USB ZigBee Adapter

User Manual

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Chapter 1. USB ZigBee Adapter

ZigBee is a low power, wireless mesh network standard, largely used in the areas of home automation, medical data collection and industrial control. The USB ZigBee Adapter connects a PC or any USB capable host to a ZigBee network.

At the core of the USB ZigBee Adapter is the XBee module from Digi, which implements the ZigBee stack. Once connected to the PC, the USB ZigBee Adapter is visible as a virtual COM port. The user can interact with the ZigBee stack, by sending commands through the virtual COM port.

The USB ZigBee Adapter also doubles up as an XBee Module Programmer for firmware upgrades.

1. Features

- USB Powered
- Built in +3.3V regulator for XBee module
- XBee ZB and XBee-PRO ZB compatible
- LEDs for TX/RX and ZigBee state
- Debug LED and Key
- Local and remote loopback

2. Wireless Parameters

Parameter	XBee ZB	XBee-PRO ZB
Data rate	250Kbps	250Kbps
Indoor range	40m	90m
Line of sight	120m	1500m
Tx. Power	1.25mW / 2mW	63mW

The international variant of XBee-Pro ZB are limited to 10mW Tx. Power

Chapter 2. Board Design

1. Overview

The devices available on the board, is shown in the following block diagram. Each device is described in detail in the following sections.

Figure 2.1. Block Diagram
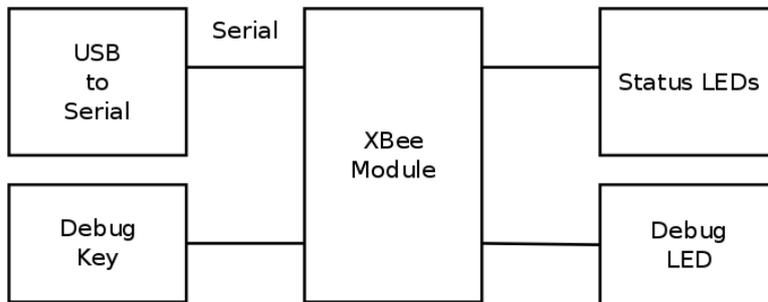
2. Locating Components

The location of the components on the board is indicated in the following diagram.

Figure 2.2. Front View

3. Power Supply

The USB ZigBee Adapter is powered from a PC USB port, and does not require an external power supply. Detailed power supply specifications are available in section Specifications.

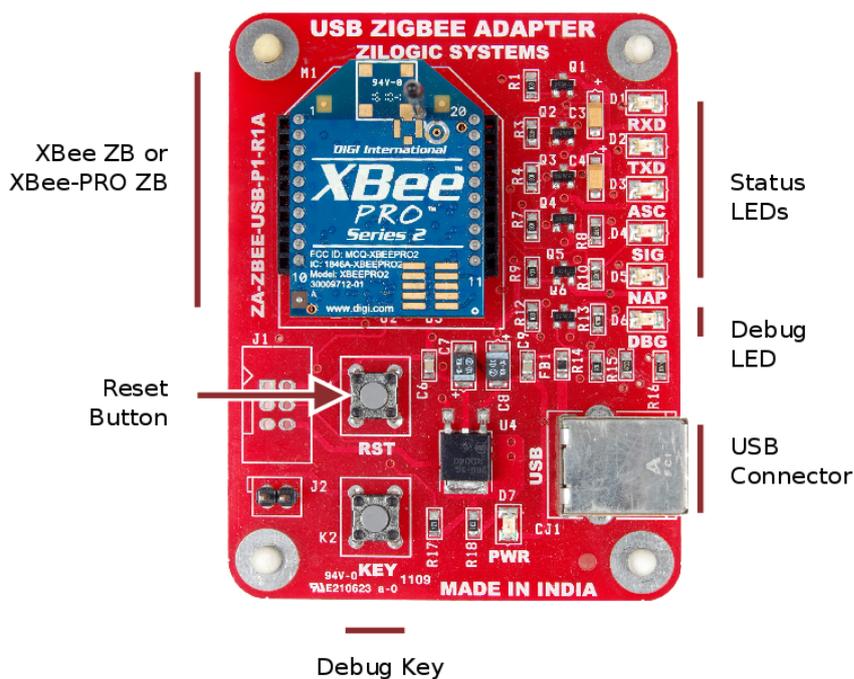## 4. XBee Module

The XBee ZB Module or XBee-PRO ZB Module can be mounted on the USB ZigBee Adapter. The module provides a UART interface through which the host PC can send and receive data. The module can also be configured through the serial interface.

5. USB Serial

The USB ZigBee Adapter has a FT232R USB to serial UART converter, for communication between the host PC and the XBee module. The OS detects the USB Serial device as a Virtual COM port. Any standard serial terminal application should be able to communicate with the XBee module, using the Virtual COM port.

The RTS and CTS signals of the USB serial converter are connected to the XBee module, for optional hardware flow control. The DTR signal of the USB serial converter is also connected to the XBee module, for switching the module into firmware upgrade mode, during module power up.

6. Status LEDs

The status LEDs indicate the following information.

RXD LED   Blink indicates data has been received by the module from the host.

TXD LED   Blink indicates data has been transmitted by the module to the host.

ASC LED   Continuos blinking indicates associated with a network, in case of a router or end device. And PAN ID and radio channel has been selected in the case of coordinator.

SIG LED   Brighter LED indicates a more stable link. In other words, shows the received signal strength of the last received packet.

NAP LED   On indicates device has woken up from sleep state.

7. Debug Key & LED

A Debug Key and Debug LED is provided for testing the local and remote IOs. The Debug Key is connected to the pin `DIO11` of the XBee module. The Debug LED is connected to the pin `DIO4` of the XBee module.

8. Specifications

Parameter	Value	Condition
USB Power Supply		
Voltage	5V	
Max. Current	100mA	With XBee ZB Module

Chapter 3. Board Usage

1. AT Mode and API Mode

The XBee modules can communicate using two protocols with the host.

1. AT Mode
2. API Mode

In AT mode, the module provides an AT command interface, similar to AT modem commands, for configuration. The AT mode also supports transparent mode of operation in which serial data sent to the module, is transmitted over the air to a remote ZigBee node.

In API mode, the module uses a binary packet interface for communicating with the host. The available packets and their formats is described in the module user manual.

2. Communicating in AT mode

The module is first updated with an AT mode firmware. AT commands can then be sent to the device using a terminal software, like putty, hyperterminal or minicom.

When the device is connected to the host system, it is detected a Virtual COM device in Windows, and a USB serial device in Linux.

Open a serial communication software like hyperterminal, teraterm, putty, etc. and configure the following parameters.

No.	Parameter	Value
1	Baudrate	9600
2	Data Bits	8
3	Stop Bits	1
4	Parity	None
5	Flow Control	None

By default the module will be in transparent mode of operation, to enter AT command mode type `+` `+` `+`. A one second gap, called the guard time, should be provided before and after the `+` `+` `+` sequence. The module on entry into AT command mode, responds with `OK\r`. After which AT commands can be sent to the device.

For example, to get the firmware version (`VR`), the following sequence of commands can be used.

```
U: +++
M: OK
U: ATVR
M: 2070
```

The character `+` used for entering the AT command mode, is called the Command Character. The guard time and command character is configurable using AT commands. The default is 1 second and `+`, respectively.

The module can be put back to transparent mode of operation manually using the `CN` AT command. The module also switches back to transparent mode of operation after a timeout, 10 seconds by default. The command mode timeout is also configurable using the `CT` AT command.

3. Sending and Receiving Data in Transparent Mode

Transparent mode of operation is demonstrated using a two node network, consisting of a coordinator and router. The following sequence shows how to send a message from the coordinator to the router.

1. Update the coordinator AT firmware in module A, and router AT firmware in module B.

2. Connect the ZigBee Adapters to the host PC. Ensure the ASC LED is blinking in both the modules.

Figure 3.1. Two Node Network

3. Note down the 64-bit MAC address specified in the module B. The 64-bit MAC of the module can be obtained from the label on the back of the module. The 64-bit MAC can also be obtained using the SH and SL AT commands.

Figure 3.2. Obtaining MAC address


```
U: +++
M: OK
U: ATSH
M: 00112233
U: ATSL
M: 44556677
```
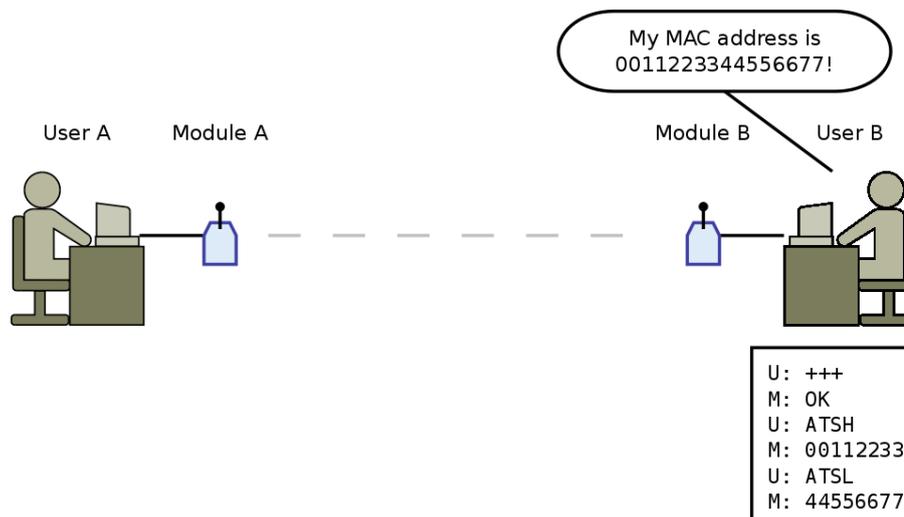
4. In module A, set the destination addressing using the DH and DL AT commands. DH is used to specify the higher order 32 bits and DL is used to specify the lower order 32 bits.

Figure 3.3. Setting the Destination


```
U: +++
M: OK
U: ATDH 00112233
M: OK
U: ATDL 44556677
M: OK
```
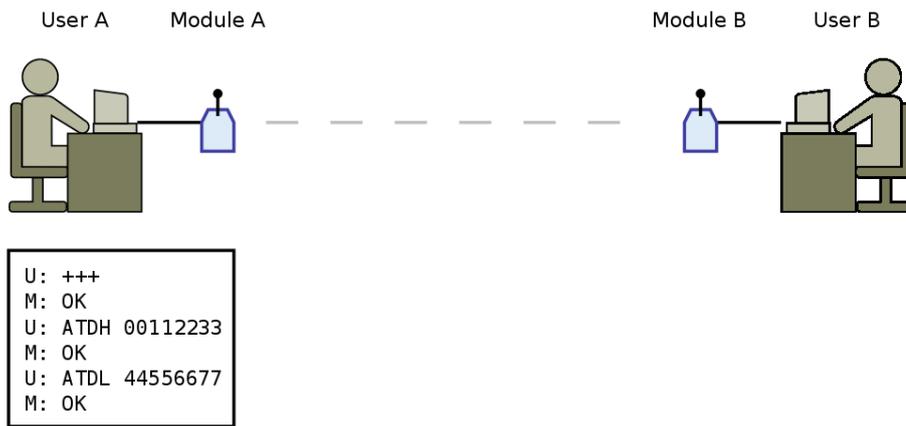
5. Switch both the module into transparent mode of operation, using the `CN` AT command. Type a message to be sent to module B, the message should appear on module B's serial output.

Figure 3.4. Sending and Receiving Message


```
U: ATCN
M: OK
U: Hello ZigBee!
```

```
U: ATCN
M: OK

M: Hello ZigBee!
```
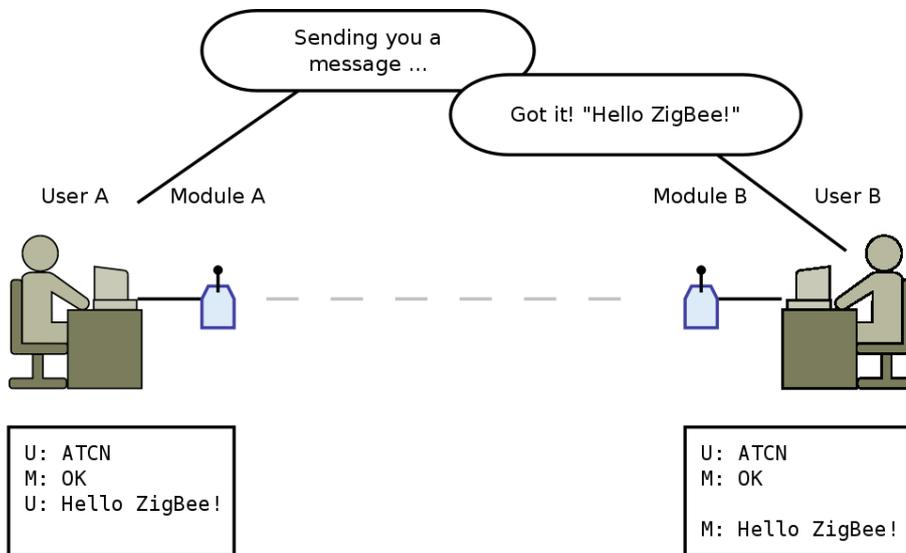
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