xecom

XE1212C
6/97

1200bps Modem Module with Parallel Host Interface

Description

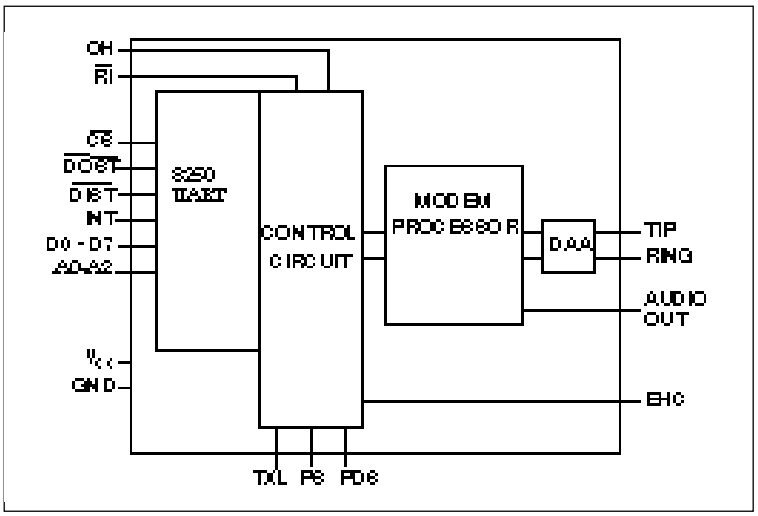
The XE1212C is a complete 1200/300 bps Modem in a compact, component form factor. It contains all circuitry necessary for complete modem functionality, including an FCC Part 68 Registered Data Access Arrangement (DAA) for direct connection to the telephone line, and a parallel 8250B UART interface for direct operation with the IBM-PC, XT or AT system bus. It operates from the industry standard 'AT' command set. The XE1212C contains all signal processing functions, including the modulators and demodulators for both PSK and FSK operation, and analog filters.

The XE1212C includes the capability for call progress monitoring and DTMF tone generation as well as the guard tones handling required for CCITT V.22/V.21 communications. It operates in the asynchronous mode and provides analog loopback, digital loopback and remote digital loopback functions for testing.

Features

- Small Size -2.28" x 1.0" x 0.5"
- FCC Part 68 Registered
- 212A/103 and CCITTV.22/V.21 Compatible
- Industry Standard "AT" Command Set
- Parallel Interface Emulates 8250B UART
- Call Progress Monitoring
- DTMF and Pulse Dialing
- Software Controlled Audio Output
- Modem Configuration storage in NVRAM
- +5 Volt Power Only
  Typical Operating Power 200 mW
  Automatic Sleep mode when idle reduces power consumption to only 50 mW.

Block Diagram

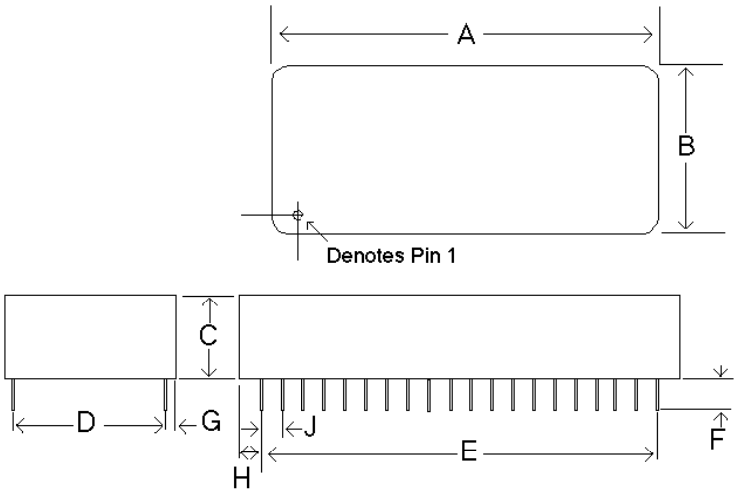


PIN CONFIGURATION

N/C	1	40	TIP
GND	2		
Vcc	3		
RI\	4	37	RING
N/C	5		
N/C	6		
N/C	7		
N/C	8		
OH	9		
N/C	10		
N/C	11		
AUDIO	12		
INT	13	28	D0
A0	14	27	D1
A1	15	26	D2
A2	16	25	D3
CS\	17	24	D4
DOST\	18	23	D5
DIST\	19	22	D6
EHC	20	21	D7

Mechanical Specifications

	Inches		Milimeters	
	Min	Max	Min	Max
A	2.255	2.305	57.2	58.6
B	0.985	1.015	25.0	25.8
C	0.490	0.510	12.4	13.0
D	0.890	0.910	22.6	23.1
E	1.890	1.910	48.0	48.5
F	0.125	0.200	3.1	5.1
G	0.040	0.060	1.0	1.5
H	0.180	0.200	4.5	5.1
J	0.090	0.110	2.3	2.8



Pins = 0.020" X 0.014"
All pins tin-plated
Recommended hole size = 0.045"

Pin Descriptions

PIN	NAME	DESCRIPTION
1	N/C	No Connect.
2	GND	Ground Reference (0 volts).
3	VCC	Positive Supply Voltage (+5 volts).
4	\RI	Ring Indication. A low level on this status line indicates the presence of the ring cycle on Tip and Ring. This line is normally used for test/status only.
5,6,7,8	N/C	No Connect
9	OH	This signal allows the user to monitor the status of the hookswitch relay in the XE1212C. When the signal on OH is high, the relay is closed, and the XE1212Csiezes the telephone line. During rotary dialing, this line is pulsed at a rate of 10 pulses per second.
10,11	N/C	No Connect
12	AUDIO	A programmable attenuator that can drive a load impedance of 300 ohms is provided on this pin to allow monitoring of the telephone line signal through an external speaker. The L and M commands adjust speaker volume and control when the audio signal will be presented. The Audio Output in conjunction with an external audio amplifier (such as an LM386) can drive a low impedance speaker.
13	INT	The Interrupt Line goes high whenever any of the enabled interrupts in the Interrupt Enable Register (IER) is active. The interrupts are Received Data Available, Transmitter Holding Register Empty, Receiver Line Status and Modem Status. The Interrupt Line is reset upon the appropriate interrupt servicing. This pin is forced to a Hi-Z state when bit 3 bit of the modem control register (MCR) is low (power on state).
14-16	A0..A2	These 3 address inputs select a UART register during read or write operations as shown in Table 1. The Divisor Latch Access Bit (DLAB) of the LCR register must be set high by the system software to access the bit rate Divisor Latch (DLM) as shown in Table 2.

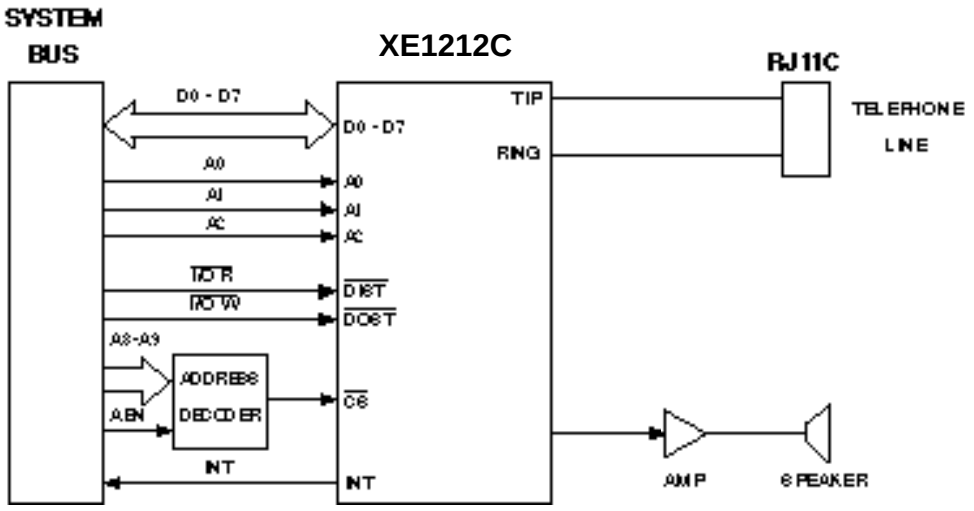
Pin Descriptions

PIN	NAME	DESCRIPTION
17	\CS	The XE1212C is selected when Chip Select is driven low. When high, the data bus lines (D0..D7) will be in the high impedance state.
18	\DOST	The CPU can write data or control words into a selected register of the XE1212C when DOST and CS are low. Data is latched on the rising edge of the signal.
19	\DIST	The CPU can read data or status from a selected register of the when DIST and CS are low.
20	EHC	External Handset Control. This pin is used to control an additional relay to connnect a telephone handset to the telephone line. During data transmission, when the internal relay in the DAA is closed (off hook), this pin is high. When the internal relay is open (on-hook), this pin is low and may be used to close an external relay to connect the telephone handset to the line.
21-28	D7-D0	This eight bit data bus provides bidirectional communications between the modem and CPU. Data, Control words and Status information are transferred on these bus lines. These are tri-state lines and have internal drive buffers eliminating the need for external buffering between the CPU bus and the XE1212C.
37,40	RING/TIP	These are the TIP and RING connections to the telephone line from the DAA. In order to maintain the high voltage isolation provided by the DAA, traces from these pins to the RJ11C Jack should have a minimum spacing of 100 mils between them and any other traces on the board.

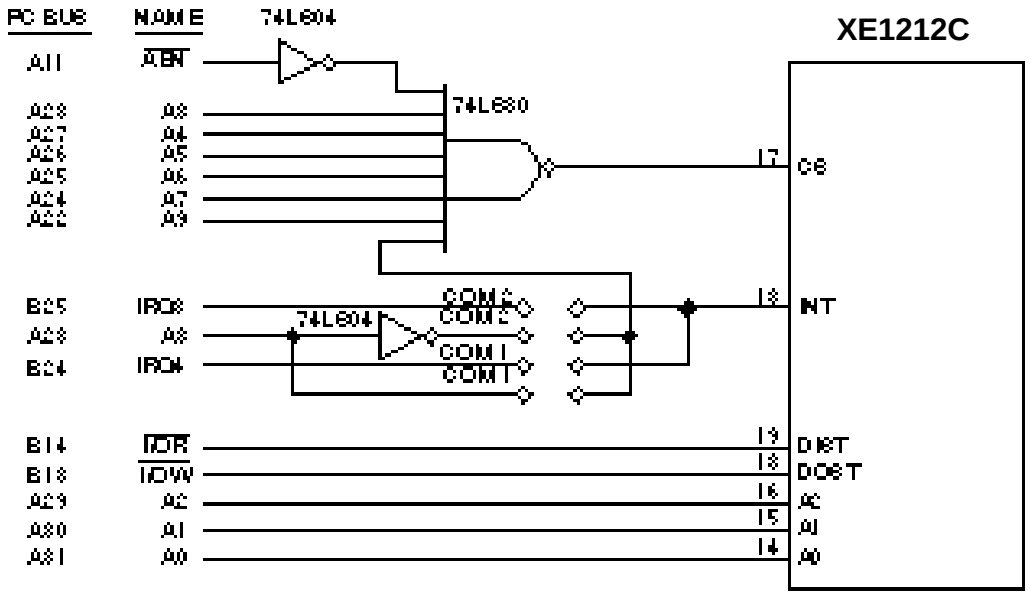
ABSOLUTE MAXIMUM RATINGS*	
SUPPLY VOLTAGE - Vcc	+6 Volts
DC INPUT VOLTAGE	-0.6 Volts to (Vcc +0.6 Volts)
STORAGE TEMPERATURE RANGE	-25° C TO +85° C
LEAD TEMPERATURE (Soldering, 2 seconds per wave)	260° C
OPERATING TEMPERATURE RANGE	0 TO 70° C

*Exceeding these values may result in permanent damage to the device.

Typical Connection Diagram



IBM-PC Bus Interface Address Decoder



UART Register Function Summary

Register Address										
	0 (DLAB=0)	0 (DLAB=0)	1 (DLAB=0)	2	3	4	5	6	0 (DLAB=1)	1 (DLAB=1)
Bit No.	Receiver Buffer Register (RBR)	Transmitter Holding Register (THR)	Interrupt Enable Register (IER)	Interrupt Indent. Register (IIR)	Line Control Register (LCR)	Modem Control Register (MCR)	Line Status Register (LSR)	Modem Status Register (MSR)	Divisor Latch (DLL)	Divisor Latch (DLM)
0	Data Bit 0*	Data Bit 0*	Enable RXD Available Interrupt	"0" if Interrupt Pending	Word Length Selection Bit 0	Data Terminal Ready (DTR)	Data Ready	Delta CTS	Bit 0	Bit 8
1	Data Bit 1	Data Bit 1	Enable Transmitter Holding Reg. Empty Interrupt	Interrupt Ident. Bit 0	Word Length Selection Bit 1	Request to Send (RTS)	Overrun Error (OE)	Delta DSR	Bit 1	Bit 9
2	Data Bit 2	Data Bit 2	Enable Receiver Line Status Interrupt	Interrupt Ident. Bit 1	Stop Bits 0=1 SB 1=2 SB	Output 1	Parity Error (PE)	Trailing Edge Ring Indicator	Bit 2	Bit 10
3	Data Bit 3	Data Bit 3	Enable Modem Status Interrupt	0	Parity Enable 1=PEN	Output 2	Framing Error (FE)	Delta Rx Line Signal Detect	Bit 3	Bit 11
4	Data Bit 4	Data Bit 4	0	0	Even Parity Select 1=EPS	Local Loopback	Break Interrupt	Clear to Send (CTS)	Bit 4	Bit 12
5	Data Bit 5	Data Bit 5	0	0	Stick Parity 1=SP	0	Transmit Holding Register Empty (THRE)	Data Set Ready (DSR)	Bit 5	Bit 13
6	Data Bit 6	Data Bit 6	0	0	Set Break 1=SB	0	Transmit Shift Register Empty (TSRE)	Ring Indicator (RI)	Bit 6	Bit 14
7	Data Bit 7	Data Bit 7	0	0	Divisor Latch Access Bit (DLAB)	0	0	Received Line Signal Detect	Bit 7	Bit 15

*Bit 0 is the least significant bit. It is the first bit serially transmitted or received.

UART Register Addresses

DLAB	A2	A1	A0	REGISTER
0	0	0	0	Receiver Buffer (read only) (RBR)
0	0	0	0	Transmitter Holding (write only) (THR)
0	0	0	1	Interrupt Enable (IER)
X	0	1	0	Interrupt Identification (read only) (IIR)
X	0	1	1	Line Control (LCR)
X	1	0	0	Modem Control (MCR)
X	1	0	1	Line Status (LSR)
X	1	1	0	Modem Status (read only) (MSR)
X	1	1	1	Scratch Register (Not Used by the Modem)
1	0	0	0	Divisor Latch (DLL)
1	0	0	1	Divisor Latch (DLM)

Interrupt Identification Register

The XE1212C Interrupt capability emulates the industry standard 8250 UART. This minimizes software overhead during data character transfers, the XE1212C prioritizes interrupts into four levels. The Interrupt Identification Register indicates that an interrupt is pending and identifies the source of the interrupt. When this register is addressed during chip select time, it freezes the highest priority interrupt pending and no other interrupts are acknowledged until the CPU services that interrupt. The table below defines the interrupt priorities and the contents of the Interupt Identification Register.

IIR Register Bit	Description
0	This bit indicates if an interrupt is pending. When bit 0 is a logic 0, an interrupt is pending and the IIR contents may be used as a pointer to the appropriate interrupt service routine. When bit 0 is logic 1, no interrupt is pending.

Bit 1	Bit 2	Interupt Priority	Interrupt Definition
1	1	(priority 1)	Receiver Line Status
0	1	(priority 2)	Received Data Ready
1	0	(priority 3)	Transmitter Holding Register Empty
0	o	(priority 4)	MODEM Status

3-7	These five bits of the Interrupt Identification Register are always a logic 0.

Interrupt Enable Register

This 8-bit register enables the four interrupt sources of the XE1212C to separately activate the Interrupt line (INT, pin 13). It is possible to totally disable the Interrupt system by resetting bits 0 through 3 of the Interrupt Enable Register. similarly, by setting the appropriate bits of this register to a logic 1, selected interrupts can be enabled. Disabling the interrupt system inhibits the Interrupt Identification Register and the active (high) INT output from the XE1212C. All other system functions operate in their normal manner, including the setting of the Line Status and Modem Status Register. The contents of the Interrupt Enable Register are described below.

IER Bit	Description
Bit 0:	This bit enables the Received Data Available Interrupt when set to logic 1.
Bit 1:	This bit enables the Transmitter Holding Register Empty Interrupt when set to a logic 1.
Bit 2:	This bit enables the Receiver Line Status Interrupt when set to logic 1.
Bit 3:	This bit enables the MODEM Status Interrupt when set to logic 1.
Bit 4-7:	These four bits are always logic 1.

Line Control Register

Bit 0-1: Bits 0 and 1 specify the number of bits in each transmitted or received character. the encoding of the bits is as follows:

Bit 1	Bit 0	WORD LENGTH
0	0	5 Bits
0	1	6 Bits
1	0	7 Bits
1	1	8 Bits

Bit 2: This bit specifies the number of stop bits in each transmitted or received character. If bit 2 is a logic 0, one stop bit is generated or checked in the transmit or receive data, respectively. If bit 2 is a logic 1 when 7-bit word length with no Parity is selected, two stop bits are generated or checked.

Bit 3: This bit is the Parity Enable bit. When bit 0 is a logic 0 and bit 3 is a logic 1, a Parity bit is generated (transmit data) or checked (receive data) between the last data word bit and the Stop bit of the serial data. (The Parity bit is used to verify that the data has been transmitted intact.)

Bit 4: This bit is the Even Parity Select bit. When bit 3 is a logic 1 and bit 4 is a logic 0, an odd parity is transmitted or checked for in the received data. When bit 3 is a logic 1 and bit 4 is a logic 1, even parity is transmitted or checked.

Bit 5: This bit is the Stick Parity bit. when bit 3 is a logic 1 and bit 5 is a logic 1, a 1 is placed in the parity bit.

Bit 6: This bit is the Set Break Control bit. When bit 6 is a logic 1, the modem output is forced to the Space state (logic 0) and remains there until reset regardless of other transmitter activity. This feature enables the CPU to alert a terminal in a computer communications system.

Bit 7: This bit is the Divisor Latch Access bit (DLAB). It must be set high (logic 1) to access the Divisor Latches of the Baud Rate Generator during a Read or Write operation. It must be set low (logic 0) to access the Receiver Buffer, the Transmitter Holding Register, or the Interrupt Enable Register.

Programmable Baud Rate Generator

The XE1212C Baud Rate Generator can be programmed for one of four Baud rates. The desired speed is selected by writing into the Divisor Latch (DLM) MSB and LSB registers.

(HEX CODE)		Decimal	
DLM	**DLS**	**DIVISOR**	**BAUD RATE**
00	30	48	2400
00	60	96	1200
00	C0	192	600
01	80	384	300

Modem Control Register

This 8-bit register controls the interface with the Modem Processor as shown in the block diagram. The contents of the Modem Control Register are described below.

Bit 0: This bit controls Data Terminal Ready (DTR) signal.

Bit 1: This bit controls the Request to Send (RTS) signal.

Bit 2: Output 1; Tied to RI during Local Loopback

Bit 3: Output 2; When this bit is a 0, INT (pin 13) is in the high-Z state.

Bit 4: Selects Local Loopback Operation: Data presented to the Transmit holding Register is lopped back to the Receiver Buffer Register. The modem control bits CTS, DSR, RI and DCD are internally connected to the modem control outputs; RTS, DTR, Output 1, and Output 2.

Bit 5-7: These bits are permanently set to logic 0.

Modem Status Register

This register shows the current state of the control lines from the ModemProcessor to the CPU. It also indicates if changes have occurred in these control lines. Bits 0-3 are set to a logic 1 whenever a control input from the ModemProcessor changes state. These bits are reset to logic 0 whenever the CPU reads the Modem Status Register. The contents of the Modem Status Register are described below.

Bits 0: This bit indicates that CTS has changed since the Modem Status Register was last read.

Bits 1: This bit indicates that DSR has changed since the Modem Status Register was last read.

Bit 2: This bit is the Trailing Edge of Ring Indicator detector. Bit 2 indicates that RI (pin 4) has changed from an On (logic 1) to an Off (logic 0) condition.

Bit 3: This bit is the Delta Received Line Signal Detector Indicator. Bit 3 indicates that the carrier detector has changed state.

Bit 4: This bit displays the status of Clear to Send.

Bit 5: This bit displays the status of Data Set Ready

Bit 6: This bit displays the complement of RI (pin 4).

Bit 7: This bit displays the status of DCD, Received Line Signal Detect.

Note 1: *Whenever bit 2 or 3 is set to logic 1, a Modem Status Interrupt is generated.*

AT Commands

The XE1212C uses "AT" commands for modem configuration. This section describes the command format and lists the commands, registers and result codes.

Modes of Operation

The "AT" commands have two operational modes; Command Mode and Data Mode.

Data Mode: The XE1212C enters data mode upon connecting with a remote modem and issues an appropriate "CONNECT" result code. In Data Mode the modem sends all data presented on Transmit Data (TXD) to the remote modem and places demodulated data from the remote modem onto Received Data (RXD). When the modem exits data mode, it issues the "NO CARRIER" result code.

Command Mode: The XE1212C 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 - Commands, except A/, begin 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 host. Speed is determined by measuring the width of the incoming bits. Parity is determined by comparing the parity bits of the "A" and "T." The XE1212C must be intialized at the desired connect speed on powered-up.

Command Line - Commands may be strung together in a single command line of up to 40 characters. Commands are executed in the sequence they appear. 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 stores up to 40 characters, including the AT prefix, from one command line. Spaces may be inserted into the command line without filling space in the command buffer. If the command buffer overflows, the modem issues an "ERROR" result code and commands are not executed.

Command Line Editing - A backspace can be used to edit a command line before execution. 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 as the command line editor.

Re-Execute Last Command - The A/ command causes the modem to reexecute the last command line. This command does not require the "AT" prefix.

Omitted Parameters - Most commands include a parameter which determine the function setting. When the command parameter is omitted from the command string, it is assumed to be a 0.

Escape Characters - An escape sequence may be 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 within a 1 second guard time to execute the escape. The default escape sequence is "+++."

Result Codes - The modem issues a result code after each action. Result codes may be provided as full words, 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 preceed and follow each result code.

XE1212C AT Command List

A - Answer Command -

Bn - Select Communications Standard
- n=0 Selects CCITT standards
- n=1 Selects Bell standards*

D - Dial Command -
- 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
- Sn = Dial number stored in location n

En - Command Echo
- n=0 Do not echo commands
- n=1 Enable command echo*

Hn - Switch Hook Control -
- n=0 Switch hook relay closes*
- n=1 The switch hook relay opens

In - Modem Identification

Ln - Speaker Volume -
- n=0 Low speaker volume
- n=1 Low speaker volume
- n=2 Moderate speaker volume*
- n=3 High speaker volume

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 detected.

On - On Line
- n=0 Return On Line with no retrain*
- n=1 No response to remote test request.

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
- n=2 Responses 0-6
- n=3 Responses 0-5, & 7
- n=4 Responses 0-8

Z - Reset -

&Cn - DCD Operation
- n=0 DCD is forced active
- n=1 DCD indicates a valid carrier signal*

&Dn - DTR
- n=0 DTR is ignored by the modem
- n=2 Modem disconnects if DTR revoked.*
- n=3 The modem performs a soft reset when DTR is revoked.

&Pn - Pulse Dialing Make-to Break Ratio
- n=0 39/61; 10 pulses per second (US, Canada)*
- n=1 33/67; 10 pulses per second
- n=2 39/61; 20 pulses per second
- n=3 33/67; 20 pulses per second

&Sn - DSR Operation
- n=0 DSR is forced active*
- n=1 DSR on from start of modem handshake

&Tn - Test Modes
- n=0 Exit test mode
- n=1 Local analog loopback
- n=3 Initiate local digital loopback
- n=4 Respond to remote loop request*
- n=5 Deny remote loop request
- n=6 Initiate a Remote Digital loopback
- n=7 Remote digital loopback w self-test
- n=8 Local analog loopback w self-test

&V - View Active Profile -

&Wn - Store Profile -
- n=0 Stores the current configuration in memory location 0.
- n=1 Stores the current configuration in memory location 1.

&Yn - Recall Profile
- n=0 Use memory location 0.
- n=1 Use memory location 1.

&Zn=X- Store Number

* Indicates the default setting for the command as shipped by Xecom.

XE1212C S-Register Summary

REG.	RANGE/UNITS	DESCRIPTION	DEFAULT
S0	0-255/rings	Number of rings to answer on	1
S1	0-255/rings	Count number of incoming rings	0
S2	0-127/ASCII	Escape character	43
S3	0-127/ASCII	Carriage return character	13
S4	0-127/ASCII	Line feed character	10
S5	0-32,127/ASCII	Backspace character	8
S6	2-255/sec	Dial tone wait time	2
S7	1-60/sec	Wait time for remote carrier in seconds	30
S8	0-255/sec	Comma pause time in seconds	2
S9	1-255/0.1 sec	Carrier detect response time in tenths of seconds	6
S10	1-255/0.1 sec	Delay from loss of carrier to hang up	014
S11	50-255/msec	DTMF Dialing Speed in miliseconds	95
S12	0-255/.020 sec	Escape code guard timer in 20 millisecond intervals	50
S14	Bit Mapped	E,Q,V commands, Tone/Pulse,Originate/Answer	170
S16	Bit Mapped	Modem loopback tests	000
S18	0-255/sec	Modem test timer in seconds	000
S21	Bit Mapped	&D, &C commands	042
S22	Bit Mapped	L, M, X, &P commands	118
S23	Bit Mapped	&T4,&T5 commands, DTE speed and parity	023
S24	5-254/seconds	Slee Mode inactivity timer in seconds	000
S27	Bit Mapped	&X, B commands	064

Power Supply Characteristics *(TA = 0 - 70°C, Vcc = 5v ±5%)*

Symbol	Parameter	Min	Typ	Max	Units	Comments
Vcc	Supply Voltage	4.75	5.0	5.25	V	
Icc	Vcc Supply Current		40	50	mA	On-Line All outputs Disconnected
Icc	Vcc Supply Current		7	10	mA	Sleep Mode

Sleep Mode: The XE1212C has an integrated, advanced power management capability. If no activity is detected on the RXD, DTR, or RI lines the modem will automatically go into a smart power down mode. In this mode power consumption is less than 50 milliwatts.

Modem Diagnostics

Analog Loopback

Before entering analog loopback, the telephone line must be disconnected. Normal telephone line signals may affect the results of the analog loopback test. The test is started by entering the following command, **AT&T1<CR>.** A CONNECT result code will be displayed. All subsequent characters typed on the keyboard are displayed on the screen. The test may be ended by the escape command. Register S18 determines the length of the test.

Analog Loopback may also be run using the modem's internal test pattern. The command **AT&T8<CR>** initiates the analog loopback with self-test. The test pattern is looped from the transmitter to the recevier and checked for errors. The number of errors is reported when the test terminates.

Digital Loopback

This test causes the modem to automatically resend each received character. It is used for testing a remote modem. The modems must be connected before the test. The test is started with the commands: **AT&T3<CR>.** All the characters received from the remote modem are looped back to it through the XE1212C and are not displayed on the local screen.

Remote Digital Loopback

This test enables the remote modem to loop received data back to the transmitting modem. To execute the test, the remote modem must be capable of operating in remote digital loopback. The test is started by the command: **AT&T6<CR>.** During this test, data transmitted by the XE1212C will be looped back by the remote modem. The Remote Digital Loopback will utilize the XE1212C internal test pattern if the test is intiated with the command **AT&T7<CR>**.

Interrupt Control Functions

Interrupt Identification Register	**Interrupt Set and Reset Functions**			
B1 B1 B0	Priority Level	Interrupt Flag	Interrupt Source	Interrupt Reset
0 0 1		None	None	
1 1 0	Highest	Receiver Line Status	Overrun Error or Parity Error or Framing Error	Reading LSR
1 0 0	Second	Receiver Data Available	Receiver Data Available	Reading the RBR
0 1 0	Third	Transmitter Holding Register Empty	Transmitter Holding Register Empty	Reading the IRR (if source of interrupt) or Writing toTHR
0 0 0	Fourth	Modem Status	Ring Indicator or or RLSD	Reading the Modem Status Register

Register Reset States

REGISTER/SIGNAL	RESET CONTROL	RESET STATE
Receiver Buffer Register	First Word Received	Data
Transmitter Holding Register	Write to Transmit Holding Register	Data
Interrupt Enable Register	Power On Reset	All Bits Low (0-3 forced and 4-7 permanent)
Interrupt Identification Register	Power On Reset	Bit 0 is High and Bits 1-7 are Low
Line Control Register	Writing into the LCR	Data
Modem Control Register	Power On Reset	All Bits Low
Line Status Register	Power On Reset	All bits Low, Except Bits 5 and 6 are high
Modem Status Register	Power On Reset	Bits 0-2 Low, Bits 3-5 High, Bits 6-7 Low
Divisor Latch (DLM)	Power On Reset	2400 bps
INT	Power On Reset	Low (Hi-Z)

Electrical Specifications

ABSOLUTE MAXIMUM RATINGS*

SUPPLY VOLTAGE - Vcc	+6 Volts
DC INPUT VOLTAGE	-0.6 Volts to (Vcc +0.6 Volts)
STORAGE TEMPERATURE RANGE	-25° C TO +85° C
LEAD TEMPERATURE(Soldering, 2 seconds per wave)	260° C
OPERATING TEMPERATURE RANGE	0 TO 70° C

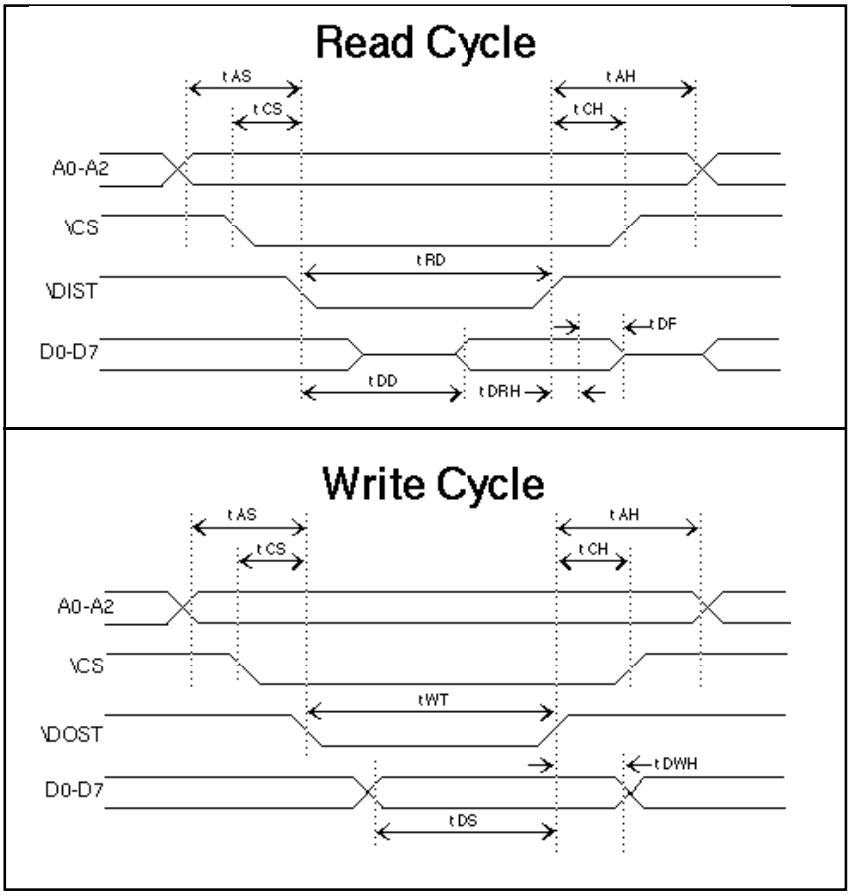
*Exceeding these values may result in permanent damage to the device.

D.C. Electrical Specifications (TA = 0 - 70°C, Vcc = 5v ±5%)

Description	Parameter	Min	Typ	Max	Units
Power Supply Voltage	Vcc	4.75	5.0	5.25	Volts
Power Supply Current	Icc (off-hook)		40	50	mA
	Icc (Sleep)		7	10	mA
High Level Input Voltage	Vih	2.0			Volts
Low Level Input Voltage	Vil			0.8	Volts
High Level Output Voltage	Voh	3.5			Volts
Low Level Output Voltage	Vol			0.4	Volts
Leakage Current				± 1.0	uA

Interface Timing

Symbol	Parameter	Min	Max	Units
tAS	Address Setup Time	25		nanoseconds
tAH	Address Hold Time		0	nanoseconds
tCS	Chip Select Setup Time	10		nanoseconds
tCSH	Chip Select Hold Time		0	nanoseconds
tRD	DIST Strobe Width	100		nanoseconds
tDF	Delay from DIST to Driver Off		30	nanoseconds
tDD	Delay from DIST to Data		75	nanoseconds
tDRH	DIST to Data Hold	10		nanoseconds
tWT	DOST Strobe Width	75		nanoseconds
tDS	Write Data Setup Time	30		nanoseconds
tDWH	Write Data Hold Time	10		nanoseconds



Telephone Line Interface Specification

Description	Min	Typ	Max	Units
Telephone Line Impedance Match		600		Ohms
Ring Detect Sensitivity (on hook, Type B Ringer)	38			Vrms
DC Line Current	20		100	mA

FCC Instructions

This product 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.

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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