WeBee

Z-0001 ZigBee Module Manual

Revision History

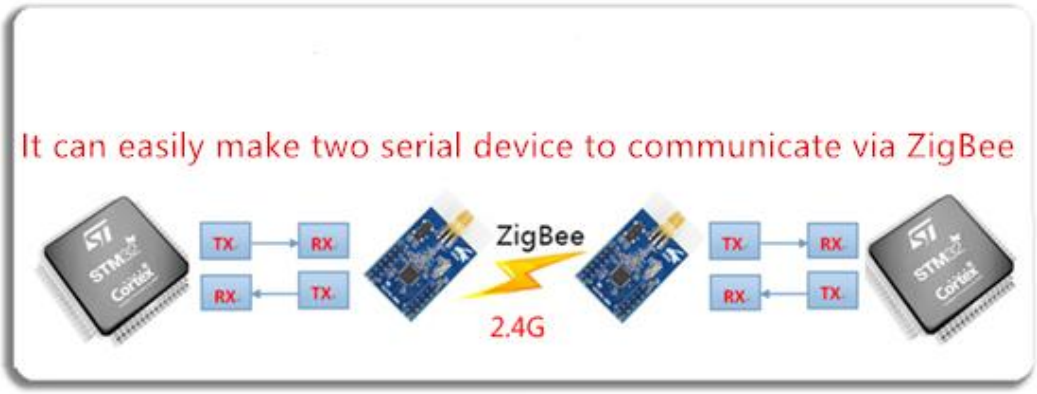
Serial	Version	Date	Author	Content
1	V1.0	2014-7-15	Logan Wu	Build Document
2	V1.1	2014-9-15	Logan Wu	1) Modify Network indicator LED. 2)Add the command for device join the network

Cotalog

1 Overview

Z-0001 ZigBee wireless module is designed with TI CC2530F256 that is a true system-on-chip (SOC) solution for IEEE 802.15.4, ZigBee applications, the module can be widely used in short distance wireless communication field, with low power consumption, small volume, strong anti-jamming capability.

Z-0001 ZigBee module which is based on TI CC2530F256 chip running ZigBee2007/PRO agreement, it has all the features of the ZigBee protocol, which is different from other types of ZigBee module. Z-0001 launch a self-forming, power-to-use ZigBee modules, users do not need to understand the complexity of the ZigBee protocol, all of the ZigBee protocol processing part, within the ZigBee module automatically, the user only needs to transmit data via the serial port, is currently on the market the most simple way to use ZigBee applications。



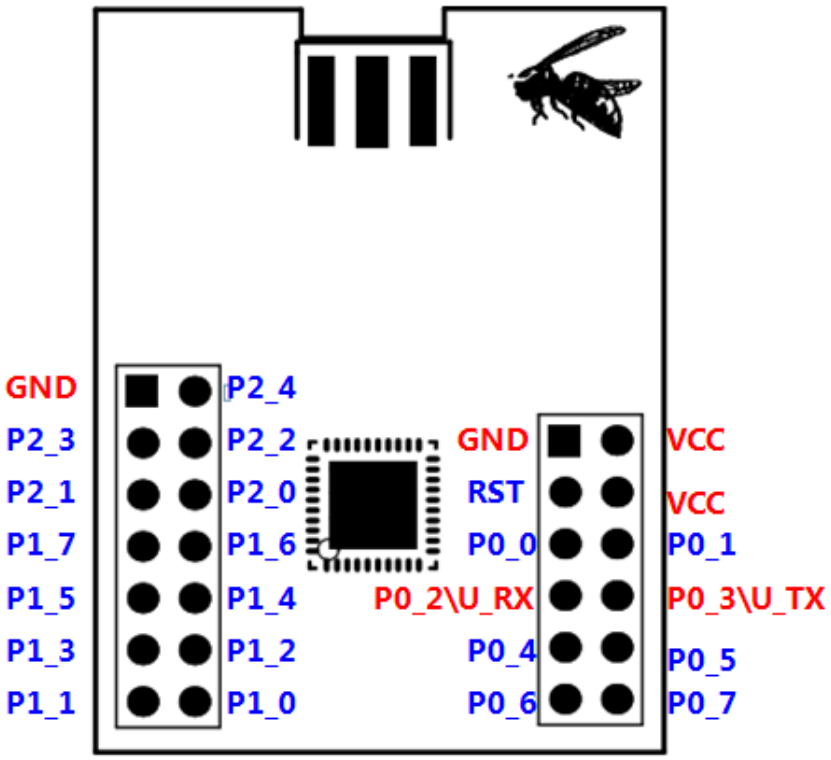
2 The detailed parameters of Module

2.1 The parameters of module

WeBee Z-0001 ZigBee module's parameters in detail in the following table:

WeBee Z-0001 ZigBee Module parameters：	
PCB parameters	1. Layers ： 4
	2. Size ： 36.5*27.8 mm
	3. Interface ： 2.54mm interval pin
	4. Material ： RF special materials
The characteristics of the module	1. Receiver sensitivity:-96 dBm
	2. Input DC voltage: 2.1V-3.6V（3.3V is recommand）
	3. Operating temperature ： -40℃— 80℃
	4. Antenna：2.4G antenna with SMA interface
	5. ZigBee protocol：ZigBee2007/PRO （ Z-Stack™）
	6. Transmission rate ： Maximum up to 250kbps
	7. Power consumption ： Receiving status <50mA; Emiting status <110mA;
	8. Transmission distance: 250 m(with 3 dBi antenna)
	9. TI CC2530F256 All IO port expansion,including debug ports
The module software features	1. Supporting uart configuration commands
	2. Transparent serial data transmission
	3. Visualize the process of ZigBee network by monitor
	4. Automatically join the network， all settings can be saved after power-off
	5. Module factory all of the node type Router, allow to switch roles

2.2 The description about module-pin

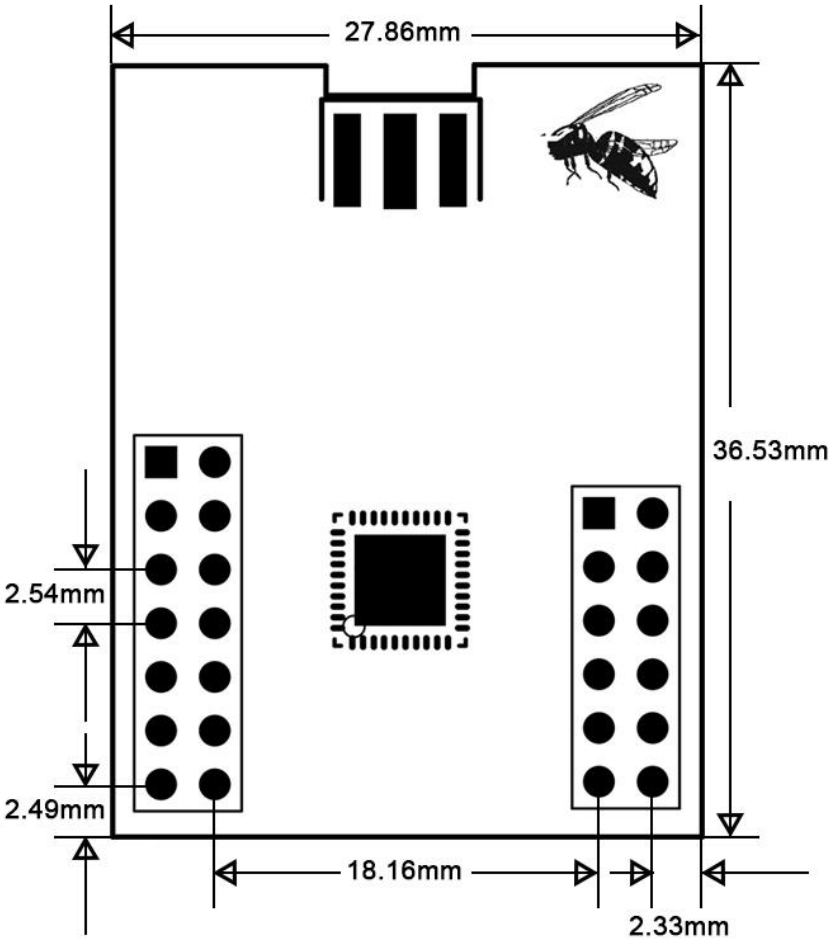


If the customer use Z-0001 ZigBee transparent transmission module，you only need to focus on the function and use of the following pin, it can directly interact with external serial devices, to implement ZigBee wireless communication

PIN	I/O	Single Name	Description
GND		--	GND
VCC	I	--	Operating voltage DC 2.0V～3.6V（3.3V is recommended）
RST	I	RTS	Low level reset,connect a resistor to VCC in default
P0_0	I	SET	When this pin is pulled low over 2S，it will restore factory settings
P0_1	I		Use Z-Sensor Monitor, falling edge trigger module obtains the topology of the entire network
P0_2	**I**	**UART0_RX**	**The UART_RX Pin of Module**
P0_3	**O**	**UART0_TX**	**The UART_TX Pin of Module**
P1_0	O	CONN	This pin shows the ZigBee connection state. High level indicates that the network is built or the device has join the network

2.3 The PCB mechanical design of Z-0001

Z-0001 ZigBee module PCB mechanical specifications：



2.4 Factory settings

Item	Default parameters
Role	Router
PAN_ID	0xFFFF
Channel	11(2405MHz)
Baud Rate	38400bps，data bit: 8 bits，stop bit:1 bit，parity: NONE
Transmit Power	4.5dbm
Local multicast number	0x0001
Target short address	0x0000
Target multicast number	0x0001
All-Data-Transmission	unicast
ZigBee Network Key	01 03 05 07 09 0B 0D 0F 00 02 04 06 08 0A 0C 0D

Every parameter of the module is configurable via PC or AT command.

3 The "AT" command of setting module

All the "AT" command format is "0x5a+0xaa+cmd+len+data", the head of the command frame is 5a aa, cmd is the command number, len is the data length and the data is the user data.

Frame		Cmd	Len	Data
0x5a	0xaa	Command num	Data length	user data

3.1 Setting functions of modules

The module can be set to join the network status by instruction.The function command number is 0x00,Specific commands refer to the following table:

Function	Command	Data	Description
Reset the module	5a aa 00 01 00	0x00	Reboot the module
Restore the default setting	5a aa 00 01 01	0x01	restore factory settings
Clear the network information	5a aa 00 01 02	0x02	Module will clear the local network information
		High 4 bit of data indicates whether to allow the nodes join into the network with power on.	
Make the device can join into the network	5a aa 0b 01 xx	0x0x	0x: allow to be join when power on，
		0x1x	1x: network can't be join when power on
		High 4 bit of data indicates the node's operation after joining the network.	
		0xx0	forbid current nodes joining network
		0xx1	Allow current nodes to join 10s，
		0xx2	allow current nodes to join 20s，
		0xx3	allow current nodes to join 30s，
		0xx4	allow current nodes to join 60s，
		0xx5	allow current nodes always joining
		0xx6	Forbid all Router devices joining network

		0xx7	allow all routers to join network 10s，
		0xx8	allow all routers to join network 20s，
		0xx9	allow all routers to join network 30s，
		0xxa	allow all routers to join network 60s，
		0xxb	Allow all routers always joining network
Example： Command：5a aa 0b 01 19 It means the devices can't be join the network when power on, after sending this command, the network can be join in 30 seconds.			
Command：5a aa 0b 01 06 It means the devices allow to join the network when power on, after sending this command ,the network forbid all nodes to join the network.			

Note:

The modules can build the network automatic and save all parameters when power off.

If the device wants to join into other network, it should clear its network information.

3.2 Setting parameters of modules

This module can set network parameters and other parameters, as the follow table shows:

Parameters	Command	Data	Description
Role	5a aa 01 01 xx	0x00	Set the nodes to coordinator
		0x01	Set the nodes to Router
		0x02	Set the nodes to End Device
PAN_ID	5a aa 02 02 xx xx	0xxx 0xxx	PAN_ID must equal to the target network PAN_ID. 0xFFFF means build a ZigBee network or join a ZigBee network.
Channel	5a aa 03 01 xx	0xxx	11-26 Channel , 16Channels （From2405MHz to 2480MHz）
Baud Rate	5a aa 04 01 xx	0x00	Set the serial port baud rate :9600 bps
		0x01	Set the serial port baud rate :19200 bps

		0x02	Set the serial port baud rate :38400 bps
		0x03	Set the serial port baud rate :57600 bps
		0x04	Set the serial port baud rate :115200 bps
Transmit Power	5a aa 05 01 xx	0x00	Set the transmit power：-4 dbm（PA：14dbm）
		0x01	Set the transmit power：-1.5 dbm（PA：17dbm）
		0x02	Set the transmit power：1 dbm（PA：19dbm）
		0x03	Set the transmit power：4.5 dbm（PA：21dbm）
Localmulticast number	5a aa 06 02 xx xx	0xxx 0xxx	Set the multicast number ofmodule , default is 0x0001
Target short address	5a aa 07 02 xx xx	0xxx 0xxx	This is the target short address when uses unicast，default is 0x0000 means sends to the Coordinator
Target multicast number	5a aa 07 02 xx xx	0xxx 0xxx	This is the target short address when uses multicast，default is 0x0001
All-Data-Transmission	5a aa 09 01 xx	0x00	Broadcast
		0x01	unicast
		0x02	multicast
ZigBee Network Key	5a aa 0a 10 xx xx…(16Byte)	16 Byte	Set the ZigBee Network Key. If the key is different, device can’t communicate with others
If the set command execute successful, it will return: 5a + cmd + len +data			
Example: Set the module role as Coordinator: 5a aa 01 01 00, if sets successful, it will return 5a 01 01 00.			

3.3 Querying parameters of modules

The command of Querying parameters about module is 0xBx, command format is: 5a+aa+cmd

parameters	Command	Data	Description
Module Role	**5a aa b1**	0xb1	Return the role of nodes.
PAN_ID	**5a aa b2**	0xb2	Return the PAN_ID of nodes.
Channel	**5a aa b3**	0xb3	Return the Channel of nodes.
Baudrate	**5a aa b4**	0xb4	Return the Baudrate of nodes.
Transmit Power	**5a aa b5**	0xb5	Return the Transmit Power of nodes.
Localmulticast number	**5a aa b6**	0xb6	Return the Localmulticast number of nodes.
Target short address	**5a aa b7**	0xb7	Return the Target short address of nodes.
Target multicast number	**5a aa b8**	0xb8	Return the Target multicast number of nodes.
All-Data-Transmission	**5a aab9**	0xb9	Return the Transmission types of nodes.
Module MAC	**5a aaba**	0xba	Return the MAC address of nodes.
Local short address	**5a aa bb**	0xbb	If return FFFE, it means no in ZigBee network
ZigBee network Key	**5a aa bc**	0xbc	Return the network Key of nodes
If the view command execute successful, it will return:5a + cmd + len +data			
Example: If want to view the module role: 5a aa b1, if execute successful, it will return 5a b1 01 00 (00 is the Coordinator).			

3.4 Command-Data-Transmission

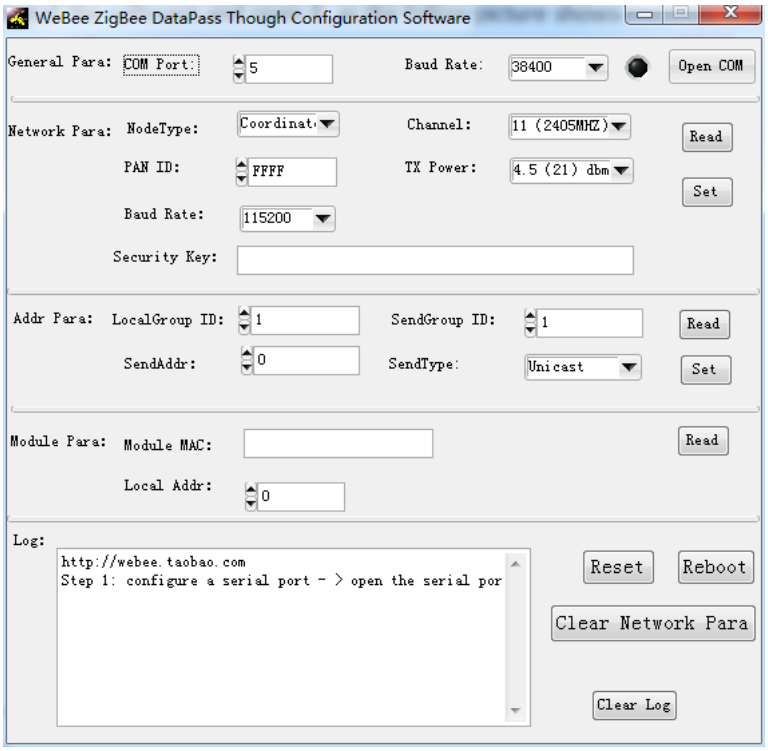
Module default is in All-Data-Transmission, if the module receive data from UART, it will send out in Broadcast、unicast、multicast method. If wants to send the data in other method, can use the Command-Data-Transmission.

Item	Command	Description
Broadcast	**5a aa a1 len data**	Send the data to all the device in the network
multicast	**5a aa a2 len xxxx(multicast number) data**	Send the data to the device which multicast number is the same
unicast	**5a aa a3 len xxxx(short address) data**	Send the data to the device which short address is the same

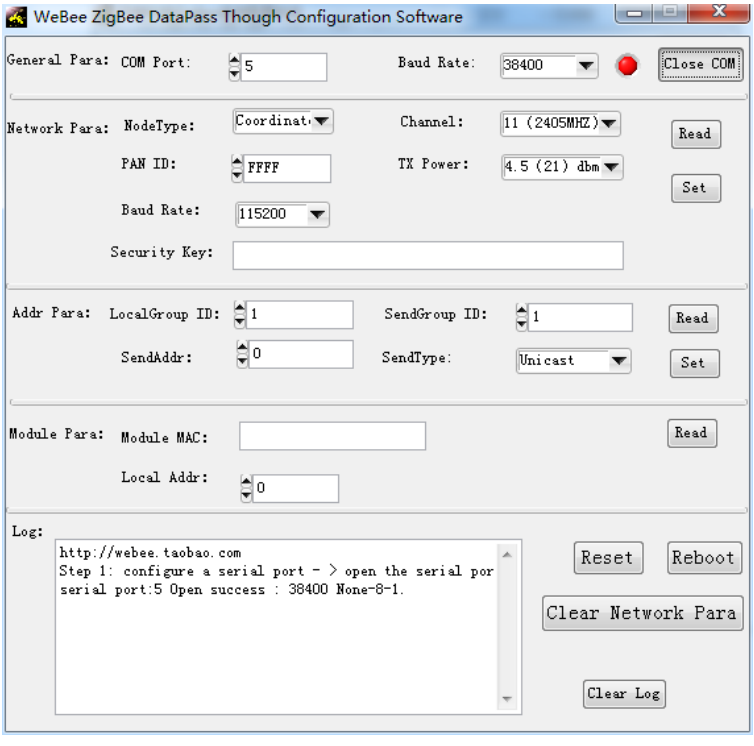
4. The PC software user guide

In addition to using the configuration command mode, you can also use a PC configuration software.

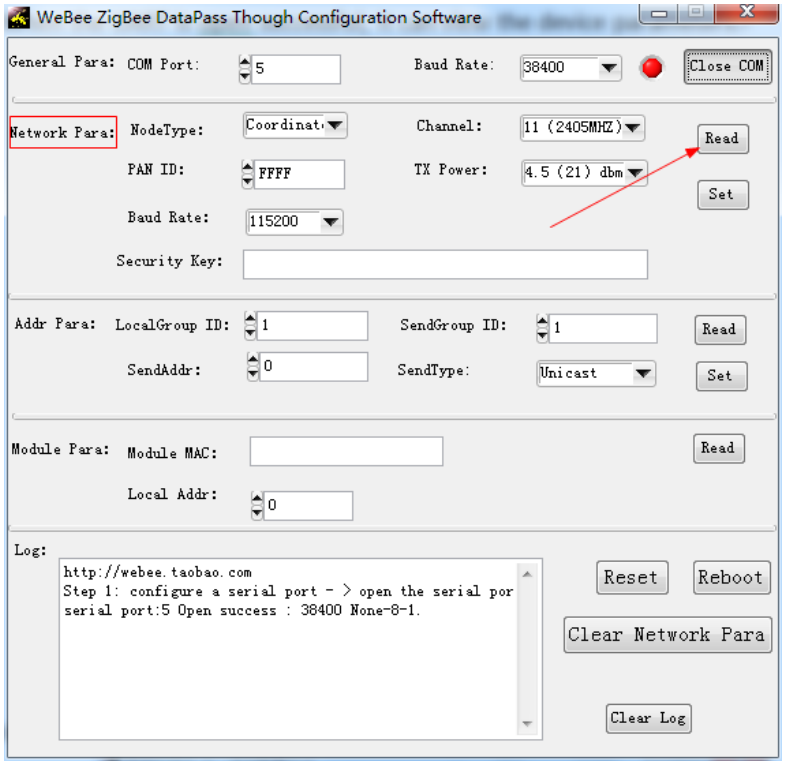
1. Install the software and open it ,as the follow picture shows



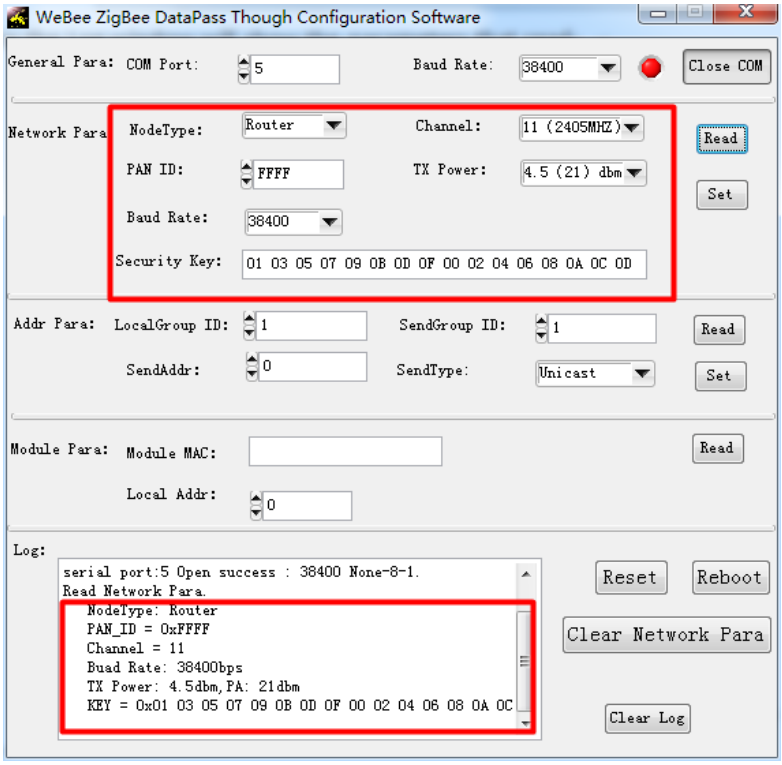
2. Configure the UART parameters and open it



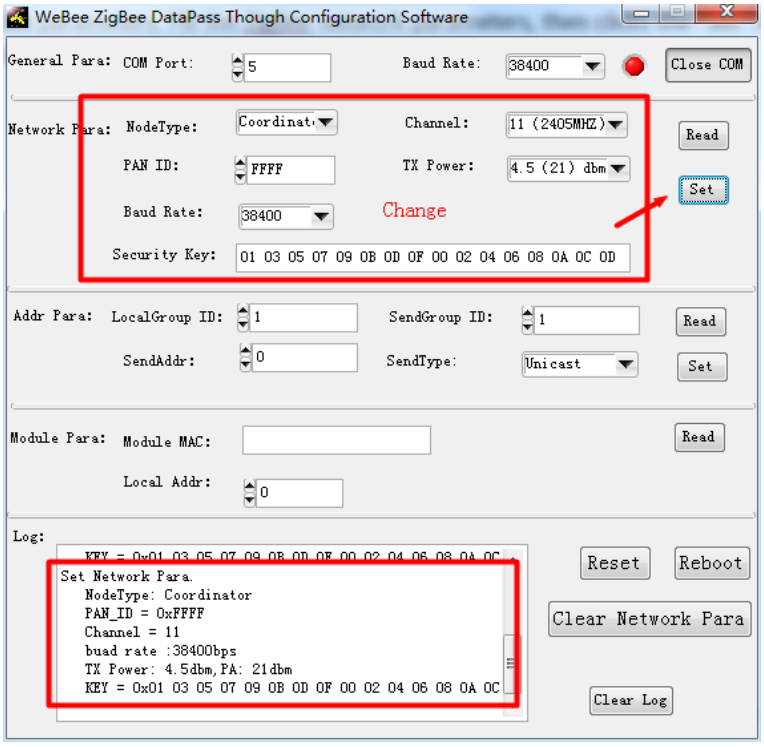
3. When the UART is open successful, It can view the device parameters.



4. In the Log window will show the parameters that read；



5. Set parameters. Fill the ZigBee network parameters, then clicks the “Set” button. It set successful, the Log windows will show the value that has set.

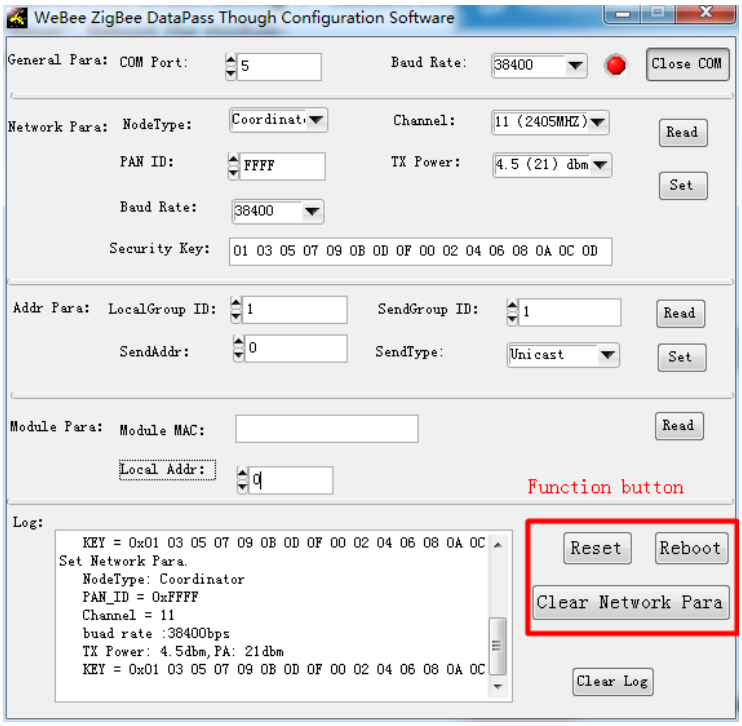


6. Function Button

“Restore the default setting”： Restore the default setting

“Reset”:Reboot the module

“Clear the Network Info”： Clear the device ZigBee network information.



Note: Also can use the “AT” command to operate.

5. Visualizing the process of ZigBee network

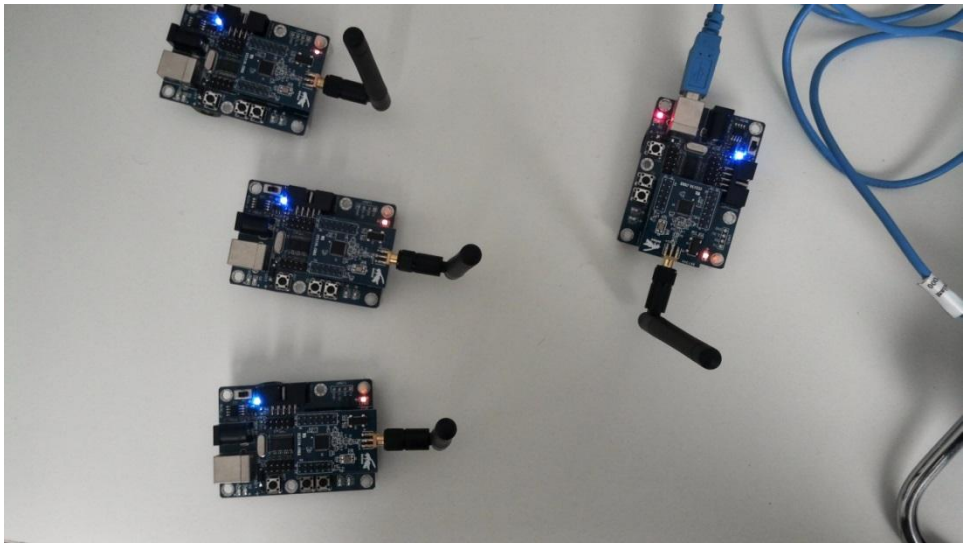
In order to visualize the process of ZigBee network building, Z-0001 set compatible with TI's Sensor Monitor software, through TI's Sensor Monitor software to monitor andtest the module's network connection,this module provides the function to get the current topology of network.

Firstly, connect the device to the PC via UART.

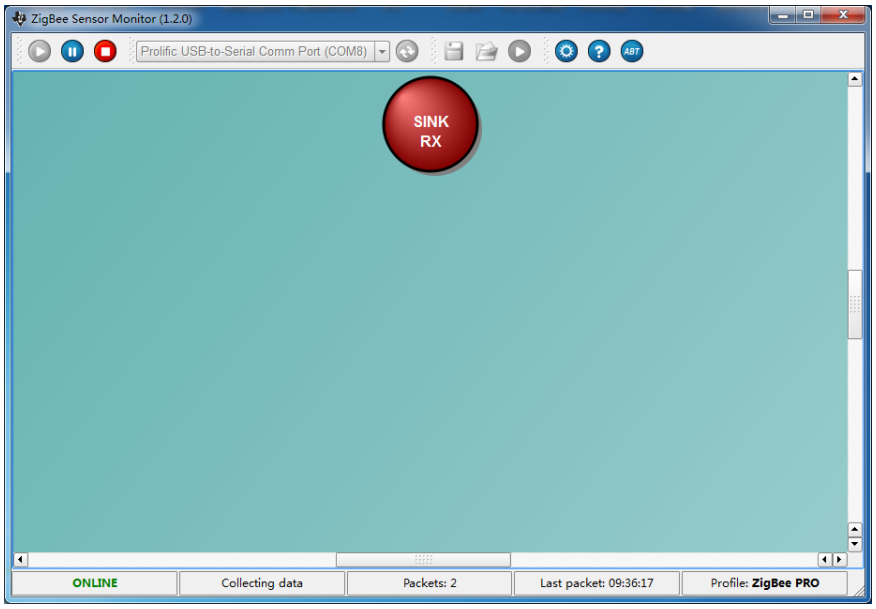
Secondly, install the Z-Sensor Monitor software.

Here is an example:

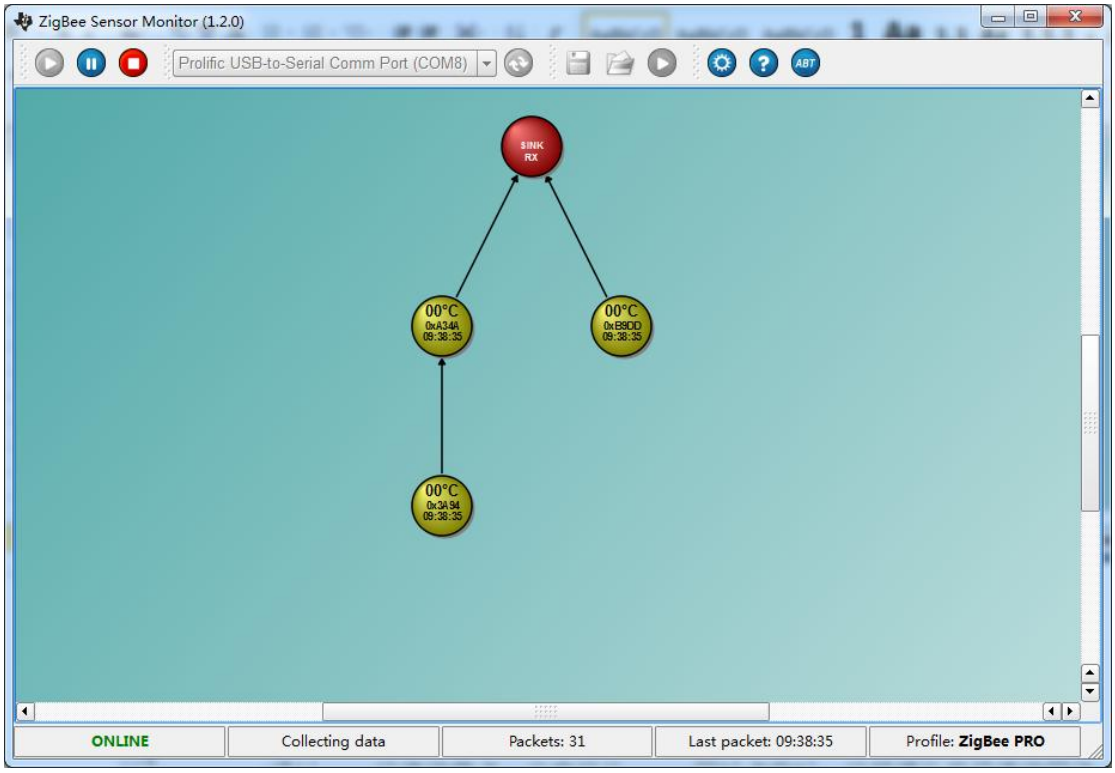
Use one coordinator modules and three Router modules,



Connect any one of them to the PC via UART. Open Z-Sensor Monitor and choose the right UART parameters



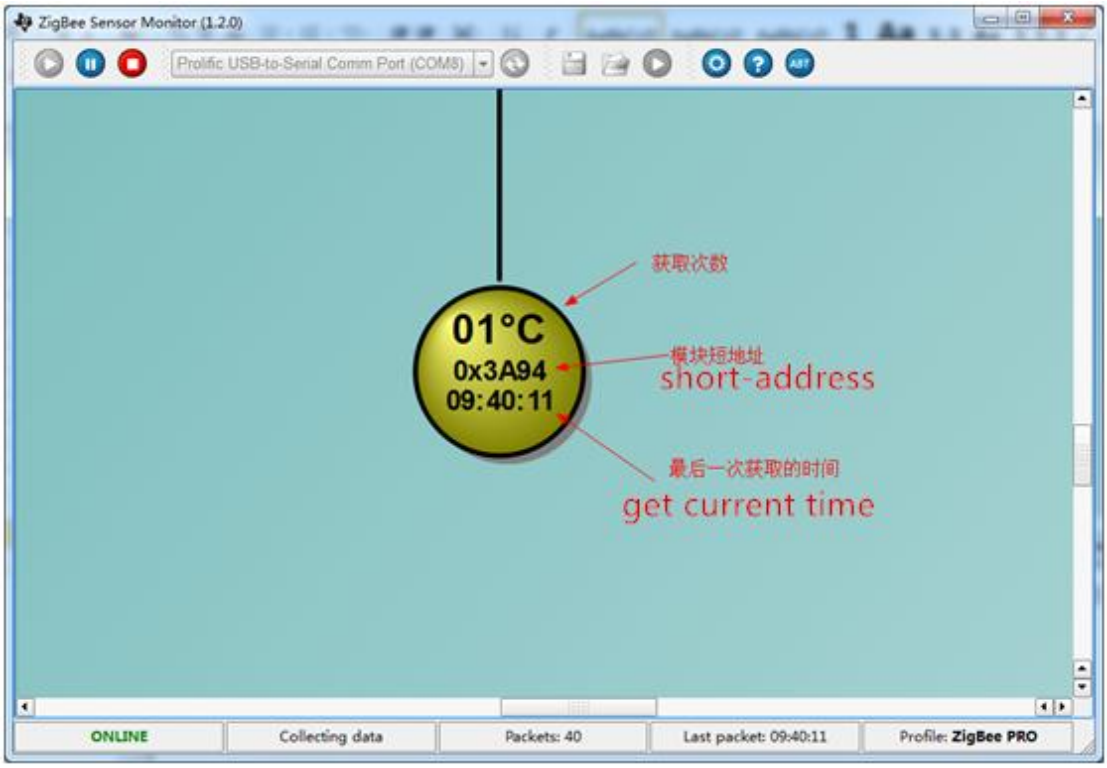
Pull down the P0.1 to the GND, then can get topology of network:



As the picture shows, the 01℃ means the count of getting topology of network,

“0x3A94” means the short address of the module,

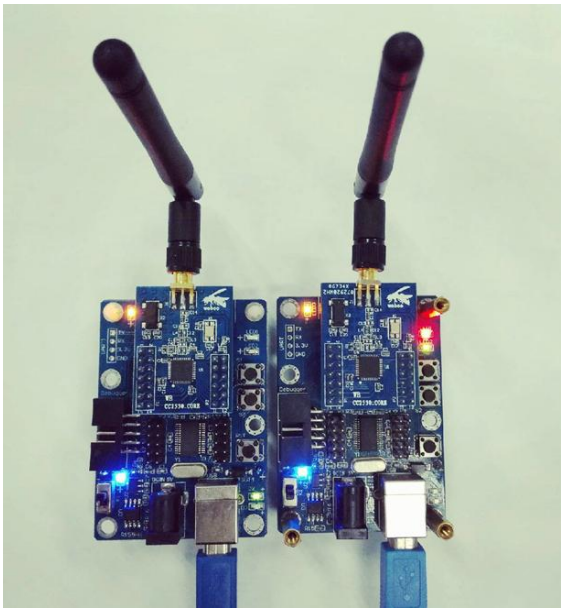
“09:40:11” means the time of getting topology of network.



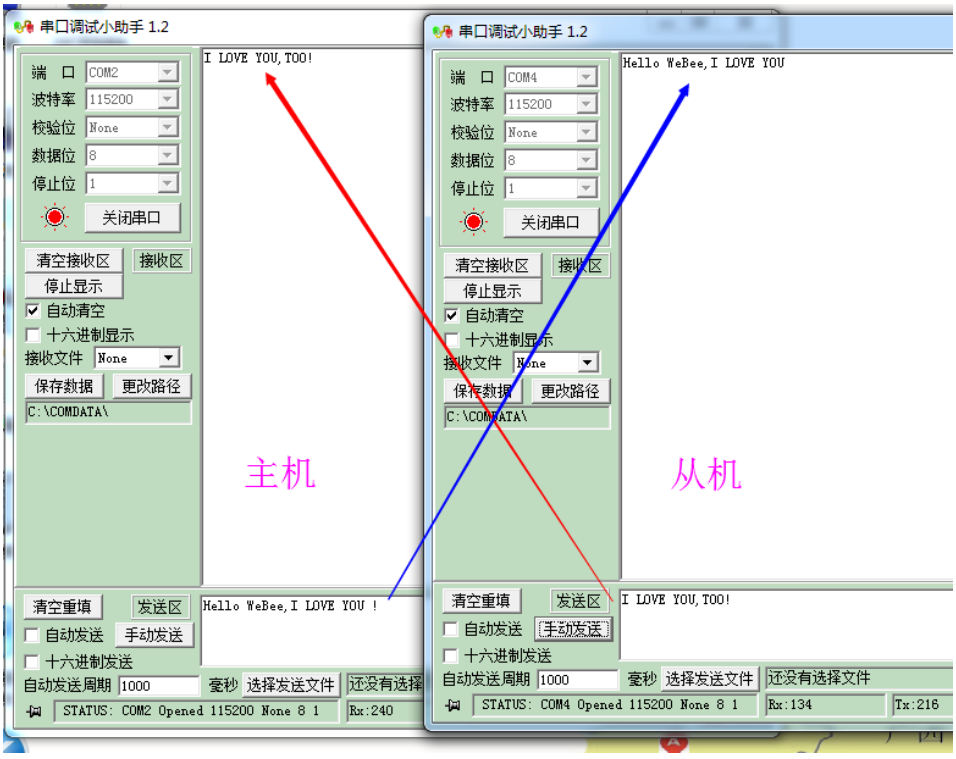
6. Zigbee Module's transparent Data transmission

Users can test transparent transmission between nodes and nodes via the ZigBee network quickly module.

1. Configureing two zigbee modules,one is Coordinator,another is Router.

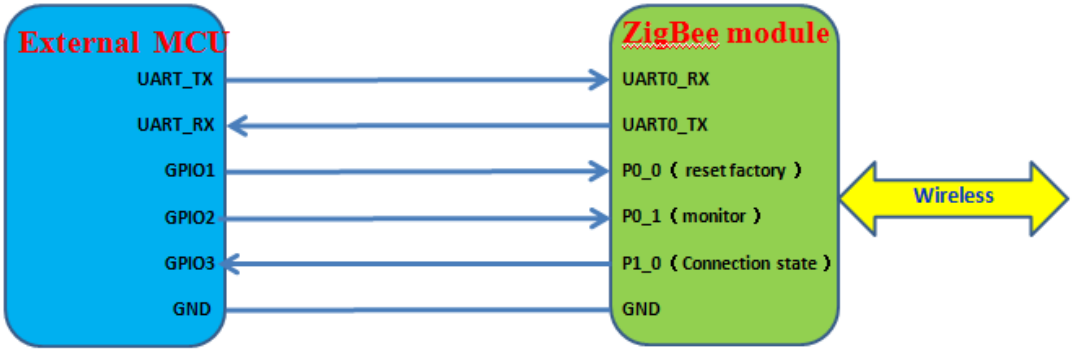


2. Open PC serial assistant,then setting the baud rate and the serial number, you can achieve serial module transparent transmission of communication in the ZigBee network.



7 The diagram of typical application circuit connection

The Z-0001 ZigBee modules are factory programmed firmware, users can use it as an ordinary common serial device.it can be transparent transmission data with a simple circuit。



ZigBee Typical application circuit