

# Getting Started Guide



## *XBee® & XBee-PRO® DigiMesh Development Kit*

- Introduction
- Set up Range Test
- Perform Range Test
- Explore Advanced Configurations

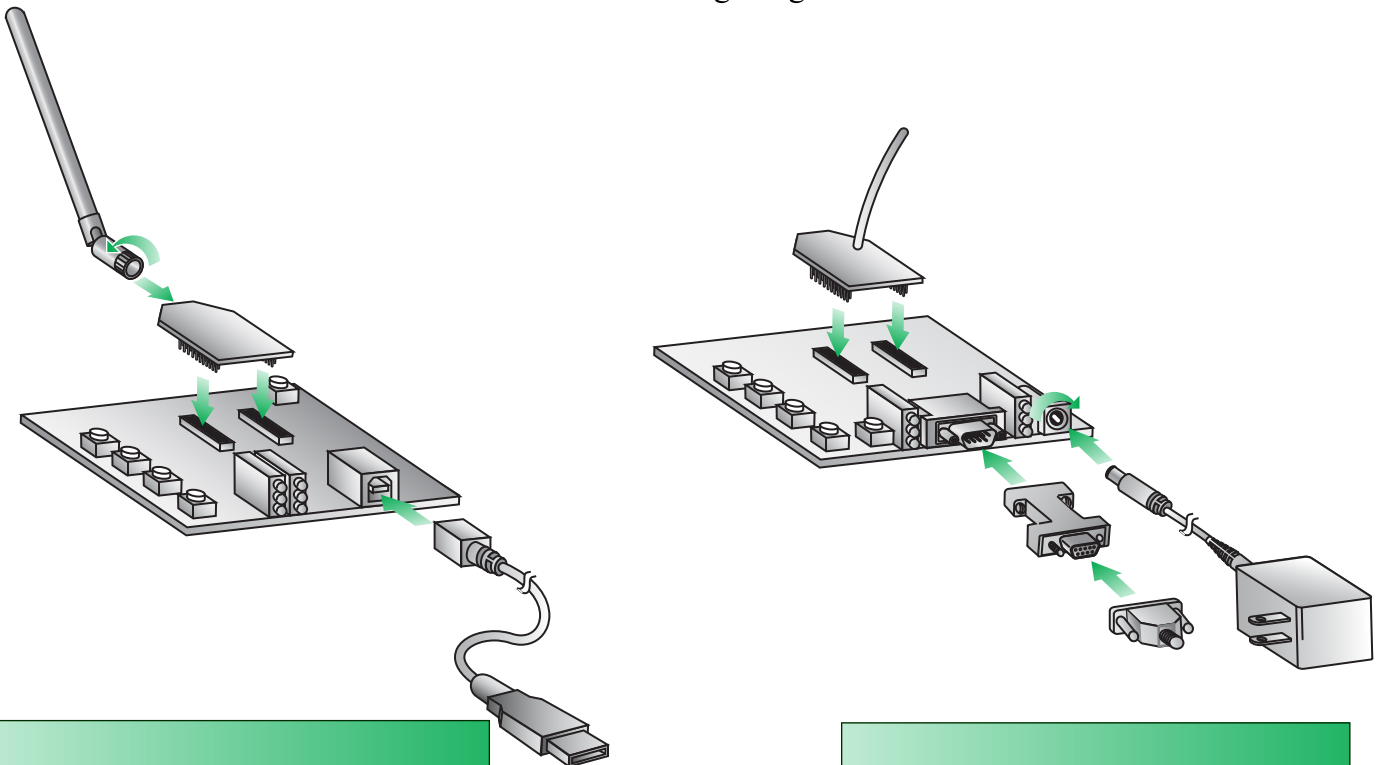
Create long-range wireless links in minutes!

## *Introduction*

This Getting Started Guide provides step-by-step instruction on how to set up wireless links and test the modules' ability to transport data over varying ranges and conditions. This guide illustrates how to set up and run a range test; then how to explore advanced module configurations.

### **CONNECT THE HARDWARE**

Connect the hardware as shown in the following images:



- XBee USB Interface Board
- XBee embedded module
- Antenna-RPSMA (M)
- USB cable

- XBee RS-232 Interface Board
- Null modem adapter (M)
- Serial loopback plug
- Power supply
- XBee embedded module
- RS-232 serial cable

# *Set up Range Test*

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## **INSTALL X-CTU SOFTWARE**

X-CTU is a stand-alone tool for configuring XBee modules. It is used to run the range test and is included on the Hardware and Software Setup CD. X-CTU can also be found on the website at: <http://www.digi.com/support/productdetl.jsp?pid=3352&osvid=57&tp=4&s=316>

To install X-CTU:

1. Insert the Hardware and Software Setup CD in the PC's CD/DVD drive.
2. On the Home page, click Modules, Sensors & Adapters Documentation/Software.
3. Click XBee Module.
4. Click Install X-CTU.
5. When installation completes, start X-CTU by selecting:

Start > Programs > Digi > X-CTU.

The X-CTU Software is ready to be used.

## **INSTALL USB DRIVERS** (Hardware USB Bus & Virtual COM port Drivers)

The USB interface board is a "plug-and-play" device that should be detected by the PC automatically. To interface between the modem and a PC, two drivers must be installed: a USB driver, and a virtual COM port driver that makes the USB port look and perform like a physical COM port. After the modem is detected, a wizard for installing the USB driver is launched. The USB driver is included on the Hardware and Software Setup CD.

Use the following steps to install the two USB drivers:

1. Connect the XBee to a PC using a USB cable. The Found New Hardware Wizard dialog box is displayed.
2. Verify that the Hardware and Software Setup CD is inserted into the drive.
3. Select Install from a specific list or location (Advanced); then click Next.
4. Select Search for the best driver in these locations and search removable media (CD-ROM). Click Next. A Hardware Installation Windows Logo Testing alert box is displayed.
5. Click Continue Anyway.
6. Click Finish.
7. You will be prompted to install another driver, the virtual COM port driver. Repeat steps 3 through 6 to install this driver.

# Perform Range Test

Objective: To determine the range capabilities of the XBee modules.

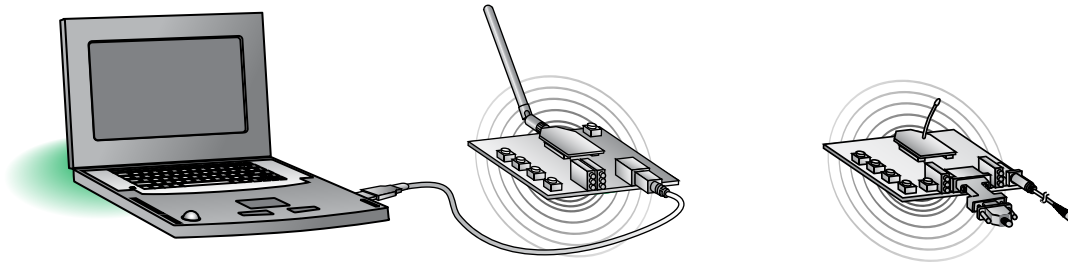


Figure 1. Range Test Setup

## RUN RANGE TEST

1. Launch the X-CTU Software: (Start > Programs > Digi > X-CTU)
2. Under the “PC Settings” tab [Figure 2], select the PC serial COM port that will be used. The standard COM port for the 9-pin serial port is COM 1. The USB ports will be labeled as Digi PKG-U Serial Port Adapters and are assigned a number based on your PC's settings.
3. Verify that the baud rate and data settings match the internal settings of the radios. The default settings for the radios are Baud Rate: 9600, Flow Control: NONE, Data Bits: 8, Parity: NONE, and Stop Bits: 1.
4. Select the “Range Test” tab [Figure 3].
5. (Optional) Check the “RSSI” checkbox to enable Received Signal Strength Indicator. The RSSI value indicates the signal strength of the last packet that the radio received.
6. Click “Start” to begin the range test.
7. Move the remote away from the base to find the maximum range of the wireless link.
8. Click “Stop” to end the range test.

## EXTEND THE NETWORK

1. Restart the Range Test.
2. Move the remote further away from the base until the signal is lost.
3. Assemble and power on another module and interface board.
4. Place this radio halfway between the remote and the base.

The intermediate radio bridges the gap between the remote and the base and reestablishes communication. The network has “self-healed” by redirecting communications as soon as a pathway becomes available. The radios are configured for broadcast mode so they can route information and communicate with one another automatically.

**TIP:** Range test works best if the user attaches the USB interface board to a mobile laptop and increases the distance between the base and the remote while monitoring the signal strength on the laptop monitor.

Figure 2. PC Settings Tab

The baud rate needs to match the BD parameter in the radios in order for X-CTU to communicate correctly with the radios. The default is 9600 baud.

Port →

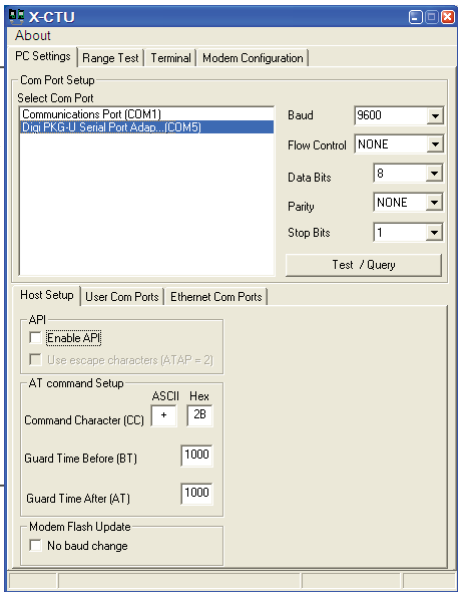
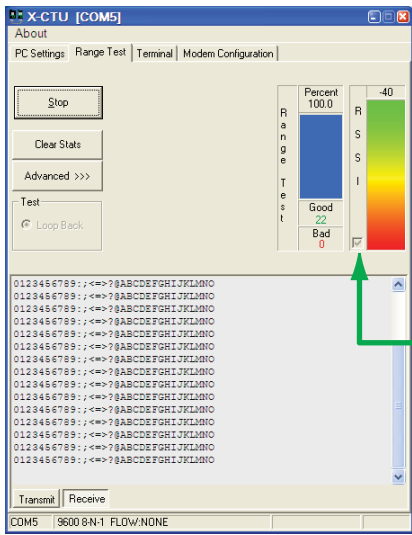


Figure 3. Range Test Tab



RSSI checkbox  
"Received Signal Strength Indicator"

(Packet Information)

# Explore Advanced Configurations

## RF MODULE CONFIGURATION

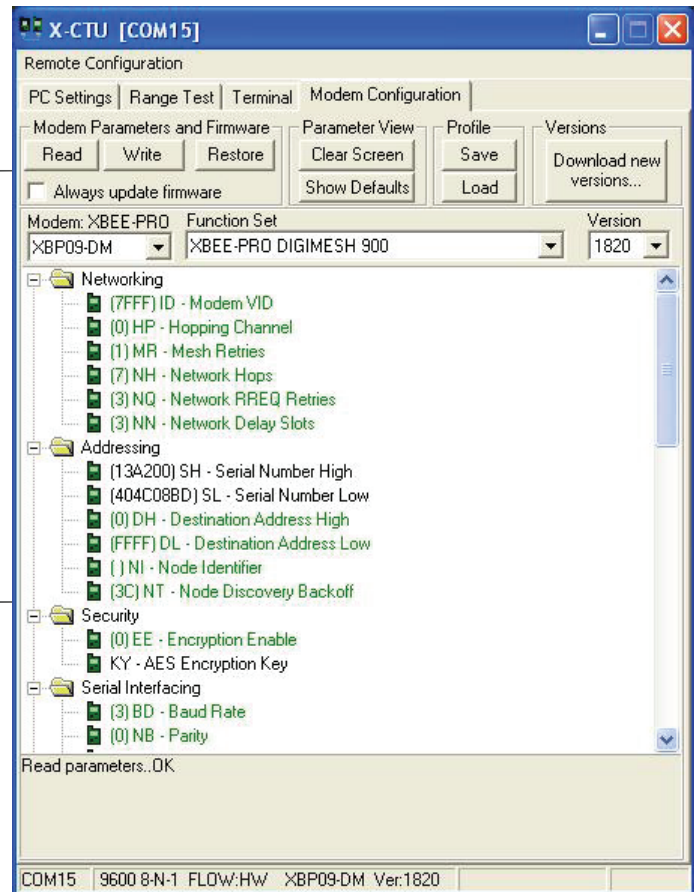
To configure RF module parameters:  
On the X-CTU "Modem Configuration" tab, click "Read." Select any of the module parameters you wish to change (e.g. Hopping Channel, Retries, Sleep Mode, etc.) and type in or select the desired value. Then click "Write" to save the changes to non-volatile memory [Figure 4]. If you want to direct a message to particular node, you can set the DL/DH to the SL/SH of that node.

This is one of several configuration methods. Refer to the product manual for more information. To restore the module back to defaults, click "Restore."

NOTE: All the devices must have the same Modem VID to operate in the same network.

Figure 4. Radio Configuration

Once the radio has been "Read", a list of configurable parameters will be displayed. The parameters listed in green are still set to default. Those in blue have been changed. The parameters shown in black are listed for informational purposes and cannot be changed.

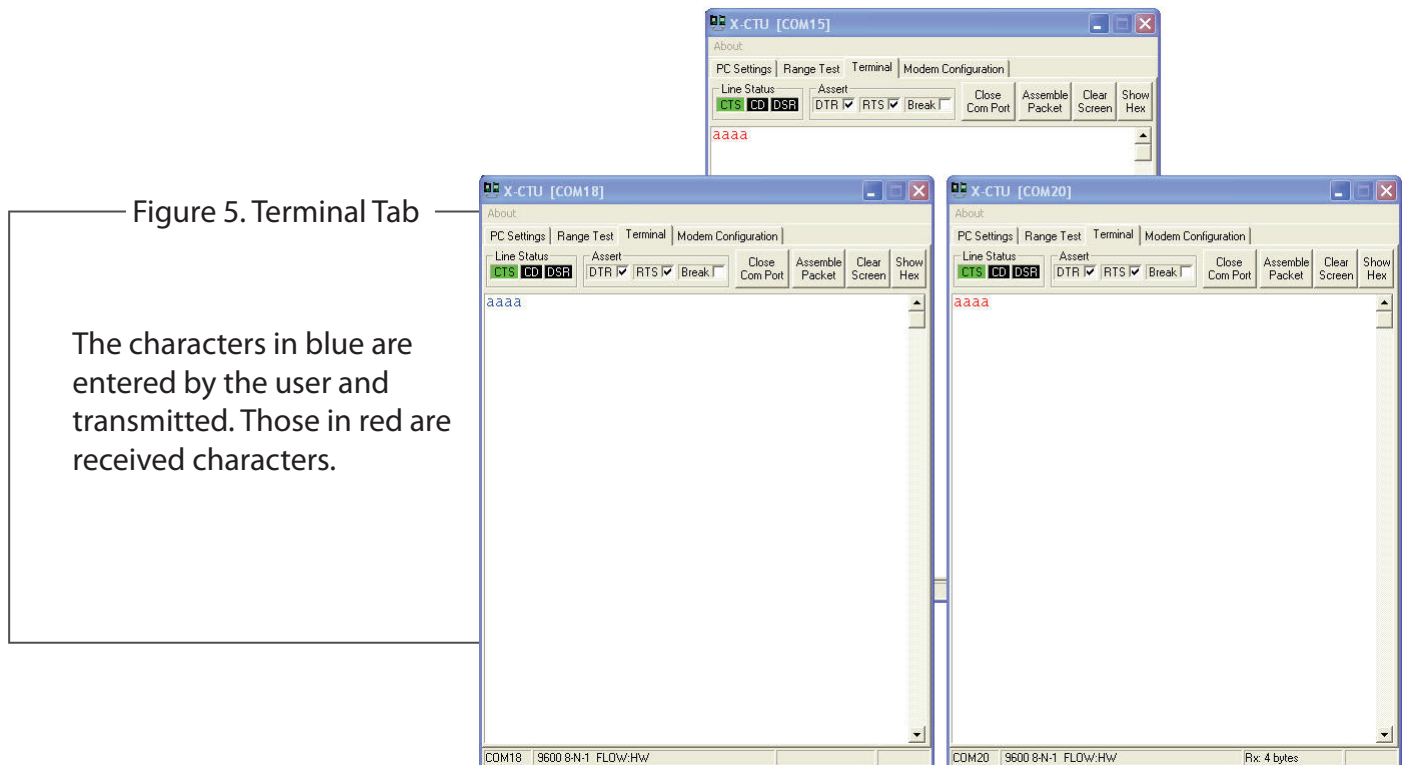


## CONFIGURE SLEEPING MODULES

The XBee's can be configured quickly and easily for synchronous sleep. Using the X-CTU software downloaded earlier, you can set up this simple example illustrating the XBee's sleeping capabilities.

1. Launch X-CTU and select the corresponding COM Port.
2. Change the settings under the PC Settings tab to Baud Rate: 9600, Flow Control: HARDWARE, Data Bits: 8, Parity: NONE, and Stop Bits: 1.
3. Click on the Modem Configuration tab.
4. Click "Read".
5. Scroll down until you find the "Sleep Commands" section.
6. Set the Sleep Options (SO) parameter to 1 on one of your radios. This sets it to be the Preferred Sleep Coordinator. The preferred sleep coordinator controls the synchronization of the network. This radio sends out a pulse to tell the others in the network when to sleep.
7. Set the Sleep Time (SP) parameter to the hexadecimal value 3E8 (10 seconds).
8. Set the Sleep Mode (SM) to 4-CYCLIC.
9. Then, click "Write".

10. Connect another XBee to your computer (USB or RS-232).
11. Open another X-CTU window and select the corresponding COM port for this new radio.
12. Set SP to 3E8 in hex and SM to 4-CYCLIC and click "Write".
13. Repeat with a third module/interface board assembly.
14. Go to the Terminal tab in all three instances of X-CTU. After a couple of cycles, you will see the CTS lines asserting and de asserting synchronously as all the radios cycle in and out of sleep.
15. Type in some characters while the radios are awake (CTS is on). The UART is active when CTS is asserted. [Figure 5]



## CONFIGURE REMOTE MODULES

These can also be configured "over-the-air" using X-CTU. This can be done through the Modem Configuration tab using the Remote Configuration feature at the top of the window. [Figure 6].

Click "Open Com Port" and "Discover" from the menu bar at the top of the window. A list of nodes in the network will populate the screen. By selecting a particular node from the list, you can interact with it as if it was connected to the PC directly.

NOTE: Unless you use the Remote Configuration feature in X-CTU, you will only be changing the parameters of the device connected to the PC. You can also configure your remote radios by connecting the RS-232 board to the PC using the included serial cable or swapping the embedded module to your already connected USB interface board.

Figure 6. Remote Configuration

The screenshot shows a window titled 'Network [COM15]' with a menu bar containing 'Close Com Port', 'Discover', 'Node List', and 'Network Settings...'. Below the menu bar, it displays '#Nodes 3 #End Nodes 0'. A table lists the discovered nodes:

Address	Node Identifier	Type	Short Address	Profile
13A200404C08BD		Router	FFFE	
13A200404C08BF		Router	FFFE	
13A200404C08BE		Router	FFFE	

The screenshot shows the 'X-CTU [COM15]' Remote Configuration window. It has tabs for 'PC Settings', 'Range Test', 'Terminal', and 'Modem Configuration'. The 'Modem Configuration' tab is active, showing 'Modem Parameters and Firmware' (Read, Write, Restore), 'Parameter View' (Clear Screen, Show Defaults), 'Profile' (Save, Load), and 'Versions' (Download new versions...). Below this, it shows 'Modem: XBEE-PRO', 'Function Set: XBEE-PRO DIGIMESH 900', and 'Version: 1820'. A tree view on the left lists configuration categories: Networking, Addressing, Security, and Serial Interfacing, with various parameters like ID, HP, MR, NH, NQ, NN, SH, SL, DH, DL, NI, NT, EE, KY, BD, and NB.

# CHANGE FIRMWARE VERSION

These modules can also be setup for multipoint communications. In some cases, a multipoint solution may be a better option. Point to multipoint is better for networks not needing routing capabilities. This topology also has more predictable timing and faster throughput. If you wish to try multipoint mode, you can simply load different firmware on your XBees.

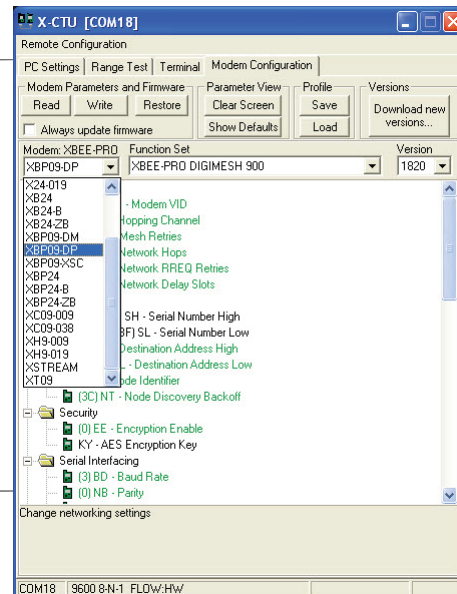
X-CTU is used to load different firmware on the radios.

1. Launch X-CTU and select the corresponding COM Port.
2. Set the PC settings back to default. (Baud Rate: 9600, Flow Control: NONE, Data Bits: 8, Parity: NONE, Stop: Bits 1)
3. Click on the Modem Configuration tab.
4. Select the modem type. The point to multipoint firmware for the XBee PRO 900 modules is XBP09-DP. The XBee 802.15.4 modules use XB24 firmware for point to multipoint communication and the XBee PRO 802.15.4 modules use XBP24 firmware. [Figure 7]
5. Choose the function set and firmware version desired.
6. Click the “Show Defaults” button. This helps to avoid out of range errors since some parameters have different limits based on the firmware type.
7. Check the “Always update firmware” box.
8. Click “Write”.

If you have further questions, please contact technical support.  
(<http://www.digi.com/support/eservice/login.jsp>)

Figure 7. Point-to-Multipoint Firmware

The function set that automatically loads is the standard point to multipoint one. The default firmware loaded is the newest version in X-CTU's database.



## Contact Digi International

Toll-free phone U.S.A. & Canada: (866) 765-9885  
Worldwide: (801) 765-9885

Live chat: [www.digi.com](http://www.digi.com)

Online support: <http://www.digi.com/support/eservice/login.jsp>