

Quick Start Guide

XBee & XBee-PRO Radio Modules on CB-1 peripheral board

Document Revision: 1.01

Date: 30th April, 2008



BiPOM Electronics

16301 Blue Ridge Road, Missouri City, Texas 77489
Telephone: 1-713-283-9970. Fax: 1-281-416-2806
E-mail: info@bipom.com
Web: www.bipom.com

1. Introduction

This Quick Start Guide provides step-by-step instruction on:

- Preparing two Zigbee nodes based on XBee Zigbee radio modules, CB-1 peripheral boards and MINI-MAX/51 single board computers
- Upgrading Xbee firmware to the latest version
- Setting up wireless links between the two nodes.

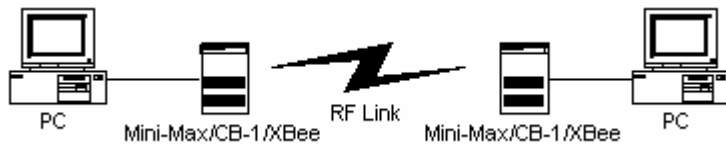


Figure 1

2. XBee/XBee-PRO OEM Radio Module Basics

The XBee and XBeePRO OEM Radio Modules are manufactured by Maxstream. These modules meet IEEE 802.15.4 standards and support wireless sensor networks. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other.

XBee Specifications:

- Indoor/Urban: up to 100 feet (30 meters)
- Outdoor line-of-sight: up to 300 feet (100 meters)
- Transmit Power: 1 mW (0 dBm)
- Receiver Sensitivity: -92 dBm

XBee-PRO Specifications:

- Indoor/Urban: up to 300 feet (100 meters)
- Outdoor line-of-sight: up to 1 mile (1500 meters)
- Transmit Power: 100 mW (20 dBm) EIRP
- Receiver Sensitivity: -100 dBm

RF Data Rate: 250,000 bps

3. Software setup

3.1) Download and install the latest release of the 8051 Development System from <http://www.bipom.com/8051dev.php>

Development software components include Micro-IDE, Micro C Compiler, Simulator and Debugger. Serial Number is 1 for DEMO version.

3.2) Download and install the FREE X-CTU utility from <http://www.maxstream.net/>
For example, http://ftp1.digi.com/support/utilities/40002637_A.exe

4. Hardware setup

4.1) Required Components

- 2 pieces of OEM RF Modules (any combination of XBee & XBee-PRO Modules)
- 2 pieces of CB-1 peripheral boards
- 2 pieces of MINI-MAX/51 single board computers
- 2 pieces of special NULL-modem cables to configure the nodes using the X-CTU utility

Please read <http://www.bipom.com/hyperterminal.php> for more details.

- 2 pieces of 6VDC Adapters
- 2 PC with serial ports (One PC with two serial ports can be used for testing)

4.2) Install JP4 and JP6 jumpers on both CB-1 boards.

4.3) Install XBee/XBeePRO modules to both CB-1 boards.

4.4) Plug the CB-1 boards into Expansion connectors of MINI-MAX/51 boards.

4.5) Connect a special serial cable between COM1 serial port of first PC and first MINI-MAX/51.

4.6) Connect a special serial cable between COM1 serial port of second PC and second MINI-MAX/51 board. If the setup is based on a PC with two serial ports, then COM2 can be connected to the second MINI-MAX/51.

4.7) Power both MINI-MAX/51 boards from 6VDC adapters.

5. Firmware setup

5.1) Download the 8051 firmware project that includes HEX file from <http://www.bipom.com/support/Xbee.zip>.

The 8051 development system provides the same project under C:\bipom\devtools\MicroC\Examples\8051\medium\cb1\Xbee folder.

5.2) Unzip Xbee.zip to any folder on the hard drive; for example, C:\Xbee

5.3) Run Micro-IDE and open cb1xbee.prj project

5.4) Press “Download” icon button to download the pre-compiled firmware (cb1xbee.hex) to both MINI-MAX/51 boards.

If you face any problems downloading the firmware, please visit http://www.bipom.com/mm51c2_faq.php for more information.

6. How does a PC communicate with an XBee/XBeePRO module on CB-1 board ?

The XBee/XBee-PRO OEM Radio Modules interface to a host device through a logic-level (CMOS/TTL) asynchronous serial port. Through its serial port, the module can communicate with any logic and voltage compatible UART. CB-1 peripheral board provides an SC16IS762 IC that has an SPI bus interface to UART. The 8051 micro-controller on the MINI-MAX/51 board communicates with the SC16IS762 via SPI of Expansion connector. MINI-MAX/51 provides a standard RS232 port to connect to a PC. Figure 2 shows the details of the interface.

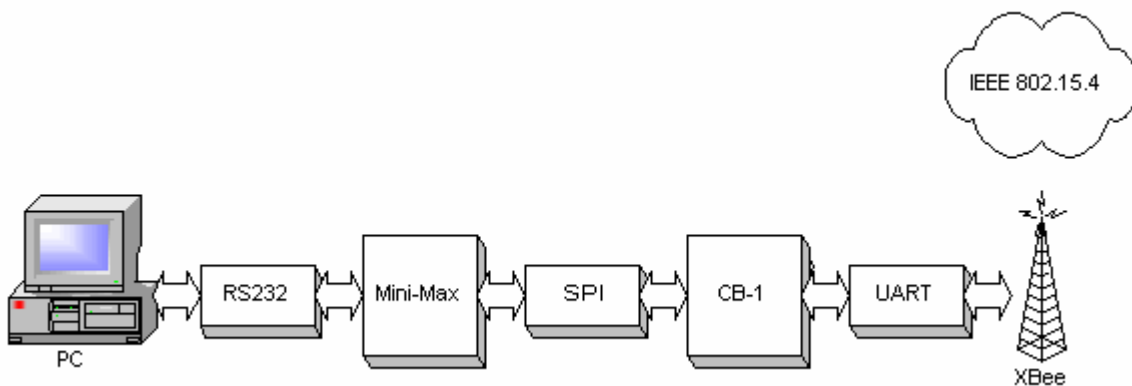
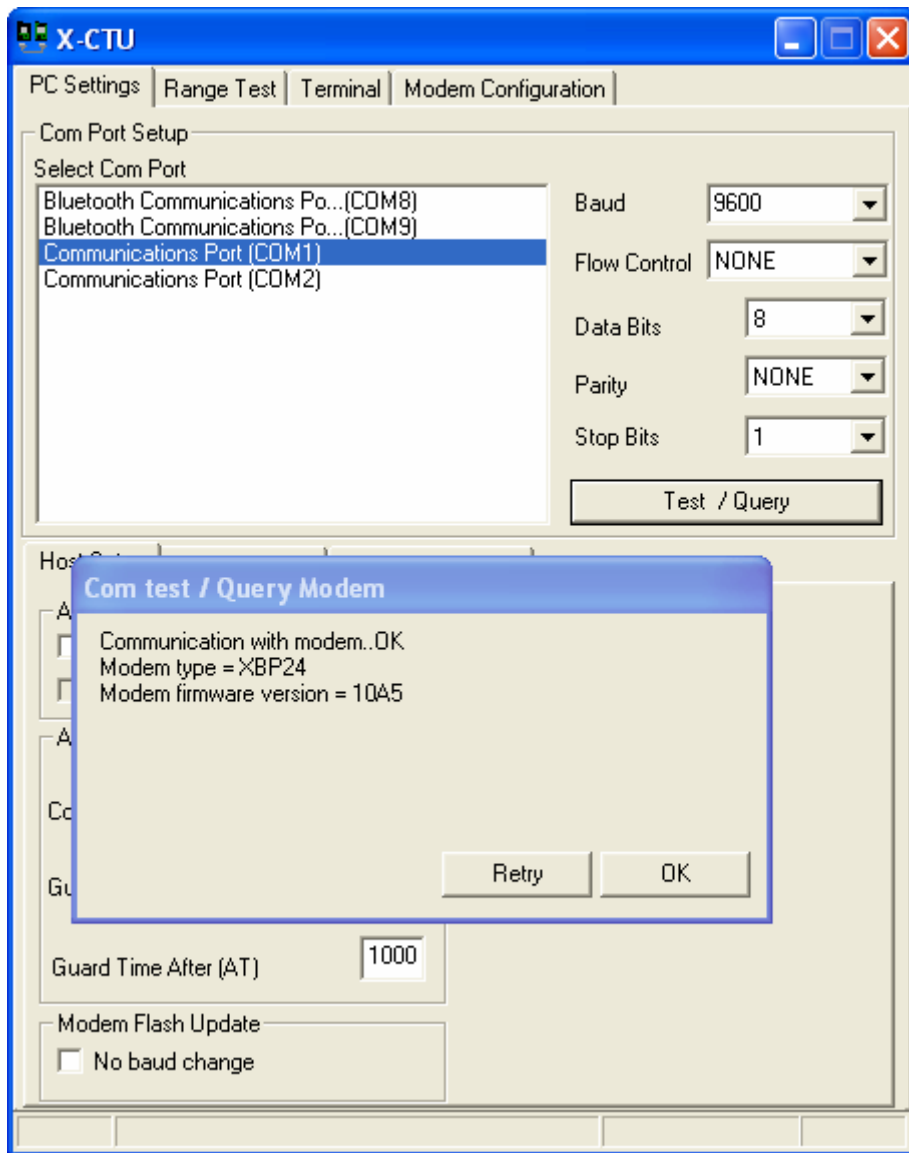


Figure 2.

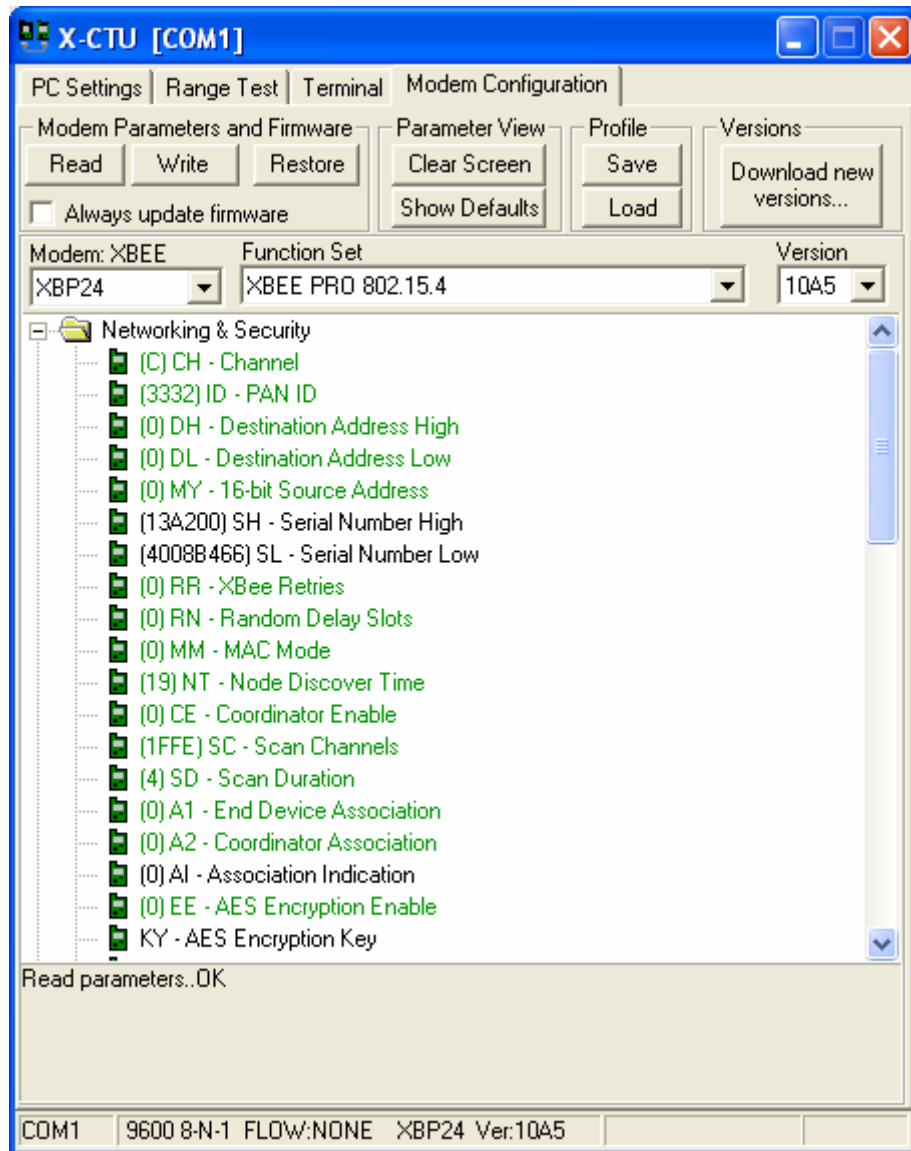
7. Configure an XBee/XBeePRO module on CB-1 board

7.1) Run the X-CTU utility. Select Communications Port (COM1) and click the Test/Query button.



If the hardware setup is built correctly, it will display “Communication with modem..OK”

7.2) Go To Modem Configuration and click the Read Button (the radio modules are referred to as Modem):



7.3) Edit the following critical parameters:

Channel **C**

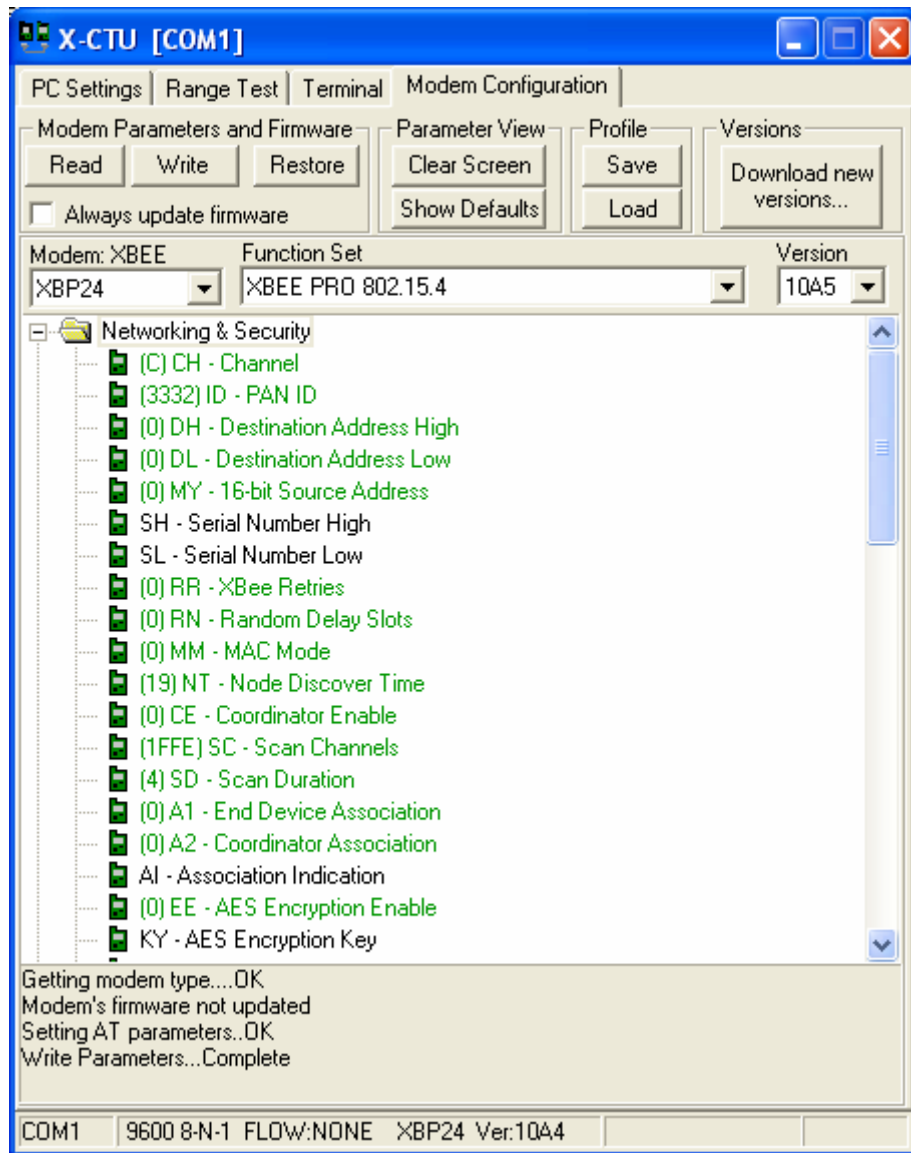
PAN ID **3332**

Destination Address High **0**

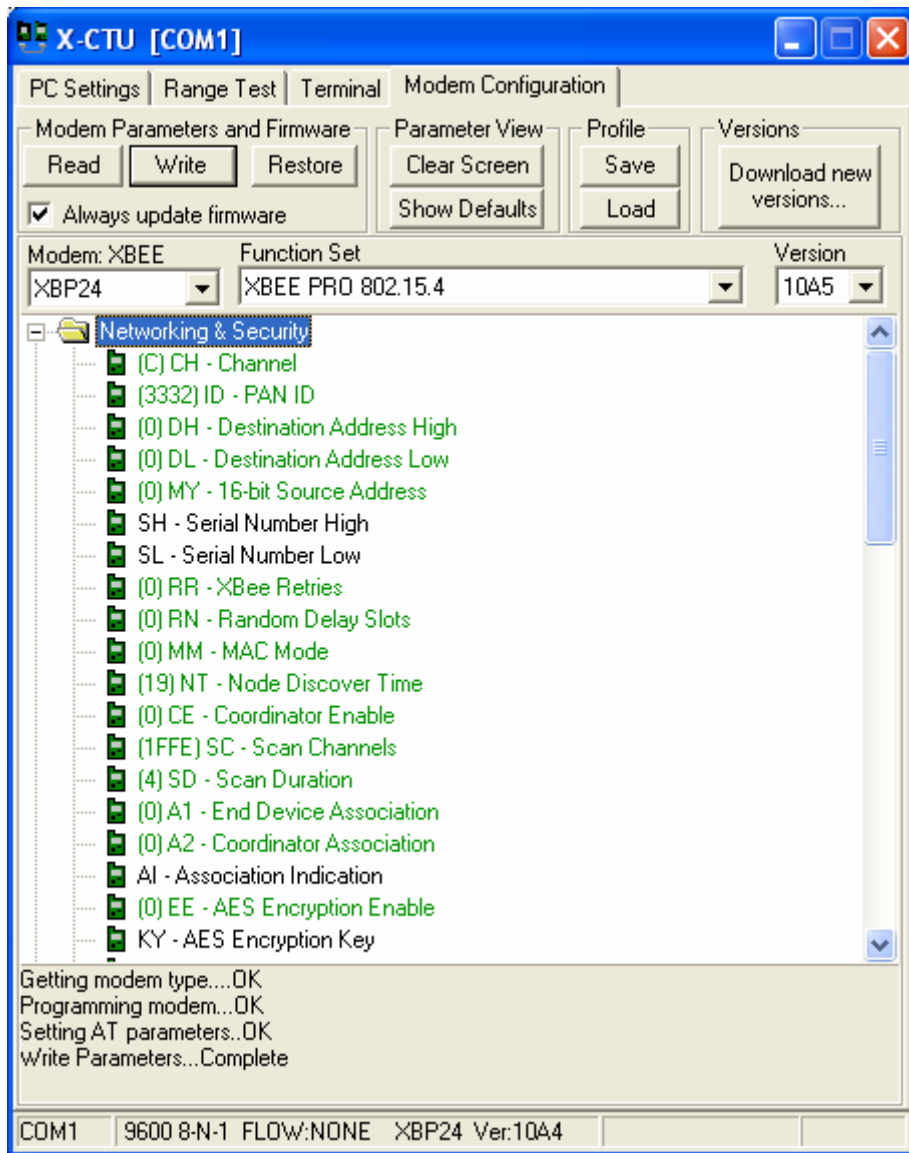
Destination Address Low **0**

16-bit Source Address **0**

Uncheck “Always update firmware” and click the Write Button:



7.4) Please check the version. If the newest version is present under a pull-down list, it is possible to update a modem firmware. Select the necessary version, check “Always update firmware”, and click the Write button:



IMPORTANT NOTE1: Be careful when updating the modem firmware. If the board loses link or power during this procedure, the firmware will be corrupted and the modem will not respond anymore. To repair the modem, it will be necessary to connect an XBee/XBeePRO module to a PC's COM port using a special RS232 converter. TXD, RXD, RTS, DTR lines should be connected properly.

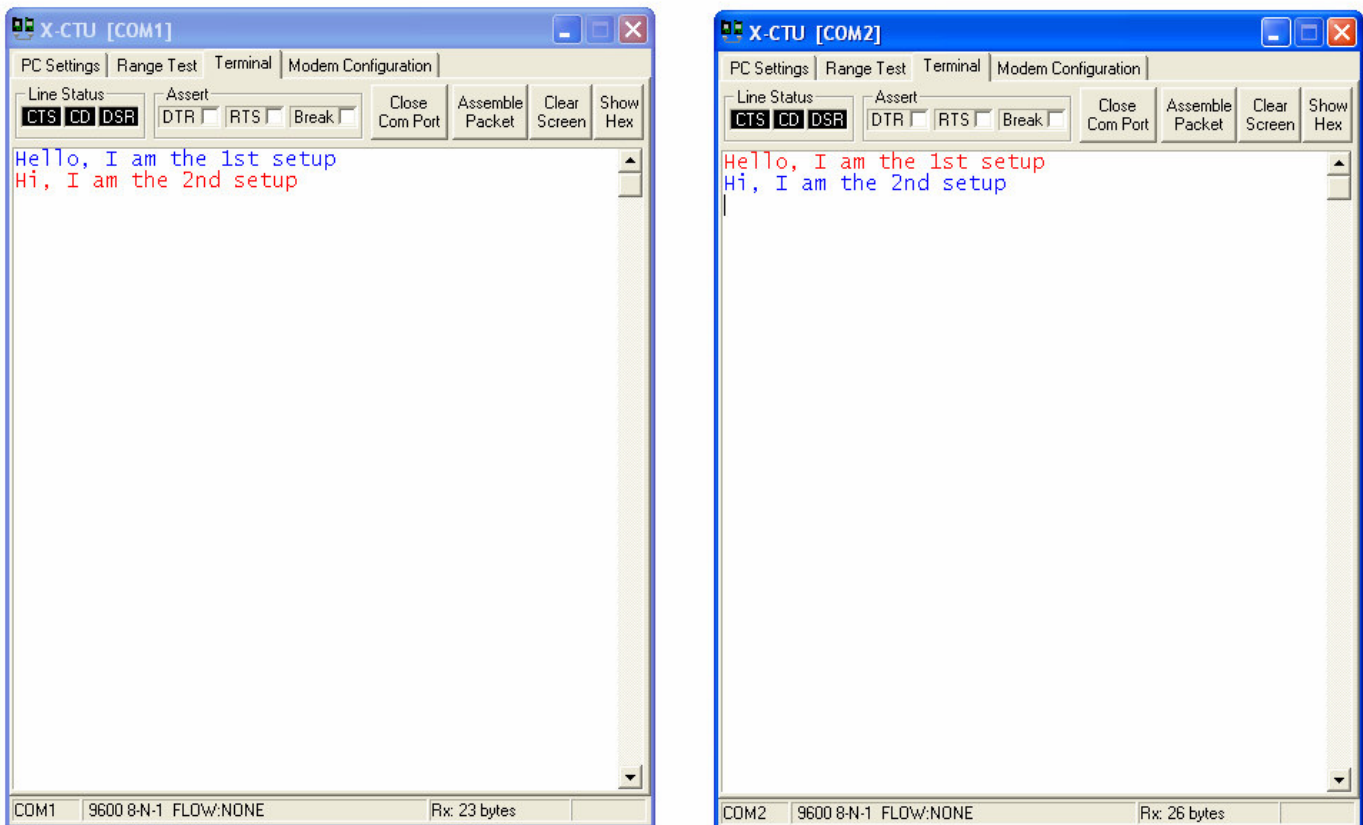
IMPORTANT NOTE2: X-CTU utility does not work reliably with some USB-to-Serial COM port adapters. Therefore, in some cases it will be impossible to upgrade the modem's firmware. Configuration will work in any case.

8. Establish Radio connection between 2 nodes

If the two nodes are configured properly, the radio connection will be established automatically.

Run two sessions of X-CTU and go to Terminal. Try to type any messages on two terminal windows.

Echo will appear on the opposite window through the radio link:



More information about Xbee/XBeePRO modules and the X-CTU utility can be obtained from www.maxstream.net site:

http://ftp1.digi.com/support/documentation/xctummanual_a.doc

http://ftp1.digi.com/support/documentation/manual_xb_oem-rf-modules_802.15.4_v1.xAx.pdf

http://ftp1.digi.com/support/documentation/quickstartguide_xbee_oem_developmentkit.pdf

MaxStream and Digi are registered trademarks of Digi International.