

**XE900 900 MHz Smart Transceiver for Base Access System**

**Description**

Xecom combines a micro-controller and a 900 MHz transceiver to create the XE900, Smart Transceiver. The XE900 can communicate with another Smart Transceiver or with Xecom's XE924 Base Access Point. The Base Access Point connects multiple remote systems to a single dial-up telephone line. The XE900 supplies wireless connectivity through an easy-to-use serial component.

Integrating the XE900 Smart Transceiver is as easy as integrating a serial modem into your system. The XE900 interfaces to the system host through a TTL level serial interface. The designer controls the wireless link by manipulating modem-like AT commands provided in the Smart Transceiver.

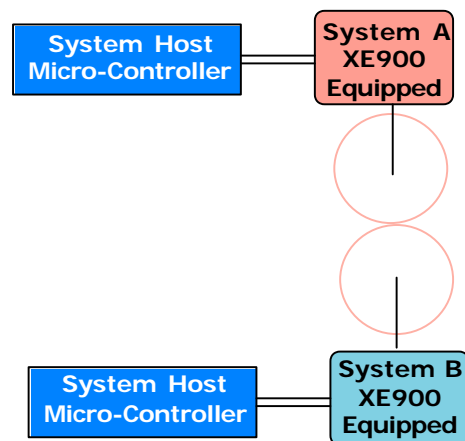
The XE900 offers a great number of wireless system options from simple point-to-point communication between Smart Transceivers to the complete Base Access Network which provides multi-point wireless communication and Dial-up modem operation.

**Features**

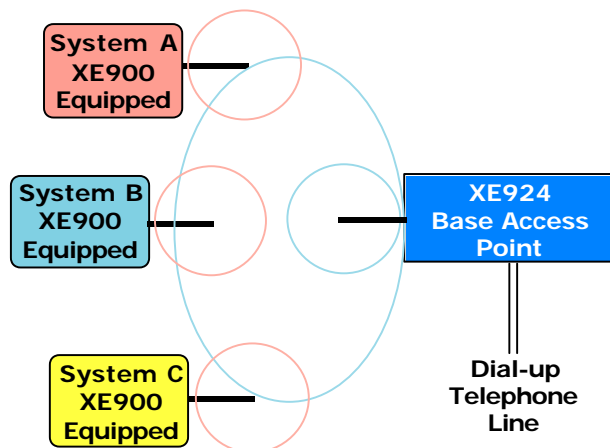
- \* Small Size: 2.75" by 1.38: by 0.42"
- \* Control and Configuration of the Wireless Link modem-like AT Commands.
- \* Wireless Carrier Frequency 916.48 MHz on ISM Band
- \* Wireless Range; maximum 150 Feet
- \* Wireless Data Rate 9600 BPS, half-duplex
- \* Integrated communications controller regulates the wireless communications protocols, error correction and controls the wireless link to the modem.
- \* FCC Part 15 Compliance

**900MHz Smart Transceiver Applications**

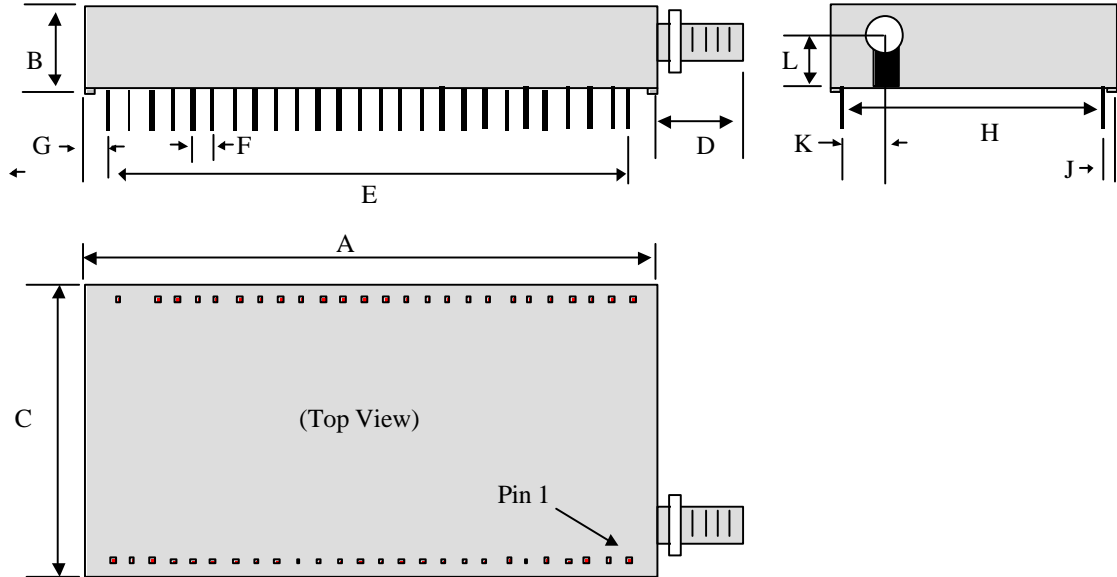
**Point to Point Wireless Connection**



**900MHz Base Access System**



## XE900 MECHANICAL SPECIFICATIONS



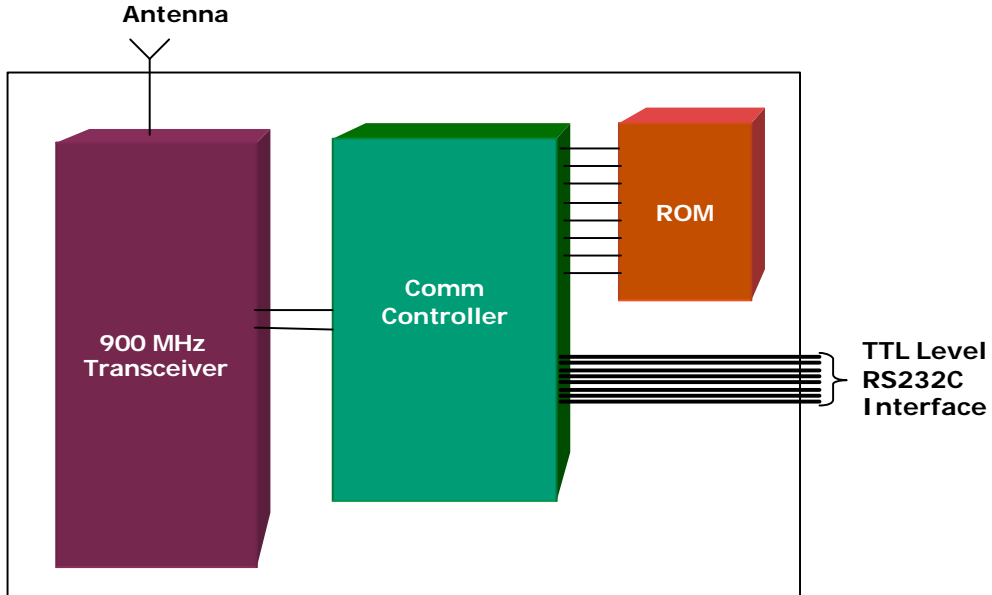
PIN	Inches		MM	
	MIN	MAX	MIN	MAX
A	2.740	2.760	69.60	70.10
B	0.550	0.560	13.97	14.22
C	1.370	1.390	34.80	35.31
D	5.300	0.510	13.46	12.95
E	2.490	2.510	63.25	63.37
F	0.090	0.110	2.29	2.79
G	0.115	0.135	2.92	3.43
H	1.190	1.210	30.23	30.73
J	0.130	0.150	3.30	3.81
K	0.220	0.240	5.59	6.10
L	0.300	0.320	7.62	8.13

**Pin Description:**

Pins are gold plated

Pin Dimensions .025 inches square, .minimum 090 inches long

## XE900 BLOCK DIAGRAM



## XE900 BLOCK DIAGRAM

		XE900		
RGND	1		52	RGND
RESERVED	2		51	RESERVED
RGND	3		50	RGND
RESERVED	4		49	RESERVED
RGND	5		48	RGND
RESERVED	6		47	RESERVED
RGND	7		46	RGND
RESERVED	8		45	RESERVED
RGND	9		44	RGND
RGND	10		43	RGND
RESERVED	11		42	RF_PDN
RESERVED	12		41	RF_TXDATA
RESERVED	13		40	RF_RXDATA
VDD	14		39	RGND
DGND	15		38	/CTS
/RST_VPP	16		37	RESERVED
VCC	17		36	/DCD
RA3	18		35	RESERVED
/DSR	19		34	/DTR
RESERVED	20		33	RESERVED
RXD	21		32	/RTS
RESERVED	22		31	RESERVED
TXD	23		30	RESERVED
RESERVED	24			
/RI	25		28	RESERVED
RESERVED	26		27	RESERVED

## XE900 PIN CONFIGURATION

SIGNAL	PINS	DESCRIPTION
RGND	1, 3, 5, 7, 9, 10, 11, 12, 13, 39, 43, 44, 46, 48, 50, 52	RGND provides the common reference point for all high frequency signals.
RESERVED	2, 4, 6, 8, 20, 22 24, 26, 27, 28, 30, 31, 33, 35, 37, 45, 47, 49, 51	These pins are reserved for future use. No connections should be made to these pins.
VDD	14	VDD provides power to the 900 MHz transceiver.
DGND	15	DGND provides the ground reference for the modem and communications controller circuitry in the XE900.
RST_PV	16	RST_PV provides a hardware reset line for the XE900's communications controller.
VCC	17	VCC provides power to the communications controller and modem circuitry.
RA3	18	Programmable I/O pin from the embedded communications controller. Register TRISA determines if RA3 will act as an input or output pin.
/DSR	19	/DSR supplies the Data Set Ready output from the XE900. DSR is an active low output.
RXD	21	/RXD is the serial data output from the XE900. A Mark condition on /RXD is active low.
/TXD	23	/TXD is the serial data input to the XE900. A Mark condition on /RXD is active low.
/RI	25	/RI is an active low output which indicates that a wireless link has been requested.
NO PIN	29	This pin is intentionally removed.
/RTS	32	/RTS is an active low input to the XE900. It can be used to stop the flow of data from the XE900 to the host. When /RTS is inactive the XE900 will not pass data to the host.
/DTR	34	/DTR connects to the Data Terminal Ready line from the host. It is an active low input to the XE900.

## XE900 PIN CONFIGURATION

/DCD	36	/DCD provides the Data Carrier Detect output from the transceiver inside XE900. This is an active low output.
/CTS	38	/CTS provides the Clear to Send output from the XE900. The XE900 deactivates /CTS to stop the flow of data from the host and prevent a buffer overflow. This is an active low output.
RF_RXDATA	40	RF_RXDATA serial data output from the 900 MHz transceiver in the XE900. A Mark condition on RF_RXDATA is active high.
RF_TXDATA	41	RF_TXDATA is the signal input to the 900 MHz transceiver in the XE900. A Mark condition on RF_TXDATA is active high. RF_TXDATA is normally tied to Pin 12.
RF_PDN	42	RF_PDN placed the XE900's 900 MHz transceiver into sleep mode to reduce power consumption when not in use. It is an active high signal. RF_PDB is normally tied to Pin 11.

## ABSOLUTE MAXIMUM RATINGS

Storage Temperature	-25° C to +85° C
Operating Temperature Range <sup>1</sup>	0° C to +70° C

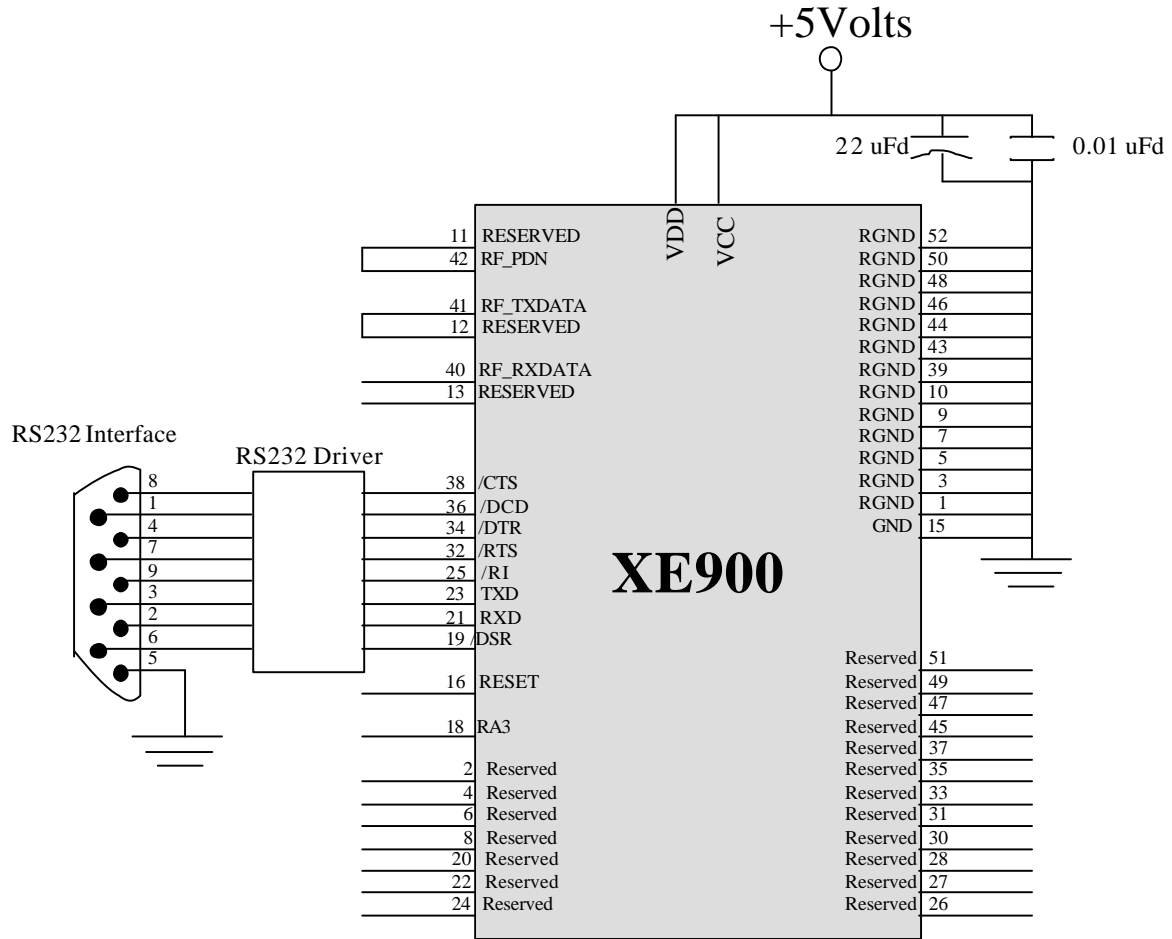
<sup>1</sup> Units may be screened for operation from -40 to +85C. An extra charge will be applied for this screening.

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## XE900 ELECTRICAL SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Comments
VCC	4.75	5.0	5.25	Volts	
ICC			260	ma	Transmit Mode
VDD	2.7		13	Volts	
IDD			29	ma	Transmit Mode
RF Carrier Frequency	916.43	916.48	916.53	MHz	
Output Power	-3	0	+4	dBm	50 Ohm Load
Wireless Receive Sensitivity		-94		dBm	
Antenna Output		50		Ohms	
RX to TX reversal			5	ms	
TX to RX reversal			6	ms	
V <sub>h</sub>	2.4			Volts	
V <sub>l</sub>			0.4	Volts	
V <sub>ih</sub>	2.0		VCC+0.3	Volts	
V <sub>il</sub>	-0.3		0.8	Volts	

## XE900 TYPICAL APPLICATION SCHEMATIC



Antenna - Xecom recommends the Linx Technologies right angle antenna, ANT-916-CS-RCL-ND

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## XE900 COMMUNICATIONS CONTROLLER

### Hardware:

The XE900 uses a simple micro-controller to supervise communications. This micro-controller formats data for the 900 MHz network and manages the host interface.

### Base Access Network

The Base Access Network includes up to eight nodes on remote systems. All systems communicate with the XE924 Base Access Point using Xecom's XE900 Smart Transceiver. The XE900 and XE924 communicate over a half-duplex channel on a single carrier frequency. The communications controller helps manage this channel preventing collisions, correcting errors, and reversing the channel.

### Carrier Sense Multiple Access (CSMA)

The primary tool used to prevent collisions between systems is a Carrier Sense Multiple Access protocol for each network transceiver. All XE900's on the Base

Access Network and the XE924 Base Access Point listen for communications activity on the 916.48 MHz band before initiating a session. If a wireless link already exists between the XE924 and one of the XE900 equipped nodes, the XE900 waits until that session is complete before initiating a wireless link.

### Data Packets

The XE900 places all data presented by the system host into packets for transmission across the wireless link. The XE924 also places all data coming across the telephone line into the same type packets. These packets provide addressing and error correction for the wireless communications. The communications controllers in the XE900 and XE924 place the data in packets only for the wireless link. The data is extracted from the packets before being sent to the modem or system host.

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## XE900 AT COMMANDS

### XE900 Host Interface

The XE900 interfaces to its host system using modem like AT commands. These AT commands control the configuration of the XE900 and the wireless link.

### Command Line Format

Command lines issued to the XE900 follow a strict format. Each command begins with the prefix AT and ends with a carriage return. The XE900 communications controller accepts commands at data rates from 1200 to 115200 BPS. The modem uses the AT command prefix to automatically determine the speed and parity of the incoming characters.

**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 parity of the commands sent to the XE900 by the host. The speed of the incoming serial data is determined by measuring the width of the incoming bytes. Parity is determined by comparing the parity bits of the "A" and the "T" characters.

**Command Line** - Commands may be strung together in a single command line of up to 36 characters. Commands in the command string are executed in the sequence they

appear. Space inserted into the command line do not fill space in the modem's 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.

**Re-Execute Last Command** - The A/ command re-executes 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 the function setting. When the command parameter is omitted from the command string, it is assumed to be a 0.

**Result Codes** - The modem normally 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.

**Disconnect Sequence** - A three character sequence initiates a disconnect of the wireless link. The sequence "~~~" is assigned to disconnect the link.



## Embedded Modem AT Commands

**An asterisk indicates the factory default**

- A** Answer Command - forces the smart transceiver respond to a summons from another wireless device.
- Dn** Initiate a Wireless Link - attempts to establish a connection with the transceiver at address n.
- En** Echo Characters - determines if the XE900 will echo the characters received on its serial interface during command mode.  
n=0 Characters not Echoed  
n=1 Characters Echoed \*
- In** Identification - displays product identification code.  
n=0 Display Product Code  
n=1 Display Product Name  
n=2 Display Model Number  
n=3 Display Copywrite  
n=4 Display Firmware Revision
- Qn** Result Code Display - determines if results codes will be displayed.  
n=0 Display Result Codes \*  
n=1 Do not Display Result Codes
- Sn= Set Value of Register Sn**
- Sn=? Read Value of Register Sn**
- Vn** Response Type - selects Full Word or Numeric responses  
n=0 Numeric Responses  
n=1 Full Word Responses \*
- Zn** Reset - executes a soft Reset  
n=0 Reset to Values Stored in User Profile 0 \*.  
n=1 Reset to Values Stored in User Profile 1
- &Cn** DCD Options - sets the operation of the DCD serial interface signal from the XE900  
n=0 DCD Always Active  
n=1 DCD Active during wireless Link \*
- &Dn** DTR Options - determines how the XE900 will react to the status of DTR from the host.  
n=0 Ignore the Status of DTR  
n=1 Not Used  
n=2 DTR Required for a Wireless Connection \*  
n=3 Execute a Soft Reset when DTR removed.
- &F** Restore Factory Settings - returns all configuration commands and registers to their factory default values.
- &Kn** Flow Control - selects the type of flow control to be used between the system host and the XE900.  
n=0 Flow Control Disabled  
n=3 RTS/CTS, hardware Flow Control  
n=4 XON/XOFF, in-band Flow Control \*
- &Sn** Data Set Ready - sets the operation of the DSR interface signal from the XE900.  
n=0 DSR Always On \*  
n=1 DSR Active during Wireless Link
- &V** View Active Configuration - sends the active configuration data to the system host.
- &Wn** Store Current Configuration - loads the current XE900 configuration into either User Profile 0 or User Profile 1.  
n=0 load configuration into User Profile 0  
n=1 load configuration into User Profile 1
- #B** Wireless Broadcast Mode - initiates wireless broadcast mode for diagnostic purposes.
- #ID= Set ID Value for the XE900**
- #ID=? Read ID Value from the XE900**
- #Ln** Check RSSI Level - Displays current Wireless received signal levels  
n=0 Display a single value \*  
n=1 Display 4 Values  
n=2 Display continuous values

## XE900 Configuration Registers

<p><b>S0 Answer Wireless Link Request:</b> S0 determines if the XE900 will automatically respond to a wireless link request.</p> <p>S0=0 No Automatic response to link requests S0=1 Automatically respond to link requests</p> <p><b>S2 Wireless Disconnect Character - S2</b> sets the ASCII character to be used in the link disconnect sequence. The default character is the tilde “~”.</p> <p>Range: 0-255 Default: 126</p> <p><b>S12 Disconnect Guard Timer - S12</b> sets the value of the guard timer in milliseconds before and after the disconnect sequence. If any characters other than the disconnect sequence are received within the window defined by S12 the link will not be disconnected.</p> <p>Range: 0-255 Default: 40 Units: Milliseconds</p>	<p><b>S14</b> Bit-mapped Register - S14 stores the values of the ATE, ATQ and ATV commands.</p> <p><b>S21</b> Bit-mapped Register - S21 stores the values of the AT&amp;D, AT&amp;C and XY&amp;S commands.</p> <p><b>S23</b> Bit -mapped Register - S23 stores the serial interface data rate.</p> <p><b>S39</b> Bit-mapped Register - S29 stores the value of the AT&amp;K command.</p> <p><b>S105</b> XE900 ID Number - S105 sets the ID number for the XE900. Each unit on the Base Access Network is required to have a unique ID number. The ID number of the Base Access Point is always 1.</p> <p>Range: 2-254</p> <p><b>S106</b> Set Noise Threshold - S106</p>
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## XE900 Responses

<u>Numeric</u>	<u>Full Word</u>	<u>Description</u>
0	OK	Successfully executed command line
1	CONNECT RF	Wireless Connection Established
2	RING	Wireless Link Request Detected
3	DISCONNECT	Failed to Establish or Lost Wireless Link
4	ERROR	Error in command line
7	BUSY	Link Request Time Out has occurred
9	WAIT	Wireless Link is not available

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## **FCC Part 15 Compliance**

The XE900 is designed to comply with FCC Part 15 rules, however, it is not FCC approved. The XE900 is not eligible for FCC approval because it is a component which requires the addition of other components to function. These other components include the power supply, antenna, and printed circuit board. Any of these other components could affect FCC Part 15 compliance if not properly designed.

Approvals may be required of your system before it can be sold in the United States or other countries. The XE900 is subject to rules governing both intended and unintended radiation. The 900 MHz transceiver must transmit its signal in compliance with FCC Part 15 rules governing intended radiation. Part 15 rules also govern unintended radiation sources such as the serial interface cable connected to the XE900. Your system will have to be approved before it can be sold; however, because the XE900 utilizes the 900 MHz ISM band, your customers will not require an FCC license.

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