

**Global 56KBPS Modem in XE<sub>xx</sub>86 Footprint**

**Description**

Xecom's XE5686G brings Global connectivity to Xecom's xx86 modem family. This permits existing designs which use the XE1486L, XE3386L or XE5686L to market their systems outside North America.

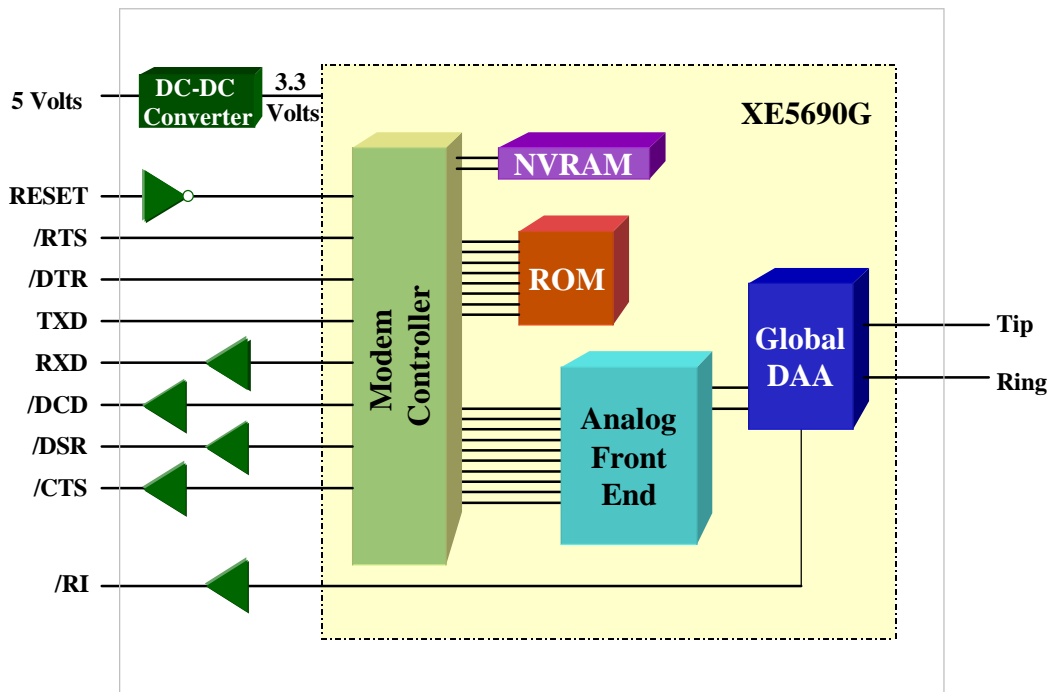
The XE5686G is based on Xecom's XE5690G Hybrid PLCC (HyPLCC) modem module. Level shifters were incorporated to allow the XE5686G to provide the same interfaces to the embedded systems as the XE<sub>xx</sub>86 modem family including the TTL serial interface and 5 volt power. This allows the XE5686G to be used in the XE1486L, XE3386L, or XE5686L socket with no hardware changes.

A single model of the XE5686G replaces the XE1486L, XE3386L and the XE5686L. Applications Notes elsewhere in this data sheet illustrate how to configure the modem to emulate a lower speed product.

**Features**

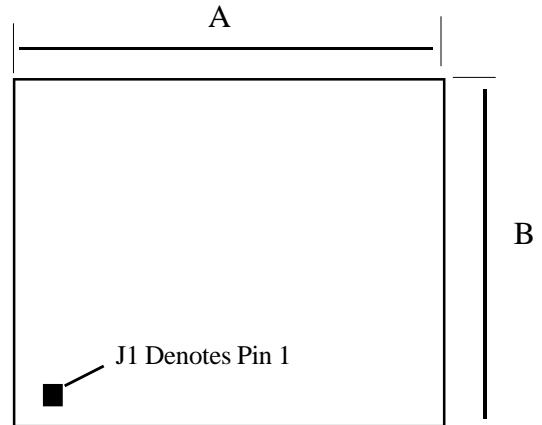
- \* Small Size: 1.22 inches by 1.02 inches by 0.525 inches thick
- \* Data transfer at rates from 300 bps to 56 KBPS (V.90)
- \* Modem Control and Configuration via industry standard AT Commands.
- \* TTL level Serial Interface
- \* Supports V.42 error correction and V.42bis data compression.
- \* Shared Line Features prevent modem operation from interfering with voice communications.
- \* Nonvolatile memory stores modem configuration.
- \* Complete integrated DAA.
- \* User Transferrable FCC Part 68 Registration
- \* Global telephone networks compliance
- \* UL60950 Recognition
- \* Low Power operation, 5 Volts, 40 milliamps;

**XE5686G BLOCK DIAGRAM**

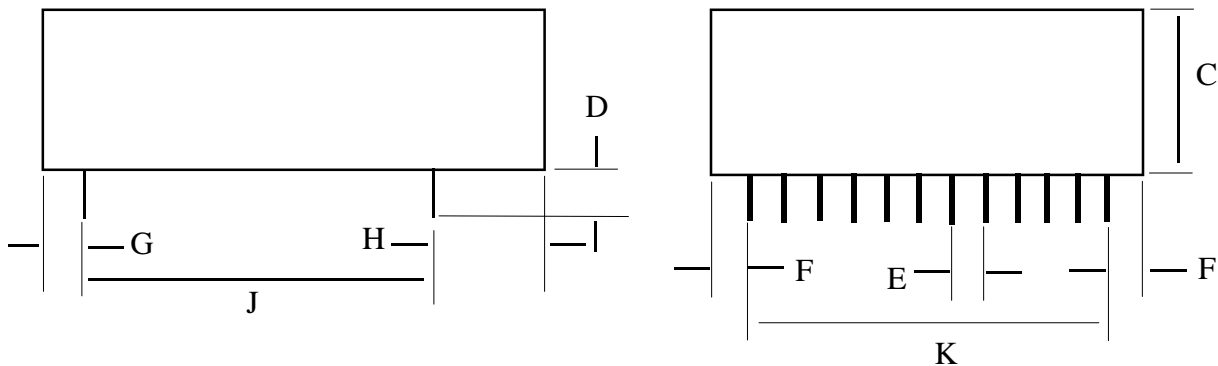


## XE5686G Mechanical Specifications

Dim	INCHES		METRIC(MM)	
	Min	Max	Min	Max
A	1.210	1.230	30.73	31.24
B	1.010	1.030	25.65	26.16
C	0.505	0.535	12.83	13.59
D	0.190	0.210	4.83	5.33
E	0.090	0.110	2.29	2.79
F	0.045	0.055	1.14	1.40
G	0.045	0.055	1.14	1.40
H	0.175	0.185	4.45	4.70
J	0.790	0.810	20.07	20.57
K	1.090	1.110	27.69	28.19



Pins = 0.025 inches Square



### ABSOLUTE MAXIMUM RATINGS\*

SUPPLY VOLTAGE - Vcc	+6.5 Volts
DC INPUT VOLTAGE	-0.3 Volts to +5.3 Volts
STORAGE TEMPERATURE RANGE	-25° C TO +85° C
LEAD TEMPERATURE (Soldering, 2 sec per wave)	260° C
OPERATING TEMPERATURE RANGE	0 TO 70° C
*Exceeding these values may result in permanent damage to the device.	

## XE5686G Pin Configuration

### Top View

1	o	RING	/RTS	o	22
2	o	RIP	RESET	o	21
			GND	o	20
3	o	N/C	VCC	o	19
4	o	N/C	N/C	o	18
5	o	N/C	/DCD	o	17
6	o	N/C	/CTS	o	16
7	o	N/C	/RI	o	15
8	o	N/C	/DSR	o	14
9	o	N/C	/DTR	o	13
10	o	TXD	N/C	o	12
11	o	RXD			

## XE5686G Pin Descriptions

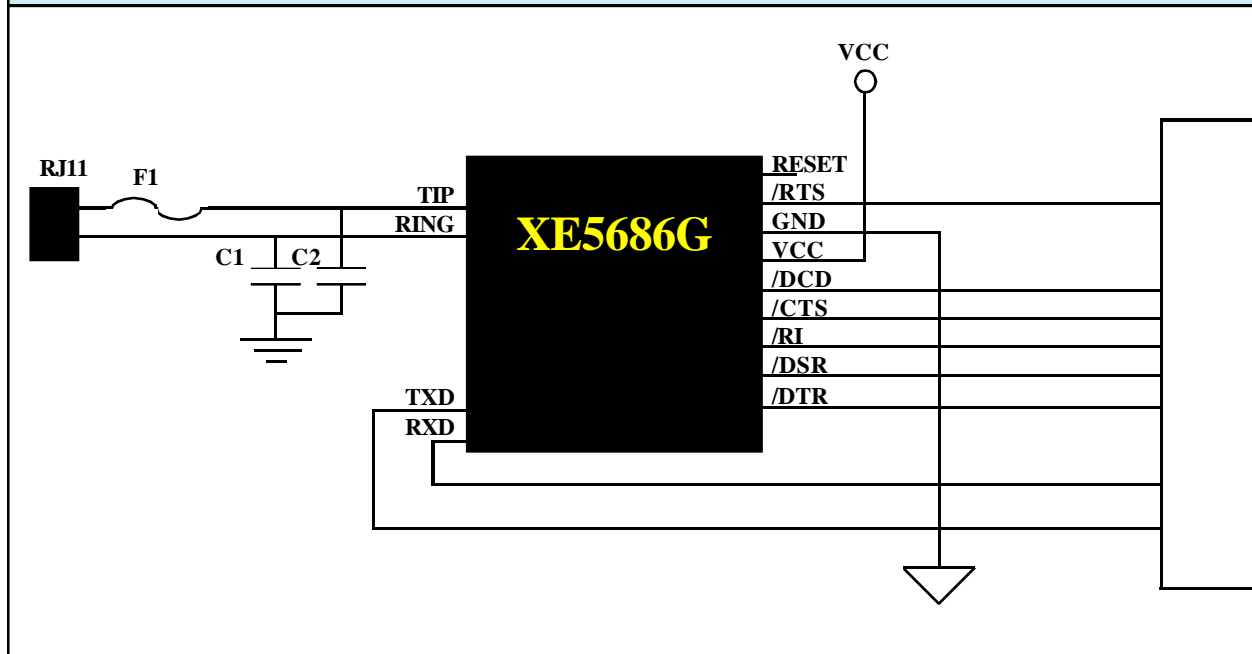
PIN	NAME	DESCRIPTION
1	Ring	Ring provides half of the two-wire connection to the telephone network, RJ-11 Pin 4. A 1500 volt barrier isolates Ring from all other circuits. This isolation must be preserved throughout the system. The battery voltage on Ring may be positive or negative with respect to Tip.
2	Tip	Tip provides half of the two-wire connection to the telephone network, RJ-11 Pin 3. A 1500 volt barrier isolates Tip from all other circuits. This isolation must be preserved throughout the system. The battery voltage on Tip may be positive or negative with respect to Ring.
3-9	Not Used	No Connection should be made to these pins.
10	TXD	TXD provides serial data input from the host. A logic high represents a "Mark" and a low represents a "Space".
11	RXD	RXD provides serial data output to the host. A logic high represents a "Mark" and a low represents a "Space".
12	N/C	No Connection
13	/DTR	Data Terminal Ready is an active low input to the modem. The AT&D command sets the function of DTR.
14	/DSR	Data Set Ready is an active low output from the modem. Its operation is determined by the AT&S command.
15	/RI	Ring Indicator is an active low output which marks the presence of a ring on the line.

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## **XE5686G Pin Descriptions (continued)**

<b>PIN</b>	<b>NAME</b>	<b>DESCRIPTION</b>
16	/CTS	The XE5686G uses Clear to Send for hardware flow control. With hardware flow control active the modem raises \CTS to signal the host that the modem's transmit data buffer is nearly full. When the buffer empties, the modem reactivates CTS.
17	/DCD	Data Carrier Detect goes low to indicate receipt of a valid incoming carrier. The AT&C1 command enables the carrier detect function.
18	N/C	No Connection
19	VCC	VCC provides the +5 volt power required by the modem.
20	GND	Ground provides the common reference for the XE5686G.
21	RESET	This active high input causes a hardware reset in the XE5686G. The reset pulse must be held high for at least 10 milliseconds to correctly reset the modem.
22	/RTS	The modem uses Request to Send for hardware flow control. The modem stops sending data to the host when the hosts raises /RTS. The modem resumes transferring data to the host when the host activates /RTS

## XE5686G Typical Connection Diagram



### Parts List for XE5686G 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 Panasonic ECK-D3F471KPB. 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.
3. F1 is a positive thermal coefficient (PTC) device which protects the modem from excessive current flow. This device or an equivalent is required for your system to pass UL60950. Fuses may be used in place of the PTC's

## XE5686G Electrical Specifications ( $T_A = 0 - 70^\circ\text{C}$ , $V_{CC} = 5\text{v} \pm 5\%$ )

Parameter	Min	Typ	Max	Unit	Comments
DTMF Level		-2.2	0	dBm	3 second average
Modem Transmit Level	-12	-10.5	-9.0	dBm	600 ohm line
Pulse Dialing Rate			10	pps	
Pulse Dialing Make/Break		39/61		%	USA
Billing Delay Interval	2.0			sec.	
Phone Line Impedance Match		600		ohms	
Ring Detect Sensitivity	26 15.3		150 68	VRMS Hz	Type B Ringer
Telephone Loop Current	20		100	milliamps	Off-hook
Input High Voltage (TXD, RTS, DTR)	2.0			Volts	
Input Low Voltage (TXD, RTS, DTR)			0.8	Volts	
Output High Voltage (DCD, DSR, CTS, RXD, RI, OH)	2.4			Volts	RXD -100 microamps; DCD, RI, OH - 1.6 milliamps
Output Low Voltage			0.4	Volts	RXD - 1.6 milliamps;

## Power Supply Characteristics ( $T_A = 0 - 70^\circ\text{C}$ , $V_{CC} = 5\text{v} \pm 5\%$ )

Symbol	Parameter	Typ	Max	Units	Comments
Vcc	Supply Voltage	5.0	5.25	Volts	
Icc	Vcc Supply Current	40	50	mA	Active, On Line
		13	15	mA	Sleep Mode
		4	5	mA	Power-Down Mode

## Configuring the XE5686G to Operate at Lower Data Rates

The XE5686G will serve as a replacement for three modem models; the XE1486L, XE3386L, and XE5686L. Two of these models, the XE1486L and XE3386L, operate at lower peak data rates than does the XE5686G. When replacing these lower data rate products with the XE5686G, the designer can simply allow the XE5686G to handshake down to the lower data rate or the XE5686G can be configured to emulate the handshake of the lower data rate products.

Note: The link data rate discussed here should not be confused with the data rate at the serial interface. All of these modems include data buffering and data compression which permit the serial interface to operate at a higher speed than the flow of data across the link.

### Automatic Rate Negotiation

Because the XE5686G supports all of the sub-rate modem protocols, it can automatically negotiate the correct baud rate with any other modem. However, it does take longer to negotiate down to a slower data rate. The slower the data rate that must be negotiated; the longer the negotiations will take. In some instances it will be necessary to extend the duration of the Carrier On timer (S7) to permit the modem to complete negotiations.

### Selecting Data Rates to be Negotiated

To avoid the delays inherent with negotiating down multiple protocol levels, the XE5686G can be configured to act as a slower speed modem. The command used to make this configuration change is the AT+MS command.

The AT+MS command has 6 parameters which can be set. They include the modulation type, automatic rate negotiation, minimum received data rate, maximum received data rate, minimum transmit data rate, and maximum transmit data rate. The format of the AT+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)

V22B - V.22bis (1200 or 2400 BPS)

V32 - V.32 (4800 or 9600 BPS)

V32B - V.32bis (4800 to 14,400 BPS)

V34 - V.34 (16,800 to 33,600 BPS)

V90 - V.90 (to 56,000 BPS)

b - Automatic Rate Negotiations

0 - Automatic Negotiation Disabled

1 - Automatic Negotiation Enabled

c - Minimum Receive Data Rate (300 to 56000 BPS)

d - Maximum Receive Data Rate (300 to 56000 BPS)

e - Minimum Transmit Data Rate (300 to 56000 BPS)

f - Maximum Transmit Data Rate (300 to 56000 BPS)

To understand the best setting for your application, it is necessary to look at the modem protocols and data rates supported by each product. The following table lists the protocols and line data rates for each modem in the xx86 family.

Protocol	Data Rate	XE1486L	XE3386L	XE5686L
Bell 103	300 bps	X	X	X
V.21	300 bps	X	X	X
Bell 212	1200 bps	X	X	X
V.22	1200 bps	X	X	X
V.22bis	2400 bps	X	X	X
V.32	9600 bps	X	X	X
V.32bis	14,400 bps	X	X	X
V.34	33,600 bps	-	X	X
V.90	56,000 bps	-	-	X

To make the XE5686G handshake like an XE1486L the following AT+MS command is issued. This command permits the modem to negotiate link speeds from 300 to 14,400 bps.

**AT+MS=V32B,1,300,14400,300,14400<CR>**

To make the XE5686G handshake like an XE3386L the issue the AT+MS command below. This command permits the modem to negotiate link speeds from 300 to 33,600 bps.

**AT+MS=V34,1,300,33600,300,33600<CR>**

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## XE5686G Shared Line Features

The XE5686G includes the ability to monitor telephone line conditions before, after and during calls. This allows the XE5686G to avoid conflicts with other equipment connected to the telephone line. There are two modes of operation for the XE5686G Shared Line Features; Connect Detect and Handset Interrupt.

### Connect Detect:

The Connect Detect mode is active when the XE5686G is on-hook. With AT%V2 selected the XE5686G 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 XE5686G 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 10 and 20 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 XE5686G 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 XE5686G from blocking outgoing emergency calls when the line is shared as in a residential application. Handset Interrupt is accomplished by monitoring the loop current through the modem while it is off-hook. Loop current will drop 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 XE5686G to be set to automatically disconnect any time another piece of equipment connects to the line while the XE5686G 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 XE5686G will begin monitoring the line for a Handset Interrupt as soon once dialing is completed.
- If only bit 15 is set, the XE5686G 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 XE5686G starts the Handset Interrupt monitoring after the modem handshake is completed.



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## Boot Command

The XE5686G 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 ATSO=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

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## XE5686G AT Commands

### Modes of Operation

The XE5686G uses AT commands for configuration and control. This section describes the AT command format and lists the AT commands, registers and result codes. The XE5686G has two operational modes; Command mode and Data mode.

**Data Mode:** The XE5686G enters data mode after it establishes a connection and issues a "CONNECT" result code. In the Data Mode the modem sends all signals on Transmit Data to the remote modem and puts data from the remote modem onto Received Data for the host equipment. When the modem exits data mode, it issues a "NO CARRIER" result code.

**Command Mode:** The XE5686G enters command mode on power-up, reset, loss of the connection, or receipt of the escape sequence. In command mode the modem accepts commands from the host on Transmit Data. Appropriate result codes are returned on Received Data.

### Command Line Format

Commands sent to the modem follow a strict format. Each command line begins with the prefix AT. The modem stores the command line in the command buffer and executes it upon receipt of a carriage return. Until executed, a backspace edits the command line.

**Command Prefix** - The "A" and "T" command prefix may be both upper or both lower case but cannot be of different cases. The prefix identifies the speed and parity of the host. The modem determines speed by measuring the width of the incoming bits and parity by comparing the parity bits of the "A" and "T." The XE5686G normally sends result codes at the speed and parity determined by the prefix.

**Command Line** - One command line may include multiple commands. The modem executes commands in the sequence they appear. Spaces inserted into the command line 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** - The command buffer accepts only 48 characters, including the AT prefix. If the command buffer overflows, the modem issues an "ERROR" result code and does not execute the commands.

**Command Line Editing** - The backspace edits the command line. Hitting the backspace key, or Control and H simultaneously on some systems, erases the previous character in the command line. All characters can be erased except for the "A" and "T." Register S5 allows the user to select a character other than a backspace to edit the command line.

**Re-Execute Last Command** - An "A/" causes the XE5686G to re-execute the last command line. This is the only command that does not require the "AT" prefix.

**Omitted Parameters** - Most commands include a parameter which determines the command function. If the command omits the parameter, the modem assumes the parameter is a zero.

**Escape Characters** - A three character escape sequence switches the modem from data mode to command mode while remaining on line. The escape character, set by Register S2, must be entered 3 times in succession to execute the escape. The default escape sequence is "+++."

**Result Codes** - The modem issues a result code after each action. The modem sends result codes as full words, numeric codes or the user may disable the result codes. Each result code ends with a carriage return when the user chooses numeric result. The modem terminates full word result codes with a Line Feed and Carriage Return.

## XE5686G AT Command List

An asterisk indicates the XE5686G default setting

**A - Answer Command** - forces the modem to immediately go off-hook and begin transmitting the answer tone sequence.

**D - Dial Command** - Below are the characters accepted in a dialing command.

- 0-9, #, \* = Dialing Digits
- L = Redial Last Number
- 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** - determines whether commands will be echoed back to the host.

- n=0 Do not echo commands
- n=1 Enable command echo\*

**Hn - Switch Hook Control** - controls the modem's hook switch

- n=0 Switch hook relay opens
- n=1 The switch hook relay closes

**In - Modem Identification** - identifies the modem

**On - On Line** - switches the modem from the command mode to the data mode.

- n=0 Return On Line with no retrain
- n=1 Initiate retrain returning On Line.
- n=2 Initiate Rate Renegotiation while returning On Line

**Qn - Responses** - determines the type of modem responses

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

**Sr? - Interrogate Register** - requests value in register Sr.

**Sr=n - Set Register Value** - sets the value of register Sr to n.

**S\$ - List Values of all S-Register**

**Vn - Result Codes** - selects numeric or full-word result codes

- n=0 Numeric Result Codes
- n=1 English Word Result Codes\*

**Xn - Result Code Set** - selects the modem result code set

- n=0 Result codes 0 to 4
- n=1 Result codes 0 to 5 and 10
- n=2 Result codes 0 to 6 and 10
- n=3 Result codes 0 to 5, 7 and 10
- n=4 Result Codes 0 to 8 & 10 \*
- n=5 Full Result codes

**Zn - Reset** - executes a modem soft reset and resets the modem configuration.

**&Dn - DTR** - determines how the modem responds to DTR.

- n=0 DTR is ignored by the modem.
- n=1 Enter command mode if DTR revoked. \*
- n=2 Disconnect if DTR revoked.
- n=3 Soft reset when DTR revoked

**&Fn - Return to Factory Defaults** - returns the modem configuration to the factory default configuration.

**&Gn - Maximum Data Rate Selection** - sets the maximum link data rate. maximum data rate is also affected by the &H and +MS commands.

- n=3 1200 bps
- n=4 2400 bps
- n=5 4800 bps
- n=6 7200 bps
- n=7 9600 bps
- n=8 12,000 bps
- n=9 14,400 bps
- n=10 16,800 bps
- n=11 19,200 bps
- n=12 21,600 bps
- n=13 24,000 bps
- n=14 26,400 bps
- n=15 28,800 bps
- n=16 31,200 bps
- n=17 33,600 bps \*

## XE5686G AT Command List (continued)

**&Hn - Protocol Selection-** sets the highest available modem protocol. Modem protocol is also affected by the +MS command.

- n=0 V.90 with automatic fallback to 300 bps \*
- n=1 V.90 with fallback to 28,800 bps
- n=2 V.34 with automatic fall back to 300 bps
- n=3 V.34 only (33,600 bps to 2400 bps)
- n=4 V.32bis with automatic fallback to 300 bps
- n=5 V.32bis only (14,400 to 4800 bps)
- n=6 V.22bis (2400 or 1200 BPS)
- n=7 V.22 (1200 BPS)
- n=8 Bell 212 (1200 BPS)
- n=9 Bell 103 (300 BPS)
- n=10 V.21 (300 BPS)
- n=11 V.23 (1200/75 BPS)

**&Tn - Test Modes -** selects modem test mode.

- n=0 Exit test mode
- n=1 Local analog loopback

**%B - Report Blacklisted Numbers -** lists the numbers that the modem is forbidden to dial

**%Cn - V.42bis Data Compression -** controls data compression operation in the modem

- n=0 Data Compression Disabled
- n=1 Bidirectional Data Compression Enabled \*
- n=2 Data Compression Transmit Only
- n=3 Data Compression Receive Only

**%Vn - Shared Line Use -** controls the modems line-in-use detection.

- n=0 No automatic detection of local line status \*
- n=1 Automatic Line Status Detection before going off-hook.

**%%\$ - Display current AT% settings.**

**\Nn - Error Control Mode -** determines what error correction protocols the modem will use

- 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

**\Qn - Modem to DTE Flow Control -** sets the type of flow control to be used between the modem and host equipment

- 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 -** locks in a serial interface speed and disables autobaud detection

- 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=7 12.0 KBPS
- n=8 14.4 KBPS
- n=9 19.2 KBPS
- n=10 38.4 KBPS
- 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 \*
- n=17 Autobaud Off

**\Vn - Connect Response -** selects the modem response to be issued upon establishing a connection

- n=0 Issue Connect and Protocol Responses \*
- n=2 Issue Connect Response only
- n=4 Issue Connect and Protocol Responses with both transmit and receive data rates.

**: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. Only the first register in the sequence must be addressed. Subsequent values will be loaded into successive registers. The :U command uses the format AT:Unn, xxxx, yyyy, zzzz, ...<CR> to load multiple

0 = Japan

## XE5686G AT Command List (continued)

### 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 = Ecuador  
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

### AT+GCI? - Report Country Configuration

**+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

B103 - Bell 103 (300 BPS)

B212 - Bell 212A (1200 BPS)

V21 - V.21 (300 BPS)

V22 - V.22 (1200 BPS)

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

V23 - V.23 (1200 Tx / 75 RX or 75 Tx / 1200 Rx)

V32 - V.32 (4800 or 9600 BPS)

V32B - V.32bis (4800 to 14,400 BPS)

V34 - V.34 (16,800 to 33,600 BPS)

V90 - V.90 (to 56,000 BPS)

K56 - K56Flex (to 56,000 BPS)

b - Automode Detection

0 - Automatic Negotiation Disabled

1 - Automatic Negotiation Enabled

c - Minimum Receive Data Rate (300 to 56000 BPS)

d - Maximum Receive Data Rate (300 to 56000 BPS)

e - Minimum Transmit Data Rate (300 to 56000 BPS)

f - Maximum Transmit Data Rate (300 to 56000 BPS)

Default: AT+MS=V34, 1, 300, 300, 300, 33600

**+VCID=n - Caller ID Enable** - enables Caller ID detection

n=0 No Caller ID \*

n=1 Formatted Caller ID Data presented

n=2 Row Caller ID Data presented

**+VCDT=n - Caller ID Type** - sets 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

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## XE5686G S-Registers

- 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 sets the ASCII escape character. Values of 0-127 select valid ASCII escape characters; values from 128 to 255 disable the escape sequence.
- |         |                 |
|---------|-----------------|
| Range:  | 0 to 255        |
| Units   | ASCII Character |
| Default | 43 (+)          |
- S3 Carriage Return Character:** S3 determines the ASCII character to serve as a carriage return to 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 Back Space 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 begins. The Dial Tone Wait Time cannot be set to less than two seconds.
- |         |          |
|---------|----------|
| Range:  | 0 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 set 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.
- |         |             |
|---------|-------------|
| Range:  | 1 to 255    |
| Units   | 0.1 Seconds |
| Default | 14          |
- S12 Escape Code Guard Timer:** S12 sets the guard timer for the escape sequence. If characters are received within the guard time, the modem aborts the escape attempt and remains in data mode.
- |         |              |
|---------|--------------|
| Range:  | 1 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       |
- S24 Sleep Mode Timer:** S24 sets the length of time in seconds that the modem must be idle before entering the low power, sleep mode. When S24 is set to 0, sleep mode is disabled.
- |          |          |
|----------|----------|
| Range:   | 0 to 255 |
| Units:   | seconds  |
| Default: | 0        |

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## XE5686G S-Registers (continued)

- S30 **Disconnect on Inactivity Timer:** S30 sets the period the modem is idle before it disconnects. A 0 disables the inactivity timer.  
Range: 0 to 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
- S41 **V.34 Symbol Rate:** S41 sets the V.34 test pattern symbol rate to be used by the AT&T4 and AT&T5 commands
- |   |                     |                      |
|---|---------------------|----------------------|
| 0 | 2400 symbols/second | 2400 to 21,600 bps * |
| 1 | 2743 symbols/second | 4800 to 26,400 bps   |
| 2 | 2800 symbols/second | 4800 to 26,400 bps   |
| 3 | 3000 symbols/second | 4800 to 28,800 bps   |
| 4 | 3200 symbols/second | 4800 to 31,200 bps   |
| 5 | 3429 symbols/second | 4800 to 33,600 bps   |
- S42 **Blacklisting** - S42 controls the Blacklisting function within the XE5686G. 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

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## XE5686G 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 XE5686G 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 3.

AT:U65,2008 - Select Powerdown Mode

**U77 Auto Disconnect on Handset Interrupt - U77 bit 11** allows the user to configure the XE5686G 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)



## **XE5686G Result Codes**

<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
11	CONNECT 4800	4800 bps Connection
12	CONNECT 9600	9600 bps Connection
14	CONNECT 19,200	19,200 bps Connection
15	CONNECT 7200	7200 bps Connection
16	CONNECT 12000	12,000 bps Connection
17	CONNECT 14400	14,400 bps Connection
18	CONNECT 16800	16,800 bps Connection
19	CONNECT 21600	21,600 bps Connection
20	CONNECT 24000	24,000 bps Connection
21	CONNECT 26400	26,400 bps Connection
22	CONNECT 28800	28,800 bps Connection
23	CONNECT 31200	31200 bps Connection
24	CONNECT 33600	33,600 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
52	CONNECT 56000	56,000 bps Connection
60	CONNECT 32000	32,000 bps Connection
61	CONNECT 48000	48,000 bps Connection

## **XE5686G Result Codes (continued)**

<u>Digits</u>	<u>Verbose</u>	<u>Description</u>
63	CONNECT 28000	28,000 bps Connection
64	CONNECT 29333	29,333 bps Connection
65	CONNECT 30666	30,666 bps Connection
66	CONNECT 33333	33,333 bps Connection
67	CONNECT 34666	34,666 bps Connection
68	CONNECT 36000	36,000 bps Connection
69	CONNECT 37333	37,333 bps Connection
70	PROTOCOL: NONE	No Link Protocol negotiated
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
83	PROTOCOL: ALTERNATE, + CLASS 5	MNP5 error correction negotiated
90	CONNECT 38666	38,666 bps Connection
91	CONNECT 40000	40,000 bps Connection
92	CONNECT 41333	41,333 bps Connection
93	CONNECT 42666	42,666 bps Connection
94	CONNECT 44000	44,000 bps Connection
95	CONNECT 45333	45,333 bps Connection
96	CONNECT 46666	46,666 bps Connection
97	CONNECT 49333	49,333 bps Connection
98	CONNECT 50666	50,666 bps Connection
99	CONNECT 52000	52,000 bps Connection
100	CONNECT 53333	53,333 bps Connection
101	CONNECT 54666	54,666 BPS Connection
102	UN-OBTAINABLE NUMBER	DTMF Dial attempt on Pulse only Line

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## **XE5686G FCC Instructions**

The XE5686G 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.

*FCC ID Number*  
**US:DWEMM00BXE5690G**

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.

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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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