

User's Manual 2006-07-06

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Zigbee Module

ZIG-100

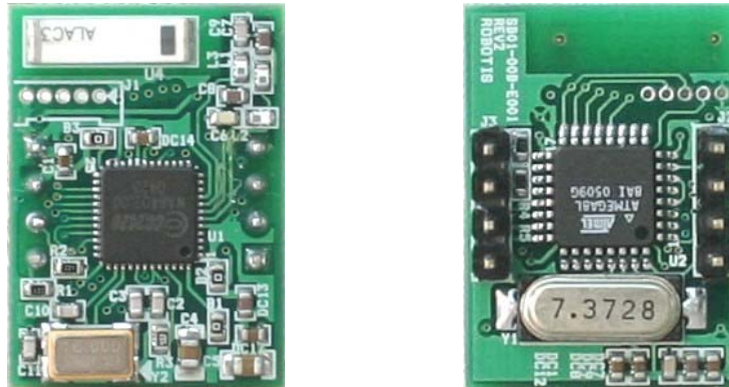
Wireless Communication

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1. Zigbee Module ZIG-100

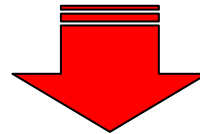
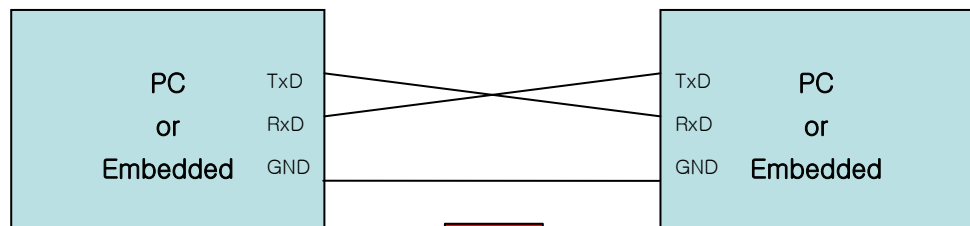
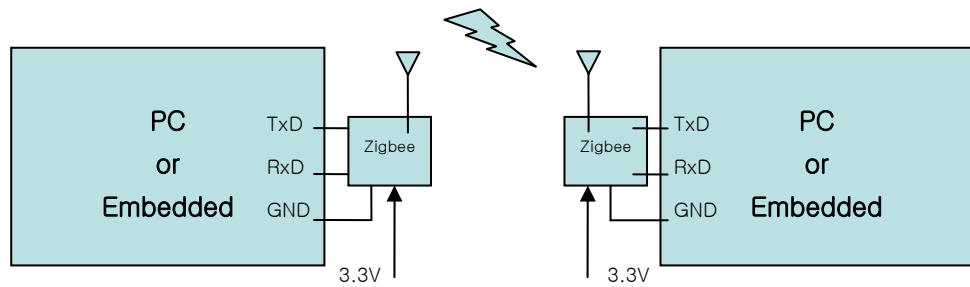


[ZIG-100 Circuit]

ZIG-100	ZIG-100 is a small module that has a built-in MCU and Zigbee IC, allowing UART communication using 2.4GHz frequency. Utilized as a PAN (Personal Area Network) Module, it replaces wired serial communication with more modern wireless characteristics. Basic specifications of Zig-100 are as follows.
Bandwidth	RF Data Transfer Bandwidth : MAX 250kbps
Interface	Using UART, it can setup configuration as well as transmitting and receiving data. Various Baud Rates are supported. Recommended Baud Rate is between 9600bps and 115200bps.
Power Supply	Voltage of 2.7V~3.6V is normally used in ZIG-100, and for stable operation, 3.3V Regulator is recommended. The power consumption is about 30mAh in 3.3V. Take note, however, that the usage of more than 3.6V may damage the product.
Dimension	Width X Length X Height: 26.5mm x 19mm x 12mm (Without a connector, the height is getting lower as 6mm.)

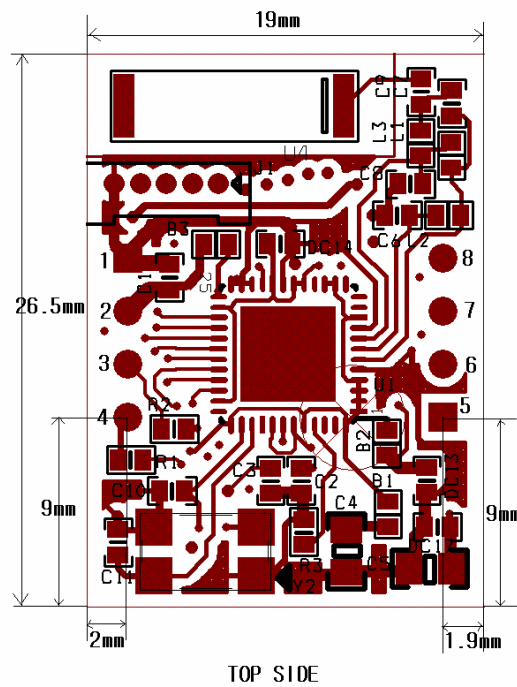
ZIG-100 Concept

As shown below, Zig-100 provides innovative wireless solution that replaces wired serial communication.

Wired Serial Communication**After Zigbee applied**

Pin Description

ZIG-100 Module viewed from top.

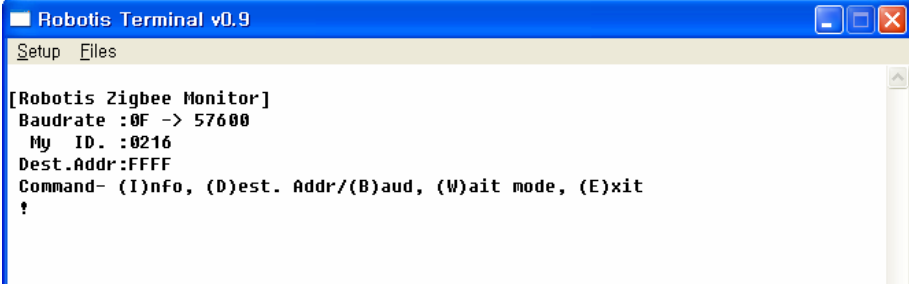


Each pin has following roles.

- 1 : GND – Zigbee Module' s Ground Level (0v)**
- 2 : VCC – Zigbee Module' s Supply Voltage (2.7~3.6V)**
- 3 : LED – Zigbee Module' s LED Indicating a connection status**
- 4 : /RESET - Reset for Zigbee Module**
(Also used In Zigbee setting mode)
- 5 : CHANNEL_SEL1 – Used In Broadcasting Mode (Explained later on)**
- 6 : CHANNEL_SEL2**
- 7 : TXD – Zigbee Module' s Transmit Signal pin**
- 8 : RXD – Zigbee Module' s Receive Signal pin**

Setting

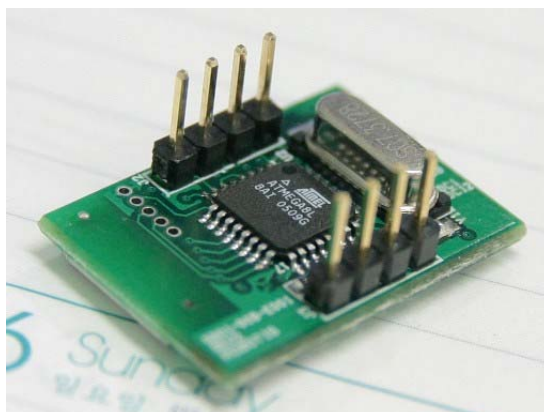
To check or to change the setup status of the Zigbee Module, it is necessary to connect to PC as shown in page 3. Run the terminal program and set to 57600 bps, No Parity, 1 Stop Bit. Next, supplying power and transmitting “!” to Zigbee Module after reset within 60ms will change to Zigbee setup mode as shown below.



```
Robotis Terminal v0.9
Setup Files

[Robotis Zigbee Monitor]
Baudrate :0F -> 57600
My ID. :0216
Dest.Addr:FFFF
Command- (I)nfo, (D)est. Addr/(B)aud, (W)ait mode, (E)xit
!
```

(In setup mode)



2. Zigbee Setting

ZIG-100 Operation Mode

Basically, Zigbee Module has a 16 bit address and each Zigbee Module has its own unique address. It can have any address between 1 and 65535; however, Address 65535 (0xFFFF) is reserved for broadcasting mode.

Zigbee Module ZIG-100 has three operation modes. Each mode can be directly controlled through terminal while it is in setup mode. Refer to page 5 to go into the setup mode.

Take Notes

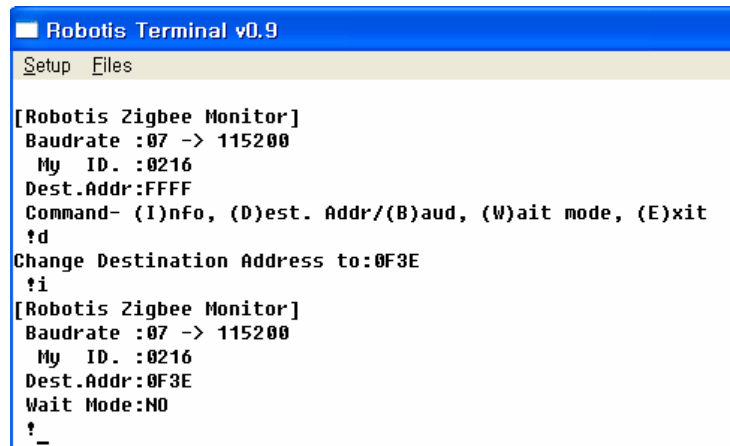
Keep in mind of following matters in setup mode.

1. Take note that only hexadecimal is used in Zigbee setup mode
2. Zigbee setup mode is always operated in 57600bps.
3. If you don't know the Baud rate of Zigbee Module, go to 57600bps setup mode and change the Baud Rate as required.
4. In Pin Description, when you connect Status LED pin to LED, you can check the connection status with blinking of LED.

1:1 Mode

The basic operation mode of Zigbee Module is 1:1 (Peer-to-Peer) communication mode. You can change the destination address in setup mode by pressing “D” and directly inputting the destination address afterward. Take note that the destination zigbee module must also set destination address of sender in 1:1 mode. That is, if the addresses 10 and 15 wants to communicate with each other, address 10 must set destination to 15, which is 0x000F, whereas, address 15 must set destination to 10, 0x000A.

A Status LED will blink when the connection is being made. After the connection is made, the LED will no longer blink and will stay on.



```

Robotis Terminal v0.9
Setup Files

[Robotis Zigbee Monitor]
Baudrate :07 -> 115200
My ID. :0216
Dest.Addr:FFFF
Command- (I)nfo, (D)est. Addr/(B)aud, (W)ait mode, (E)xit
?d
Change Destination Address to:0F3E
?i
[Robotis Zigbee Monitor]
Baudrate :07 -> 115200
My ID. :0216
Dest.Addr:0F3E
Wait Mode:NO
?_

```

(Destination Address Setting Example)

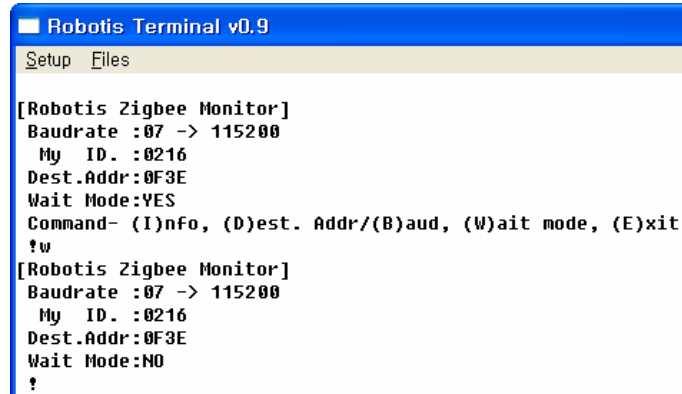
Waiting Mode

Waiting Mode is provided for connection with the unspecified Zigbee Module. It is shown in setup mode only when the destination address is not 0xFFFF. By pressing “W” it toggles “Yes” or “No” and it is in 1:1 mode when the status is “No,” and in waiting mode when it is changed to “Yes.”

Waiting mode allows the connection when other Zigbee Modules try to make connection with waiting moded Zigbee Module regardless of its destination addresses. In other words, the other Zigbee Module must set destination address of waiting-moded Zigbee Module in 1:1 mode.

In this case, when the Zigbee Module is in waiting mode, without any separate operation, it can form connection with other Zigbee Modules.

A Status LED will slowly blink in Waiting Mode. After connection, the LED will no longer blink and will stay on.



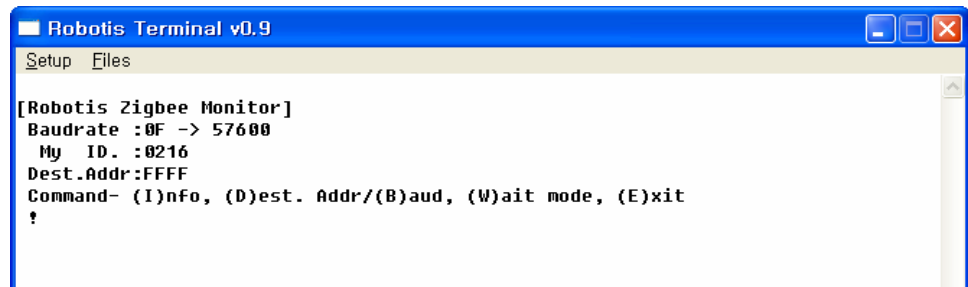
```
Robotis Terminal v0.9
Setup Files

[Robotis Zigbee Monitor]
Baudrate :07 -> 115200
My ID. :0216
Dest.Addr:0F3E
Wait Mode:YES
Command- (I)nfo, (D)est. Addr/(B)aud, (W)ait mode, (E)xit
?w
[Robotis Zigbee Monitor]
Baudrate :07 -> 115200
My ID. :0216
Dest.Addr:0F3E
Wait Mode:NO
?
```

(Waiting Mode Example)

BroadCasting Mode Zigbee Module also has Broadcasting Mode that allows simultaneous connections with many Zigbee Modules. To do so, you must set the destination address to 65535(0xFFFF) first. Upon doing so, when you send a packet, all Zigbee modules that have been set as Broadcasting Mode will receive the packet. To control the chaotic traffic that might result from broadcasting, you can set four channels only through hardware setting. When you refer to page 4, you will notice CHANNEL_SEL1, 2 pins in number 5 and 6 pins. Here, you can choose four channels by configuring low/high combinations. On default when nothing is connected, it will be set to high/high by Pull-up Resistor that is embedded in Zigbee Module.

A Status LED light will be on continuously in BroadCasting Mode.



```
Robotis Terminal v0.9
Setup Files

[Robotis Zigbee Monitor]
Baudrate :0F -> 57600
My ID. :0216
Dest.Addr:FFFF
Command- (I)nfo, (D)est. Addr/(B)aud, (W)ait mode, (E)xit
?
```

(In Broadcasting Mode)

Baud Rate Setting

In setup mode, press "B" to set Baud Rate.
Following are Baud Rate configurations.

$$\text{Target Baud} = (f_{osc} / 8) / (x + 1)$$

f_{osc} : Main Frequency – 7.3728MHz

x : divider factor

Zigbee Module involves method where x (Divider Factor) is used and accordingly, use following configurations.

$$X = (921600 / \text{Target Baud}) - 1$$

Target Baud (bps)	X (Hexadecimal)
9600	5F
14400	3F
19200	2F
28800	1F
38400	17
57600	0F
115200	07

```

Robotis Terminal v0.9
Setup Files

[Robotis Zigbee Monitor]
Baudrate :0F -> 57600
My ID. :0216
Dest.Addr:FFFF
Command- (I)nfo, (D)est. Addr/(B)aud, (W)ait mode, (E)xit
!b
Change Baud Rate.(921600/x)-1 (x:target baud)
Ex) 9600-0x5F, 57600-0x0F, 115200-0x07:07
!i
[Robotis Zigbee Monitor]
Baudrate :07 -> 115200
My ID. :0216
Dest.Addr:FFFF
!_

```

(Baud Rate Setting Example.)

Baud Rate between 9600~115200 bps has been tested and verified. The operation above this range of baud rate can not be guaranteed.

3. PC Interface Zig Board Schematic

Interface with PC

To use Zig-100 in PC, you need a simple Zig board. That is, COM Port or USB-to-Serial module sends $\pm 12V$ RS-232 signal and to be compatible with ZIG-100 (3.3V), it needs RS-232 Drivers/Receivers IC of either MAX232 or MAX3232. For example, below schematics illustrate MAX232, and in VCC, only 4~5.5V is allowed. In case of using regular 1.5V alkaline battery, three are needed. For Zigbee Module power, Voltage Regulator and additionally, LM1117-3.3V was used. Through the various LED blinking pattern, current status of ZIG-100 communication can be checked.

