



# **XBee<sup>®</sup> Adapters, Routers, and Sensors User's Guide**

## **XBee 802.15.4 Adapters:**

- XBee RS-232 Adapter**
- XBee RS-232 PH (Power Harvester) Adapter**
- XBee RS-485 Adapter**
- XBee Analog I/O Adapter**
- XBee Digital I/O Adapter**
- XBee Sensor Adapter**
- XBee USB Adapter**
- XStick 802.15.4**

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This section includes information that applies to all XBee<sup>®</sup> Adapter products.

## About this guide

This guide describes the features and functions of XBee Adapter products, including connection and setup information, pinouts, configuration, data retrieval, and LEDs and buttons.

This section provides general information that applies to all products.

## Scope

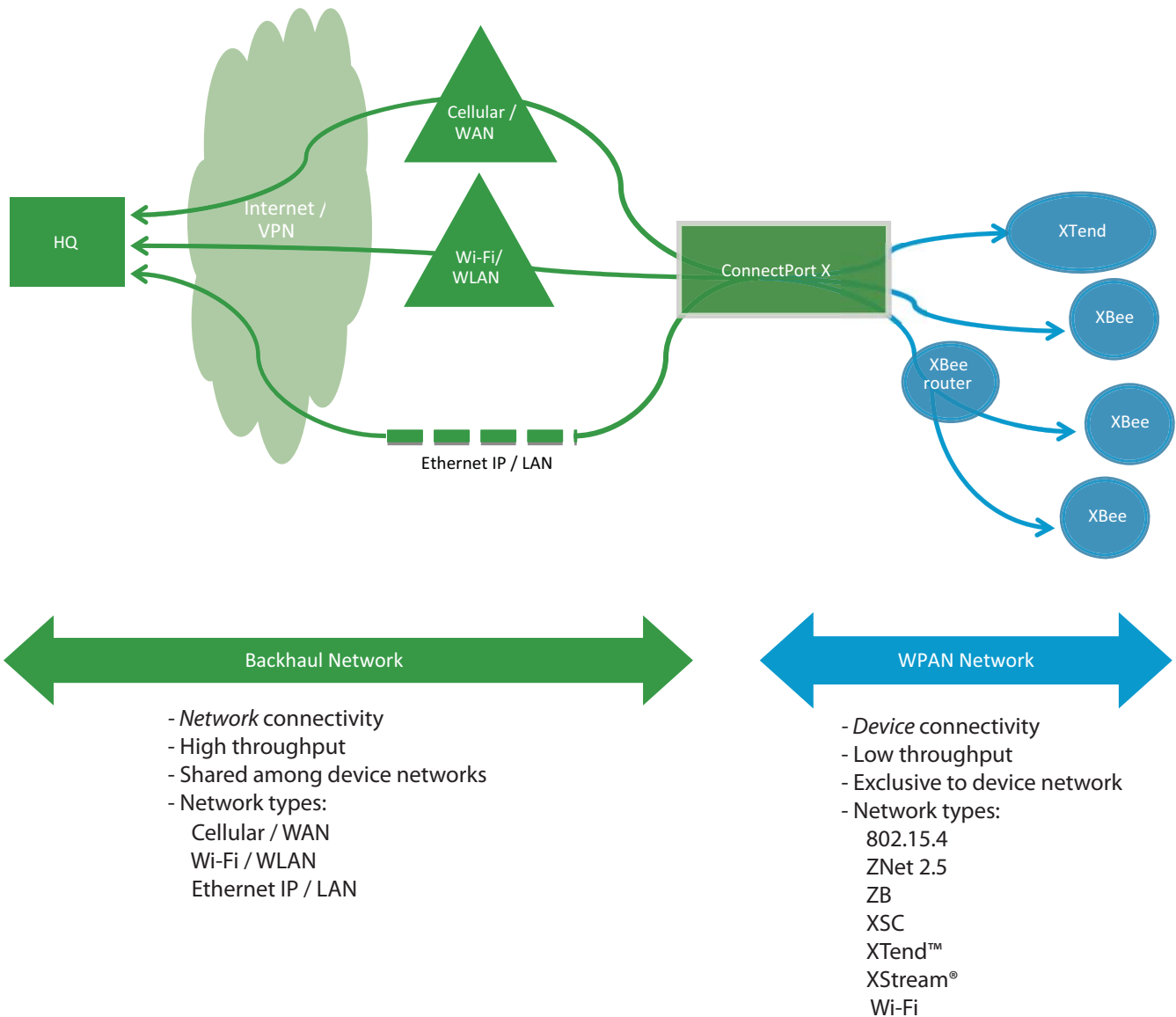
This guide covers all XBee 802.15.4 adapter products.

## Compatibility Note

Two series of XBee and XBee-PRO<sup>®</sup> adapters are offered: ZNet 2.5 and 802.15.4. Though overall performance and product specifications are largely similar, the two series are built on distinct and non-compatible technology platforms. Thus, users must standardize on one series or the other for operability. The same is true for compatibility with the ConnectPort X gateways. ZNet 2.5 XBee adapters are compatible only with ZNet 2.5 gateways, while 802.15.4 XBee adapters are compatible only with 802.15.4 gateways.

### Drop-in Networking definitions

This guide uses several terms to describe the networks, connectivity, and data communications involved in Drop-in Networking. The figure shows a ConnectPort X device and its role in Drop-in Networking connectivity.



**Drop-in Networking:** Involves *end-to-end device-to-network connectivity*, commonly through gateways, routers, adapters, and embedded modules.

**Backhaul network:** Involves *network connectivity*, commonly through LAN (Ethernet), WLAN (Wi-Fi), or WAN (cellular).

**WPAN (Wireless Personal Area Network):** Involves *end device connectivity*, commonly through ZigBee, 802.15.4, and many other public or proprietary technologies.

## Mounting orientation

All XBee adapters can be mounted in any orientation.

## Warranty exception for batteries

Some XBee adapters ship with alkaline batteries that must be replaced by the user when discharged and are not covered under the terms and conditions of the Digi warranty.

Lithium batteries must be replaced by qualified service personnel.

## Additional reference material

For additional information about the features and functions of XBee RF modules in XBee Adapters, see these documents.

### **XBee Adapters data sheet**

[http://www.digi.com/pdf/ds\\_xbeeadapters.pdf](http://www.digi.com/pdf/ds_xbeeadapters.pdf)

### **RF Module Product Manual**

Describes the RF module embedded in your product, including features, modes of operation, 802.15.4 network fundamentals, and commands for configuring, controlling, and retrieving data from the RF module.

For a preliminary version of the XBee 802.15.4 module product manual, please contact Digi Support and request a copy of Digi Part Number **90000982\_A**.

### **ConnectPort X Family User's Guide (90000832)**

[http://ftp1.digi.com/support/documentation/90000832\\_a.pdf](http://ftp1.digi.com/support/documentation/90000832_a.pdf)

When XBee Adapter products are deployed in Drop-in Networks, a ConnectPort X gateway serves as a coordinator and configuration and monitoring interface for your adapter/router/sensor product. See this guide to learn more about ConnectPort X features and functions.

### **Related ConnectPort X documentation**

<http://www.digi.com/support/supporttype.jsp?tp=3>

An extensive list of related documentation for ConnectPort X gateways is available on digi.com; go to **Support > Documentation** and select the appropriate ConnectPort X model.

**Digi Python Custom Development Environment page**

<http://www.digi.com/technology/drop-in-networking/python.jsp>

**Digi Python Programming Guide (90000833)**

[http://ftp1.digi.com/support/documentation/90000833\\_b.pdf](http://ftp1.digi.com/support/documentation/90000833_b.pdf)

**Python Support Forum on digi.com**

<http://www.digi.com/support/forum/forum.jspa?forumID=104>

Python is a dynamic, object-oriented language for developing software applications, from simple programs to complex embedded applications. Python functions can be used to obtain data from attached and integrated sensors on XBee Adapter products.

The *Digi Python Programming Guide* introduces the Python programming language by showing how to create and run a simple Python program. It reviews Python modules, particularly those modules with Digi-specific behavior. It describes how to load and run Python programs onto Digi devices, either through the command-line or web user interfaces, and how to run several sample Python programs.

## Questions and technical support

For technical assistance with your product, contact Digi Technical Support at: **801-765-9885** or **877-912-3444**

or make an online support request at:

<http://www.digi.com/support/index.jsp>

## Overview

The XBee RS-232 Adapter provides short-range wireless connectivity to any RS-232 serial device, with available solutions for both ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, these off-the-shelf adapters provide instant wireless connectivity to existing RS-232 serial devices. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity.

## Power options

Depending on adapter model, there are several powering options.

### Alkaline battery model

This product can be powered by a 9-30VDC external power supply (see "Power requirements" on page 61) or by batteries. Use 3x1.5V "N" alkaline battery cells. To install batteries, insert a screwdriver in the slots in the side of the adapter case and twist to snap off the cover. Insert the batteries following the polarity diagram on the board.

### Lithium battery model

This product can be powered by a 3-6VDC external power supply or by 2/3 AA 3.6V lithium batteries and a 1/2 AA boost capacitor. Replacement batteries available for purchase; contact Digi at **952-912-3444** or **877-912-3444**.

## Connection and power-on

1. Connect the desired device to the RS-232 port of the adapter.
2. Connect the power supply to the adapter or insert batteries.



## Pinouts

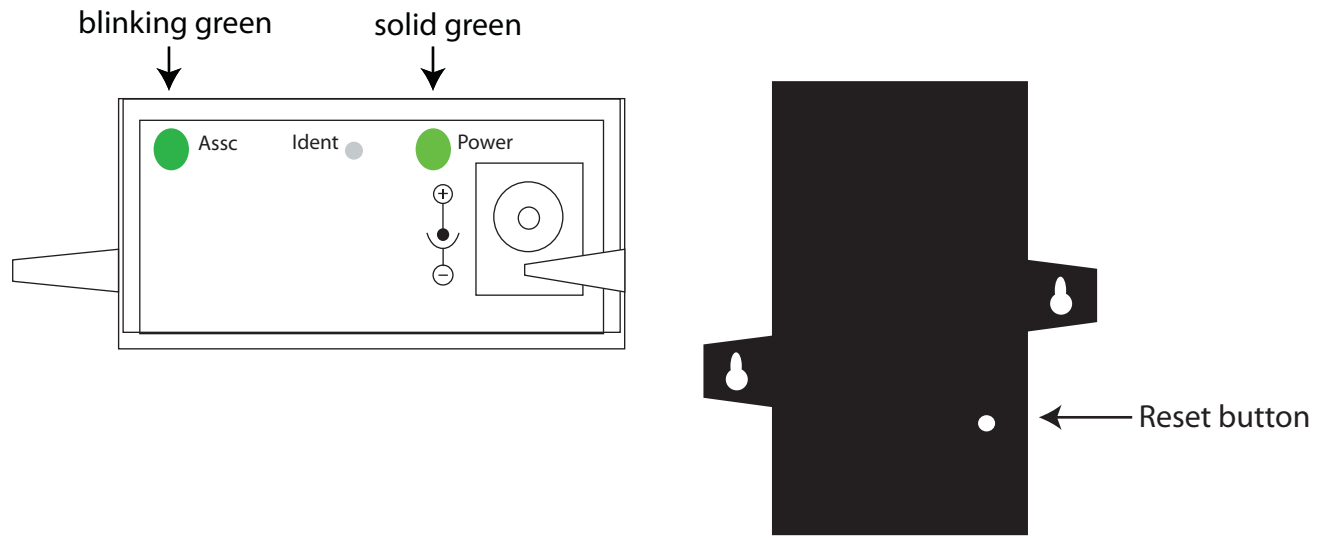
The RS-232 connector is an industry-standard DB9 male connector with a DTE configuration, similar to a PC serial port. Pinouts for the connector are:

Pin	Function	Data direction
1	CD	Input
2	RXD	Input
3	TXD	Output
4	DTR	Output
5	GND	
6	DSR	Input
7	RTS	Output
8	CTS	Input
9	+12VDC switched power out	Output

## Data retrieval

Retrieving data from XBee adapters is done by issuing a remote AT IS (Force Sample) command through the XBee API. The XBee API and AT IS command are described in detail in the RF Module's data sheet. AT IS commands can be issued via a Python program that is executed on the gateway. See also the *Product Manual* for the RF module and the *Digi Python Programming Guide*.

## LEDs and buttons



**Power LED:** Indicates that power is on. Illuminated only when adapter is connected to external power only, not when powered by batteries. Not available in lithium-battery models.

**Assc LED:** Indicates the adapter's 802.15.4 network association status.  
**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.

**Reset button:** Recessed button on underside of the adapter. Performs equivalent of a power-cycle. Use a small non-conductive tool with a blunt end to press gently and hold down button.

**Ident button:** Recessed button on power end of the adapter between **Assc** and **Power** LEDs. Performs multiple functions for identifying and configuring the adapter in a 802.15.4 network. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

Button press	Network association	Action
Single	Associated	Cannot wake module, but will cause adapter to remain awake for 30 seconds if pressed during a sleep interval, then sends a Node Identification broadcast transmission. All devices that receive this transmission will blink their Associate LED rapidly for 1 second.
	Unassociated	<p>Blinks a numeric error code returned by the ATAI (Association Indication) command on the Assc LED. The AI code indicates the cause of the join failure. See the 802.15.4 XBee module's Product Manual for descriptions of these codes.</p> <p><b>1 blink:</b> Active scan timeout.</p> <p><b>2 blinks:</b> Active scan found no PANs.</p> <p><b>3 blinks:</b> Active scan found PAN, but the Coordinator Allow Association bit is not set.</p> <p><b>4 blinks:</b> Active scan found PAN, but Coordinator and End Device are not configured to support beacons.</p> <p><b>5 blinks:</b> Active scan found PAN, but Coordinator ID (PAN ID) value does not match the ID of the End Device.</p> <p><b>6 blinks:</b> Active Scan found PAN, but Coordinator CH (Channel) value does not match the CH of the End Device.</p> <p><b>7 blinks:</b> Energy scan timeout.</p> <p><b>8 blinks:</b> Coordinator start request failed.</p> <p><b>9 blinks:</b> Coordinator could not start due to invalid parameters.</p> <p><b>10 blinks:</b> Coordinator Realignment is in progress.</p> <p><b>11 blinks:</b> Association request not sent.</p> <p><b>12 blinks:</b> Association request timed out - no reply was received.</p> <p><b>13 blinks:</b> Association request had an invalid parameter.</p> <p><b>14 blinks:</b> Association request channel access failure - Request was not transmitted - CCA failure.</p> <p><b>15 blinks:</b> Remote Coordinator did not send an ACK after Association Request was sent.</p> <p><b>16 blinks:</b> Remote Coordinator did not reply to the Association Request, but an ACK was received after sending the request.</p> <p><b>17 blinks:</b> [reserved].</p> <p><b>18 blinks:</b> Sync-Loss - Lost synchronization with a beaconing coordinator.</p> <p><b>19 blinks:</b> Disassociated - No longer associated to coordinator.</p>
Two	Associated	Not supported.
Four	Associated/ Unassociated	Performs an ATRE command to reset the parameters in the XBee module.

## XBee RS-232 PH Adapter

### Overview

The XBee RS-232 PH Adapter provides short range wireless connectivity to any RS-232 serial device, with available solutions for both ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, these off-the-shelf adapters provides instant wireless connectivity to existing RS-232 serial devices. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity

Using a powering mode known as power harvesting (PH), this adapter is powered by the connected host device through its RS-232 serial port.

### Power requirements

This product requires a fully functional serial port conforming to the RS-232C standard for optimal operation. It requires a sleep/wake duty cycle as part of its normal operation. An internal battery provides power when the adapter is operating, and recharges from the serial port when in sleep mode. The sleep/wake duty cycle requirements vary based on the current output of serial port

Serial ports that provide hard power of 5 to 14VDC on one or more pins allow the device to operate continually without a sleep/wake cycle.



**WARNING:** Do not use this adapter with serial ports with more than 14VDC output as they may cause the adapter to malfunction.

### Connection and power-on

Connect the adapter to the RS-232 port of the host device.

The adapter's power comes from the host's serial port.

## Pinouts

The RS232 connector is an industry-standard DB9 male connector with a DTE configuration, similar to a PC serial port. Pinouts for the connector are:

Pin	Function	Data direction
1	CD	Input Also used for parasitic power input from host.
2	RXD	Input Also used for parasitic power input from host.
3	TXD	Output
4	DTR	Output
5	GND	
6	DSR	Input Also used for parasitic power input from host.
7	RTS	Output
8	CTS	Input Also used for parasitic power input from host.
9	RI	Input Also used for parasitic power input from host.

## Configuration

Several key attributes of the XBee RS-232 PH adapter's firmware allow the adapter to have a net charge on its batteries: Sleep Mode (SM), Idle Time (ST), Sleep Period (SP), and Power-up sleep period.

Sleep mode determines the sleeping behavior for the XBee module in the adapter. By default, the XBee module has cyclical sleep enabled. With cyclical sleep enabled, if the XBee module is idle (no RS-232 traffic, no transmit/receive) for the given amount of Idle Time, the XBee module then performs a sleep cycle for the duration of the value of Sleep Period.

The default sleep mode settings are:

- SM = 4 (Cyclical sleep enabled)
- ST = 0x3E8 (Idle time of 1 second)
- SP = 0x40 (Each sleep period's duration is 640 milliseconds)

On power-up, the XBee module immediately enters a sleep period for approximately 79 seconds. This initial sleep period ensures that a sufficient charge will exist on the battery for normal operations. After this initial sleep period, the XBee module will execute normal cyclic sleep operations, based on the SM, ST, and SP parameters.

For this configuration, the default sleep mode settings mean that the XBee module would sleep for a total of 640 milliseconds when performing a sleep period, after it was idle for 1 second. During an RF receive/transmit, the device is in an active state for a significant amount of time, regardless of the Idle Time setting. If continuous requests/queries are made to the device, it will stay in an active state, which can lead to a net discharge of the battery, and eventually the adapter will become unresponsive.

Adjusting the default settings is not recommended. Doing so can lead to an adapter that will not power on. If this occurs:

1. Remove the XBee module from the adapter.
2. Plug the adapter into the serial line for several hours.
3. Re-insert the XBee module in the adapter and re-adjust the module's sleep parameters using X-CTU software. This software is available on the Software and Documentation CD that accompanies Drop-in Networking kits and ConnectPort X gateways.

The battery can take up to 24 hours to fully charge. If the unit is run in the worst-case scenario—no sleep mode enabled and continuously queried—the battery has only a charge for around 40 minutes. After that, the unit will become unresponsive. In addition, if the unit isn't immediately put into a sleep mode after the battery first becomes unable to power the adapter, the battery will further deplete, and you will have to perform the above procedure to recover the device.

## Data retrieval

Retrieving data from XBee adapters is done by issuing a remote AT IS (Force Sample) command through the XBee API. The XBee API and AT IS command are described in detail in the RF module's data sheet. AT IS commands can be issued via a Python program that is executed on the gateway. See also the *Product Manual* for the RF module and the *Digi Python Programming Guide*.

## LEDs and buttons



**Assoc LED:** Indicates the adapter's 802.15.4 network association status.

**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.

**Reset button:** Performs equivalent of a power-cycle. Use a small non-conductive tool with a blunt end to press gently and hold down button.

**Ident button:** Performs multiple functions for identifying and configuring the adapter in a 802.15.4 network. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

Button press	Network association	Action
Single	Associated	Cannot wake module, but will cause adapter to remain awake for 30 seconds if pressed during a sleep interval. Sends a Node Identification broadcast transmission. All devices that receive this transmission will blink their Associate LED rapidly for 1 second.
	Unassociated	<p>Blinks a numeric error code returned by the ATAI (Association Indication) command on the Assc LED. The AI code indicates the cause of the join failure. See the 802.15.4 XBee module's Product Manual for descriptions of these codes.</p> <p><b>1 blink:</b> Active scan timeout.</p> <p><b>2 blinks:</b> Active scan found no PANs.</p> <p><b>3 blinks:</b> Active scan found PAN, but the Coordinator Allow Association bit is not set.</p> <p><b>4 blinks:</b> Active scan found PAN, but Coordinator and End Device are not configured to support beacons.</p> <p><b>5 blinks:</b> Active scan found PAN, but Coordinator ID (PAN ID) value does not match the ID of the End Device.</p> <p><b>6 blinks:</b> Active Scan found PAN, but Coordinator CH (Channel) value does not match the CH of the End Device.</p> <p><b>7 blinks:</b> Energy scan timeout.</p> <p><b>8 blinks:</b> Coordinator start request failed.</p> <p><b>9 blinks:</b> Coordinator could not start due to invalid parameters.</p> <p><b>10 blinks:</b> Coordinator Realignment is in progress.</p> <p><b>11 blinks:</b> Association request not sent.</p> <p><b>12 blinks:</b> Association request timed out - no reply was received.</p> <p><b>13 blinks:</b> Association request had an invalid parameter.</p> <p><b>14 blinks:</b> Association request channel access failure - Request was not transmitted - CCA failure.</p> <p><b>15 blinks:</b> Remote Coordinator did not send an ACK after Association Request was sent.</p> <p><b>16 blinks:</b> Remote Coordinator did not reply to the Association Request, but an ACK was received after sending the request.</p> <p><b>17 blinks:</b> [reserved].</p> <p><b>18 blinks:</b> Sync-Loss - Lost synchronization with a beaconing coordinator.</p> <p><b>19 blinks:</b> Disassociated - No longer associated to coordinator.</p>
Two	Associated	Not supported.
Four	Associated/ Unassociated	Performs an ATRE command to reset the parameters in the XBee module.



## Overview

The XBee RS-485 PH Adapter provides short range wireless connectivity to any RS-485 serial device, with available solutions for ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, these off-the-shelf adapters provides instant wireless connectivity to existing RS-485 serial devices. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity

## Power options

Depending on adapter model, there are several powering options.

### Alkaline battery model

This product can be powered by a 9-30VDC external power supply (see "Power requirements" on page 61) or by batteries. Use 3x1.5V "N" alkaline battery cells. To install batteries, insert a screwdriver in the slots in the side of the adapter case and twist to snap off the cover. Insert the batteries following the polarity diagram on the board.

### Lithium battery model

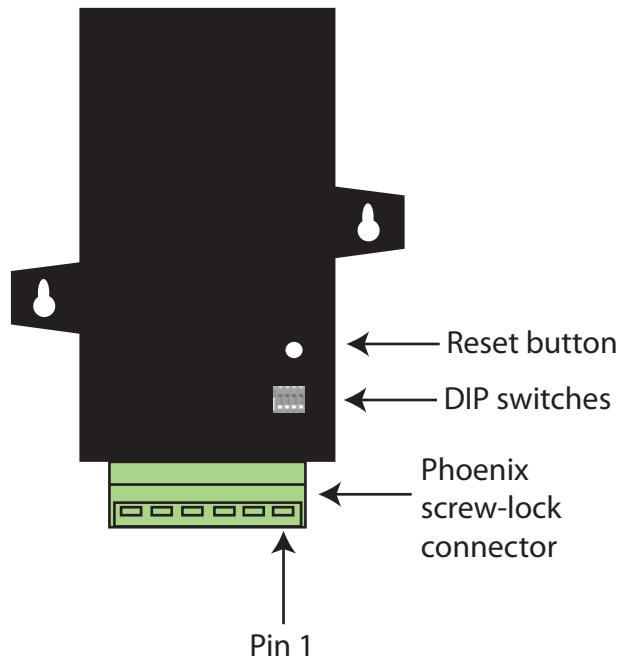
This model can be powered by a 3-6VDC external power supply or by 2/3 AA 3.6V lithium batteries and a 1/2 AA boost capacitor. Replacement batteries available for purchase; contact Digi at **952-912-3444** or **877-912-3444**.

## Connection and power-on

1. Connect the desired device to the RS-485 port of the adapter.
2. Connect the power supply to the adapter or insert batteries.

## Pinouts

The connector for the adapter is a 6-position wire terminal block. The figure shows Pin 1 of the connector when the adapter is oriented with the mounting tabs, facing upwards (the underside of the adapter).



The adapter is switch-selectable between RS-422 half duplex, RS-422 full duplex, and RS-485 modes (see DIP switches, below). The function for several pins varies between RS-422 and RS-485 modes.

Using the orientation in the above figure, from right to left, the pinouts are:

Pin	Function in RS-422 mode	Function in RS-485 mode
1	TxD+ (RS422)	TxD+ and RxD+ (RS485)
2	TxD- (RS422)	TxD- and RxD- (RS485)
3	RxD+ (RS422)	Not used.
4	RxD- (RS422)	Not used.
5	Ground	Ground
6	+12VDC 50mA max switched power out	+12VDC 50mA max switched power out

The connector accommodates wire gauges from 16AWG to 30AWG.

To insert wires, insert the wires into the removable Phoenix screw-lock connector and tighten the screws associated with the wire slots. To remove wires, loosen the screws associated with the wire slots and remove the wires.

## DIP switches

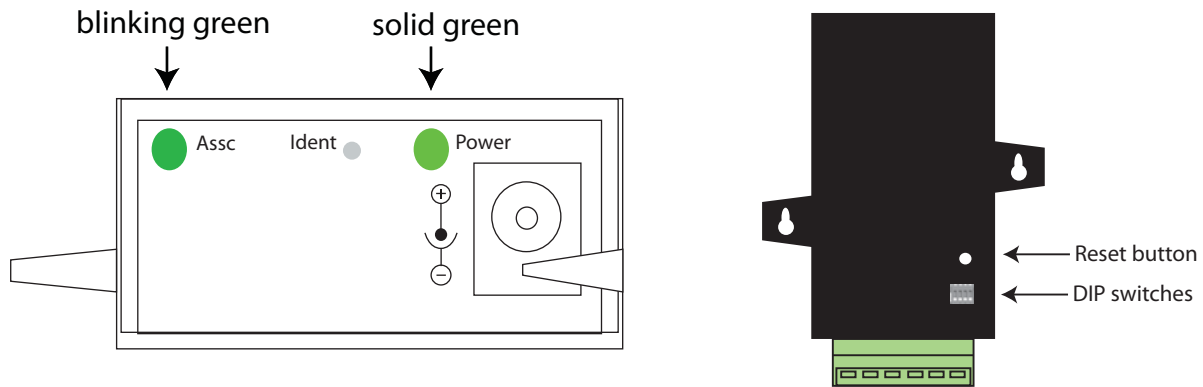
The XBee RS-485 Adapter has several DIP switches on the underside of the unit, with these settings:

DIP Switch	Switch settings
1	Not used. It is covered up by the case and is not accessible.
2, 3, 4 together	ON = RS485 OFF = RS422
5, 6 together	ON = RS485 Bias and line termination on. OFF = RS485 Bias and line termination off. Note: Bias and line termination feature can be used only when powering from the external power supply.

## Data retrieval

Retrieving data from XBee adapters is done by issuing a remote AT IS (Force Sample) command through the XBee API. The XBee API and AT IS command are described in detail in the RF module's data sheet. AT IS commands can be issued via a Python program that is executed on the gateway. See also the *Product Manual* for the RF module and the *Digi Python Programming Guide*.

## LEDs and buttons



- Power LED:** Indicates that power is on. Illuminated only when adapter is connected to external power only, not when powered by batteries. Not available in lithium-battery models.
- Assc LED:** Indicates the adapter's 802.15.4 network association status.  
**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.
- Reset button:** Recessed button on underside of the adapter. Performs equivalent of a power-cycle. Use a small non-conductive tool with a blunt end to press gently and hold down button.
- Ident button:** Recessed button on power end of the adapter between **Assc** and **Power** LEDs. Performs multiple functions for identify and configure the adapter in a 802.15.4 network. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

Button press	Network association	Action
Single	Associated	<p>Cannot wake module, but will cause adapter to remain awake for 30 seconds if pressed during a sleep interval.</p> <p>Sends a Node Identification broadcast transmission. All devices that receive this transmission will blink their Associate LED rapidly for 1 second.</p>
	Unassociated	<p>Blinks a numeric error code returned by the ATAI (Association Indication) command on the Assc LED. The AI code indicates the cause of the join failure. See the 802.15.4 XBee module's Product Manual for descriptions of these codes.</p> <p><b>1 blink:</b> Active scan timeout.</p> <p><b>2 blinks:</b> Active scan found no PANs.</p> <p><b>3 blinks:</b> Active scan found PAN, but the Coordinator Allow Association bit is not set.</p> <p><b>4 blinks:</b> Active scan found PAN, but Coordinator and End Device are not configured to support beacons.</p> <p><b>5 blinks:</b> Active scan found PAN, but Coordinator ID (PAN ID) value does not match the ID of the End Device.</p> <p><b>6 blinks:</b> Active Scan found PAN, but Coordinator CH (Channel) value does not match the CH of the End Device.</p> <p><b>7 blinks:</b> Energy scan timeout.</p> <p><b>8 blinks:</b> Coordinator start request failed.</p> <p><b>9 blinks:</b> Coordinator could not start due to invalid parameters.</p> <p><b>10 blinks:</b> Coordinator Realignment is in progress.</p> <p><b>11 blinks:</b> Association request not sent.</p> <p><b>12 blinks:</b> Association request timed out - no reply was received.</p> <p><b>13 blinks:</b> Association request had an invalid parameter.</p> <p><b>14 blinks:</b> Association request channel access failure - Request was not transmitted - CCA failure.</p> <p><b>15 blinks:</b> Remote Coordinator did not send an ACK after Association Request was sent.</p> <p><b>16 blinks:</b> Remote Coordinator did not reply to the Association Request, but an ACK was received after sending the request.</p> <p><b>17 blinks:</b> [reserved].</p> <p><b>18 blinks:</b> Sync-Loss - Lost synchronization with a beaconing coordinator.</p> <p><b>19 blinks:</b> Disassociated - No longer associated to coordinator.</p>
Two	Associated	Not supported.
Four	Associated/ Unassociated	Performs an ATRE command to reset the parameters in the XBee module.

## Overview

The XBee Analog I/O Adapter provides short-range wireless connectivity to any analog device, with available solutions for ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, this off-the-shelf adapter provides instant wireless connectivity to existing analog devices. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity.

The XBee Analog I/O adapter allows for several interfaces to analog devices. It provides greater flexibility and uses than Digi XBee Sensor Adapters and XBee Sensors, in that it can be used with a variety of off-the-shelf sensor products and in situations when the item being measured or analyzed must be separated from the sensor/measuring device itself.

## Analog Modes

The XBee Analog I/O Adapter has three modes in which it can measure input on its four terminal lines.

- **0-10 volt mode:** measures voltage on a scale of 1 to 10 volts, and translates it into a 10-bit scale from 0 to 1023 as possible values.
- **Current Loop (4 mA to 20 mA) mode:** measures amperage on a scale of 4 to 20 mA, and translates it into a 10-bit scale from 0 to 1023 as possible values.
- **Differential input mode:** measures paired terminals (1 and 2 paired, 3 and 4 paired) and translates the difference in voltage between the two lines to into a 10-bit scale from 0 to 1023 as possible values.

A Python module named **xbeeain.py** is available to set the analog mode; see page 27.

## Power options

Depending on adapter model, there are several powering options.

### Alkaline battery model

This model can be powered by a 9-30VDC external power supply (see "Power requirements" on page 61) or by batteries. Use 3x1.5V "N" alkaline battery cells. To install batteries, insert a screwdriver in the slots in the side of the adapter case and twist to snap off the cover. Insert the batteries following the polarity diagram on the board.

### Lithium battery model

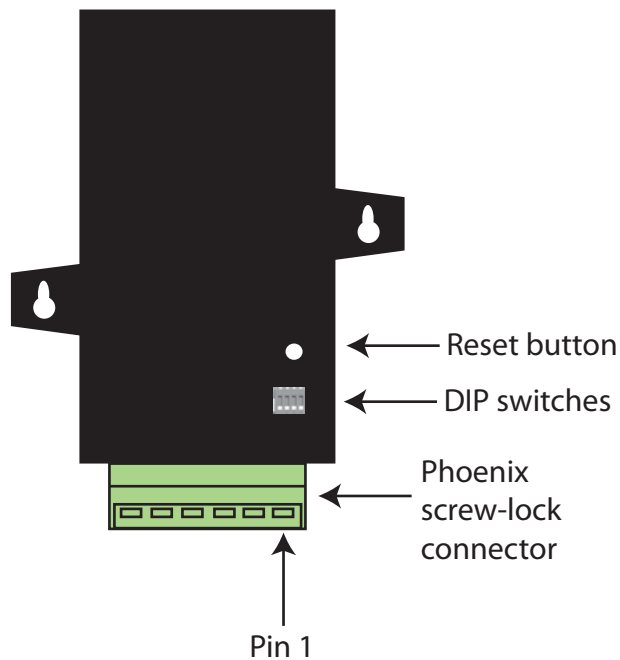
This model can be powered by a 3-6VDC external power supply or by 2/3 AA 3.6V lithium batteries and a 1/2 AA boost capacitor. Replacement batteries available for purchase; contact Digi at **952-912-3444** or **877-912-3444**.

## Connection and power-on

1. Connect the wires for the desired analog device to the connector for the adapter. The connector accommodates wire gauges from 16AWG to 30AWG.

To insert wires, insert the wires into the removable Phoenix screw-lock connector and tighten the screws associated with the wire slots. To remove wires, loosen the screws associated with the wire slots and remove the wires.

The connector for the adapter is a 6-position wire terminal block. The figure shows Pin 1 of the connector when the adapter is oriented with the mounting tabs, facing upwards (the underside of the adapter).



2. Connect the power supply to the adapter or insert batteries.

## Pinouts

Using the orientation in the previous figure, from right to left, the pinouts are:

Pin	Analog Mode		
	Ten Volt	Current Loop	Differential
1	0-10 Volt	4-20 mA	Terminal Pair 1 positive
2	0-10 Volt	4-20 mA	Terminal Pair 1 negative
3	0-10 Volt	4-20 mA	Terminal Pair 2 positive
4	0-10 Volt	4-20 mA	Terminal Pair 2 negative
5	Ground	Ground	Ground
	+12VDC 50mA max switched power out	+12VDC 50mA max switched power out	+12VDC 50mA max switched power out

## DIP switches

The XBee Analog I/O Adapter has several DIP switches on the underside of the unit, with these settings:

DIP Switch	Switch settings
1	Enables and disables direct battery pack voltage output. On=battery power out Off=no battery power out
2	Enables and disables +12V power out. On=+12V power out Off=no +12V power out
3	Not used
4	Not used

**Note:** Switches 1 and 2 should not be on at the same time as increased parasitic battery drain will result.



## Configuring inputs and outputs

### Input selection

Six control lines from the RF module are used to place the four external terminals into the desired input mode.

The power-on default is 0-10VDC on all four terminals.

### Set the analog mode

The AT commands D8, D4, and D6 set the analog mode for terminals 1 and 2. P0, D7, and P2 set the mode for terminals 3 and 4. All other configurations are invalid. A Python module named `xbeeain.py` is available to set the analog mode; see page 27.

Terminal	Analog Mode	Terminal	Analog Mode	AT Commands		
				D8	D4	D6
Terminal 1	Current Loop	Terminal 2	Current Loop	0	0	0
	Current Loop		Ten Volt	0	0	1
	Ten Volt		Current Loop	0	1	0
	Ten Volt		Ten Volt	0	1	1
	Differential		Differential	1	0	0
				P0	D7	P2
Terminal 3	Current Loop	Terminal 4	Current Loop	0	0	0
	Current Loop		Ten Volt	0	0	1
	Ten Volt		Current Loop	0	1	0
	Ten Volt		Ten Volt	0	1	1
	Differential		Differential	1	0	0

### Enable a terminal line for measurement

To enable a terminal line for measurement, the following analog I/O lines have to be set to value **2**:

- D0
- D1
- D2
- D3

D0, D1, D2, and D3 represent terminal lines 1, 2, 3, and 4 respectively. In the case of a terminal pair in differential mode, only the first terminal of the terminal pair should be enabled. To disable a terminal line, set the respective analog I/O line to value 0.

## Input specifications and characteristics

Analog mode	Specification	Value
0-10 volt mode	Full-scale input	10.25 VDC
	Minimum input	0 VDC
	Maximum safe input	11VDC
	Minimum safe input	-.5VDC
	Input impedance	28200 ohms
Current Loop (4 mA to 20 mA) mode	Full-scale input	23.5mA
	Minimum input	0mA
	Maximum safe input	40mA
	Minimum safe input	-.5VDC
	Input impedance	51.1 ohms
+/- 2 VDC differential mode	Full-scale input	+2.4 VDC differential
	0V differential	Half-scale reading
	-2V differential	Minimum-scale reading
	Maximum safe input (each pin)	11VDC
	Minimum safe input (each pin)	-.5VDC
	Input impedance	~1 Megaohm
All modes	Resolution	10 bits
	Accuracy	2% when battery powered Up to 4% when powered by power supply



Exceeding the maximum or minimum safe input values will result in damage to the unit.

## Power output specifications

External terminal 6 is a power-out pin. It can be set to either battery pack voltage out or +12VDC at 50mA out via DIP switches 1 and 2.

External terminal 5 is a system ground pin. This ground pin should be used for all external ground connections for both power and input connections.

DIP switch 1 enables battery pack voltage minus .5VDC to terminal 6, resulting in 4VDC out with new alkaline batteries, or 3.1VDC with new lithium battery. DIP switch 2 enables +12VDC to terminal 6. Only one switch should be on at a time. No damage will happen if both are set to on, but the output will default to the +12VDC output and increased parasitic battery drain will result.

The battery pack voltage is on terminal 6 all the time, and is not gated with the sleep of the module when DIP switch 2 is on. Any current draw from terminal 6 will result in reduced battery life.

When DIP switch 2 is on, the +12VDC at 50mA max is provided at terminal 6. This power is gated by both the sleep of the module and AT command P3. For this power setting to be on, the RF module needs to be awake and AT command P3 set to a high level.

## Python modules for configuring inputs and outputs

Digi provides a library of Python modules for configuring inputs and outputs on the adapter and retrieving data from the adapter. These modules are available for downloading from [www.digi.com/din/docs](http://www.digi.com/din/docs), in a file named **XBee Adapter Libraries**. By uploading these Python modules to the gateway that serves as a coordinator for the adapter, you can use them in your own programs.

The Python modules in the XBee Adapter Libraries that are relevant to programming the XBee Analog I/O Adapter are:

Module	Description
xbeeprodid.py	Contains calls to determine the type of adapter; (Analog, Digital, Sensor, RS-232, etc.)
xbeedevice.py	Implements a base class of any XBee device on the 802.15.4 network.
xbeeain.py	Configures analog mode, issues AT commands to retrieve data from the adapter, including raw analog sample data and sensor data scaled appropriately for operating mode, and toggles power on/off on terminal 6. Functions and arguments are shown on page 29.  This module derives an AIO (analog input/output) class from the base class of any XBee device on the 802.15.4 network. That is, module xbeeain.py uses xbeedevice.py internally.
sensor_io.py	Decodes the output of the AT IS command.

**Upload Python modules to gateway**

1. Go to **www.digi.com/din/docs**.
2. In the list of downloadable files, select and download file **XBee Adapter Libraries**.
3. Unzip the downloaded file.
4. Read the readme file.
5. Open the web interface for the gateway, go to **Applications > Python**.
6. In the **Upload File** edit box, enter the file name for the XBee Adapter Libraries, **DigiXBeeDrivers.zip**, using the **Browse** button as needed, and click **Upload**.

**Use Python modules in programs**

To use the Python modules in the XBee Adapter Libraries in programs that you develop, append this statement:

```
sys.path.append("WEB/python/DigiXBeeDrivers.zip")
```

## Use xbeeain.py functions in Python programs

To use the functions in the module **xbeeain.py**, any Python programs must contain the next statement:

```
from xbeeain import *
```

The functions and arguments in module **xbeeain.py** are as follows.

```
#####
#                                                                 #
#                               Class XBeeAIN                     #
#                                                                 #
#####
#                                                                 #
# This class derives from the base XBeeDevice class, and implements #
# the Analog IO layer of the Digi XBee Analog IO Adapter.         #
#                                                                 #
#####
#                                                                 #
# Functions:                                                       #
#                                                                 #
#   configure(channel, mode) - Define channel usage                #
#       channel - Channel number to be configured.                #
#       mode    - One of (CurrentLoop, TenV, Differential)         #
#                                                                 #
#   raw_sample(channel)                                           #
#       channel - Channel number to be read.                       #
#       Returns raw analog sample data for specified channel      #
#                                                                 #
#   sample(channel)                                               #
#       channel - Channel number to be read.                       #
#       Returns sensor data scaled appropriately for operating mode #
#                                                                 #
#   power(onoff) - Toggles Power Output on Terminal 6.           #
#       onoff - Specifies Power Output either on (1) or off (0).  #
#                                                                 #
#####
```

### Additional programming resources

For further information on writing Python programs and using Python functions, see:

- Digi Python Custom Development Environment page  
<http://www.digi.com/technology/drop-in-networking/python.jsp>
- Digi Python Programming Guide  
[http://ftp1.digi.com/support/documentation/90000833\\_b.pdf](http://ftp1.digi.com/support/documentation/90000833_b.pdf)
- The Python Support Forum on digi.com  
<http://www.digi.com/support/forum/forum.jspa?forumID=104>

For more information about AT commands, see:

- RF Module data sheet  
[http://www.digi.com/pdf/ds\\_xbeemultipointmodules.pdf](http://www.digi.com/pdf/ds_xbeemultipointmodules.pdf)
- RF Module Product Manual

For a preliminary version of the XBee 802.15.4 module product manual, please contact Digi Support and request a copy of Digi Part Number **90000982\_A**.

## Data retrieval

To retrieve measurement data from the XBee Analog I/O Adapter, use these Python modules, provided in the XBee Adapter Libraries:

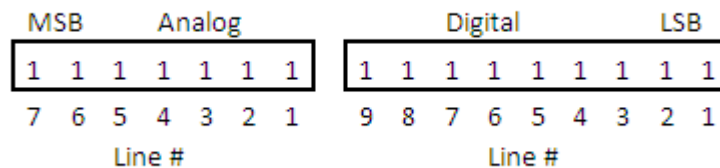
- **xbeeain.py**: Issues the AT IS command to retrieve the data.
- **sensor\_io.py**: Decodes the output of the AT IS command.

## Byte structure returned by IS command

The AT IS (Force Sample) command is used to force a read of all enabled analog I/O lines. The command returns a sample with a byte structure that identifies which lines are enabled for analog or digital sampling, and the current measurement.

Byte size	Purpose
1	The number of samples in this message.
2	Bit mask of which analog and digital I/O lines are enabled for this message.
2	Digital sample, only present if any digital I/O lines are enabled.
2 * N	Analog sample; N is the number of analog I/O lines enabled.

The Analog/Digital Mask is split up on the bit level. The 7 most significant bits represent the Analog mask, and the 9 least significant bits represent the Digital mask. The bits represent the lines ordered from LSB to MSB according to the Mask. The diagram illustrates this representation:



The number of analog samples is dependent on the mask. If none of the Analog mask bits are enabled, the 2-byte analog samples will not be present within the byte structure.

## Number of samples

The number of samples in this reading. Should always be 0x01.

**Bitmask for digital and analog sampling**

In this bitmask, bit 0 is the least significant bit.

The measurement associated with AD0 is from terminal line 1, AD1 is from terminal line 2, etc.

Bit	Matching I/O line
0	DIO0
1	DIO1
2	DIO2
3	DIO3
4	DIO4
5	DIO5
6	DIO6
7	DIO7
8	DIO8
9	AD0
10	AD1
11	AD2
12	AD3
13	AD4
14	AD5
15	n/a

**Note:** If any of these AT commands is set to values 3, 4, or 5, the bitmask will show them as enabled. If they are set to values 0, 1, or 2, the bitmask will show them as disabled.

**Digital sample**

This field should be ignored.

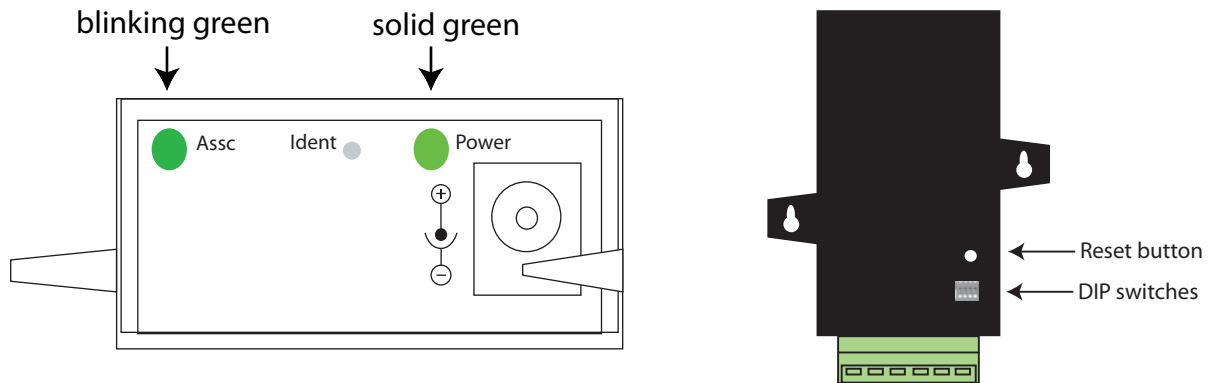
**Analog sample**

Contains the measured results from the analog-enabled digital I/O lines. This example is for a 10-bit sample.

Each measurement is 2 bytes long, and ranges between 0-1023 for value (10 bit resolution). The lowest lines are always first, so if digital I/O 0 and 2 were enabled, the first 2 bytes would represent digital I/O 0's measurement and the second two bytes would represent digital I/O 2's measurement.



## LEDs and buttons



- Power LED:** Indicates that power is on. Illuminated only when adapter is connected to external power only, not when powered by batteries. Not available in lithium-battery models.
- Assc LED:** Indicates the adapter's 802.15.4 network association status.  
**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.
- Reset button:** Recessed button on underside of the adapter. Performs equivalent of a power-cycle. Use a small non-conductive tool with a blunt end to press gently and hold down button.
- Ident button:** Recessed button on power end of the adapter between **Assc** and **Power** LEDs. Performs multiple functions for identifying and configuring the adapter in a 802.15.4 network. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

Button press	Network association	Action
Single	Associated	Cannot wake module, but will cause adapter to remain awake for 30 seconds if pressed during a sleep interval. Sends a Node Identification broadcast transmission. All devices that receive this transmission will blink their Associate LED rapidly for 1 second.
	Unassociated	<p>Blinks a numeric error code returned by the ATAI (Association Indication) command on the Assc LED. The AI code indicates the cause of the join failure. See the 802.15.4 XBee module's Product Manual for descriptions of these codes.</p> <p><b>1 blink:</b> Active scan timeout.</p> <p><b>2 blinks:</b> Active scan found no PANs.</p> <p><b>3 blinks:</b> Active scan found PAN, but the Coordinator Allow Association bit is not set.</p> <p><b>4 blinks:</b> Active scan found PAN, but Coordinator and End Device are not configured to support beacons.</p> <p><b>5 blinks:</b> Active scan found PAN, but Coordinator ID (PAN ID) value does not match the ID of the End Device.</p> <p><b>6 blinks:</b> Active Scan found PAN, but Coordinator CH (Channel) value does not match the CH of the End Device.</p> <p><b>7 blinks:</b> Energy scan timeout.</p> <p><b>8 blinks:</b> Coordinator start request failed.</p> <p><b>9 blinks:</b> Coordinator could not start due to invalid parameters.</p> <p><b>10 blinks:</b> Coordinator Realignment is in progress.</p> <p><b>11 blinks:</b> Association request not sent.</p> <p><b>12 blinks:</b> Association request timed out - no reply was received.</p> <p><b>13 blinks:</b> Association request had an invalid parameter.</p> <p><b>14 blinks:</b> Association request channel access failure - Request was not transmitted - CCA failure.</p> <p><b>15 blinks:</b> Remote Coordinator did not send an ACK after Association Request was sent.</p> <p><b>16 blinks:</b> Remote Coordinator did not reply to the Association Request, but an ACK was received after sending the request.</p> <p><b>17 blinks:</b> [reserved].</p> <p><b>18 blinks:</b> Sync-Loss - Lost synchronization with a beaconing coordinator.</p> <p><b>19 blinks:</b> Disassociated - No longer associated to coordinator.</p>
Two	Associated	Not supported.
Four	Associated/ Unassociated	Performs an ATRE command to reset the parameters in the XBee module.

## Overview

The XBee Digital I/O Adapter provides short range wireless connectivity to any digital device, as well as an interface to logic-level inputs and sinking driver output. Solutions are available for ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, these off-the-shelf adapters provide instant wireless connectivity to existing digital devices. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity.

## Power options

Depending on adapter model, there are several powering options.

### Alkaline battery model

This product can be powered by a 9-30VDC external power supply (see "Power requirements" on page 61) or by batteries. Use 3x1.5V "N" alkaline battery cells. To install batteries, insert a screwdriver in the slots in the side of the adapter case and twist to snap off the cover. Insert the batteries following the polarity diagram on the board.

### Lithium battery model

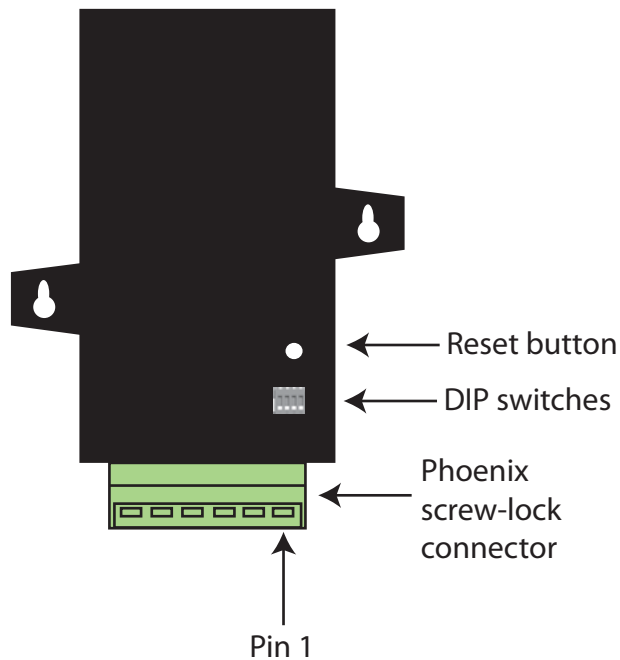
This model can be powered by a 3-6VDC external power supply or by 2/3 AA 3.6V lithium batteries and a 1/2 AA boost capacitor. Replacement batteries available for purchase; contact Digi at **952-912-3444** or **877-912-3444**.

## Connection and power-on

1. Connect the wires for the desired analog device to the connector for the adapter. The connector accommodates wire gauges from 16AWG to 30AWG.

To insert wires, insert the wires into the removable Phoenix screw-lock connector and tighten the screws associated with the wire slots. To remove wires, loosen the screws associated with the wire slots and remove the wires.

The connector for the adapter is a 6-position wire terminal block. The figure shows Pin 1 of the connector when the adapter is oriented with the mounting tabs, facing upwards (the underside of the adapter).



2. Connect the power supply to the adapter or insert batteries.

## Pinouts

Using the orientation in the above figure, from right to left, the pinouts are:

Pin	Function
1	These pins are configurable as digital input or sinking driver output.
2	
3	
4	
5	GND
6	+12VDC 50mA max switched power out

## DIP switches

The XBee Digital I/O Adapter has several DIP switches on the underside of the unit, with these settings:

DIP Switch	Switch settings
1	Enables and disables direct battery pack voltage output. On=battery power out Off=no battery power out
2	Enables and disables +12V power out. On=+12V power out Off=no +12V power out
3	Turns on 10K pullup on terminal 1 to 3VDC.
4	Turns on 10K pullup on terminal 2 to 3VDC.

**Note:**

- Switches 1 and 2 should not be on at the same time as increased parasitic battery drain will result.
- Pullup use is not recommended when running from battery power, owing to the constant drain on the batteries.

## Configuring inputs and outputs

As shown in the pinouts table, the XBee Digital I/O Adapter product has four external terminals that can be set as either a digital input or a sinking driver output.

The RF module controls the sinking drivers on pins 11, 16, 12, 4 for terminals 1, 2, 3, 4 respectively.

The AT commands to the RF module for the output function are D4, D6, D7, P2 for terminals 1, 2, 3, 4 respectively.

Outputs are activated (that is, the sinking function is turned on) by setting high the corresponding XBee pin for the output that is desired. To set a terminal high, set the corresponding AT command to value 5. To set a terminal low, set the corresponding AT command to value 4. For example, calling the AT command D4 and setting it to 5 would cause terminal 1 to be set high.

Since the input and output functions overlap, the input function is always active and when the input function is desired, the output control pin for the matching output must be set low (turns off the sinking function). This feature can allow the inputs to monitor the output sinking operation if desired.

## Input/output specifications and characteristics

Digital mode	Specification	Value
Digital Input	Input type	Non-inverting Schmidt trigger gate
	Positive-going switching threshold	~1.6 VDC
	Negative-going switching threshold	~1.0 VDC
	Maximum safe input	+30VDC
	Minimum safe input	-.5VDC
	Input impedance	~1.5 Megaohms
	Default level when no input applied	Low
Digital Output	Output type	Open collector sinking driver
	Maximum sink current	1.8ADC
	Maximum off voltage	+30VDC
	Minimum safe input	-.5VDC
	Resistor pullups	10K ohms pulled up to 3VDC; switch-selectable



Exceeding the maximum or minimum safe input values will result in damage to the unit.

## Power output specifications

External terminal 6 is a power-out pin. It can be set to either battery pack voltage out or +12VDC at 50mA out via DIP switches 1 and 2.

External terminal 5 is a system ground pin. This ground pin should be used for all external ground connections for both power and input connections.

DIP switch 1 enables battery pack voltage minus .5VDC to terminal 6, resulting in 4VDC out with new alkaline batteries, or 3.1VDC with new lithium battery. DIP switch 2 enables +12VDC to terminal 6. Only one switch should be on at a time. No damage will happen if both are set to on, but the output will default to the +12VDC output and increased parasitic battery drain will result.

The battery pack voltage is on terminal 6 all the time and not gated with the sleep of the module when DIP switch 2 is on. Any current draw from terminal 6 will result in reduced battery life. This mode is primarily intended with switch closure applications with the XBee Digital I/O Adapter with the external switch in the customer equipment in the normally open position, so no battery current results until the activating event happens.

When DIP switch 2 is on, the +12VDC at 50mA max is provided at terminal 6. This power is gated by both the sleep of the module and AT command P3. For this power setting to be on, the RF module needs to be awake and AT command P3 set to a high level.

## Python modules for configuring inputs and outputs

Digi provides a library of Python modules for configuring inputs and outputs on the adapter and retrieving data from the adapter. These modules are available for downloading from [www.digi.com/din/docs](http://www.digi.com/din/docs), in a file named **XBee Adapter Libraries**. By uploading these Python modules to the gateway that serves as a coordinator for the adapter, you can use them in your own programs.

The Python modules in the zip file that are relevant to programming the XBee Digital I/O Adapter are:

Module	Description
xbeeprodid.py	Contains calls to determine the type of adapter; (Analog, Digital, Sensor, RS-232, etc.)
xbeedevic.py	Implements a base class of any XBee device on the 802.15.4 network.
xbeedin.py	Configures inputs and outputs, issues AT commands to retrieve data from the adapter, and toggles power on/off on terminal 6. Functions and arguments are shown page 41. Derives an DIO (digital input/output) class from the base class of any Digi Xbee device on the mesh network. That is, module xbeedin.py uses xbeedevic.py internally.
sensor_io.py	Decodes the output of the AT IS command.

## Upload Python modules to gateway

1. Go to [www.digi.com/din/docs](http://www.digi.com/din/docs).
2. In the list of downloadable files, select and download file **XBee Adapter Libraries**.
3. Unzip the downloaded file.
4. Read the readme file.
5. Open the web interface for the gateway, go to **Applications > Python**.
6. In the **Upload File** edit box, enter the file name for the XBee Adapter Libraries, **DigiXBeeDrivers.zip**, using the **Browse** button as needed, and click **Upload**.

## Use Python modules in programs

To use the Python modules in the XBee Adapter Libraries in programs that you develop, append this statement:

```
sys.path.append("WEB/python/DigiXBeeDrivers.zip")
```



**Use xbeedin.py functions in Python programs**

To use the functions in the module **xbeedin.py** for programming inputs and outputs, any Python programs you create must contain this statement:

```
from xbeedin import *
```

The functions and arguments in module **xbeedin.py** are as follows.

```
#####
#                                                                 #
#                               Class XBeeDIN                       #
#                                                                 #
#####
#                                                                 #
# This class derives from the base XBeeDevice class, and implements #
# the Digital IO layer of the Digi XBee Digital IO Adapter.       #
#                                                                 #
#####
#                                                                 #
# Functions:                                                       #
#                                                                 #
#   configure(channel, mode, highlow) - Define channel usage      #
#       channel - Channel number to be configured.                #
#       mode    - One of (Input, Output)                           #
#       highlow - If in Output mode, this specifies whether the signal #
#                 should be driven high (1) or low (0).           #
#                                                                 #
#   sample(channel)                                               #
#       channel - Channel number to be read.                       #
#       Returns digital sample data for specified channel         #
#                                                                 #
#   power(onoff) - Toggles Power Output on Terminal 6.           #
#       onoff   - Specifies Power Output either on (1) or off (0). #
#                                                                 #
#####
```

### Additional programming resources

For further information on writing Python programs and using Python functions, see:

- Digi Python Custom Development Environment page  
<http://www.digi.com/technology/drop-in-networking/python.jsp>
- Digi Python Programming Guide  
[http://ftp1.digi.com/support/documentation/90000833\\_b.pdf](http://ftp1.digi.com/support/documentation/90000833_b.pdf)
- The Python Support Forum on digi.com  
<http://www.digi.com/support/forum/forum.jspa?forumID=104>

For more information about AT commands, see:

- RF Module data sheet  
[http://www.digi.com/pdf/ds\\_xbeemultipointmodules.pdf](http://www.digi.com/pdf/ds_xbeemultipointmodules.pdf)
- RF Module Product Manual

For a preliminary version of the XBee 802.15.4 module product manual, please contact Digi Support and request a copy of Digi Part Number **90000982\_A**.

## Data retrieval

To retrieve measurement data from the XBee Digital I/O Adapter, use these Python modules, provided in the XBee Adapter Libraries:

- **xbeedin.py**: Issues the AT IS command to retrieve the data.
- **sensor\_io.py**: Decodes the output of the AT IS command.

To enable a terminal line for measurement, the following digital I/O lines have to be set to value **3**:

- D8
- D1
- D2
- D3

D8, D1, D2, and D3 represent terminal lines 1, 2, 3, and 4 respectively. To disable a terminal line, set the respective digital I/O line to value 0.

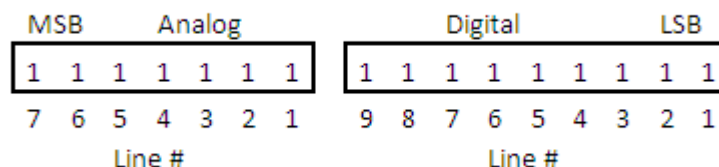
Following is a description of the data returned by the IS command.

### Byte structure returned by IS command

The AT IS (Force Sample) command is used to force a read of all enabled digital I/O lines. The command returns a byte structure that identifies which lines are enabled for analog or digital sampling, and the current measurement.

Byte size	Purpose
1	The number of samples in this message.
2	Bitmask of which analog and digital I/O lines are enabled for this message.
2	Digital sample, only present if any digital I/O lines are enabled.
2 * N	Analog sample; N is the number of analog I/O lines enabled.

The Analog/Digital Mask is split up on the bit level. The 7 most significant bits represent the Analog mask, and the 9 least significant bits represent the Digital mask. The bits represent the lines ordered from LSB to MSB according to the Mask. The diagram illustrates this representation:



The number of analog samples is dependent on the mask. If none of the Analog mask bits are enabled, the 2-byte analog samples will not be present within the byte structure.

**Number of samples**

This represents the number of samples that make up the measurement. This number is most commonly set to 1.

**Bit mask for digital and analog sampling**

In this bitmask, bit 0 is the least significant bit.

The measurement associated with AD0 is from terminal line 1, AD1 is from terminal line 2, etc.

Bit	Matching I/O line
0	DIO0
1	DIO1
2	DIO2
3	DIO3
4	DIO4
5	DIO5
6	DIO6
7	DIO7
8	DIO8
9	AD0
10	AD1
11	AD2
12	AD3
13	AD4
14	AD5
15	n/a

**Note:** If any of these AT commands is set to values 3, 4, or 5, the bitmask will show them as enabled. If they are set to values 0, 1, or 2, the bitmask will show them as disabled.

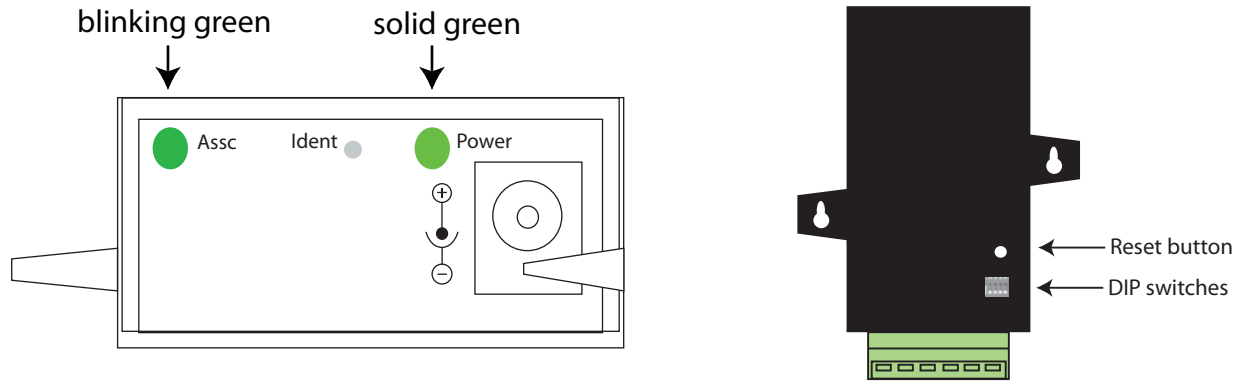
**Bit mask for analog sampling**

Should always be 0x00 on the digital adapter.

**Digital sample**

The ninth LSB (least significant bit) represents terminal line 1. Terminal line 2 is represented by the second LSB. Terminal line 3 is represented by the third LSB, and terminal Line 4 is represented by the fourth LSB.

## LEDs and buttons



- Power LED:** Indicates that power is on. Illuminated only when adapter is connected to external power only, not when powered by batteries. Not available in lithium-battery models.
- Assc LED:** Indicates the adapter's 802.15.4 network association status.  
**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.
- Reset button:** Recessed button on underside of the adapter. Performs equivalent of a power-cycle. Use a small non-conductive tool with a blunt end to press gently and hold down button.
- Ident button:** Recessed button on power end of the adapter between **Assc** and **Power** LEDs. Performs multiple functions for identifying and configuring the adapter in a 802.15.4 network. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

Button press	Network association	Action
Single	Associated	Cannot wake module, but will cause adapter to remain awake for 30 seconds if pressed during a sleep interval. Sends a Node Identification broadcast transmission. All devices that receive this transmission will blink their Associate LED rapidly for 1 second.
	Unassociated	<p>Blinks a numeric error code returned by the ATAI (Association Indication) command on the Assc LED. The AI code indicates the cause of the join failure. See the 802.15.4 XBee module's Product Manual for descriptions of these codes.</p> <p><b>1 blink:</b> Active scan timeout.</p> <p><b>2 blinks:</b> Active scan found no PANs.</p> <p><b>3 blinks:</b> Active scan found PAN, but the Coordinator Allow Association bit is not set.</p> <p><b>4 blinks:</b> Active scan found PAN, but Coordinator and End Device are not configured to support beacons.</p> <p><b>5 blinks:</b> Active scan found PAN, but Coordinator ID (PAN ID) value does not match the ID of the End Device.</p> <p><b>6 blinks:</b> Active Scan found PAN, but Coordinator CH (Channel) value does not match the CH of the End Device.</p> <p><b>7 blinks:</b> Energy scan timeout.</p> <p><b>8 blinks:</b> Coordinator start request failed.</p> <p><b>9 blinks:</b> Coordinator could not start due to invalid parameters.</p> <p><b>10 blinks:</b> Coordinator Realignment is in progress.</p> <p><b>11 blinks:</b> Association request not sent.</p> <p><b>12 blinks:</b> Association request timed out - no reply was received.</p> <p><b>13 blinks:</b> Association request had an invalid parameter.</p> <p><b>14 blinks:</b> Association request channel access failure - Request was not transmitted - CCA failure.</p> <p><b>15 blinks:</b> Remote Coordinator did not send an ACK after Association Request was sent.</p> <p><b>16 blinks:</b> Remote Coordinator did not reply to the Association Request, but an ACK was received after sending the request.</p> <p><b>17 blinks:</b> [reserved].</p> <p><b>18 blinks:</b> Sync-Loss - Lost synchronization with a beaconing coordinator.</p> <p><b>19 blinks:</b> Disassociated - No longer associated to coordinator.</p>
Two	Associated	Not supported.
Four	Associated/ Unassociated	Performs an ATRE command to reset the parameters in the XBee module.

## Overview

The XBee Sensor Adapter provides short-range wireless connectivity to Digi Watchport<sup>®</sup> Sensors, with available solutions for ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, these off-the-shelf adapters provide instant wireless connectivity to existing Watchport Sensors. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity

## Available sensor products

The XBee Sensor Adapter can be used with a variety of Watchport sensors. For a description and list of supported sensors, go to Digi's Drop-in Networking page at [www.digi.com/din](http://www.digi.com/din), navigate to **Products**, and click on **Sensors**.

## Power options

Depending on adapter model, there are several powering options.

### Alkaline battery model

This product can be powered by a 9-30VDC external power supply (see "Power requirements" on page 61) or by batteries. Use 3x1.5V "N" alkaline battery cells. To install batteries, insert a screwdriver in the slots in the side of the adapter case and twist to snap off the cover. Insert the batteries following the polarity diagram on the board.

### Lithium battery model

This model can be powered by a 3-6VDC external power supply or by 2/3 AA 3.6V lithium batteries and a 1/2 AA boost capacitor. Replacement batteries available for purchase; contact Digi at **952-912-3444** or **877-912-3444**.

## Siting recommendations

Isolate the XBee Sensor Adapter from temperature sources other than the one you are measuring. For example, when using it to monitor indoor room temperature, do not place it in direct or indirect sunlight.

For the light sensor, low-Hertz light bulbs, such as fluorescent lamps, can produce inconsistent measuring results. Multiple light samples should be taken to achieve reliable results.

## Connection and power-on

1. Connect the sensor to the **SENSOR** port of the adapter.
2. Connect the power supply to the adapter or insert batteries.

## Pinouts

The XBee Sensor Adapter uses an industry-standard RJ45 10 pin modular jack with these pinouts:

Pin	Function
1	Not used.
2	Not used.
3	Not used.
4	GND
5	1-wire (sensor) data
6	+5VDC switched power out.
7	GND
8	+5VDC switched power out.
9	General-purpose logic input for moisture sensor.
10	Not used.



## Sensor function configuration and data retrieval

Digi provides a Python module for configuring sensor functions and retrieving data from XBee Sensor Adapters. This module is named **xbee\_sensor.py** and is available for downloading from [www.digi.com/din/docs](http://www.digi.com/din/docs), in a file named **XBee Adapter Libraries**. By uploading this Python module to the gateway that serves as a coordinator for the adapter, you can use it in your own programs. The XBee Adapter Libraries file includes a readme file and a sample program showing how **xbee\_sensor.py** is used. **xbee\_sensor.py** issues a remote **AT 1S** (retrieve sensor data) command through the XBee API and decodes the results. See these files for more information.

### Upload Python modules to gateway

1. Go to **www.digi.com/din/docs**.
2. In the list of downloadable files, select and download file **XBee Adapter Libraries**.
3. Unzip the downloaded file.
4. Read the readme file.
5. Open the web interface for the gateway, go to **Applications > Python**.
6. In the **Upload File** edit box, enter the file name for the XBee Adapter Libraries, **DigiXBeeDrivers.zip**, using the **Browse** button as needed, and click **Upload**.

### Additional programming resources

For further information on writing Python programs and using Python functions, see:

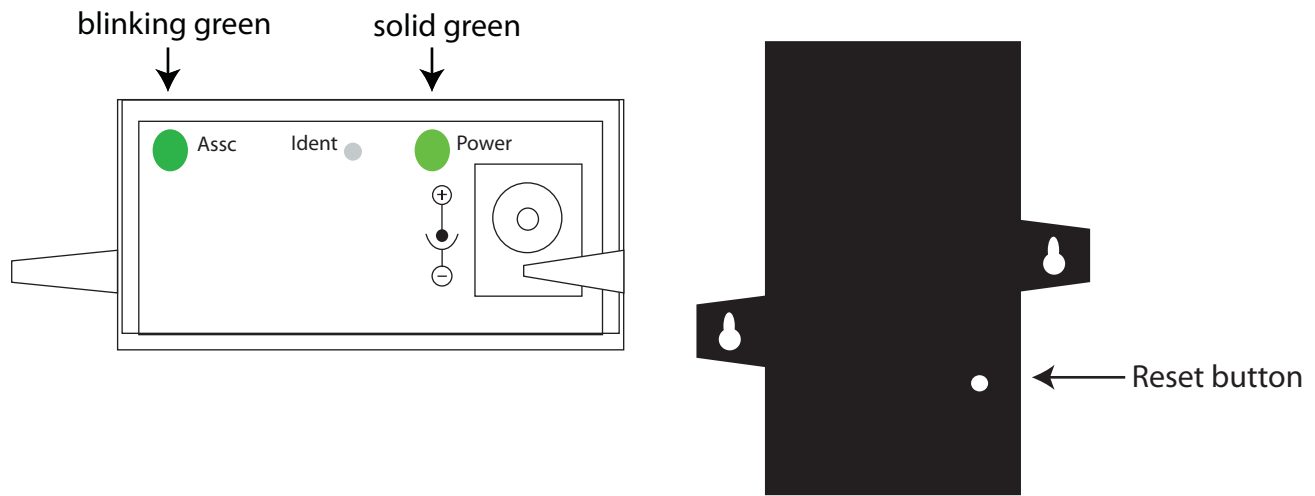
- Digi Python Custom Development Environment page  
<http://www.digi.com/technology/drop-in-networking/python.jsp>
- Digi Python Programming Guide  
[http://ftp1.digi.com/support/documentation/90000833\\_b.pdf](http://ftp1.digi.com/support/documentation/90000833_b.pdf)
- The Python Support Forum on digi.com  
<http://www.digi.com/support/forum/forum.jspa?forumID=104>

For more information about AT commands, see:

- XBee ZNet 2.5 RF Module data sheet  
[http://www.digi.com/pdf/ds\\_xbeemultipointmodules.pdf](http://www.digi.com/pdf/ds_xbeemultipointmodules.pdf)
- RF Module Product Manual

For a preliminary version of the XBee 802.15.4 module product manual, please contact Digi Support and request a copy of Digi Part Number **90000982\_A**.

## LEDs and buttons



- Power LED:** Indicates that power is on. Illuminated only when adapter is connected to external power only, not when powered by batteries. Not available in lithium-battery models.
- Assc LED:** Indicates the adapter's 802.15.4 network association status.  
**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.
- Reset button:** Recessed button on underside of the adapter. Performs equivalent of a power-cycle. Use a small non-conductive tool with a blunt end to press gently and hold down button.
- Ident button:** Recessed button on power end of the adapter between **Assc** and **Power** LEDs. Performs multiple functions for identifying and configuring the adapter in a 802.15.4 network. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

Button press	Network association	Action
Single	Associated	Cannot wake module, but will cause adapter to remain awake for 30 seconds if pressed during a sleep interval. Sends a Node Identification broadcast transmission. All devices that receive this transmission will blink their Associate LED rapidly for 1 second.
	Unassociated	<p>Blinks a numeric error code returned by the ATAI (Association Indication) command on the Assc LED. The AI code indicates the cause of the join failure. See the 802.15.4 XBee module's Product Manual for descriptions of these codes.</p> <p><b>1 blink:</b> Active scan timeout.</p> <p><b>2 blinks:</b> Active scan found no PANs.</p> <p><b>3 blinks:</b> Active scan found PAN, but the Coordinator Allow Association bit is not set.</p> <p><b>4 blinks:</b> Active scan found PAN, but Coordinator and End Device are not configured to support beacons.</p> <p><b>5 blinks:</b> Active scan found PAN, but Coordinator ID (PAN ID) value does not match the ID of the End Device.</p> <p><b>6 blinks:</b> Active Scan found PAN, but Coordinator CH (Channel) value does not match the CH of the End Device.</p> <p><b>7 blinks:</b> Energy scan timeout.</p> <p><b>8 blinks:</b> Coordinator start request failed.</p> <p><b>9 blinks:</b> Coordinator could not start due to invalid parameters.</p> <p><b>10 blinks:</b> Coordinator Realignment is in progress.</p> <p><b>11 blinks:</b> Association request not sent.</p> <p><b>12 blinks:</b> Association request timed out - no reply was received.</p> <p><b>13 blinks:</b> Association request had an invalid parameter.</p> <p><b>14 blinks:</b> Association request channel access failure - Request was not transmitted - CCA failure.</p> <p><b>15 blinks:</b> Remote Coordinator did not send an ACK after Association Request was sent.</p> <p><b>16 blinks:</b> Remote Coordinator did not reply to the Association Request, but an ACK was received after sending the request.</p> <p><b>17 blinks:</b> [reserved].</p> <p><b>18 blinks:</b> Sync-Loss - Lost synchronization with a beaconing coordinator.</p> <p><b>19 blinks:</b> Disassociated - No longer associated to coordinator.</p>
Two	Associated	Not supported.
Four	Associated/ Unassociated	Performs an ATRE command to reset the parameters in the XBee module.

## Overview



The XBee USB Adapter provides short-range wireless connectivity to any USB device, with available solutions for both ZigBee and 802.15.4 point-to-multipoint networks. Unlike an embedded wireless module, which requires design integration and development time, these off-the-shelf adapters provide instant wireless connectivity to existing USB devices. All XBee adapters can be used with Digi's ConnectPort X gateways for data aggregation and IP connectivity

## Power requirements

The XBee USB Adapter is a bus-powered device.

## Download and install device driver

The XBee USB Adapter requires a device driver, FT232R. This device driver causes adapter device to appear as an additional COM port available to the PC. Application software can access the adapter in the same way as it would access a standard COM port.

To download this device driver, go to this web page and select the download appropriate for your operating system:

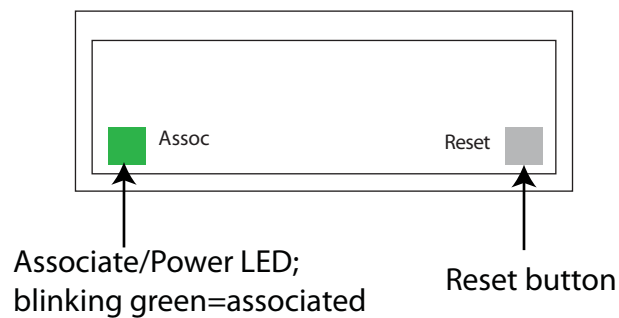
<http://www.ftdichip.com/Drivers/VCP.htm>

## Data retrieval

Retrieving data from XBee adapters is done by issuing a remote AT IS (Force Sample) command through the XBee API. The API and AT IS command are described in detail in the RF module's data sheet. These AT IS commands can be issued via a Python program that is executed on the gateway. See also the *Product Manual* for the RF module and the *Digi Python Programming Guide*.

## LEDs and buttons

There is one LED and one button on the end of the adapter opposite the USB connector:



### Associate/ Power LED:

Indicates the adapter's 802.15.4 network association status.

**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.

### Reset button:

Performs a reset.

Use a small non-conductive tool with a blunt end to press gently and hold down button. Consecutive button presses must occur within 800 milliseconds of each other to perform the desired action.

## Overview

The XStick 802.15.4 is a USB peripheral module adapter that provides short-range wireless connectivity to a 802.15.4 network.

## Power requirements

The XStick 802.15.4 is a USB bus-powered device.

## Connection and startup

Plug the XStick 802.15.4 into the USB connector of a PC, or use a USB extension cable. The extension cable must be no more than 3 meters long.

## Download and install device driver

The XStick 802.15.4 requires a device driver, FT232R. To download this device driver, go to this web page and select the download appropriate for your operating system:

<http://www.ftdichip.com/Drivers/VCP.htm>

## Unsupported XBee AT commands

The XStick 802.15.4 does not support these XBee AT commands:

AV, D0, D1, D2, D3, D4, D5, D6, D7, D8, IA, IC, IO, IR, IS, IT, IU, M0, M1, PR, PT, P0, P1, P2, RP, T0, T1, T2, T3, T4, T5, T6, T7,

## LEDs and buttons

### Associate/ Power LED:

This LED is located inside the case of the device. It indicates whether the device is powered and its 802.15.4 network association status.

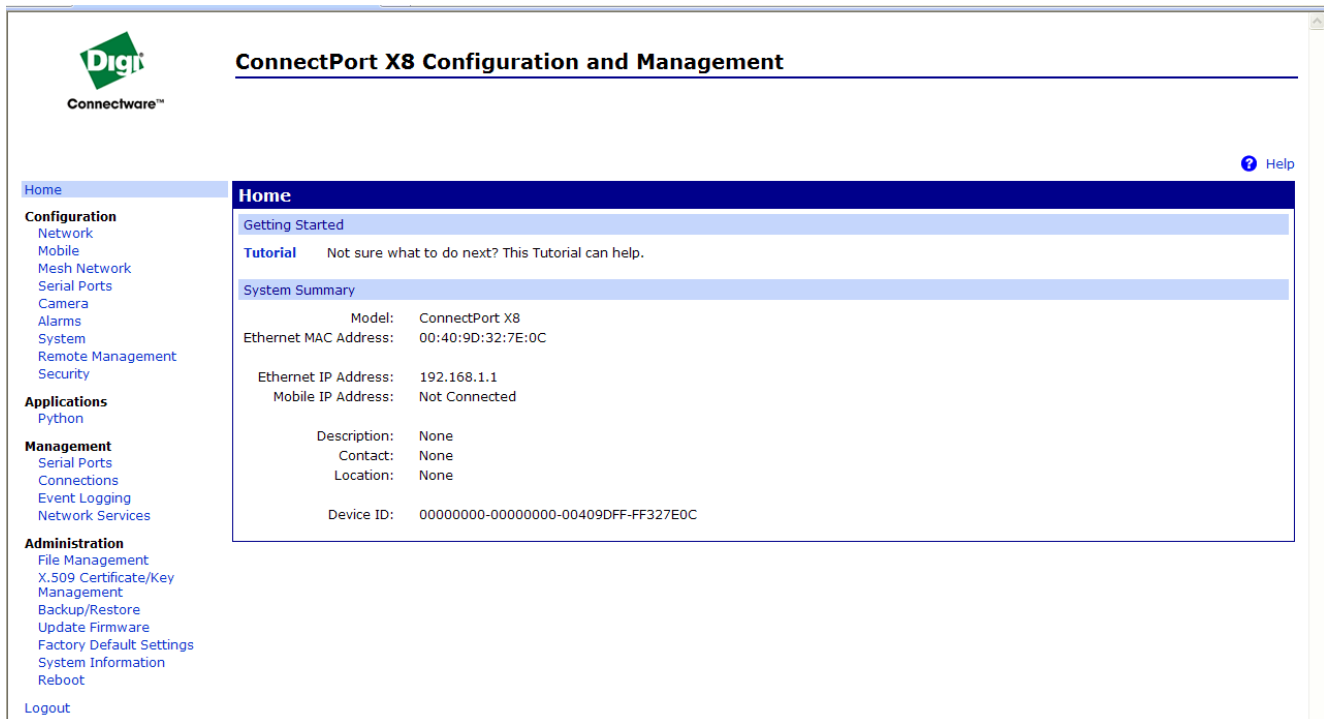
**Note:** 802.15.4 networks are not required to use a coordinator for network creation. As a result, the 802.15.4 adapters are not set up to associate, but are configured with a default PAN ID and destination address. To maintain LED consistency, on power-up, these adapters will immediately indicate association by blinking. See the XBee 802.15.4 Product Manual for more information regarding association options.

There are several configurable radio settings in XBee Adapter, Router, and Sensor products, including the PAN ID, the node identifier or name for the unit, and timeout and scanning settings. This chapter shows how to configure your XBee product through the gateway's web interface.

## Configuration with a ConnectPort X gateway

### Access the gateway's web interface

1. On the PC, open a web browser such as Internet Explorer.
2. In the browser's address bar, enter **192.168.1.1** which is the default IP address for the gateway.
3. The home page of the gateway's web interface is displayed.



**ConnectPort X8 Configuration and Management**

Connectware™

Home

**Configuration**

- Network
- Mobile
- Mesh Network
- Serial Ports
- Camera
- Alarms
- System
- Remote Management
- Security

**Applications**

- Python

**Management**

- Serial Ports
- Connections
- Event Logging
- Network Services

**Administration**

- File Management
- X.509 Certificate/Key Management
- Backup/Restore
- Update Firmware
- Factory Default Settings
- System Information
- Reboot

Logout

Home

Getting Started

**Tutorial** Not sure what to do next? This Tutorial can help.

**System Summary**

Model:	ConnectPort X8
Ethernet MAC Address:	00:40:9D:32:7E:0C
Ethernet IP Address:	192.168.1.1
Mobile IP Address:	Not Connected
Description:	None
Contact:	None
Location:	None
Device ID:	00000000-00000000-00409DFF-FF327E0C

Help

**Discover the device and view the network**

1. In the gateway's web interface, select **Administration > System Information** from the menu.

**Administration**

- [File Management](#)
- [X.509 Certificate/Key Management](#)
- [Backup/Restore](#)
- [Update Firmware](#)
- [Factory Default Settings](#)
- [System Information](#)
- [Reboot](#)

The **System Information** page is displayed.

**System Information**

▼ General

Model:	ConnectPort X8
Ethernet MAC Address:	00:40:9D:32:7A:08
WiFi MAC Address:	00:40:9D:2E:91:74
Firmware Version:	2.7.0.9 (Version 82001115_C_SA9 12/14/2007)
Boot Version:	1.1.3 (release_82001113_C)
POST Version:	1.1.3 (release_82001114_C1P)
CPU Utilization:	6%
Up Time:	15 minutes 22 seconds
Total Memory:	16384 KB
Used Memory:	13705 KB
Free Memory:	2679 KB

- ▶ Serial
- ▶ Network
- ▶ WiFi LAN
- ▶ Mobile
- ▶ **Mesh Network**
- ▶ Diagnostics



- From the list of System Information links, click **Mesh Network** or **WPAN**, depending on how the link is labeled for the gateway. The **Mesh Network/WPAN** page is displayed. It shows several settings for the gateway, followed by the **Network View of Nodes**. In the **Node Type** column, all discovered nodes are listed as **end nodes**.

Network View of the Mesh Devices			
Node ID	Network Address	Extended Address	Node Type
[0000]!	[0000]!	00:13:a2:00:40:00:96:14!	end node
[0000]!	[0000]!	00:13:a2:00:40:08:df:a2!	end node

Clear list before performing refresh

Refresh

### View and change XBee radio settings as needed

- In the web interface, go to **Configuration > Mesh Network** or **WPAN**, depending on how the link is labeled for the gateway. The **Mesh/WPAN Network Configuration** page is displayed. It shows several settings for the gateway, followed by the **Network View of Nodes**. To refresh the view, click the **Refresh** button.

Mesh Network Configuration			
Network View of the Mesh Devices			
Node ID	Network Address	Extended Address	Node Type
[0000]!	[0000]!	00:13:a2:00:40:00:96:14!	end node
[0000]!	[0000]!	00:13:a2:00:40:08:df:a2!	end node

Clear list before performing refresh

Refresh

- In the list under **Network View of Nodes**, locate your product by its physical address. This address is printed on a label on the bottom of the unit. Click on the **Network Address** or **Physical Address** to open the product's settings page.

## 3. The Mesh Network Configuration page is displayed.

Mesh Network Configuration

Basic Radio Settings

PAN ID:  hex (0-FFFF,FFFF=any PAN ID)  
*Note: Changing the PAN ID may make this .*

Node Identifier:

Scan Channels:  hex (1FFE=all channels)

Scan Duration:  (0-7)

Advanced Radio Settings

Transmit Power Level:  ▾

CCA Threshold:  -dBm (36-80)

Random Delay Slots:  (0-3, 0=disabled)

View and change configuration settings as needed. To apply configuration changes, click **Apply**.

**Basic radio settings** control basic operation of the RF module in a 802.15.4 network.

- **Extended PAN ID (ID):** Sets the PAN (Personal Area Network) ID, in hexadecimal. This is the preferred PAN ID for the 802.15.4 network. All 802.15.4 Digi Drop-in Networking products have a default PAN ID of **3222**. A PAN ID of **FFFF** causes the RF module to select a random PAN ID. Otherwise, the specified ID will be used.

When a Router or End device searches for a Coordinator on the WPAN, it joins to a parent that has a matching PAN ID. If that device's configured ID setting is FFFF, the device will join a parent operating on any PAN ID.



**Note:** Changing the PAN ID may make your XBee product inaccessible.

- **Node Identifier (NI):** A descriptive, user-friendly name for the device. This identifier is returned as part of any Node Discover operations done on the 802.15.4 network. Using Node Identifiers for Drop-in Networking devices makes it possible to reference them by names rather than their physical addresses. Enter a name of up to 20 characters.
- **Scan Channels (SC):** A bit field list of the channels to scan. The Digi device chooses the channels when starting the network.
- **Scan Duration (SD):** Sets the scan duration exponent of the Active and Energy Scans (on each channel) that are used to determine an acceptable channel and Pan ID for startup of the Coordinator.

**Advanced radio settings** control behavior of the RF module at a more detailed level. Generally, these settings can be left at their defaults.

- **Transmit Power Level (PL):** Sets the power level at which the RF module transmits conducted power.

For XBee modules:

Power Level	Conducted Power in dBm
Lowest (0)	-10 dBm
Low (1)	-6 dBm
Medium (2)	-4 dBm
High (3)	-2 dBm
Maximum (4)	0 dBm

For XBee-PRO modules:

Power Level	Conducted Power in dBm
Lowest (0)	10 dBm
Low (1)	12 dBm
Medium (2)	14 dBm
High (3)	16 dBm
Maximum (4)	18 dBm

- **CCA Threshold:** Sets the CCA (Clear Channel Assessment) threshold. Prior to transmitting a packet, a CCA is performed to detect energy on the channel. The packet will not be transmitted if the detected energy is above the CCA threshold.
  - **Random Delay Slots:** Sets the minimum value of the back-off exponent in the CSMA-CA algorithm for collision avoidance. If set to zero, collision avoidance is disabled during the first iteration of the algorithm.
4. If you assigned a Node Identifier, to view it, go to **Configuration > Mesh Network** and click **Refresh**. The new name is displayed in the **Node Identifier** field.

## XBee Adapters

## Hardware specifications for XBee Adapters (Sheet 1 of 3)

Specification		Value
Environmental	Operating temperature	<p><b>XBee RS-232 Adapter, XBee RS-485 Adapter, XBee Analog I/O Adapter, XBee Digital I/O Adapter, XBee Sensor Adapter, XBee USB Adapter:</b></p> <p>-40° to 158° F (-40° C to 70° C)</p> <p><b>Operating temperature for powering options:</b></p> <p>The temperature range of the UL/C-UL Listed power supply must be -- 40° to 158° F (-40° C to 70° C) minimum to meet the allowed ambient temp range for XBee Adapters. If a power supply with an ambient rating of less than 70 C is used, then the allowed ambient temperature range of the XBee Adapter is reduced to the rating of the power supply chosen.</p> <ul style="list-style-type: none"> <li>• Battery: 0.4° to 131° F (-18° C to 55° C)</li> <li>• External power: 32° to 104° F (0° C to 40° C)</li> <li>• External power (hardened): -31° to 165.2° F (-35° C to 74° C)</li> </ul> <p><b>XBee RS-232 PH Adapter:</b></p> <p>32° to 149° F (0° C to 65° C)</p>

## Hardware specifications for XBee Adapters (Sheet 2 of 3) (Continued)

Specification		Value
Power requirements	DC power input	<p><b>XBee RS-232 Adapter, XBee RS-485 Adapter, XBee Analog I/O Adapter, XBee Digital I/O Adapter, XBee Sensor Adapter:</b></p> <p>External power supply varies by model:</p> <ul style="list-style-type: none"> <li>• <b>Alkaline battery model:</b> UL /c-UL Listed ITE or Class II external power supply, with output rated between <b>9 to 30VDC</b>, with a current rating of 300mA or greater; locking-barrel connector of 2.1mm x 5.5mm, center is positive.</li> <li>• <b>Lithium battery model:</b> <b>3-6VDC</b> external power supply with locking-barrel connector.</li> </ul>
	N-cell batteries	<p><b>XBee RS-232 Adapter, XBee RS-485 Adapter, XBee Analog I/O Adapter, XBee Digital I/O Adapter, XBee Sensor Adapter:</b></p> <p>3x1.5V "N" alkaline battery cells</p>
	Lithium batteries	<p><b>XBee RS-232 Adapter, XBee RS-485 Adapter, XBee Analog I/O Adapter, XBee Digital I/O Adapter, XBee Sensor Adapter:</b></p> <p>2/3 AA 3.6V lithium batteries and a 1/2 AA boost capacitor.</p>
	Power harvesting (PH)	<p><b>XBee RS-232 PH Adapter:</b></p> <p>Internal battery provides power when unit is operating and recharges from the serial port when in sleep mode.</p> <ul style="list-style-type: none"> <li>• Requires a sleep/wake duty cycle as part of its normal operation.</li> <li>• Requires a fully functional serial port conforming to the RS-232C standard for optimal operation.</li> <li>• Sleep/wake duty cycle requirements vary based on the current output of serial port.</li> <li>• Serial ports with more than 14VDC output (rare) are not supported and may cause malfunction.</li> <li>• Serial ports that provide hard power of 5 to 14VDC on one or more pins allow the device to operate continually without a sleep/wake cycle.</li> </ul>
	Bus-powered	<p><b>XBee USB Adapter:</b></p> <ul style="list-style-type: none"> <li>• Bus powered: +5V from USB bus</li> <li>• Power consumption during normal operation: <ul style="list-style-type: none"> <li>- XBee: 70 mA</li> <li>- XBee-PRO: 70 mA (Rx) and 250 mA (Tx)</li> </ul> </li> <li>• Power consumption during suspend mode: <ul style="list-style-type: none"> <li>XBee and XBee-PRO: 200 uA</li> </ul> </li> </ul>

## Hardware specifications for XBee Adapters (Sheet 3 of 3) (Continued)

Specification	Value	
Dimensions	<b>XBee RS-485 Adapter, XBee Analog I/O Adapter, XBee Digital I/O Adapter:</b>	
	Length	3.6 in (9.14cm)
	Width	1.9 in (4.82 cm)
	Height	1.2 in (3.04 cm)
	Weight	2.29 oz (65.0 g)
	<b>XBee RS-232 PH Adapter, XBee USB Adapter:</b>	
	Length	2.87 in (7.29 cm)
	Width	1.80 in (4.57 cm)
	Height	0.83 in (2.10 cm)
	Weight	1.60 oz (45.36 g)

**XStick 802.15.4**

Specification		Value
Environmental	Operating temperature	-40° to 185° F (-40°C to 85°C)
Power Requirements	Supply voltage	5V from USB port of PC
	Operating current (transmit)	64mA
	Operating current (receive)	64mA
	Power-down current	Do not put the XStick in sleep mode.
Dimensions	Width	0.7 in (1.78 cm)
	Height	0.4 in (1.02 cm)
	Length	1.8 in (4.57 cm)
	Weight	0.265 oz (7.5 g)
RF Operation	Operating frequency band	2.4GHz ISM
	Antenna options	internal only
RF Performance	Indoor/urban range	15m
	Outdoor RF line-of-sight Range	40m
	Transmit power output (nominal 25°C)	1mW (0dBm) Peak Conducted (FCC & Industry Canada)
	RF data rate	250kbps
	Serial interface data rate (software selectable)	1200 bps-1M bps
	Receiver sensitivity	-90dBm
Networking and Security	Supported network topologies	<ul style="list-style-type: none"> <li>• Point-to-point</li> <li>• Point-to-multipoint</li> <li>• Peer-to-peer</li> </ul>
	Number of channels (software selectable)	16
	Addressing options	PAN, Channel and address
Certifications	The XStick 802.15.4 is a radio transceiver, and has received these agency approvals:	
	United States (FCC Part 15.247)	FCC ID: MCQ-XSTICK1
	Industry Canada (IC)	IC: 1846A-XSTICK1
	Europe (CE)	ETSI

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.

**Class I Division 2, Groups A, B, C, D Hazardous location**

XBee Adapter, Sensor, and Router products are intended for use **in ordinary locations only.**

The device and any leads for the device may **not** be extended into a Hazardous Location.

This device has not been evaluated for use in wet locations or near combustible liquids, fumes, or vapors.

**Lithium battery safety precaution**

XBee adapter and sensor products have no user-serviceable parts and are intended to be opened by qualified service personnel only.

Danger of explosion exists if lithium batteries are replaced incorrectly. Replacement must be done by qualified service personnel, and only with the same or equivalent battery type recommended by the manufacturer. Dispose of unused batteries according to the manufacturer's instructions.