HOW TO PERFORM A RANGE TEST

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What is a range test?

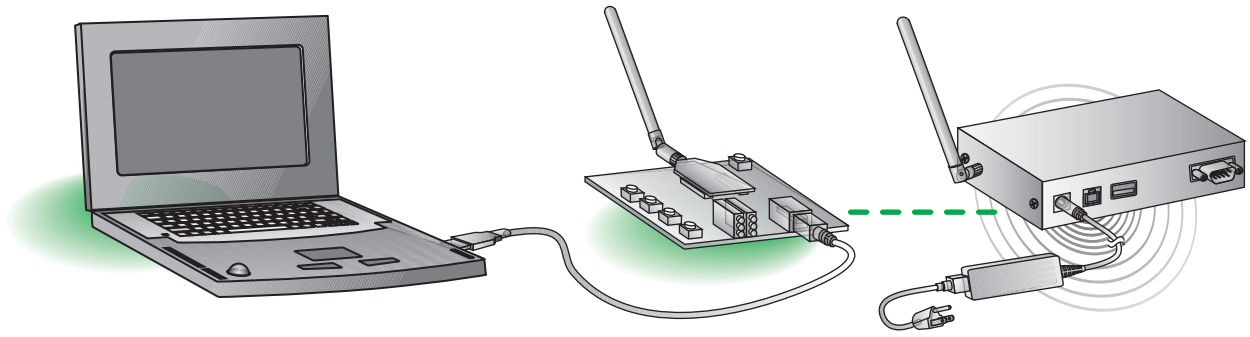
A range test demonstrates the real-world RF range of the XBee embedded modules in the Drop-in Networking Professional Development Kit.

This range information is useful when planning for and deploying an actual network.

Equipment used in range test

The range test uses this equipment:

- PC
- USB interface board, connected to the PC via the USB cable
- Digi gateway



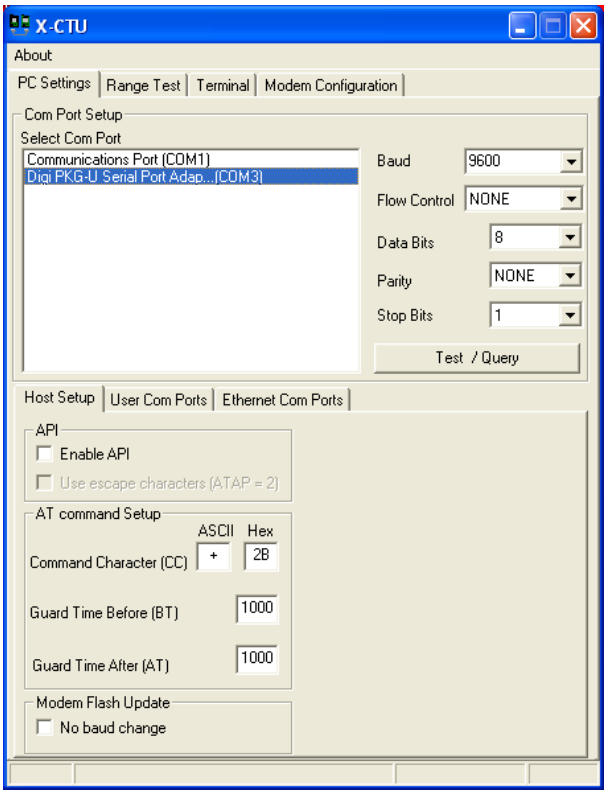
Install and start X-CTU software

X-CTU is a software tool which is used for configuring XBee modules and for running a range test.

To install X-CTU:

1. Download and install the latest version of X-CTU from **www.digi.com/xctu**.
2. When prompted to check the Web for updates, ensure your PC is connected to the Internet and click **Yes**.
3. When installation completes, to start X-CTU, select **Start > Programs > Digi > X-CTU**.

The X-CTU software interface is displayed.



X-CTU user interface

The X-CTU interface has several tabs:

- **PC Settings**: Sets up PC serial COM ports to interface with the XBee module.
- **Range Test**: Tests the range of wireless links under varying conditions.
- **Terminal**: Reads and sets communications parameters on the XBee module and monitors data communications.
- **Modem Configuration**: Reads and sets configuration parameters on the XBee module.

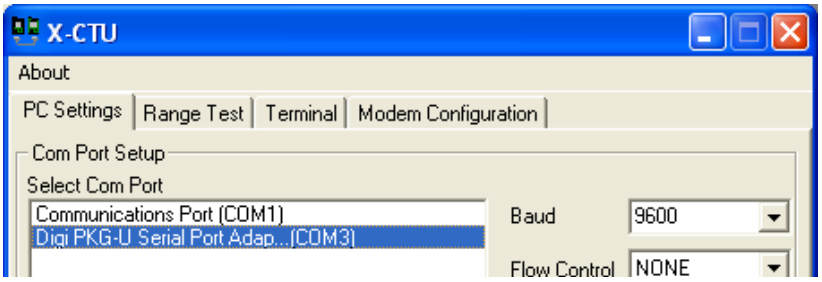
For more information on X-CTU functions, features, and controls, see the X-CTU Configuration Test Utility Software manual, available for downloading at **www.digi.com**.

Discover nodes

This kit demonstrates discovering nodes from a variety of interfaces. In this first instance, node discovery is done through X-CTU.

This procedure involves entering command mode and sending AT commands. If you are unfamiliar with either concept, see the Command Mode section of the XBee module's product manual.

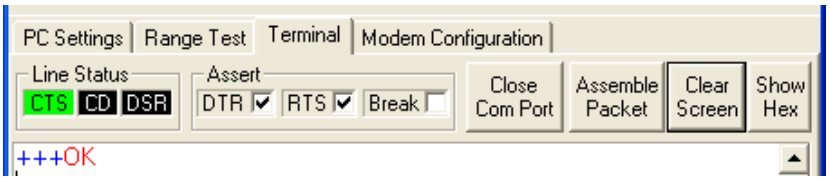
1. In the X-CTU interface, on the **PC Settings** tab, select the COM port to which the USB interface board is attached; this is the COM port created during USB driver installation. Select **DIGI-PKG-U (Serial Port Adap...)**



2. On the **Terminal** tab, enter command mode. This mode eliminates over-the-air communications for the XBee module, and allows internal communication with the XBee module parameters. There is a one-second "guard time" before and after entering command mode, and a ten-second timeout.

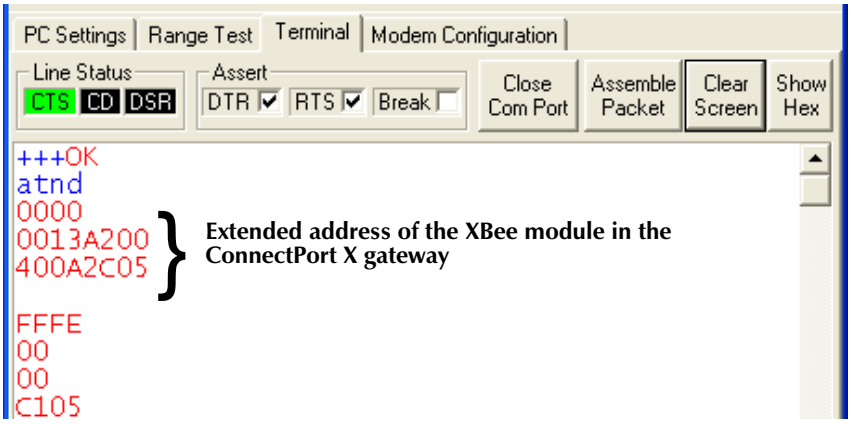
   To enter command mode, enter **+++** with no carriage return.

   When command mode is entered, an **OK** message is displayed.



3. Enter the **atnd** (Node Discover) command followed by a carriage return. This command discovers and reports all modules on its current operating channel and PAN ID (ID parameter). All powered nodes that have joined the network respond to this command with their device information.

   One node should be returned: the gateway. The gateway is identified by the **extended address** of its integrated XBee module. Every XBee device will have a unique extended address. In X-CTU, this address is split over two lines, as shown:

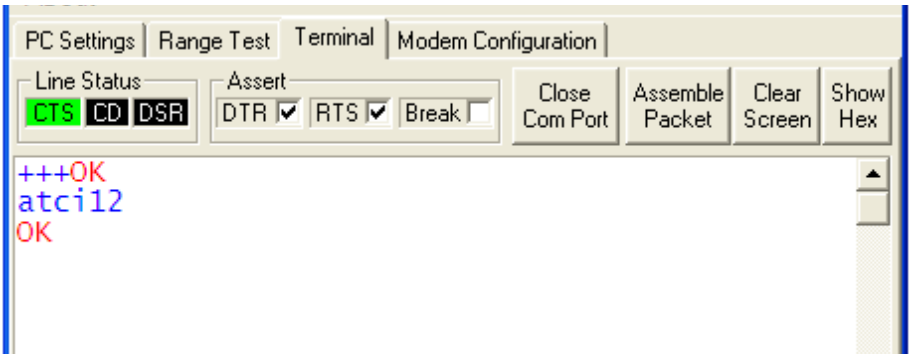


   Note: If you encounter problems in this step, there is a way to force the XBee module on the interface board to leave any XBee network it may have joined and attempt to join an XBee network. Press the Ident/SW1 button on the USB interface board four times to attempt to associate to the gateway. Association is indicated by a blinking red LED. See "LEDs and buttons" on page 6.

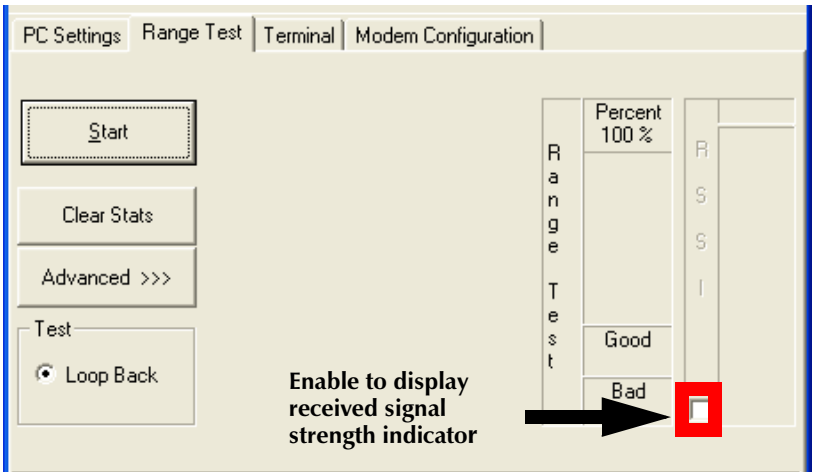
Run range test

1. On the **Terminal** tab, re-enter command mode by typing **+++** with no carriage return.
2. Configure the XBee to send loopback packets to the gateway. Enter this command:

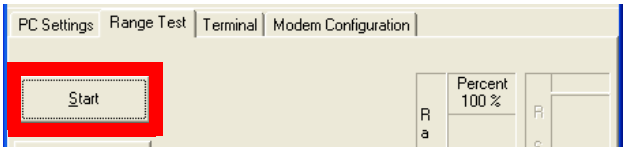
   atci12



   The **atci12** command (Destination Cluster ID=12, Loopback) sets the cluster ID on packets transmitted from the XBee module. Packets sent with this cluster ID value are sent back to the originator when received by the recipient (the XBee module in the gateway).
3. Click the **Range Test** tab.
4. Enable the checkbox in the RSSI part of the display to display the received signal strength indicator.

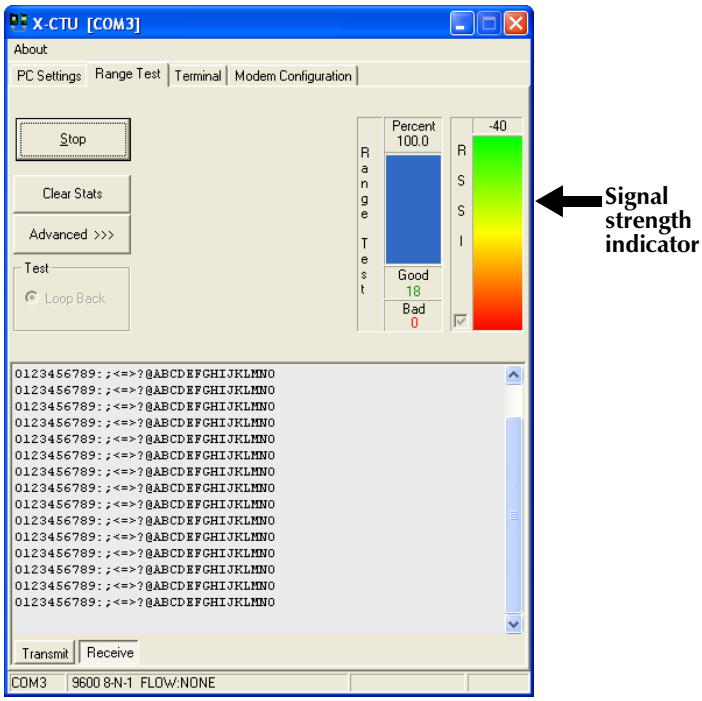


5. Click the **Start** button to start the range test.



The range test runs indefinitely until you click **Stop**.

As the test runs, the **0123…LMNO** data is the default data packet that is transmitted and received between the radios. The **Percent** field indicates true link quality by showing the percentage of successful packet transmissions. If the **RSSI** checkbox is enabled, the signal strength of packets received by the XBee module on the USB interface board is displayed.



6. Test the range of the wireless link between the XBee modules on the interface board and gateway:
   - Move the PC and USB interface board away from the gateway, or remove the antenna from the USB interface board's XBee module.
   - Click **Start** again.
   - Observe how the signal strength indicator changes.
7. Click **Stop** to end the range test.

What does this test show you?

The range test gives a sense of the range of the kit's XBee modules. When deploying an actual network, multiple range tests are recommended to test for varying conditions in your application. If a range test indicates there is not enough range in an area where network devices must reside, you can install XBee Wall Routers to extend the range. The XBee Wall Router is designed primarily to "patch" areas within an XBee network where signal erosion or loss occurs due to distance limitations or interference.

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