XCite™ OEM RF Module

XCite OEM RF Module

Data Radio System Components

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Appendices

Product Manual v1.1

For XCite OEM RF Module Part Numbers: XC09-009…
                                          XC09-038…

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XCite OEM RF Module

Introduction

The XCite OEM RF Module is a drop-in wireless solution that can add RF connectivity to any data system. It transfers a standard asynchronous serial data stream and features the following:

- Continuous data stream of up to 38400 bps (factory-set, RF baud rate)
- Serial Interfacing from 1200 to 57600 bps
- Software selectable between Hopping (FHSS) and Single Frequency Channel Modes
- Approved by the FCC under Part 15 of the FCC Rules and Regulations
- Variable input supply voltage (2.85 – 5.50 VDC)

This manual contains information critical to basic XCite OEM RF Module operation. Information about more advanced functionality is in the "XCite Advanced Programming & Configuration" manual. (Located on the MaxStream CD or on the web: www.maxstream.net/helpdesk/)

Features

Long Range

- Indoor/Urban Range: **Up to 300'** (90 m)
- Outdoor/RF Line-of-sight Range: **Up to 1000'** (300 m) w/ 2.1 dB dipole antenna
- Receiver Sensitivity: **-108 dBm** (9600 Baud), **-104 dBm** (38400 Baud)

Low Power

- Transmit Power Output: **4 mW** [50 mW effective considering excellent receiver sensitivity]
- **55 mA** transmit / **45 mA** receive current consumption
- Power-down current as low as **20 μA**

Advanced Networking & Security (True Peer-to-Peer (no "master" required), Point-to-Point, Point-to-Multipoint, Multidrop)

Specifications [Appendix B]

1-Year Warranty [Appendix B]

Free & Unlimited Technical Support [Appendix C]

Worldwide Acceptance

FCC Approved (USA) [Go to Appendix A for FCC Requirements]
Devices that embed XCite Radio Modems can inherit MaxStream's FCC certification
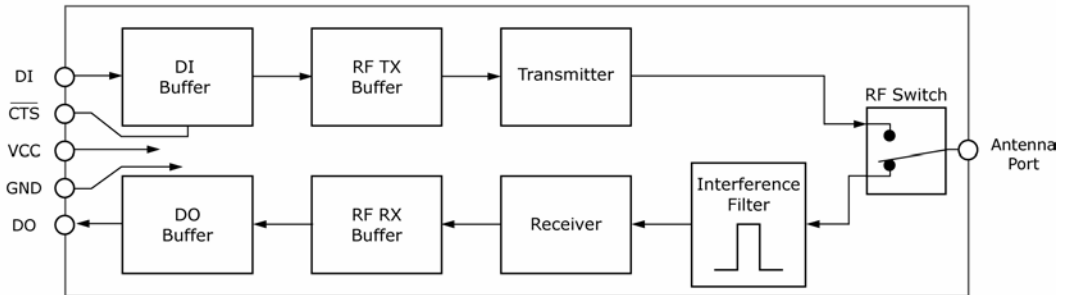
IC (Industry Canada) **Certified**

ISM (Industrial, Scientific & Medical) frequency band

MaxStream products manufactured under **ISO 9001:2000 registered standards** since 2000

Block Diagram

Figure 1. XCite OEM RF Module Block Diagram

MaxStream's proprietary XII™ (Interference Immunity Technology) is contained in the 'Interference Filter' of the block diagram. The filter blocks interference from pagers and cellular.

Module Pin Signals

XCite Module pin signals and their functions:

Table 1. J1 Pin Descriptions
(Low-asserted signals distinguished with a horizontal line over signal name.)

Module Pin	Signal Name	I/O	When Active	Description
1	DO2	O*	low	Clear-to-Send (CTS) Flow Control
2	DI3	I*	high	Can be used to enter Sleep Modes that consume less power
3	DO (Data Out)	O*	n/a	Serial Data leaving the XCite Module (to the host)
4	DI (Data In)	I	n/a	Serial data entering the XCite Module (from the host)
5	DI2	I**	low	Request-to-Send (RTS)
6	RESET	I*	low	Reset Module Parameters
7	DO3	O	high	Receive (RX) LED
8	TX / PWR	O	low	TX - Asserted during transmission
			high	PWR – Indicates power is on
9	CONFIG	I***	low	Backup method for entering AT Command Mode. Primary method is with "+++" [See CC Parameter]
10	VCC	I	-	2.85 – 5.50 VDC Regulated
11	GND	-	-	Ground

*   Pin utilizes 10K Ω Pull-Up resistor (already installed in the module)

**   Pin utilizes 10K Ω Pull-Down resistor (already installed in the module)

***   Pin utilizes 100K Ω Pull-Up resistor (already installed in the module)

Note: When integrating the XCite Module onto a Host PC Board, all lines that are not used should be left disconnected (floating).

Table 2. J2 Pin Descriptions

Module Pin	Signal Name
1	reserved
2	GND
3	GND
4	GND

J2 pins are used primarily for mechanical stability and may be left disconnected.

The interface signals are available through the 11-pin header. All pins operate on VCC CMOS levels. Five signals commonly used in applications are:

- DI (pin 4 – Data In)
- DO (pin 3 – Data Out)
- VCC (pin 10 – Power)
- GND (pin 11 – Ground)
- DO2-$\overline{\text{CTS}}$ (pin 1 – Clear-to-Send)

The remaining six pins may be used for additional functionality. Go to the "XCite Advanced Programming & Configuration" manual for more detailed information about Pin Signals.

Application Circuit

Figure 2. Application Circuit – connection to host processor
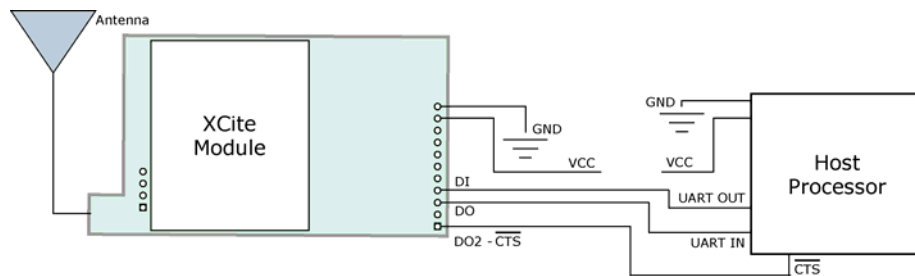
Mechanical Drawings

Figure 3. Mechanical Drawings (measured in inches)
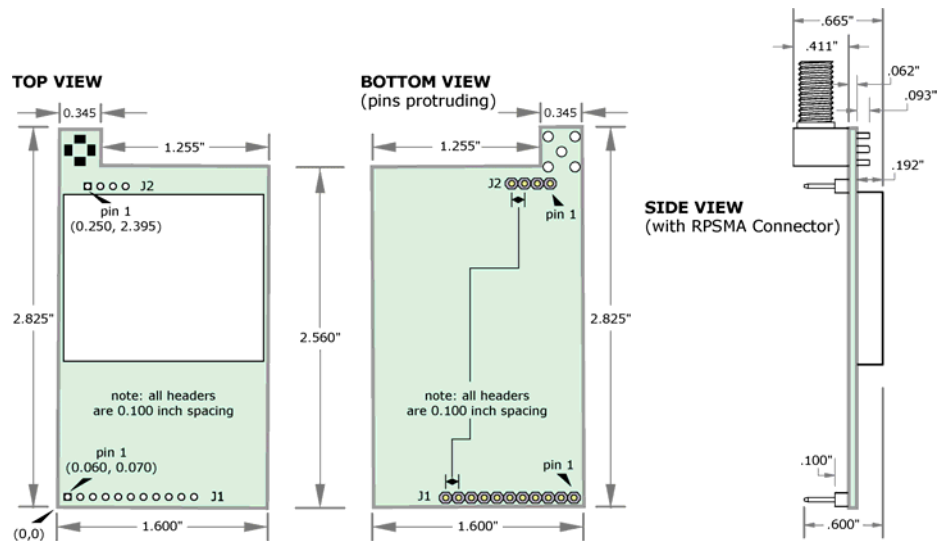
Electrical Characteristics

Timing Specifications

The diagram below shows 9XCite Modules providing an RF Link between hosts.

Figure 4.   System Block Diagram – RF Link between hosts

The RF data flow sequence is initiated when the first byte of data is received by the transmitting XCite Module. As long as XCite Module A is not already receiving RF data, the serial data goes into the DI Buffer, is packetized, and then transmitted to XCite Module B.

Figure 5.   Timing Specifications ("A" and "B" are associated with Figure 4)
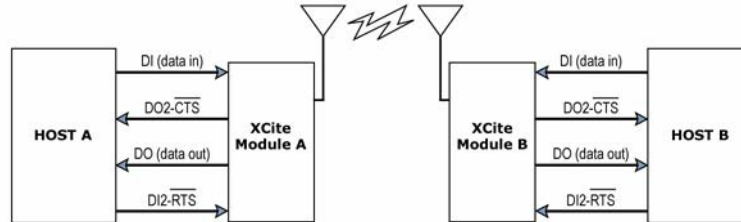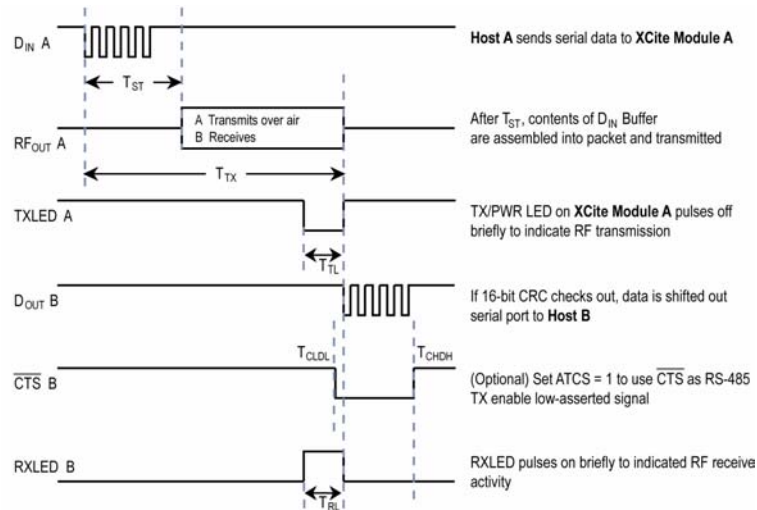

Table 3.   DC Characteristics (Vcc = 2.85 to 5.50V)

Symbol	Parameter	Condition	Min	Typical	Max	Units
V_{IL}	Input Low Voltage	All input signals	-0.5		0.3 * Vcc	V
V_{IH}	Input High Voltage	All except $\overline{RESET}$ pin	0.6 * Vcc		Vcc + 0.5	V
V_{IH2}	Input High Voltage	$\overline{RESET}$ pin *	0.9 * Vcc		Vcc + 0.5	V
V_{OL}	Output Low Voltage	I_{OL} = 20 mA, Vcc = 5V			0.7 0.5	V
V_{OH}	Output High Voltage	I_{OH} = -20 mA, Vcc = 5V	4.0 2.0			V
I_{IL}	Input Leakage Current I/O Pin	Vcc = 5.5V, pin low (absolute value)			3	µA
I_{IH}	Input Leakage Current I/O Pin	Vcc = 5.5V, pin high (absolute value)			3	µA
I_{IL2}		$\overline{CTS}$, DO, $\overline{RESET}$		(Vcc – VI) / 10 **		mA
I_{IL3}		$\overline{CONFIG}$		(Vcc – VI) / 47 **		mA
I_{IH2}		$\overline{RTS}$		(Vcc – VI) / 10 **		mA

* Reset pulse must last at least 250 nanoseconds

** V_I = the input voltage on the pin

Data Radio System Components

Serial Communications

The XCite OEM RF Module interfaces to a host device through a CMOS-level asynchronous serial port. Through its serial port, the XCite Module can communicate directly with any UART-interfaced or RS-232/485/422 device. [Timing specifications illustrated in Figure 5]

UART-Interfaced Data Flow

Devices that have a UART interface can connect directly through the pins of the XCite OEM RF Module as is shown in the figure below.

Figure 6.   **Data Flow in a UART-interfaced environment**
(Low-asserted signals distinguished with horizontal line over signal name.)
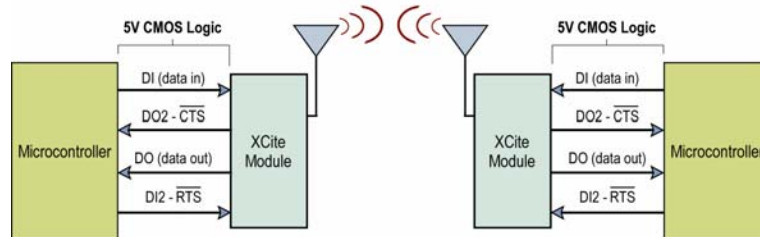
RS-232 and RS-485/422 Data Flow

The XCite Module can enable a host device to communicate wirelessly. To transmit, the host device simply sends serial data to the XCite Module pins. The XCite Module then converts the data into FCC-approved RF data. Once transmitted, the RF data can be detected by receiving XCite Modules, checked for integrity and then sent to a receiving device.

Figure 7.   **Data Flow in RS-232 and RS-485/422 environments.**
(Low-asserted signals distinguished with a horizontal line over signal name.)
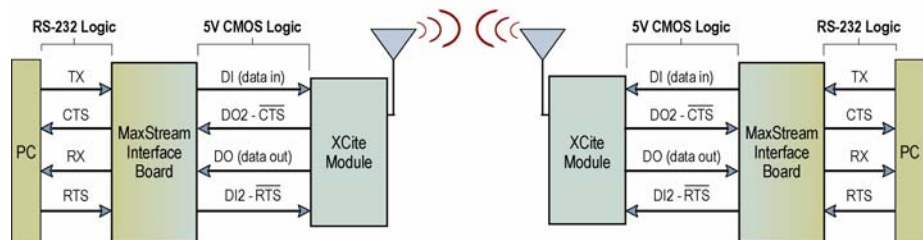
Serial Data

Data enters the MaxStream OEM RF Module through the DI Pin (pin 4) as an asynchronous serial signal. The signal should idle high when no data is being transmitted.

The UART performs tasks (such as timing and parity checking) needed for communication. Serial communication consists of two UARTs which must be configured with compatible parameters (Baud rate, parity, start bits, stop bits, data bits) to have successful communication. Each data packet consists of a start bit (low), 8 data bits (least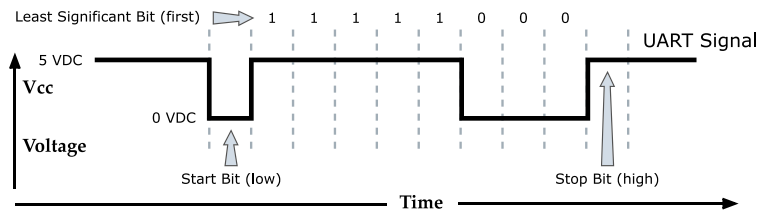 significant bit first) and a stop bit (high). The following figure illustrates the serial bit pattern of data passing through the module.

Figure 8. **Serial (UART) data packet 0x1F (decimal "31") as transmitted through the XCite Module**
Data Format is 8-N-1 (8 bits - No Parity - 1 Stop Bit)

In the example above, the MaxStream Module transfer 8 bits over-the-air [Selectable using BI (Number of Bits) Parameter]. Start and stop bits of the UART signal are not transmitted over-the-air, but are regenerated by the receiving module.

The MaxStream OEM RF Modules support the following data formats [See NB (Parity) Parameter]:

- 8-none-1, 7-any-1
- 8-even-1
- 8-odd-1
- 8-mark-1, 8-none-2
- 8-space-1

DI (Data In) Buffer

Once serial data has entered the 9XCite Module through the Data In (DI) Pin, the data is stored in the DI Buffer until it can be transmitted.

Once the first byte of data enters the DI Buffer, the module begins to initialize the RF channel (unless RF data is being received). In the case where the module is receiving RF data, the serial (UART) data is stored in the DI Buffer. When the DI Buffer has only 17 bytes of memory left, the XCite Module de-asserts (high) $\overline{CTS}$ to signal to the host device to stop sending data. $\overline{CTS}$ re-asserts once the DI Buffer has at least 35 bytes available in memory. Once in the DI Buffer, the data is packetized for transmission. [Packet structures are broken down below.]

Interfacing Hardware

MaxStream, Inc. developed proprietary interface boards (MaxStream Product numbers: XIB-R for RS-232/485 interfacing) to facilitate the connection between XCite OEM RF Modules and serial devices. Many integrators develop their own interfacing circuitry; others use MaxStream's Interface Boards. In either case, the following sections illustrate how to interface with XCite OEM RF Modules by illustrating properties of the MaxStream XIB-R Interface Board.

XCite Development Kit (RS-232/485/422)

The XStream Development Kit includes all the hardware and software needed for basic wireless connections.

Table 4.   **XCite Development Kit contents**

Item	Qty.	Description	Part Number
Quick Start Guide	1	Quickly familiarize users with some of the XCite Module's most important functions. The guide provides step-by-step instructions on how to make an RF link and test its ability to transport data over varying ranges and conditions.	MD0009
CD	1	CD includes documentation and configuration software	M100105
XCite Module (w/ RPSMA antenna port)	1	Module comes with fixed RF Data (baud) rates up to 38400 bps	XC09 - (…) NSC
XCite Module (w/ attached wire antenna)	1	Module comes with fixed RF Data (baud) rates up to 38400 bps	XC09 - (…) WNC
MaxStream Interface Board	2	Supplies regulated 5V DC power to module and provides signal-level conversion for interfacing with PC RS-232 serial ports or RS-485/422 devices	XIB-R
RPSMA Antenna	1	RPSMA half-wave dipole antenna	A09-HASM-675
Serial Loopback Adapter	1	Connects to the female RS-232 (DB-9) serial connector of the XCite Module and can be used to configure the radio modem to function as a repeater (for range testing)	JD2D3-CDL-A
NULL Modem Adapter (male-to-male)	1	Connects to the female RS-232 (DB-9) serial connector of the XCite Module and can be used to connect the radio modem to another DCE (female DB9) device	JD2D2-CDN-A
NULL Modem Adapter (female-to-female)	1	Used to bypass radios to verify serial cabling is functioning properly	JD3D3-CDN-A
Male DB-9 to RJ-45 Adapter	1	Facilitates adapting a DB-9 Connector to a CAT5 cable (female RJ45 to male DB9)	JE1D2-CDA-A
Female DB-9 to RJ-45 Adapter	1	Facilitates adapting a DB-9 Connector to a CAT5 cable (female RJ45 to female DB9)	JE1D3-CDA-A
9V AC Power Adapter	2	Wall-based transformer with US 2-prong plug	JP4P2-9V4-6F
9V Battery Clip	1	Allows Interface Board to be remotely powered by a 9V battery	JP2P3-C2C-4I
RS-232 Cable (6')	2	Straight-through serial cable that connects interface board (DCE) to a PC (DTE)	JD2D3-CDS-6F

MaxStream Interface Board (Part Number: XIB-R)

The MaxStream Interface board was developed to provide a means of connecting the XCite Module to any system having an RS-232 or RS-485/422 connection. Since the XCite Module requires signals to enter at CMOS voltages, one of the main functions of the interface board is to convert interface signals between CMOS levels (2.85 – 5.50V) and RS-232 levels (-12 - +12V). The MaxStream Interface Board includes the following built-in features:

- DIP Switch
- Configuration Switch
- Power Switch
- LEDs
- DB-9 Connector
- Power Connector

RS-232/485 Interface Board Components & Features

Figure 9.   Front View

9a. Power
Switch

9b. LEDs:
Yellow (top)
Green (middle)
Red (bottom)

9c. DB-9
Serial Port

9d. Power
Connector
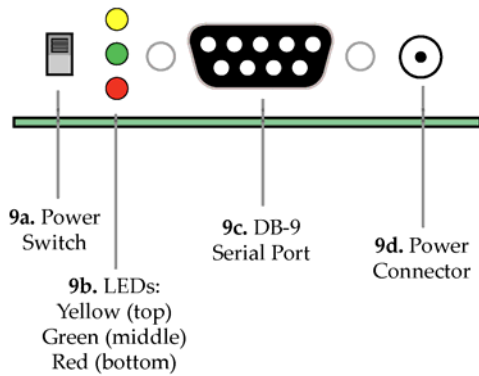
9a. Power Switch

Move the Power Switch to the on (up) position to power the Interface Board. DIP Switch [10a] settings are only read during a power-up sequence.

9b. LEDs

The LED indicators visualize diagnostic status information. The radio modem's status is represented as follows:

- **Yellow** (top LED) = Serial Data Out
- **Green** (middle) = Serial Data In
- **Red** (bottom) = Power/TX Indicator (Red light is on when powered, off briefly during RF transmission)

9c. Serial Port

Standard female DB-9 (RS-232) DCE connector – This connector can be also used for RS-485 and RS-422 connections.

9d. Power Connector

7-18 VDC Power Connector (Center positive, 5.5/2.1mm) – Power can also be supplied through Pin 9 of the DB-9 Connector.

10a. DIP Switch

Figure 10.   Back View

10b. Configuration
Switch
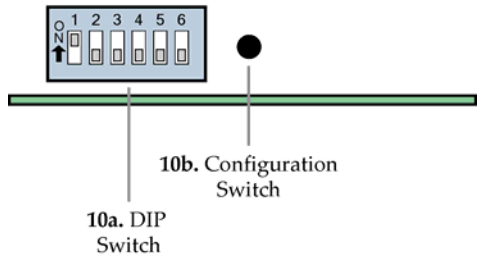
10a. DIP
Switch

The DIP Switch configures the XCite OEM RF Module to operate in different modes. DIP Switch settings are only read and applied during a powering-on sequence. [See Figure below for DIP Switch settings]

10b. Configuration Switch

The Configuration Switch provides an alternate way to enter "AT Command Mode". To enter "AT Command Mode" at the radio modem's default baud rate, hold the Configuration Switch down while powering on the module using the Power Switch.

Figure 11.   MaxStream XIB-R Interface Board DIP Switch Settings

* The "(Restore Defaults)" setting, for switches 1 & 2, can be used to restore AT Settable parameters to their default states. Once switches are in position, reset occurs during next power-up.
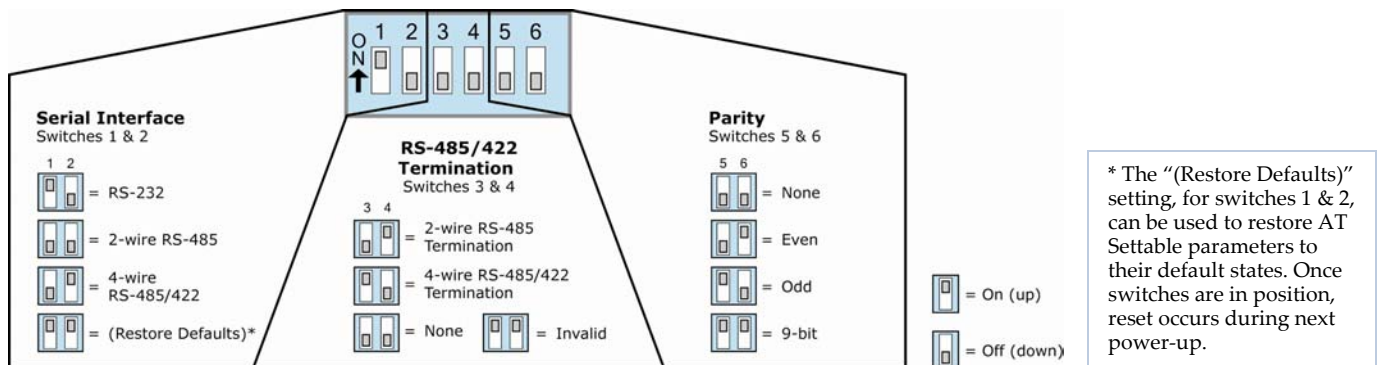
RF Module Configuration

The following versions of the XCite Module are currently available:

- 900 MHz, 9600 Baud (RF data rate), Hopping Channel Mode
- 900 MHz, 9600 Baud, Single Channel mode
- 900 MHz, 38400 Baud, Hopping Channel mode
- 900 MHz, 38400 Baud, Single Channel mode

XCite Modules can operate in both Single Channel and Hopping modes. Mode is selectable using the "Function Set" dropdown list of the "XCite Configuration" tab of the MaxStream-provided X-CTU Software.

The XCite Module is shipped with a unique parameter set in its memory. Parameters within the set are organized under the following categories: AT Commands & Non-AT Settable Parameters.

Command & Parameter Types

AT Commands

AT Commands can be changed at any time by entering AT Command Mode and sending commands to the module. [AT Commands are listed in Table 5.]

AT Commands can be modified using the any of the following means:

- X-CTU Software "Modem Configuration" tab
- X-CTU Software "Terminal" tab
- Terminal software program (such as "HyperTerminal")
- Microcontroller

Non-AT Settable Parameters (X-CTU Software configurable only)

Non-AT Settable Parameters can only be adjusted using the MaxStream-provided X-CTU Software. To modify Non-AT Settable Parameter, connect the module to the serial com port of a PC (interface board is necessary for RS-232 connection) and modify parameter values through the X-CTU Software interface. These parameters enable features that need to be set before the module is used in the field. [Non-AT Settable Parameters are listed in Table 6.]

Non-AT Settable Parameters can only be modified using the following means:

- X-CTU Software "Modem Configuration" tab

XCite Commands & Parameter Reference

XCite AT Commands and Non-AT Settable Parameters are organized under the following command categories:

- AT Command Mode Options
- Diagnostic
- Networking
- Serial Interfacing
- Sleep Mode (Low Power)

Table 5.   XCite AT Commands
(Settable/Readable using X-CTU Software, serial communications software or microcontroller)

AT Designator	Command Description	Parameters	Command Category	# Bytes Returned	Factory Default
CD	DI3 Configuration. Redefines the RX LED I/O line (RX LED signal).	Range: 0 – 2 0 = RX LED 1 = high 2 = low	Serial Interfacing	1	0
CN	Exit AT Command Mode. Explicitly exit radio modem from AT Command Mode and return it to Idle Mode.	-	AT Command Mode Options	-	-
CS	DO2 Configuration. Select behavior of DI2 (Digital Output 2) between $\overline{CTS}$ and RS-485 options.	Range: 0 – 4 0 = normal $\overline{CTS}$ 1 = RS-485 enable low 2 = high 3 = RS-485 enable high 4 = low	Serial Interfacing	1	0
DB	Receive Signal Strength. Returns the signal strength (in decibels) of the last received packet.	Range: 0x25 – 0x6A (Read-only)	Diagnostic	1	-
DT	Destination Address. Set the address that identifies the destination of the RF packet. Only radio modems having matching addresses can communicate with each other.	Range: 0 – 0xFFFF	Networking	2	0
HP	Channel *. Select "Hopping" or "Single Frequency" channel on which the radio modem is to communicate. Channels are not non-interfering.	Range (Hopping): 0 – 6 Range (Single Frequency): 0 – 0x18	Networking	1	0
HV	Hardware Version. Read the hardware version of the modem.	Range: 0 – 0xFFFF (Read-only)	Diagnostic	2	-
MK	Address Mask. Set address mask to configure local and global address space.	Range: 0 – 0xFFFF	Networking	2	0xFFFF (65535d)
RE	Restore Defaults. Restore radio modem parameters to the factory default configuration.	-	(Special)	-	-
SH	Serial Number High. Read High 16 bits of unique serial number of radio modem.	0 – 0xFFFF (Read-only)	Diagnostic	2	-
SL	Serial Number Low. Read Low 16 bits of unique serial number of radio modem.	0 – 0xFFFF (Read-only)	Diagnostic	2	-
VR	Firmware Version. Read firmware version currently loaded on radio modem.	0 x 0xFFFF (Read-only)	Diagnostic	2	-
WR	Write. Write parameters to radio modem's non-volatile memory in order for changes to persist through next power-up or reset.	-	(Special)	-	-

* To select the Channel Mode: Select mode from the 'Function Set' dropdown list on the "Modem Configuration" tab of the X-CTU Software. Then click the 'Write Parameters' button.

Table 6. **Non-AT Settable Parameters**

(Settable/Readable using the X-CTU Software's "Modem Configuration" tab only)

| AT Designator	Command Description	Parameters	Command Category	# Bytes Returned	Factory Default
AT	Guard Time After. Set required DI pin silent time after the Command Sequence Characters of the AT Command Mode Sequence (BT+ CC + AT).	Range: 0 – 0xFFFF (x 1 ms)	AT Command Mode Options	2	0x1F4 (500d)
BD	Baud Rate. Set serial data rate (baud rate at which radio modem interfaces with host). Serial data rate is different than RF data rate which is fixed and factory-set. If the serial data rate is set higher than RF data rate, $\overline{CTS}$ may need to be observed to prevent DI buffer overrun.	Range: 0 – 6 (1200 - 57600 bps)	Serial Interfacing	1	Set to equal radio modem's fixed RF data rate.
BI	Number of Bits. (7 or 8) – Sets number of data bits per character (bits between start and stop bits).	Range: 0 – 1 0 = 7 bits 1 = 8 bits	Serial Interfacing	1	1
BT	Guard Time Before. Set required DI pin silent time before the Command Sequence Characters of the Command Mode Sequence (BT+ CC + AT).	Range: 0 – 0xFFFF (x 1 ms)	AT Command Mode Options	2	0x1F4 (500d)
CC	Command Sequence Character. Set the ASCII character to be used between Guard Times of the AT Command Mode Sequence (BT+ CC + AT). The AT Command Mode Sequence enters the radio modem to AT Command Mode (from Idle Mode).	Range: 0x20 – 0x7F	AT Command Mode Options	1	0x2B (plus sign (+) in ASCII)
CT	Time before Exit AT Command Mode. Set time period of inactivity (no valid commands received) after which radio modem automatically exits from AT Command Mode.	Range: 0x02 – 0xFFFF (x 100 ms)	AT Command Mode Options	2	0xC8 (200d)
FL	Software Flow Control. Enable serial software flow control on the radio modem. (Hardware flow control ($\overline{CTS}$) is on by default.)	Range: 0 - 1 0 = disable 1 = enabled	Serial Interfacing	1	0
HT	Time before Wake-up Initializer. Set time period of inactivity (no serial or RF data is sent or received) before a Wake-up Initializer is sent. Base station tracks awake-status of remote radios. HT of base radio should be set shorter than ST of remote radios.	Range: 0 – 0xFFFF (x 100 ms)	Sleep (Low Power)	2	0xFFFF (no wake-up Initializer will be sent)
ID	Modem VID. Read radio modem VID (Vendor Identification Number). Only radio modems with matching VIDs can communicate with each other.	Range: 0 – 0x7FFF (above this range is Read-only)	Networking	2	0x3332
LH	Wake-up Initializer Time. Set time of the Wake-up Initializer used to wake remote radios that are in cyclic sleep mode. Time of Wake-up Initializer should be longer than that of the remote radio's cyclic sleep cycle (SM 3 - 8).	Range: 0 – 0xFF (x 100 ms)	Sleep (Low Power)	1	1
NB	Parity. Select parity format. Settings 0-4 transfer only 8 bits out the antenna port and generate the parity bit on the radio modem receiving side.	Range: 0 – 4 0 = 8-none-1, 7-any-1 1 = 8-even-1 2 = 8-odd-1 3 = 8-mark-1, 8-none-2 4 = 8-space-1	Serial Interfacing	1	0
PW	Pin Wake-up. Enable pin wake-up from Cyclic Sleep Mode.	Range: 0 – 1 0 = disabled 1 = enabled	Sleep (Low Power)	1	0
RT	DI2 Configuration. Enable $\overline{RTS}$ Mode ($\overline{RTS}$/CMD signal - pin 5 of OEM RF Module).	Range: 0 - 1 0 = Disabled 1 = $\overline{RTS}$ flow control	Serial Interfacing	1	0
SB	Stop Bits. Set number of stop bits.	Range: 0 – 1 0 = 1 stop bit 1 = 2 stop bits	Serial Interfacing	1	0
SM	Sleep Mode. Specify Sleep Mode settings.	Range: 0 – 8 0 = No sleep 1 = Pin Sleep 2 = Serial Port Sleep 3 to 8 = Cyclic intervals ranging from 0.5 to16.0 seconds	Sleep (Low Power)	1	0
ST	Time before Sleep. Set time period of inactivity (no serial or RF data is sent or received) before activating Sleep Mode. Use with Cyclic Sleep and Serial Port Sleep. (see SM Command)	Range: 0x10 – 0xFFFF (x 100 ms)	Sleep (Low Power)	2	0x64 (100d)

Configuration Software

X-CTU Software

X-CTU is MaxStream-provided software used to configure XCite Modules. It is the only means that can be used to set all three command parameter types [AT Commands and Non-AT Settable Parameters].

X-CTU Software is organized into the following four tabs:

- **PC Settings** tab - Setup PC serial ports to interface with an XCite Module assembly
- **Range Test** tab – Test XCite Module range
- **Terminal** tab – Configure and read XCite Module parameters using AT Commands
- **Modem Configuration** tab – Configure and read XCite Module parameters

Figure 12. X-CTU User Interface (PC Settings, Range Test, Terminal & Modem Configuration tabs)
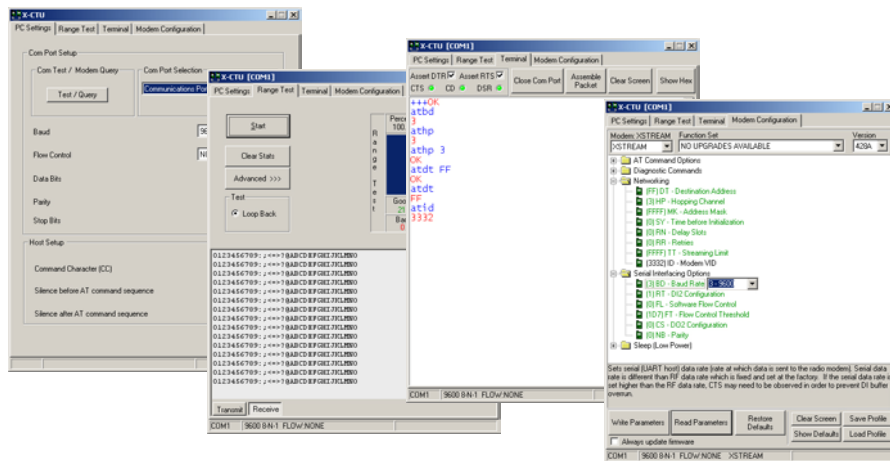
Install X-CTU software

Double-click the "setup_X-CTU.exe" file and follow prompts of the installation screens. This file is located in the 'software' folder of the MaxStream CD and also under the 'Downloads' section of the following web page: http://www.maxstream.net/helpdesk/

Using X-CTU software

In order to use the X-CTU software, a module assembly (an XCite Module mounted to a MaxStream Interface Board) must be connected to the serial port of a PC. The baud rate of the serial port ("PC Settings" tab) must match the baud rate of the module (BD (Baud Rate) Command on the "Modem Configuration" tab).

Serial Communications Software (for AT Commands Only)

A terminal program has been built into the X-CTU software. Serial Communications Software can be used to issue AT Commands, but cannot be used to set Non-AT Settable Parameters. Use the syntax illustrated in the following example when issuing AT Commands using terminal software. (This example sets the destination address of the module to "0x1F". WR (Write) Command would also have to be used to save the new value to non-volatile memory.)

Figure 13. Syntax for sending AT Commands:
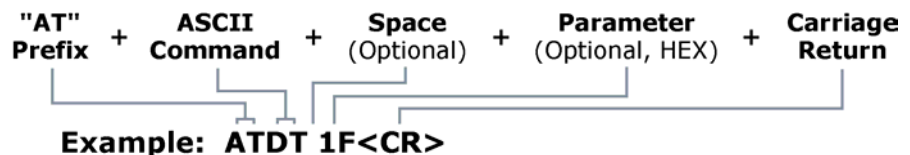
Appendix A: FCC Certifications

FCC Compliance

The MaxStream XCite OEM RF Module complies with Part 15 of the FCC Rules. Compliance requires the following be stated:

FCC ID: **OUR-9XCITE**
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

OEM Labeling Requirements

Label Warning

⚠ WARNING The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown in the figure below.
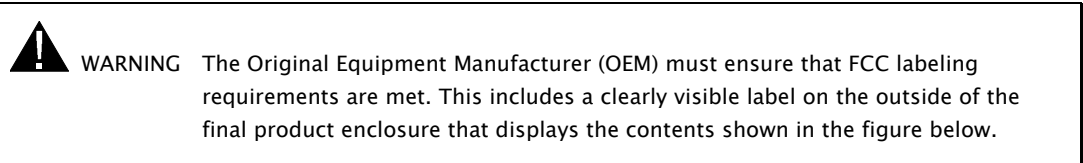
Figure 14. Required FCC Label for OEM products containing XCite OEM RF Module

Contains FCC ID: OUR–9XCITE
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.
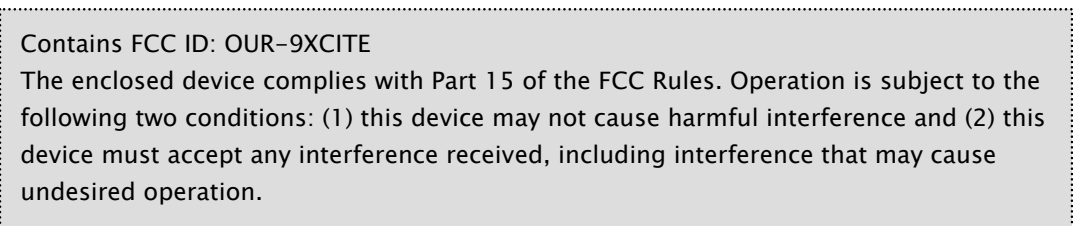
FCC Notices

Adherence to the following is required:

IMPORTANT: The XCite (900 MHz) OEM RF Module has been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Changes or modifications not expressly approved by MaxStream could void the user's authority to operate the equipment.

IMPORTANT: OEMs must test their final product to comply with unintentional radiators (FCC section 15.107 and 15.109) before declaring compliance of their final product to Part 15 of the FCC Rules.

IMPORTANT: The XCite OEM RF Module has been certified for remote and base radio applications. If the XCite will be used for portable applications, the device must undergo SAR testing.

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

9XCite (900 MHz) **Approved Antennas**

ANTENNA WARNING

⚠ WARNING This device has been tested with Reverse Polarity SMA connectors with the antennas listed in the table below. When integrated into the OEM product, these fixed antennas require installation preventing end–users from replacing them with non–approved antennas. Any antenna not already tested with the XCite module must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions.

Table 7.   Antennas approved for use with the 9XCite (900 MHz) OEM RF Module

Part Number	Type	Gain	Application
*	Yagi	6.2dBi	Fixed/Mobile **
*	Yagi	7.2dBi	Fixed/Mobile **
A09-Y8	Yagi	8.2dBi	Fixed/Mobile **
	Yagi	9.2dBi	Fixed/Mobile **
	Yagi	10.2dBi	Fixed/Mobile **
A09-Y11	Yagi	11.2dBi	Fixed/Mobile **
	Yagi	12.2dBi	Fixed/Mobile **
	Yagi	13.2dBi	Fixed/Mobile **
	Yagi	14.2dBi	Fixed/Mobile **
A09-Y15	Yagi	15.2dBi	Fixed/Mobile **
A09-F2	Omni Direct	2.2dBi	Fixed **
A09-F5	Omni Direct	5.2dBi	Fixed **
A09-F8	Omni Direct	8.2dBi	Fixed **
*	Omni Direct	9.2dBi	Fixed **
*	Omni Direct	7.2dBi	Fixed **
A09-M7	Omni Direct	7.2dBi	Fixed **
A09-H	1/2 wave antenna	2.1dBi	Fixed/Mobile **
A09-HBMM-P5I	1/2 wave antenna	2.1dBi	Fixed/Mobile **
A09-QBMM-P5I	1/4 wave antenna	1.9 dBi	Fixed/Mobile **
*	1/4 wave integrated wire antenna	1.9 dBi	Fixed/Mobile **

 * FCC-approved antennas not inventoried by MaxStream – Contact MaxStream for more information.

** Can be approved for portable applications if integrator gains approval through SAR testing

Over 100 additional antennas that have been tested and are approved for use with MaxStream 900 MHz Radio Modems (including "Mag Mount", "Dome", "Multi-path" and "Panel" antennas). Because of the large number of approved antennas, MaxStream requests that you send specific information about an antenna you would like to use with the modem and MaxStream will evaluate whether the antenna is covered under our FCC filing.

Contact MaxStream (801) 765-9885 for more information.

RF EXPOSURE

⚠ WARNING Portable Antenna Applications: The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co–located or operating in conjunction with any other antenna or transmitter for satisfying RF exposure compliance.

The preceding statement must be included as a CAUTION statement in manuals for OEM products to alert users on FCC RF Exposure compliance.

Appendix B: Additional Information

XCite OEM RF Module Specifications

Table 8.   XCite OEM RF Module Specifications

| Specification	9XCite (900 MHz) OEM RF Module	
Performance		
Indoor/Urban Range	up to 300' (90 m)	
Outdoor LOS Range	up to 1000' (300 m) w/ 2.1 dB dipole antenna	
Transmit Power Output	4 mW (6 dBm)	
Serial Data Rate	**9600 bps**	**38400 bps**
RF Data Rate (Baud)	10000 bps	41666 bps
Receiver Sensitivity	-108 dBm	-104 dBm
Interfacing, Networking & Security		
Frequency	902-928 MHz	
Spread Spectrum Type	Frequency Hopping, Direct FM modulator	
Single Channel (Optional)	Fixed or User Selectable (up to 12 channels)	
Network Topology	Peer-to-Peer, Point-to-Multipoint, Point-to-Point, Multi-Drop Transparent	
Channel Capacity	Hopping Mode (7 hop sequences share 25 frequencies) or Single Channel Mode (25 single frequency channels)	
Serial Data Interface	CMOS	
I/O Data Rate	Software selectable 1200-57600 bps	
Power Requirements		
Supply Voltage	2.85 to 5.50 VDC	
Transmit Current (@ 2.85V)	55 mA	
Receive Current (@ 2.85V)	45 mA	
Receive Current (@ 5V)	55 mA	
Power Down Current	20 µA	
Physical Properties		
Module Board Size	1.6" x 2.825" x 0.35" (4.06 cm x 7.17 cm x 0.89 cm)	
Weight	0.8 oz. (24 g)	
Connector	11-Pin & 4-Pin 0.1" spaced Male Berg-type headers	
Operating Temperature	Commercial (0 to 70º C) or Industrial (-40 to 85º C)	
Antennas		
Type	¼ Wave Monopole, 3" (7.62 cm) integrated wire, 1.9 dBi	
Connector (Optional)	Reverse-polarity SMA (RPSMA)	
Impedance	50 ohms unbalanced	
Certifications (For complete list, visit www.MaxStream.net or call 1-801-765-9885)		
FCC Part 15.247	OUR-9XCITE	
Industry Canada (IC)	4214A-9XCITE	

1-Year Warranty

The XCite OEM RF Module from MaxStream, Inc. (the "Product") is warranted against defects in materials and workmanship under normal use, for a period of 1-year from the date of purchase. In the event of a product failure due to materials or workmanship, MaxStream will repair or replace the defective product. For warranty service, return the defective product to MaxStream, shipping prepaid, for prompt repair or replacement.

The foregoing sets forth the full extent of MaxStream's warranties regarding the Product. Repair or replacement at MaxStream's option is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND MAXSTREAM SPECIFICALLY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MAXSTREAM, ITS SUPPLIERS OR LICENSORS BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS, OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES. THEREFOR, THE FOREGOING EXCLUSIONS MAY NOT APPLY IN ALL CASES. This warranty provides specific legal rights. Other rights which vary from state to state may also apply.

XCite OEM RF Module Part Numbers

Figure 15.   Part Numbers Key
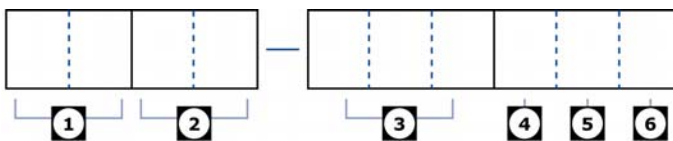
Divisions of the XCite OEM RF Module part number:

1 MaxStream Product Family
XC = XCite
X   = XStream

2 Operating Frequency
09 = 902-928 MHz

3 RF Data Rate (Baud)
009 = 9600 Baud
038 = 38400 Baud

4 Wire Antenna
W = Wire Antenna
N = No Wire Antenna

5 Connector
S = RPSMA Connector
N = No Connector

6 Module Temperature Rating
C = Commercial: 0 to 70° C
I = Industrial: -40 to 85° C, conformal coated
T = Tested:-40 to 85° C , conformal coating & 100% tested

For example: XC09-038NSC
(9XCite Module, 900 MHz, 38400 Baud, No Wire Antenna, RPSMA Connector, Commercial Temperature Rating)

Appendix C: Troubleshooting & FAQs

Contact MaxStream

Free and unlimited technical support is included with every MaxStream Radio Modem sold.

Please use the following resources for additional support:

Documentation: www.maxstream.net/helpdesk/

Technical Support:	Phone.	(866) 765-9885 U.S. & Canada
		(801) 765-9885 Worldwide
	Live Chat.	www.maxstream.net
	E-Mail.	rf-xperts@maxstream.net

MaxStream office hours are 8:00 am – 5:00 pm [U.S. Mountain Standard Time]