

# XBee-PRO® XSC RS-232/RS-485/USB RF Modem

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Overview

Interfacing Protocol

## Product Manual

For XBee-PRO XSC RF Modem Part Numbers:

XM-C91-2P... XM-C92-2P...

XM-C91-4P... XM-C92-4P...

XM-C91-UP... XM-C92-UP...

**900 MHz Stand-alone RF Modems by Digi International, Inc.**



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# 1. Overview

The XBee-PRO XSC RF Modem is a small, low-power solution that uses the XBee-PRO XSC (S3B) 900 MHz RF Module in an enclosure to communicate with systems using RS-232, RS-485, and USB interfaces. It allows the user to easily make their existing wired systems wireless simply by connecting to this product. The XBee-PRO XSC RF Modem is a market replacement of Digi's 9XStream PKG and is able to fully communicate with existing 9XStream RF Modems.



When a system is connected to the XBee-PRO XSC RF Modem, it can transmit and receive data from multiple radios on the same wireless network. This is achieved by using Digi's XBee-Pro XSC (S3B) RF Module.

This manual is not a comprehensive manual where a full description of the XSC RF Modem is given. This manual only covers the interfaces needed to communicate with the XSC (S3B) 900 MHz RF Module. For an extensive guide on use of the XSC (S3B) 900 MHz RF Module, see Appendix A of the XBee-PRO 900 HP/XBee-PRO XSC RF Modules Product Manual.



## 1.1. Features Overview

### Long Range Data Integrity

Range

- Indoor/Urban: **Up to 2000' (610 m)**
- Outdoor line-of-sight: **Up to 9 miles (14 km)**

Transmit Power: **Up to 24 dBm (250 mW)**  
(software selectable)

Receiver Sensitivity: **-109 dBm (@10kbps)**

RF Data Rate: **Up to 20kbps**

### Advanced Networking & Security

True peer-to-peer (no "master" required) communications

Point-to-point & point-to-multipoint topologies supported

Retries and Acknowledgements

7 hopping channels, each with over 65,000 available network addresses

FHSS (Frequency Hopping Spread Spectrum)

### Low Power

Receive Current: **60 mA (@9V)**

Transmit Current: **140 mA (@9V)**

### Easy-to-Use

No configuration required for out-of-the-box RF data communications.

Free X-CTU Software (Testing and configuration software)

RS-232 and RS-485 variants configurable via the mini USB port.

Advanced configurations available through standard AT & binary commands.

Built in RS-232/RS-485/USB interfacing

Small form factor

Software-selectable serial interface baud rates

Support for multiple data formats (parity, start and stop bits, etc.)

Free & Unlimited Technical Support

### 1.1.1. Worldwide Acceptance

**FCC Approved (USA)** Refer to Appendix A for FCC Requirements.  
 Systems that include XBee®/XBee-PRO® XSC RF modems inherit Digi Certifications.  
 ISM (Industrial, Scientific & Medical) 900 MHz frequency band  
 Manufactured under **ISO 9001:2000** registered standards  
 XBee®/XBee-PRO® XSC (900 MHz) RF Modems are approved for use in US, Canada,  
 and Australia.



## 1.2. Specifications

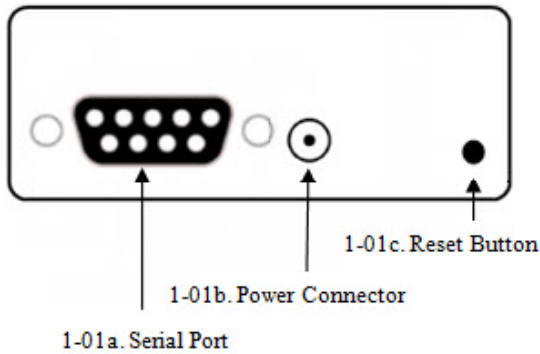
**Table 1-01. Specifications of the XBee-PRO XSC RS-232/RS-485/USB RF Modem**

Specification	XBee-PRO
<b>Performance</b>	
Indoor/Urban Range	Up to 2000 ft (610 m)
Outdoor line-of-sight Range	Up to 9 miles (14 km) w/ dipole antenna Up to 28 miles (45 km) w/ high-gain antenna
Transmit Power Output	Up to 24 dBm (250 mW) software selectable
Throughput Data Rate	9.6kbps or 19.2kbps
RF Data Rate	10kbps or 20kbps
Interface Data Rate	125 - 65,000 bps (Software selectable, includes non-standard baud rates)
Receiver Sensitivity	-109dBm at 10kbps; -107dBm at 20kbps
<b>Networking &amp; Security</b>	
Frequency	902-928MHz (located in the 900MHz ISM Band)
Spread Spectrum	Frequency Hopping
Supported Network Topologies	Point-to-point, Point-to-Multipoint, Peer-to-Peer
Channel Capacity	7 hop sequences share 25 frequencies
<b>Antenna</b>	
Connector	RPSMA (reverse polarity SMA)
Impedance	50 ohms unbalanced
<b>Power Requirements</b>	
Power Supply	7-30 VDC
Receive Current	60 mA (@9V)
Transmit Current	140 mA (@9V)
<b>Physical Properties</b>	
Size	4.500" x 2.750" x 1.125" (11.4cm x 7.0cm x 2.9cm)
Weight	5.25 oz. (150 g)
Data Connection	Female DB-9, RS-485/422 screw terminal, USB Type B, USB Mini-B
Operating Temperature	-40 - 85° C (Industrial)
<b>Certifications (partial list)</b>	
United States (FCC Part 15.247)	MCO-XB900HP
Industry Canada (IC)	1846A-XB900HP
Australia	C-Tick
RoHS	Compliant

\* See Appendix A for region-specific certification requirements.

## 1.3. External Interface

Figure 1-01. Front View (RS232)



### 1-01a. Serial Port

Standard female DB-9

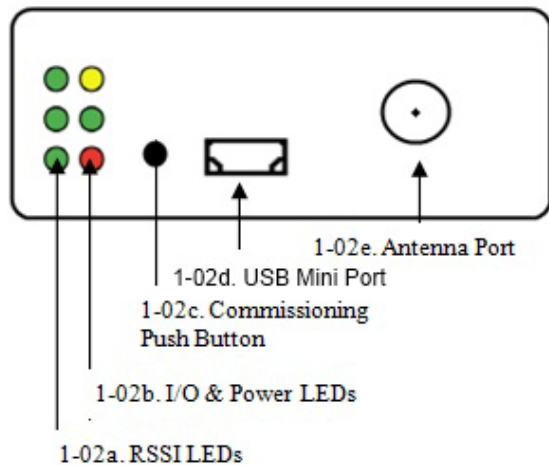
### 1-01b. Power Connector

7-30 VDC power connector, barrel type 2.1/5mm, center positive.

### 1-01c. Reset Button

The Reset Switch is used to reset (re-boot) the XBee-PRO XSC RF Modem. This switch only applies when using the configuration tabs of Digi's X-CTU Software.

Figure 1-02. Back View (RS232)



### 1-02a. RSSI LEDs

Not applicable to XBee-PRO XSC RF Modem.

### 1-02b. I/O & Power LEDs

LEDs indicate RF modem activity as follows:

Yellow (top LED) = Serial Data Out (to host)

Green (middle) = Serial Data In (from host)

Red (bottom) = Power/TX Indicator (Red light is on when powered, off briefly during RF transmission)

### 1-02c. Commissioning Push Button

Not applicable to XBee-PRO XSC RF Modem.

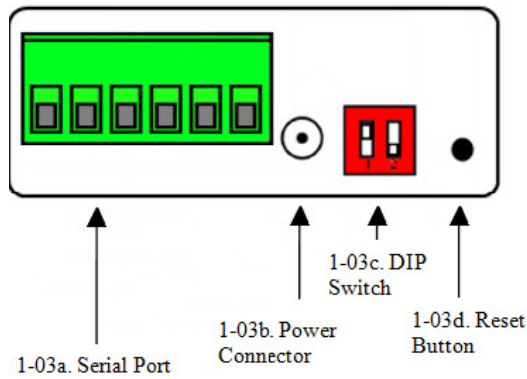
### 1-02d. USB Mini-B Port

When USB mini is plugged in, all RS232 communications to and from the XBee are disabled. The USB is to serve as a configuration port. The XBee should not transmit when USB is plugged in.

### 1-02e. Antenna Port

Port is a 50Ω RF signal connector for connecting to an external antenna. The connector type is RPSMA (Reverse Polarity SMA) female. The connector has threads on the outside of a barrel and a male center conductor.

Figure 1-03. Front View (RS485)



**1-03a. Serial Port**

Phoenix 6- pin connector

**1-03b. Power Connector**

7-30 VDC power connector, barrel type 2.1/5mm, center positive.

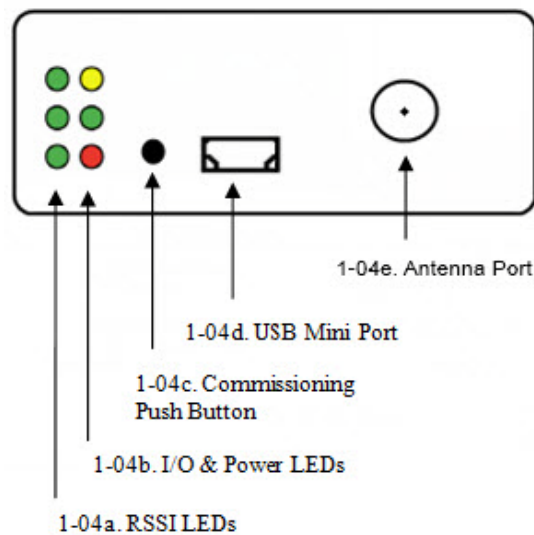
**1-03c. DIP Switch**

120 ohms termination for the receiving differential pairs if switch is in the up Position. Switch 1 is for half duplex (2 wire) termination. Switch 2 is for full duplex (4 wire) termination.

**1-03d. Reset Button**

The Reset Switch is used to reset (re-boot) the XBee-PRO XSC RF Modem. This switch only applies when using the configuration tabs of Digi's X-CTU Software.

Figure 1-04. Back View (RS485)



**1-04a. RSSI LEDs**

Not applicable to XBee-PRO XSC RF Modem.

**1-04b. I/O & Power LEDs**

LEDs indicate RF modem activity as follows:

Yellow (top LED) = Serial Data Out (to host)

Green (middle) = Serial Data In (from host)

Red (bottom) = Power/TX Indicator (Red light is on when powered, off briefly during RF transmission)

**1-04c. Commissioning Push Button**

Not applicable to XBee-PRO XSC RF Modem.

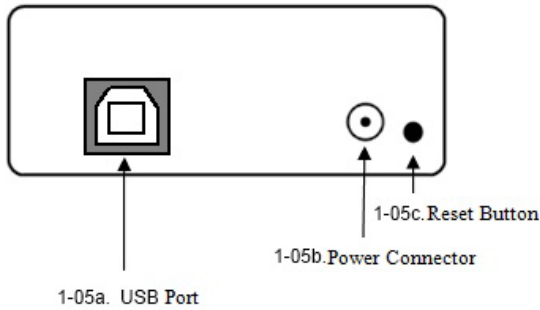
**1-04d. USB Mini-B Port**

When USB mini is plugged in, all RS485 communications to and from the XBee are disabled. The USB is to serve as a configuration port. The XBee should not transmit if USB is plugged in.

**1-04e. Antenna Port**

Port is a 50Ω RF signal connector for connecting to an external antenna. The connector type is RPSMA (Reverse Polarity SMA) female. The connector has threads on the outside of a barrel and a male center conductor.

Figure 1-05. Front View (USB)



**1-05a. USB Port**

Type B USB port

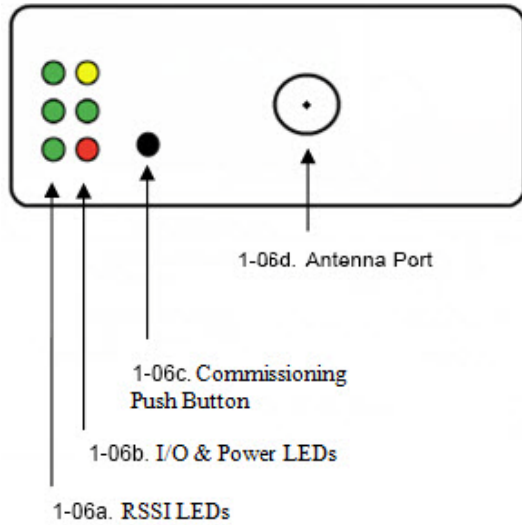
**1-05b. Power Connector**

7-30 VDC power connector, barrel type 2.1/5mm, center positive.

**1-05c. Reset Button**

The Reset Switch is used to reset (re-boot) the XBee-PRO XSC RF Modem. This switch only applies when using the configuration tabs of Digi's X-CTU Software.

Figure 1-06. Back View (USB)



**1-06a. RSSI LEDs**

Not applicable to XBee-PRO XSC RF Modem.

**1-06b. I/O & Power LEDs**

LEDs indicate RF modem activity as follows:

Yellow (top LED) = Serial Data Out (to host)

Green (middle) = Serial Data In (from host)

Red (bottom) = Power/TX Indicator (Red light is on when powered, off briefly during RF transmission)

**1-06c. Commissioning Push Button**

Not applicable to XBee-PRO XSC RF Modem.

**1-06d. Antenna Port**

Port is a 50Ω RF signal connector for connecting to an external antenna. The connector type is RPSMA (Reverse Polarity SMA) female. The connector has threads on the outside of a barrel and a male center conductor



## 1.4. RF Modem Symbols

The following symbols are found on top of the RF Modem. The description of the symbol is next to the symbol.



Not applicable to XSC RF Modem



Reset Button



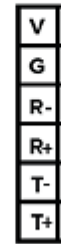
RS-232 Serial Port

**A·T·R**

I/O LEDs  
Red-Association  
Green- Transmit from Host  
Yellow- Receive from Host



Switch 1-Termination for 2-wire configuration  
Switch 2-Termination for 4-wire configuration



RS-485 Serial Port



Not applicable to XSC RF Modem



Power Supply (7-30 VDC)



Antenna Port



USB Port

# 2. Interfacing Protocol

The XBee-PRO XSC RS-232/485/USB RF Modem supports the following interfacing protocols:

- RS-232
- RS-485 (2-wire) Half-duplex
- RS-485 (4-wire) and RS-422
- USB

## 2.1. RS-232 Operation

### 2.1.1. Pin Signals

Figure 2-01. Pins used on the female RS-232 (DB-9) Serial Connector

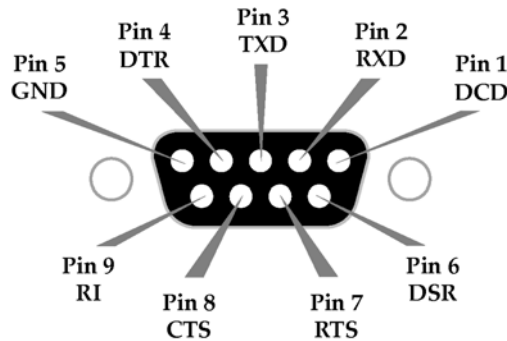
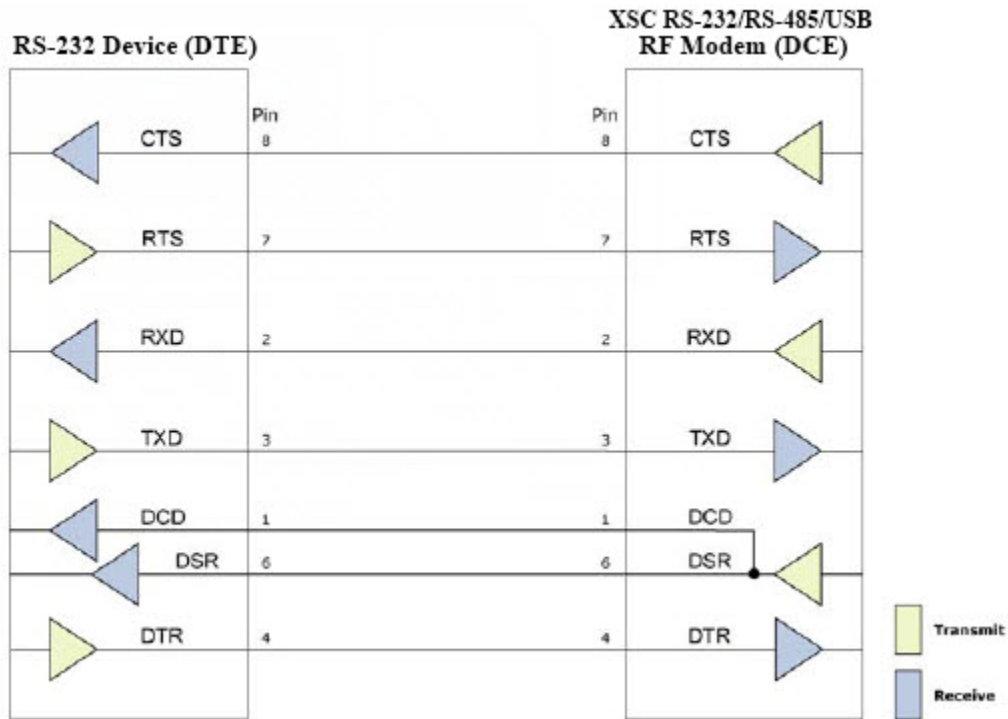


Table 2-01. RS-232 Pin Assignments and Implementation

DB-9 Pin	RS-232 Name	Description	Implementation*
1	DCD	Data-Carrier-Detect	Connected to DSR (pin6)
2	RXD	Received Data	Serial data exiting the RF modem (to host)
3	TXD	Transmitted Data	Serial data entering into the RF modem (from host)
4	DTR	Data-Terminal-Ready	By default, this pin is not used. To configure this pin to support Sleep Mode, refer to the Sleep Mode, SM Command and PW Command Sections.
5	GND	Ground Signal	Ground
6	DSR	Data-Set-Ready	Connected to DCD (pin1)
7	$\overline{\text{RTS}}$ / CMD	Request-to-Send / Command Mode	RTS(request-to-send) flow control – By default, this pin is not used. To configure this pin to regulate the flow of serial data exiting the modem, refer to the Serial Communications and <a href="#">RT Command section</a> CMD – Refer to Binary Commands and RT Command Sections to enable binary command programming
8	$\overline{\text{CTS}}$	Clear-to-Send	CTS (clear-to-send) flow control –When pin is driven low, UART host is permitted to send serial data to the modem. Refer to the Serial communications and CS Command sections for more information
9	RI	Ring Indicator	Optional power input (protection circuitry to prevent back flow from other power sources internal to the board)

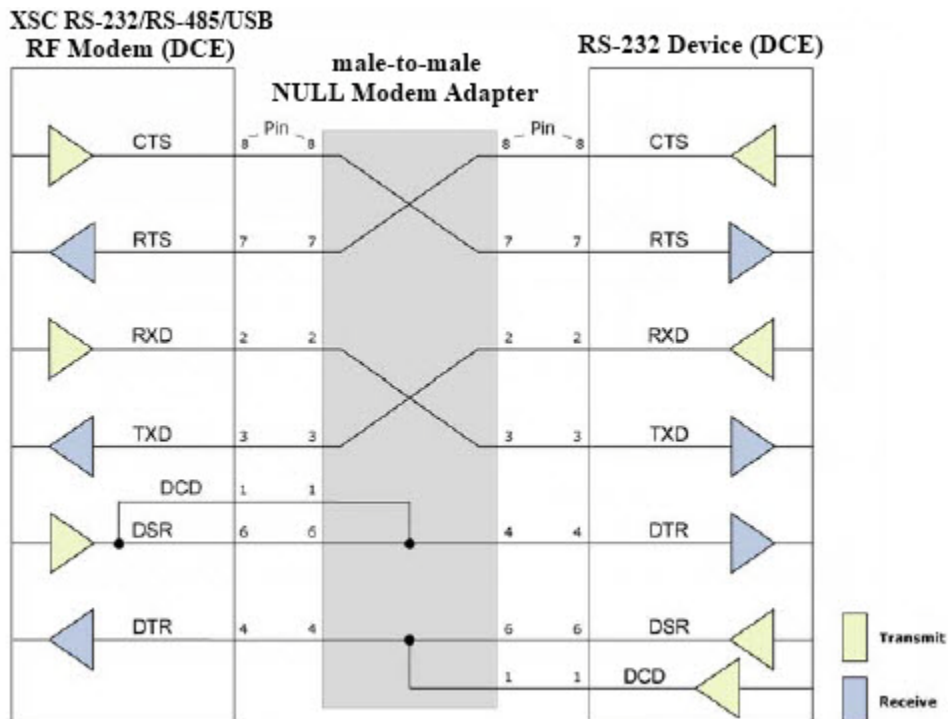
## 2.1.2. Wiring Diagrams

Figure 2-02. RS-232 Device DTE Device (male DB-9 connector) wired to a DCE RF modem (female DB-9) XBee-PRORF Modem



### DCE RF Modem to an DCE RS-232 Device

Figure 2-03. DCE RF Modem (female DB-9 connector) wired to an RS-232 DCE Device (male DB-9)XBee-PRORF Modem



**Sample Wireless Connection: DTE <--> DCE ⚡ DCE <--> DCE**

Figure 2-04. Typical wireless link between DTE and DCE devices



## 2.2. RS-485 (2-wire) Operation

Note that with the RS-485 variant of the XSC RF Modem, the RF Modem is defaulted with the CS command (AT parameter) to 3. This parameter controls the TX enable signal and allows the modem to output any data in the DO buffer to the host device for the RS-485 interface. In the event that the parameter is accidentally changed, which would result in RS-485 communication being halted, a USB mini cable should be plugged into the modem to reconfigure it. The reconfiguration can be done by using Digi’s X-CTU.

With the USB plugged in, open X-CTU and select the Com port of the USB. Select the Terminal tab and type '+++'. The system will respond with 'OK'. Type 'ATCS3' then <Enter>, and the system will respond with 'OK'. Type 'ATWR' then <Enter>, and the system will respond with 'OK'. Type 'ATCN' then <Enter> to exit command mode, and the system will respond with 'OK'. Unplug the USB and return to the existing RS-485 interface. The XSC RF Modem is now ready to communicate in RS-485 mode.



NOTE: Failure to enter AT Command Mode is most commonly due to baud rate mismatch. Ensure the ‘Baud’ setting on the “PC Settings” tab matches the BD (Interface Data Rate) setting of the RF modem (by default, BD parameter = 3, which is associated to 9600 baud).

### 2.2.1. Pin Signals

Figure 2-05. Pins used on the RS-485 (2 wire) Phoenix 6 Pin Connector

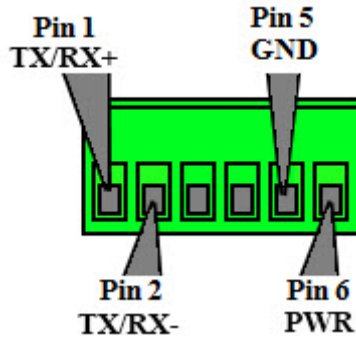
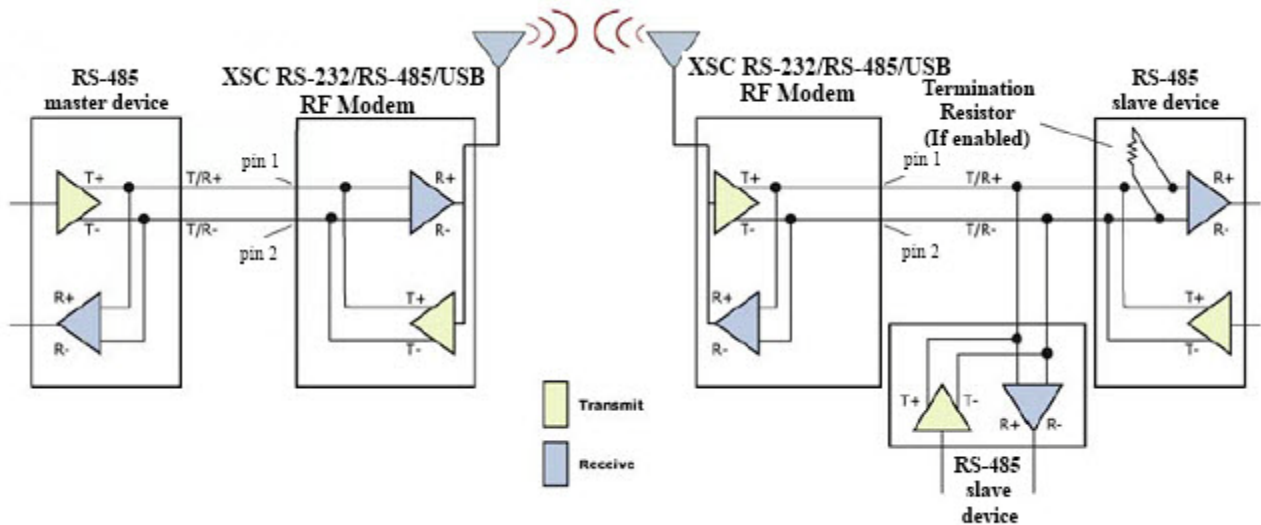


Table 2-02. Pins used on the RS-485 (2 wire) Phoenix 6 Pin Connector

Phoenix 6 Pin	RS-485 Name	Description	Implementation*
1	TX/ RX+	Negative Data Line	Transmit serial data to and from the RF modem
2	TX/ RX-	Positive Data Line	Transmit serial to and from the RF modem
5	GND	Ground Signal	Ground
6	PWR	Power Signal	Optional power input (protection circuitry to prevent back flow from other power sources internal to the board)
3, 4		Not Used	

### 2.2.2. Wiring Diagram

Figure 2-06. RF Modem in an RS-485 (2-wire) half duplex



## 2.3. RS-485 (4-wire) Operation & RS-422 Operation

Note that with the RS-485 variant of the XSC RF Modem, the RF Modem is defaulted with the CS command (AT parameter) to 3. This parameter controls the TX enable signal and allows the modem to output any data in the DO buffer to the host device for the RS-485/422 interface. In the event that the parameter is accidentally changed, which would result in RS-485 communication being halted, a USB mini cable should be plugged into the modem to reconfigure it. The reconfiguration can be done by using Digi's X-CTU.

With the USB plugged in, open X-CTU and select the Com port of the USB. Select the Terminal tab and type '+++'. The system will respond with 'OK'. Type 'ATCS3' then <Enter>, and the system will respond with 'OK'. Type 'ATWR' then <Enter>, and the system will respond with 'OK'. Type 'ATCN' then <Enter> to exit command mode, and the system will respond with 'OK'. Unplug the USB and return to the existing RS-485/422 interface. The XSC RF Modem is now ready to communicate in RS-485 mode.



NOTE: Failure to enter AT Command Mode is most commonly due to baud rate mismatch. Ensure the 'Baud' setting on the "PC Settings" tab matches the BD (Interface Data Rate) setting of the RF modem (by default, BD parameter = 3, which is associated to 9600 baud).

### 2.3.1. Pin Signals

Figure 2-07. Pins used on the RS-485 (4-wire) Phoenix 6 Pin Connector

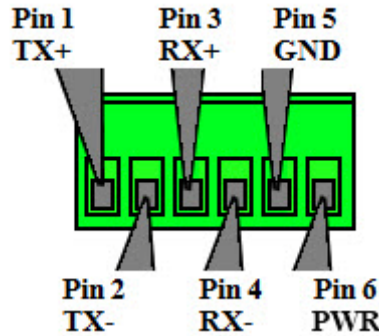


Table 2-03. RS-485 (4-wire) 6-pin Connector Pin Assignments and Implementation

Phoenix 6 Pin	RS-485 Name	Description	Implementation*
1	TX+	Transmit Positive	Serial data sent from RF modem
2	TX-	Transmit Negative Data Line	Serial data received by the RF modem
3	RX+	Receive Positive Data Line	Serial data received the RF modem
4	RX-	Receive Negative Data Line	Serial data received by the RF modem
5	GND	Ground Signal	Ground
6	PWR	Power Signal	Optional power input (protection circuitry to prevent back flow from other power sources internal to the board)

### 2.3.2. Wiring Diagrams

Figure 2-08. XSC RF Modem in an RS-485 (4-wire) environment

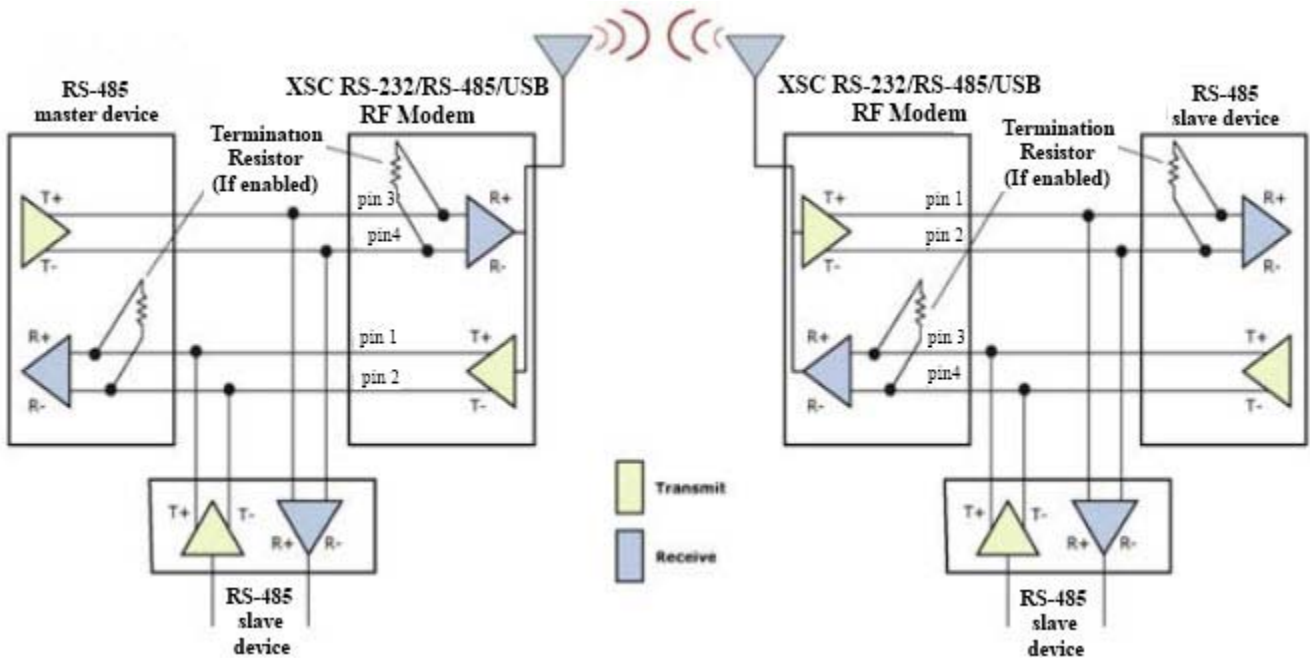
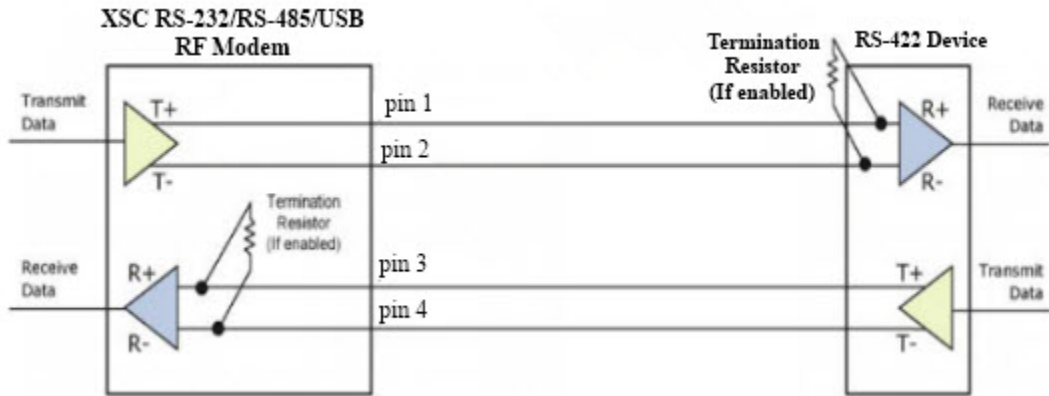


Figure 2-09. XSC RF Modem in an RS-422 environment



### 2.3.3. RS-485/422 Connection Guidelines

The RS-485/422 protocol provides a solution for wired communications that can tolerate high noise and push signals over long cable lengths. RS-485/422 signals can communicate as far as 4000 feet (1200 m). RS-232 signals are suitable for cable distances up to 100 feet (30.5 m).

RS-485 offers multi-drop capability in which up to 32 nodes can be connected. The RS-422 protocol is used for point-to-point communications.

Suggestions for integrating the XSC RF Modem with the RS-485/422 protocol:

Twisted pair cabling should be used for the positive and negative data lines. An Ethernet cable is good for twisted pairs. When using Ethernet twisted pair cabling: Select wires so that TX+ and TX- are connected to a twisted pair. Likewise, select wires so that RX+ and RX- are connected to a twisted pair. (For example, tie the green and white/green wires to TX+ and TX-). This reduces the amount of noise on the data line.



## 2.4. USB Operation

Note that when a Mini-USB cable is plugged into the XSC RF Modem, communication to and from the RS-232 interface and the RS-485/422 is halted. USB communications take precedence over all other interfaces when plugged in. To restore communication with other interfaces, the USB cable should be unplugged.

\*\*The Mini-B USB Connector is intended as a configuration port. The RF Modem should not transmit data when the Mini USB cable is connected.

### 2.4.1. Pin Signals

Figure 2-010. Pins used on the Type B USB Connector

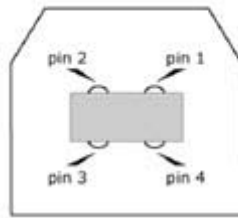


Table 2-04. Type B USB Connector Pin Assignments and Implementation

Pin	Name	Description	Implementation*
1	VBUS	Power	Power the RF modem
2	D-	Negative Data Line	Transmit data to and from the RF modem
3	D+	Positive Data Line	Transmit data to and from the RF modem
4	GND	Ground Signal	Ground

Figure 2-011. Pins used on the Mini-B USB Connector

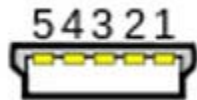


Table 2-05. Mini-B USB Connector Pin Assignments and Implementation

Pin	Name	Description	Implementation*
1	VBUS	Power	Power the RF modem
2	D-	Negative Data Line	Transmit data to and from the RF modem
3	D+	Positive Data Line	Transmit data to and from the RF modem
4	ID	Permits distinction of host connection from slave connection	Not connected
5	GND	Ground Signal	Ground

# Appendix A: Agency Certifications

## FCC (United States) Certification

The XBee-PRO® XSC RF Modem complies with Part 15 of the FCC rules and regulations. Compliance with the labeling requirements, FCC notices and antenna usage guidelines is required. RF Modems/integrators must comply with the following regulations:

1. The system integrator must ensure that the text provided with this device [Figure A-01] is placed on the outside of the final product and within the final product operation manual.
2. The XBee-PRO® XSC RF Modem may only be used with antennas that have been tested and approved for use with this modem (refer to Table A-01).

### Labeling Requirements



**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 text shown in the figure below.

Figure A-01. Required FCC Label for OEM products containing the XBee-PRO® XSC RF Modem.

Contains FCC ID: MCQ-XB900HP

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

### FCC Notices

**IMPORTANT:** The XBee-PRO® XSC RS-232/RS-485/USB RF Module has been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Modifications not expressly approved by Digi could void the user's authority to operate the equipment.

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

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

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: Re-orient or relocate the receiving antenna, Increase the separation between the equipment and receiver, Connect equipment and receiver to outlets on different circuits, or Consult the dealer or an experienced radio/TV technician for help.

### Limited Modular Approval

This modem contains an RF module approved for Limited Modular use operating as a mobile transmitting device with respect to section 2.1091 and is limited to OEM installation for Mobile and Fixed applications only. During final installation, end-users are prohibited from access to any

programming parameters. Professional installation adjustment is required for setting module power and antenna gain to meet EIRP compliance for high gain antenna(s).

Final antenna installation and operating configurations of this transmitter including antenna gain and cable loss must not exceed the EIRP of the configuration used for calculating MPE. Grantee (Digi) must coordinate with OEM integrators to ensure the end-users and installers of products operating with the modem are provided with operating instructions to satisfy RF exposure requirements.

The FCC grant is valid only when the device is sold to OEM integrators. Integrators are instructed to ensure the end-user has no manual instructions to remove, adjust or install the device.

## **FCC-approved Antennas**

---



**WARNING:** This device has been tested with Reverse Polarity SMA connectors with the antennas listed in the tables of this section. When integrated into OEM products, fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Antennas not listed in the tables must be tested to comply with FCC Section 15.203 (unique antenna connectors) and Section 15.247 (emissions).

### **Fixed Base Station and Mobile Applications**

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Digi RF modules are pre-FCC approved for use in fixed base station and mobile applications. When the antenna is mounted at least 20cm (8") from nearby persons, the application is considered a mobile application.

### **Portable Applications and SAR Testing**

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If the module will be used at distances closer than 20cm to all persons, the device may be required to undergo SAR testing. Co-location with other transmitting antennas closer than 20cm should be avoided.

### **RF Exposure**

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This statement must be included as a CAUTION statement in OEM product manuals.



**WARNING:** This equipment is approved only for mobile and base station transmitting devices. 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.

## **IC (Industry Canada) Certification**

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This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

### **Labeling Requirements**

Labeling requirements for Industry Canada are similar to those of the FCC. A clearly visible label on the outside of the final product enclosure must display one of the following text:

**Contains IC: 1846A-XB900HP**

The integrator is responsible for its product to comply with IC ICES-003 & FCC Part 15, Sub. B- Unintentional Radiators. ICES-003 is the same as FCC Part 15 Sub. B and Industry Canada accepts FCC test report or CISPR 22 test report for compliance with ICES-003.

**Antenna Options: 900 MHz Antenna Listings**

The antennas in the tables below have been approved for use with this product. Digi does not carry all of these antenna variants. Contact Digi Sales for available antennas.

**Table A-01. Antennas approved for use with the XBee-PRO XSC RF Modem**

Part Number	Type	Connector	Gain	Application	Cable Loss or Power Reduction for S3B Radio
<b>Omni-directional antennas</b>					
A09-F0	Fiberglass Base	RPN	0 dBi	Fixed	0dB
A09-F1	Fiberglass Base	RPN	1.0 dBi	Fixed	0dB
A09-F2	Fiberglass Base	RPN	2.1 dBi	Fixed	0dB
A09-F3	Fiberglass Base	RPN	3.1 dBi	Fixed	0dB
A09-F4	Fiberglass Base	RPN	4.1 dBi	Fixed	0dB
A09-F5	Fiberglass Base	RPN	5.1 dBi	Fixed	0dB
A09-F6	Fiberglass Base	RPN	6.1 dBi	Fixed	0dB
A09-F7	Fiberglass Base	RPN	7.1 dBi	Fixed	0dB
A09-F8	Fiberglass Base	RPN	8.1 dBi	Fixed	0dB
A09-F9	Base Station	RPSMAF	9.2dBi	Fixed	0dB
A09-W7	Wire Base Station	RPN	7.1 dBi	Fixed	0dB
A09-F0	Fiberglass Base	RPSMA	0 dBi	Fixed	0dB
A09-F1	Fiberglass Base	RPSMA	1.0 dBi	Fixed	0dB
A09-F2	Fiberglass Base	RPSMA	2.1 dBi	Fixed	0dB
A09-F3	Fiberglass Base	RPSMA	3.1 dBi	Fixed	0dB
A09-F4	Fiberglass Base	RPSMA	4.1 dBi	Fixed	0dB
A09-F5	Fiberglass Base	RPSMA	5.1 dBi	Fixed	0dB
A09-F6	Fiberglass Base	RPSMA	6.1 dBi	Fixed	0dB
A09-F7	Fiberglass Base	RPSMA	7.1 dBi	Fixed	0dB
A09-F8	Fiberglass Base	RPSMA	8.1 dBi	Fixed	0dB
A09-M7	Base Station	RPSMAF	7.2dBi	Fixed	0dB
A09-W7SM	Wire Base Station	RPSMA	7.1 dBi	Fixed	0dB
A09-F0TM	Fiberglass Base	RPTNC	0 dBi	Fixed	0dB
A09-F1TM	Fiberglass Base	RPTNC	1.0 dBi	Fixed	0dB
A09-F2TM	Fiberglass Base	RPTNC	2.1 dBi	Fixed	0dB
A09-F3TM	Fiberglass Base	RPTNC	3.1 dBi	Fixed	0dB
A09-F4TM	Fiberglass Base	RPTNC	4.1 dBi	Fixed	0dB
A09-F5TM	Fiberglass Base	RPTNC	5.1 dBi	Fixed	0dB
A09-F6TM	Fiberglass Base	RPTNC	6.1 dBi	Fixed	0dB
A09-F7TM	Fiberglass Base	RPTNC	7.1 dBi	Fixed	0dB
A09-F8TM	Fiberglass Base	RPTNC	8.1 dBi	Fixed	0dB
A09-W7TM	Wire Base Station	RPTNC	7.1 dBi	Fixed	0dB
A09-HSM-7	Straight half-wave	RPSMA	3.0 dBi	Fixed / Mobile	0dB
A09-HASM-675	Articulated half-	RPSMA	2.1 dBi	Fixed / Mobile	0dB
A09-HABMM-P6I	Articulated half-	MMCX	2.1 dBi	Fixed / Mobile	0dB
A09-HABMM-6-P6I	Articulated half-	MMCX	2.1 dBi	Fixed / Mobile	0dB
A09-HBMM-P6I	Straight half-wave	MMCX	2.1 dBi	Fixed / Mobile	0dB
A09-HRSM	Right angle half-	RPSMA	2.1 dBi	Fixed	0dB
A09-HASM-7	Articulated half-	RPSMA	2.1 dBi	Fixed	0dB

A09-HG	Glass mounted	RPSMA	2.1 dBi	Fixed	0dB
A09-HATM	Articulated half-	RPTNC	2.1 dBi	Fixed	0dB
A09-H	Half-wave dipole	RPSMA	2.1 dBi	Fixed	0dB
A09-HBMMP6I	1/2 wave antenna	MMCX	2.1dBi	Mobile	0dB
A09-QBMMP6I	1/4 wave antenna	MMCX	1.9 dBi	Mobile	0dB
A09-QI	1/4 wave integrated wire antenna	Integrated	1.9 dBi	Mobile	0dB
29000187	Helical	Integrated	-2.0 dBi	Fixed/Mobile	0dB
A09-QW	Quarter-wave wire	Permanent	1.9 dBi	Fixed / Mobile	0dB
A09-QRAMM	3 "Quarter-wave	MMCX	2.1 dBi	Fixed / Mobile	0dB
A09-QSM-3	Quarter-wave	RPSMA	1.9 dBi	Fixed / Mobile	0dB
A09-QSM-3H	Heavy duty quarter-	RPSMA	1.9 dBi	Fixed / Mobile	0dB
A09-QBMM-P6I	Quarter-wave w/ 6"	MMCX	1.9 dBi	Fixed / Mobile	0dB
A09-QHRN	Miniature Helical	Permanent	-1 dBi	Fixed / Mobile	0dB
A09-QHSN	Miniature Helical	Permanent	-1 dBi	Fixed / Mobile	0dB
A09-QHSM-2	2" Straight	RPSMA	1.9 dBi	Fixed / Mobile	0dB
A09-QHRSM-2	2" Right angle	RPSMA	1.9 dBi	Fixed / Mobile	0dB
A09-QHRSM-170	1.7" Right angle	RPSMA	1.9 dBi	Fixed / Mobile	0dB
A09-QRSM-380	3.8" Right angle	RPSMA	1.9 dBi	Fixed / Mobile	0dB
A09-QAPM-520	5.2" Articulated	Permanent	1.9 dBi	Fixed / Mobile	0dB
A09-QSPM-3	3" Straight screw	Permanent	1.9 dBi	Fixed / Mobile	0dB
A09-QAPM-3	3" Articulated screw	Permanent	1.9 dBi	Fixed / Mobile	0dB
A09-QAPM-3H	3" Articulated screw	Permanent	1.9 dBi	Fixed / Mobile	0dB
A09-DPSM-P12F	omni directional	RPSMA	3.0 dBi	Fixed	0dB
A09-D3NF-P12F	omni directional	RPN	3.0 dBi	Fixed	0dB
A09-D3SM-P12F	omni directional w/	RPSMA	3.0 dBi	Fixed	0dB
A09-D3PNF	omni directional	RPN	3.0 dBi	Fixed	0dB
A09-D3TM-P12F	omni directional w/	RPTNC	3.0 dBi	Fixed	0dB
A09-D3PTM	omni directional	RPTNC	3.0 dBi	Fixed	0dB
A09-M0SM	Mag Mount	RPSMA	0 dBi	Fixed	0dB
A09-M2SM	Mag Mount	RPSMA	2.1 dBi	Fixed	0dB
A09-M3SM	Mag Mount	RPSMA	3.1 dBi	Fixed	0dB
A09-M5SM	Mag Mount	RPSMA	5.1 dBi	Fixed	0dB
A09-M7SM	Mag Mount	RPSMA	7.1 dBi	Fixed	0dB
A09-M8SM	Mag Mount	RPSMA	8.1 dBi	Fixed	0dB
A09-M0TM	Mag Mount	RPTNC	0 dBi	Fixed	0dB
A09-M2TM	Mag Mount	RPTNC	2.1 dBi	Fixed	0dB
A09-M3TM	Mag Mount	RPTNC	3.1 dBi	Fixed	0dB
A09-M5TM	Mag Mount	RPTNC	5.1 dBi	Fixed	0dB
A09-M7TM	Mag Mount	RPTNC	7.1 dBi	Fixed	0dB
A09-M8TM	Mag Mount	RPTNC	8.1 dBi	Fixed	0dB

**Yagi antennas**

A09-Y6	2 Element Yagi	RPN	6.1 dBi	Fixed / Mobile	0dB
A09-Y7	3 Element Yagi	RPN	7.1 dBi	Fixed / Mobile	0dB
A09-Y8	4 Element Yagi	RPN	8.1 dBi	Fixed / Mobile	0dB
A09-Y9	4 Element Yagi	RPN	9.1 dBi	Fixed / Mobile	0dB
A09-Y10	5 Element Yagi	RPN	10.1 dBi	Fixed / Mobile	0dB
A09-Y11	6 Element Yagi	RPN	11.1 dBi	Fixed / Mobile	0dB

A09-Y12	7 Element Yagi	RPN	12.1 dBi	Fixed / Mobile	0dB
A09-Y13	9 Element Yagi	RPN	13.1 dBi	Fixed / Mobile	0.8dB
A09-Y14	10 Element Yagi	RPN	14.1 dBi	Fixed / Mobile	1.8dB
A09-Y14	12 Element Yagi	RPN	14.1 dBi	Fixed / Mobile	1.8dB
A09-Y15	13 Element Yagi	RPN	15.1 dBi	Fixed / Mobile	2.8dB
A09-Y15	15 Element Yagi	RPN	15.1 dBi	Fixed / Mobile	2.8dB
A09-Y6TM	2 Element Yagi	RPTNC	6.1 dBi	Fixed / Mobile	0dB
A09-Y7TM	3 Element Yagi	RPTNC	7.1 dBi	Fixed / Mobile	0dB
A09-Y8TM	4 Element Yagi	RPTNC	8.1 dBi	Fixed / Mobile	0dB
A09-Y9TM	4 Element Yagi	RPTNC	9.1 dBi	Fixed / Mobile	0dB
A09-Y10TM	5 Element Yagi	RPTNC	10.1 dBi	Fixed / Mobile	0dB
A09-Y11TM	6 Element Yagi	RPTNC	11.1 dBi	Fixed / Mobile	0dB
A09-Y12TM	7 Element Yagi	RPTNC	12.1 dBi	Fixed / Mobile	0dB
A09-Y13TM	9 Element Yagi	RPTNC	13.1 dBi	Fixed / Mobile	0.8dB
A09-Y14TM	10 Element Yagi	RPTNC	14.1 dBi	Fixed / Mobile	1.8dB
A09-Y14TM	12 Element Yagi	RPTNC	14.1 dBi	Fixed / Mobile	1.8dB
A09-Y15TM	13 Element Yagi	RPTNC	15.1 dBi	Fixed / Mobile	2.8dB
A09-Y15TM	15 Element Yagi	RPTNC	15.1 dBi	Fixed / Mobile	2.8dB

#### Transmitters with Detachable Antennas

This radio transmitter (IC: 1846A-XB900HP) has been approved by Industry Canada to operate with the antenna types listed in the table above with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 1846A-XB900HP) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

#### Detachable Antenna

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

# Appendix B: Additional Information

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## 5-Year Warranty

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XBee RF Modems from Digi International, Inc. (the "Product") are warranted against defects in materials and workmanship under normal use, for a period of 5 years from the date of purchase. In the event of a product failure due to materials or workmanship, Digi will repair or replace the defective product. For warranty service, return the defective product to Digi International, shipping prepaid, for prompt repair or replacement.

The foregoing sets forth the full extent of Digi International's warranties regarding the Product. Repair or replacement at Digi International's option is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND DIGI SPECIFICALLY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL DIGI, 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. THEREFORE, 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.

## Contact Digi International

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Free and unlimited technical support is included with every Digi Radio Modem sold. For the best in wireless data solutions and support, please use the following resources:

Documentation: <http://www.digi.com/support/>

Technical Support: Phone. 952-912-3444 U.S.A. & Canada  
877-912-3444 Worldwide

Live Chat. <http://www.digi.com/contactus/>

E-Mail. <http://www.digi.com/support/eservice/eservicelogin.jsp>