connecting shared line features to the XE2420. HI3 interfaces to the 911 Interrupt circuit. This circuit detects changes in the loop current when an extension handset is lifted as when making an emergency call. The system host should immediately abort the modem connection to permit the user to complete their call. See the Application Note on Page 10 of this data sheet to see how these line monitoring circuits interface with the XE2420.</p>
20	N/C	<p>No internal connection, To prevent damage in case of voltage surges on the telephone line, we recommend that nothing be connected to this pin.</p>
21	N/C	<p>No internal connection, To prevent damage in case of voltage surges on the telephone line, we recommend that nothing be connected to this pin.</p>
22	Tip	<p>The Ring and Tip signals provide modem the connection 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 all public switched telephone lines. The XE2420 will operate regardless of the polarity of this “Battery” voltage. The “Battery” voltage drives up to 100 milliamps of DC loop current.</p> <p>UL60950 requires minimum creepage and clearances distances be maintained between the Tip and Ring traces and all other circuits. Clearance is the shortest distance between conductive circuits; creepage is the distance between conductive surfaces along the surface</p>
23	N/C	<p>No internal connection, To prevent damage in case of voltage surges on the telephone line, we recommend that nothing be connected to this pin.</p>
24	Ring	<p>The Ring and Tip signals provide modem the connection 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 all public switched telephone lines. The XE2420 will operate regardless of the polarity of this “Battery” voltage. The “Battery” voltage drives up to 100 milliamps of DC loop current.</p> <p>UL60950 requires minimum creepage and clearances distances be maintained between the Tip and Ring traces and all other circuits. Clearance is the shortest distance between conductive circuits; creepage is the distance between conductive surfaces along the surface.</p>

## XE2420 Soldering Instructions

The XE2420 is subject to damage if over-exposed to heat during solder reflow operations. Following the soldering instructions below will ensure that the process of soldering the module to the board does not damage the modem. The XE2420 must not be exposed to direct Infrared (IR) heating. If your process includes direct IR heating, you must shield the XE2420 from the infrared rays.

Maximum Temperature	220° C
Maximum Time at 220° C	20 Seconds
Maximum Time above Eutectic (180° C)	90 Seconds
Maximum Preheat Dwell Time	180 Seconds

**Maximum Recommended Solder Temperature Profile**



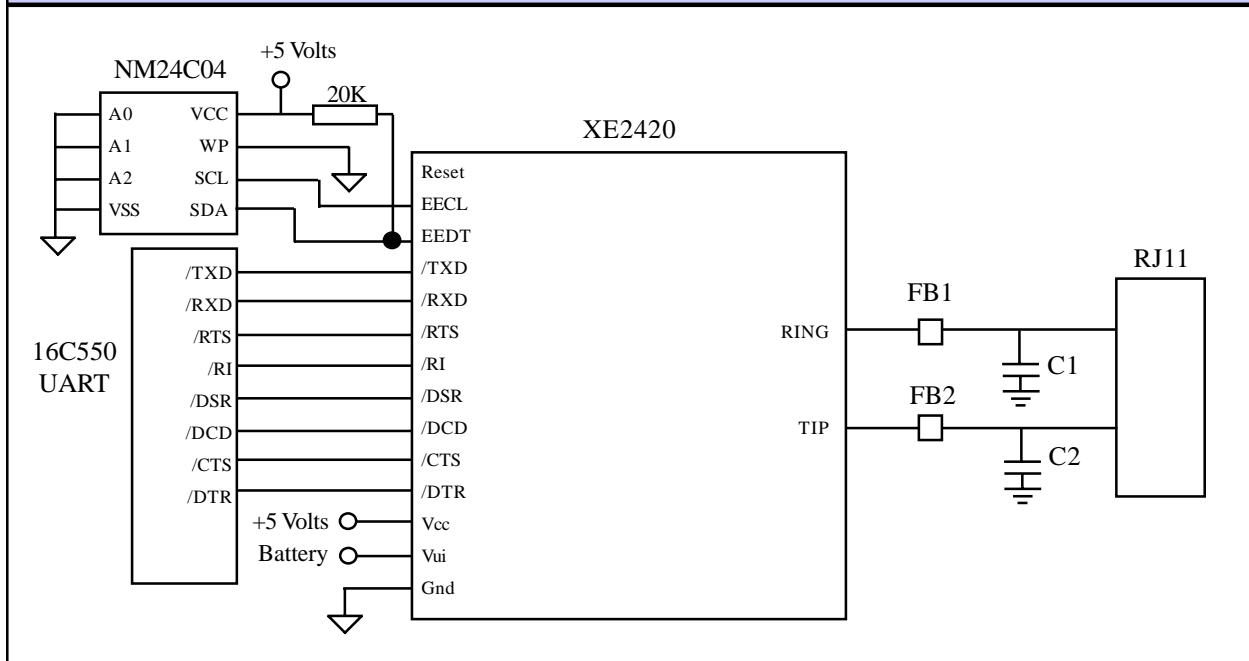
## XE2420 Electrical Specifications

Parameter	Min	Typ	Max	Units	Comments
VCC	4.75		5.25	Volts	
ICC	60	66	72	ma	On Line
ICC		25		ma	idle
Vui	4.75		5.25	Volts	
Iui			1	µa	No Ring Signal Present
Ring Voltage Detected	38		150	RMS	Type B Ringer
Ring Frequency Detected	15.3		68	Hz	Type B Ringer
Connect Detect Sensitivity	20			Volts DC	Battery Voltage level detected by circuit shown on Page 10
Handset Interrupt Detection		1.0		Volts DC	Change in Battery Voltage detected by circuit shown on Page 10
Telephone Loop Current	10	40	100	ma	
Line Impedance		600		Ohms	
Data Transmit level	-12	-10	-9	dBm	
DTMF Transmit Level		-2.5	0	dBm	Avg over 3 second interval
Voh	2.4			Volts	
Vol			0.4	Volts	
Vih	2.0		VCC+0.3	Volts	
Vil	-0.3		0.8	Volts	

### XE2420 ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-25° C to +85° C
Operating Temperature Range <sup>1</sup>	0° C to +70° C
Maximum Time Above Eutectic (183° C)	90 seconds
Preheat Dwell Time	120 to 180 seconds
<sup>1</sup> The XE2420 can be ordered with an Operating Temperature of -40° C to +85° C at extra cost. Order XE2420-ITR or to specify Industrial Temperature Range (ITR).	

## XE2420 Typical Application Schematic



### Notes:

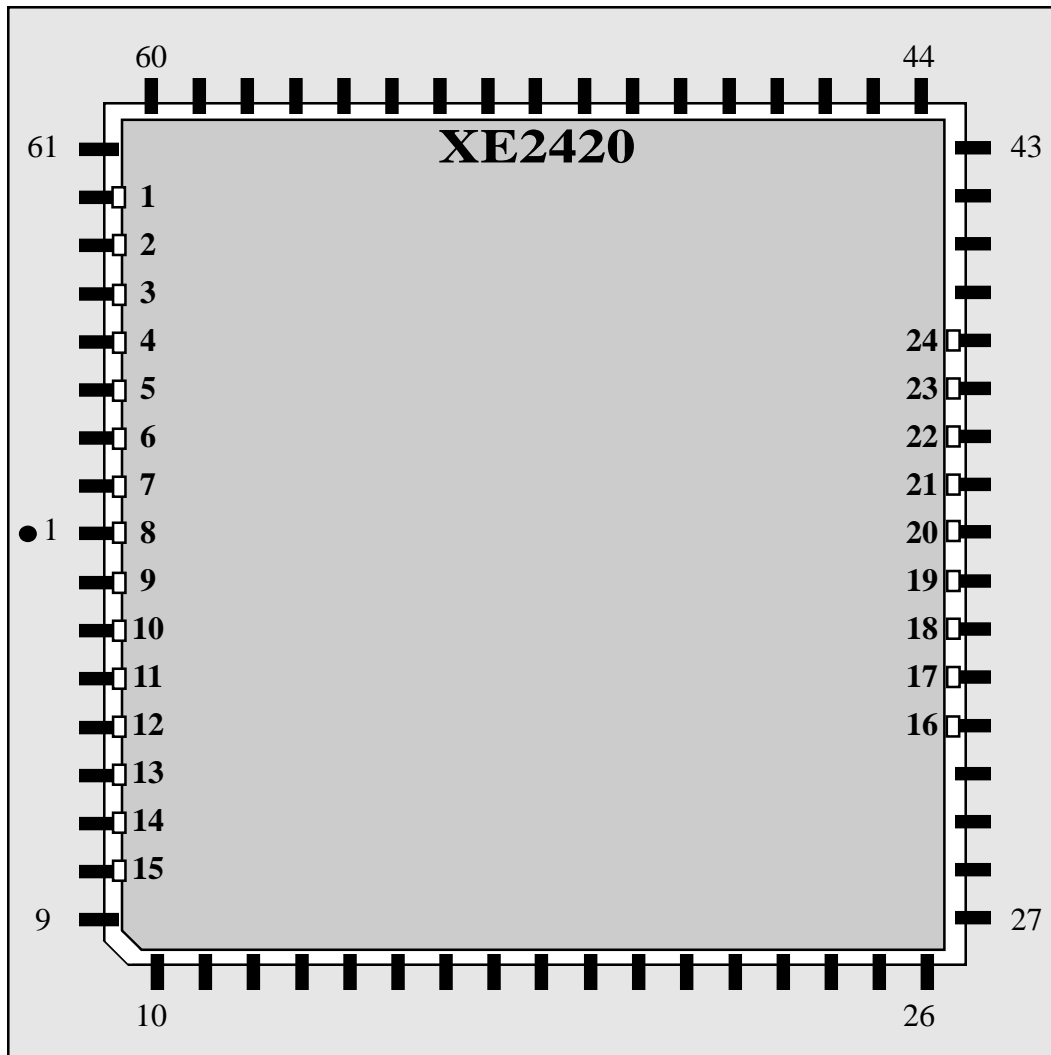
1. FB1 and FB2 are ferrite beads which may be required for EMI filtering in your system. Without these components you may experience unintended radiation when the telephone cable is attached to your system. We recommend selecting components such as the TDK ACB2012L-120 which provide a minimum of 100 ohms of impedance at frequencies above 100 MHz.
2. C1 and C2 are high-voltage capacitors which may be required for EMI filtering in your system. Without these components you may experience unintended radiation when the telephone cable is attached to your system. We recommend selecting components such as the Panasonic ECKDRS471. This 470 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.
3. The Battery applied to Vui allows the XE2420's Ring Indicate output to remain active even when the modem itself is powered down. If this power-down mode is not required for your application, Vui should be tied to VCC.
4. The EEPROM, NM24C04, provides for non-volatile storage of telephone numbers using the AT&Z command. The EEPROM must be programmed using the Diplomat™ Utility from Zilog Inc.

Diplomat™ is a trademark of Zilog Inc.



### Application Note: Using a 68-Pin PLCC Socket

The XE2420 can be inserted into a socket for a 68-pin PLCC device. The HyPLCC package uses only 24 pins; 15 on one side and 9 on the opposite side. Alignment within the socket is critical for all pins of the XE2420 to make contact with the appropriate pins of the PLCC socket. The drawing below illustrates how the XE2420 can be inserted into the 68-pin PLCC socket.

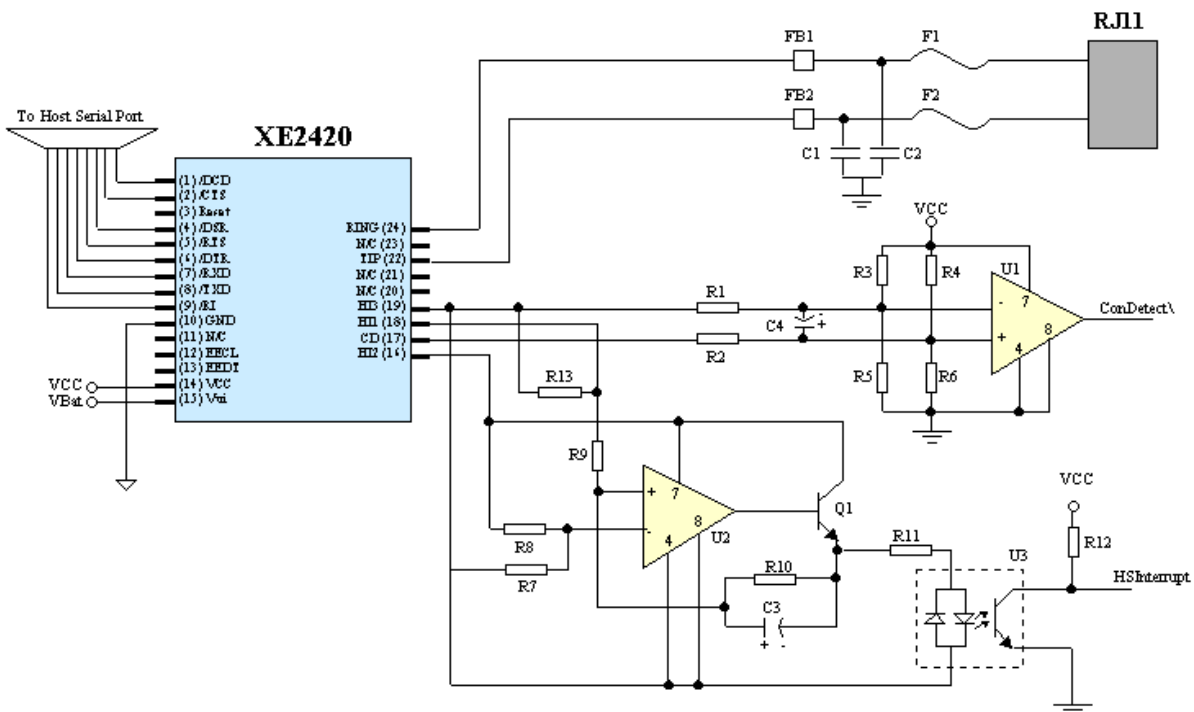


## Application Note: XE2420 Shared Line Feature

For applications where the XE2420 shares a telephone line with a telephone handset, Xecom has provided four hardware hooks for connecting two monitoring circuits. These circuits monitor the status of the telephone line to prevent the modem from interfering with a voice call.

The Connect Detection Circuit monitors the telephone loop voltage when the modem is not in use. This allows the system host to check the status of the telephone line before initiating a call. The ConDetect signal will be high when the phone line is available but goes low to indicate that the telephone line is in use.

The Handset Interrupt or 911 Interrupt circuit monitors loop current while the modem is in the off-hook state. This circuit detects the change in loop current which occurs when a handset on the shared telephone line is lifted. The HSInterrupt output will go low momentarily if the handset is lifted during data communications. The system host can then immediately abort the modem connection and permit the user to complete their call.



### Parts List for Shared Line Feature Application Note

Reference Designation	Qty	Description	Reference Designation	Qty	Description
C1, C2	2	Cap. 470 pfd 2600V	R7	1	Resistor, 56K 5%
C3	1	Cap. 10 ufd 20% 16V	R8	1	Resistor, 33K 5%
C4	1	Cap. 1 Ufd, 20% 10V	R9	1	Resistor, 402K 5%
F1, F2	2	PTC, TR600-150	R10	1	Resistor, 1M 5%
FB1, FB2	2	Ferrite, ACB2012L-120	R11	1	Resistor, 1.5K 5%
Q1	1	Trans. FMMT3904	R12	1	Resistor, 20K 5%
R1, R2	2	Resistor, 10M 5%	R13	1	Resistor, 100K 5%
R3, R5, R6	3	Resistor, 200K 1%	U1, U2	2	OP Amp, TLC271CD
R4	1	Resistor, 280K 1%	U3	1	Opto-coupler, PS2705-1

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## XE2420 AT Commands

The XE2420 uses "AT" commands for configuration and control. This section describes use of the AT command format and lists the AT commands, Registers and Result codes. XE2420 "AT" commands have two operational modes; Command Mode and Data Mode.

**Data Mode:** The XE2420 enters data mode after it connects with 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 XE2420 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 line is stored in the command buffer and executed 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 either 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 by the host. Speed is determined by measuring the width of the incoming bits. Parity is determined by comparing the parity bit of the "A" and the "T."

**Command Line** - Commands may be strung together in a single command line of up to 36 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. 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 Buffer** - No more than 36 characters, including the AT prefix, may be loaded into the command buffer. If the command buffer overflows, the modem issues an "ERROR" result code and commands are not executed.

**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 maybe entered while in data mode 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 the command mode. The default escape sequence is "+++."

**Result Codes** - The modem issues a result code after each action. Result codes may be provided 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.

## XE2420 AT Commands

An asterisk indicates the factory default

### A - Answer Command -

### Bn - Select Communications Standard

- n=0 Selects CCITT standards
- n=1 Selects Bell standards\*
- n=2 Selects V.23/Bell 202 (see S37)

### D - Dial Command -

- 0-9, A-D, #, \* = Dialing Digits
- P = Pulse dial
- T = Tone dial
- R = Connect as an answering modem
- W = Wait for dial tone
- , = Pause for the duration of S8
- @ = Wait for silence
- ! = Switch hook flash
- ; = Return to the command state
- S=n = Dial Stored Number n

### 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

### 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 carrier is detected.

### On - On Line

- n=0 Return On Line with no retrain\*
- n=1 Initiate retrain while returning On line.

### Qn - Responses

- n=0 Send responses \*
- n=1 No Responses

### Sr? - Interrogate Register -

### Sr=n - Set Register Value -

### 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 0-7 & 10\*

### &Cn - DCD Operation

- n=0 DCD is forced active\*
- n=1 DCD indicates a valid carrier signal

### &Dn - DTR

- n=0 DTR is ignored\*
- n=1 When the modem is on-line DTR off 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 Factory Defaults

### &Gn - Guard Timer -

- n=0 None \*
- n=1 550 Hz Guard Timer
- n=2 1800 Hz Guard Timer

### &Sn - Data Set Ready

- n=0 Data Set Ready Forced Active \*
- n=1 Data Set Ready on at Start of Modem handshake

### &Z=x - Store dialing string x

### %En - Automatic Retrain

- n=0 Automatic Retrain Disabled
- n=1 Automatically retrain on poor signal quality \*

### \Nn - Data Buffering

- n=0 Data Buffered
- n=1 Direct Mode no data buffering \*

### \Qn - Flow Control

- n=0 Flow Control Disabled
- n=1 XON/XOFF Flow Control
- n=2 CTS Flow Control
- n=3 RTS/CTS Flow Control \*
- n=4 DCE to DTE XON/XOFF Flow Control

## XE2420 Modem Registers

S0	<p><b>Answer on nth Ring:</b> S0 sets the modem to automatically answer on the nth ring. Setting S0 to 0 disables automatic answer.</p> <p>Range: 0 to 255 Units Rings Default 0</p>	S7	<p><b>Wait for Carrier after Dialing:</b> S7 determines how long the modem waits for a valid carrier signal after dialing is completed.</p> <p>Range: 1 to 255 Units Seconds Default 30</p>
S1	<p><b>Ring Count:</b> 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.</p> <p>Range: 0 to 255 Units Rings Default 0</p>	S8	<p><b>Comma Pause Time:</b> 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.</p> <p>Range: 1 to 255 Units Seconds Default 2</p>
S2	<p><b>Escape Character:</b> S2 determines the ASCII escape character. Values of 0-127 select valid ASCII escape characters; values from 128 to 255 disable the escape sequence.</p> <p>Range: 0 to 255 Units ASCII Character Default 43 (+)</p>	S9	<p><b>Carrier Detect Response Time:</b> S9 establishes the length of time the remote modem's carrier must be present to be recognized as valid.</p> <p>Range: 1 to 255 Units 0.1 Seconds Default 6</p>
S3	<p><b>Line Termination Character:</b> S3 determines the ASCII character which will terminate commands and modem responses.</p> <p>Range: 0 to 127 Units ASCII Character Default 13 (Carriage Return)</p>	S10	<p><b>Carrier Off Disconnect Delay:</b> 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 loss of carrier.</p> <p>Range: 1 to 255 Units 0.1 Seconds Default 14</p>
S4	<p><b>Line Feed Character:</b> S4 sets the ASCII character to act as a line feed character in modem responses.</p> <p>Range: 0 to 127 Units ASCII Character Default 10 (Line Feed)</p>	S11	<p><b>Tone Dialing Speed:</b> S11 sets the duration and spacing of the dialing tones. S11 does not affect the pulse dialing rate.</p> <p>Range: 50 to 255 Units 1 Millisecond Default 95</p>
S5	<p><b>Backspace Character:</b> S5 defines the ASCII character used as a backspace to edit the command line.</p> <p>Range: 0 to 127 Units ASCII Character Default 8 (Back Space)</p>	S12	<p><b>Escape Code Guard Timer:</b> 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.</p> <p>Range: 0 to 255 Units 0.02 Seconds Default 50</p>
S6	<p><b>Dial Tone Wait Time:</b> S6 determines how long the modem waits for dial tone before dialing begins. The Dial Tone Wait Time cannot be set to less than two seconds.</p> <p>Range: 2 to 255 Units Seconds Default 2</p>		

## XE2420 Modem Registers continued

S28 **Inactivity Timer:** S28 determines how long the modem will remain on line with not data flowing. A 0 in this register disables the inactivity time out.

Range: 0-255  
 Units Minutes  
 Default 0

S29 **Hook Flash Time:** S29 determines the the amount of time the modem will go on-hook when a hook switch flash is called for.

Range: 0-255  
 Units 0.02 Seconds  
 Default 25

S37 **Maximum Line Data Rate:** S37 sets the maximum line data rate or modulation technique that the XE2420 will support for any connection.

Register

<u>Value</u>	<u>Communications Supported</u>
0	Maximum Data Rate determined by the autobaud function of the AT Command
1	Connect using V.23, asymmetrical modem modulation, 1200/75 BPS
2	Connect using Bell 202, asymmetrical modulation, 1200/150 BPS
3	V.21, Bel 103, 300 BPS
4	Reserved
5	V.22, Bell212A 1200 BPS
6	V.22bis 2400 BPS

## XE2420 Modem Responses

<u>Digits</u>	<u>Verbose</u>	<u>Description</u>
0	OK	Successfully executed command line
1	CONNECT	300 bps connection
2	RING	Ring signal detected
3	NO CARRIER	Carrier not detected/lost
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	5 second silence not detected
10	CONNECT 2400	2400 bps Connection
16	CONNECT 1200TX/75RX	V.23 Connection transmitting at 1200 BPS
17	CONNECT 75TX/1200RX	V.23 Connection transmitting at 75 BPS
18	CONNECT 1200TX/150RX	Bell 202 Connection transmitting at 1200 BPS
19	CONNECT 150TX/1200RX	Bell 202 Connection transmitting at 150 BPS

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## FCC Instructions

The XE2420 complies with part 68 of the FCC Rules and Regulations. With each device shipped, there is a label which contains, among other information, the FCC Registration Number and Ringer Equivalence Number (REN) for this product. You must, upon request, provide this information to your telephone company.

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.

The device may not be used on coin service lines provided by the telephone company (this does not apply to private coin telephone applications which use standard telephone lines). Connection to party lines is subject to state tariffs.

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## 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.

## Life Support Policy

Xecom's products are not authorized for use as Critical Components in Life Support Devices or Systems.

**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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